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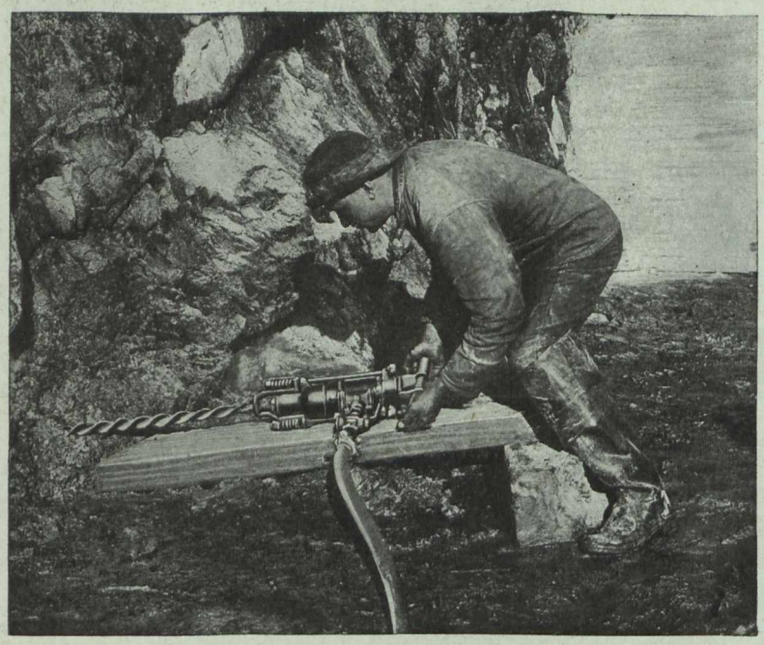

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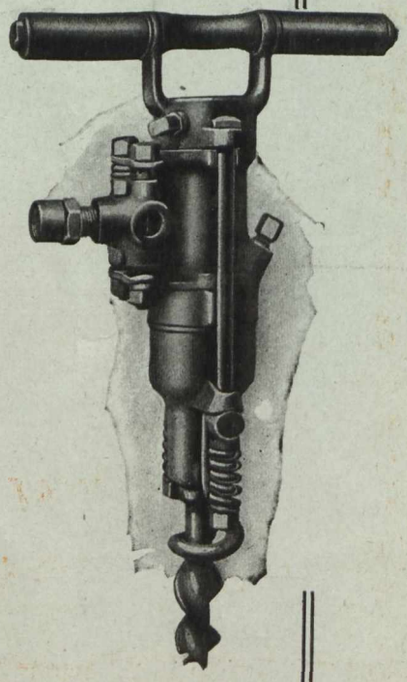

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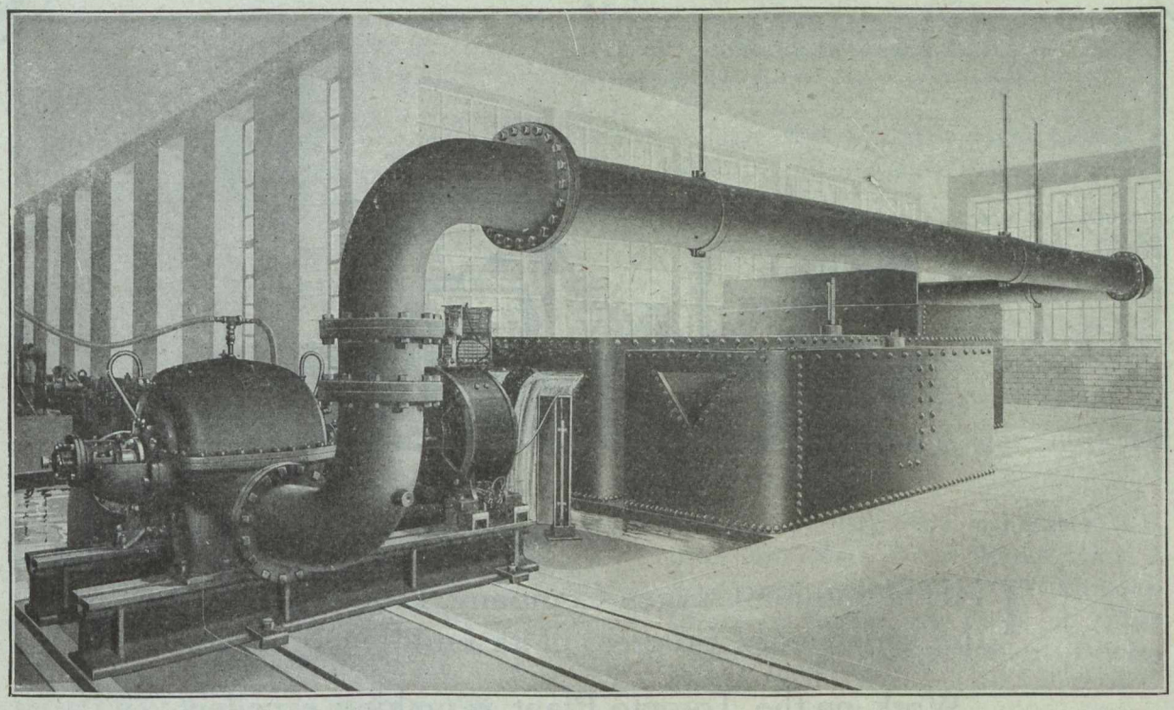

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Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favorable for the occurrence of minerals, 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver mines of Cobalt occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain Mines.

Practically all economic minerals (with the exception of coal and tin) are found in Ontario:—actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt and tale. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone sandstone , granite, trap, sand and gravel, meet every demand. Lime, Portland cement, brick and tile are manufactured within the Province.

Ontario in 1918 produced 45 per cent. of the total mineral output of Canada. Returns made to the Ontario Bureau of Mines show the output of the mines and metallurgical works of the Province for the year 1918 to be worth $80,308,972 of which the metallic production was $66,178,059.

Dividends and bonuses paid to the end of 1918 amounted to $13,359,210 for gold mining companies, and $74,810,521 for silver mining companies, or a total of $88,169,733.

The prospector can go almost anywhere in the mineral regions in his canoe; the climate is invigorating and healthy, and there is plenty of wood and good water. Hydro-electric power is available in many parts of the Province, and many undeveloped water-powers remain to be harnessed. A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 240 day's assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on loca-tion in surveyed or unsurveyed territory.

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Canadian Mining Journal

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EDITORIAL

PEAT FUEL IN CANADA.

The opinion of Professor Purcell of Dublin University upon the promising nature of the work done at the Alfred peat bog near Ottawa is one that is heartening because it is delivered by an authority on peat utilization. Professor Purcell's researches on the peat bogs of Ireland considered as a source of fuel have been published by the Department of Scientific and Industrial Research of Great Britain.*

Complaint has been made that the results obtained by the Peat Committee have not justified the time and money spent on experiments, and it is possible that one cause of this feeling is that too much, in too short a time, has been expected from the trials. The manner in which the problem of the commercial utilization of peat as a competitive fuel against the best coal in the world has been handled by the Peat Committee has excited the admiration of those who appreciate the technical difficulties, and it is has in particular called forth much commendation from workers on a similar problem in Great Britain.

Every peat bog is not a suitable source of peat-fuel. Writing in the "Journal of the American Peat Society," Mr. Herbert Garnett of Minneapolis assumes that fifty per cent of the failures of peat fuel projects can be traced to selections of unsuitable raw material, and he states that the knowledge required for successful peat technology includes such studies as botany, chemistry, geology and an intelligent understanding of the functions of mechanical maceration. Peat fuel is not an experiment today, provided the raw material is suitable. In 1919, in the United States, 76,301 tons of peat were sold valued at $860,841, which is less by 31,000 tons than the quantity marketed in 1918, in which year the value exceeded one million dollars.

If, as it is reported, the Alfred Bog has produced 20,000 tons of fuel, that is 20,000 tons to the good for Canada. The chief importance of the production of this by no means negligible tonnage of fuel lies, however, in the experience that has been gained. Facts have been learned concerning the suitability of raw material, its chemical and botanical characteristics, its physical behavior under the maceration process, and other things, trivial in themselves, but all important in their aggregate, that will many times repay any expenditure so far made.

It is not quite fair to quote Dr. Haanel's estimate of sixteen billion tons of coal-fuel equivalent in the peat bogs of Canada, unless it is qualified by particulars of the locality of the bogs, and the nature of their contents, but Dr. Haanel has most properly called attention to the tremendous potentialities of this fuel source, and no doubt his point of view—like that of all who urge greater development of our internal fuel resources—is that we can call nothing our own that we have not got in Canada.

We would suggest that if the Peat Committee had given more publicity to their trials and successes through the technical press it might have assisted in disseminating knowledge of a very justifiable expenditure of public monies, and of experiments that have much technical interest which the "Journal" would have been glad to have described in its columns.

While we believe that nothing that can be done in Canada in regard to the utilization of water-powers, peat-fuel, or lignite utilization can ever be more than palliations of a chronic fuel inadequacy in default of more intensive development of the bituminous coals of Nova Scotia, Alberta and British Columbia; yet every little helps, nor is any good likely to come of disparagement of any branch of fuel engineering. We need full development in Canada of every available and local source of heat and power, not forgetting the necessity for fuel economy, a vast and only partially explored field of endeavor. We recommend the attention of the university faculties of Canada to the opportunities that Canada offers to graduates in fuel engineering.

When the American Institute of Chemical Engineers was entertained in Ottawa a few weeks ago, each visitor was presented with a lignite briquette. We wonder how many of those present realized the historical significance of that gift?

*See "Journal," July 9th, page 572.

TRIPLE FATALITY USING OXYGEN BREATHING APPARATUS IN ABANDONED MINE.

Our British Columbia correspondent states that the Minister of Mines has instructed the Chief Inspector of Mines for British Columbia to follow any investigation that may be instituted into the death of three men using oxygen breathing apparatus who undertook to explore an abandoned mine filled with black damp situated in Washington State. The despatch from

Seattle reporting this occurrence stated that an inquest had not been considered necessary. In default of exact information regarding this disaster—for it is not less than that—it is not possible to comment, any more than to express the opinion that the occurrence should be investigated in every detail. The statement made that the cause of death was the lack of an adequate supply of oxygen in the apparatus is not in any sense an explanation. The mine is more likely to have contained carbon monoxide than the mixture of inert gases usually called "blackdamp." For the sake of the good repute of the oxygen breathing apparatus it is to be hoped that the United States Bureau of Mines will enquire into this most unfortunate accident, and give the widest publicity to its report thereon. Mr. Sloan has rightly apprehended the importance to coal miners of correct information on this unprecedented triple fatality connected with the use of oxygen breathing apparatus, and no man using these devices will be satisfied until he knows just how and why the fatal results were caused.

RELATIVE SAFETY OF GAUZES FOR MINERS' LAMPS.

Investigations by engineers of the United States Bureau of Mines, quoted in this issue, have shown that the greater the protection from air-currents given to the flame of the oil safety-lamp the greater the relative safety against ignition of inflammable mixtures of mine air. The double-gauze is to be preferred to the single gauze, and the bonneted lamp to the unbonneted. To Canadian readers an interesting suggestion is that the properties of monel-metal or nickel in lamp gauzes should be investigated. Steel wire was proved by the investigators to be preferable to brass or copper, but it has the objection of susceptibility to oxidation. Monel-metal or nickel having a higher melting point than steel, and not being subject to rusting even under severe conditions, would seem suitable materials, and would have unusual wearing qaulities.

RADIUM.

In view of the possibility that radium-bearing ores may be found in the pre-Cambrian rocks of Canada in sufficient percentage to allow of commercial concentration, the article published in this issue and extracted from "Chemical Age," on "The Business of Radium" shows how very specialized is the new industry of obtaining radium in a concentrated form. If radium ores containing the necessary quantity of radium element are found in Canada presumably the concentrate would be sold to parties in the United States possessing the necessary equipment to produce radium of high purity.

HARNESSING AUSTRALIA'S GREATEST RIVER

The "Industrial Australian and Mining Standard" of June 17th, contains an illustrated supplement which gives an account of a little known undertaking, namely the control and efficient distribution of the waters of the Murray River, the result of which will be a vast addition to the area of land capable of irrigation; security and regularity of water supply, establishment of new settlements; increased production, and the securing of a permanent navigable channel along the River Murray Valley of over one thousand miles in length.

The work, which when completed will cost £7,000,000, and will, it is believed make available for agricultural purposes a territory capable of supporting 5,000,000 people, is under the direction of a Commission composed representatives of the Commonwealth Government, and the three States interested, namely New South Wales, Victoria and South Australia.

The steel, concrete aggregate materials, and stone used in the construction of the impounding reservoirs, irrigation conduits, weirs and dams, together with the modern machinery for excavating and handling materials which are in use have provided an outlet for the growing steel industry of Australia, and for the utilization of local sources of concrete materials and granite, which are plentifully distributed.

To those who think of Australia as a land of heat and periodical droughts, there is pleasant surprise in reading of the snow-covered mountains that supply the waters of the great Murray River, and to read, in the advertisement of the Victoria Government Tourist Bureau, of the attractions of skating, tobogganning, and ski-ing in the Australian Alps, and of the mountain scenery and trout streams of the Grampians.

The endeavor of a sister Dominion to obtain the most efficient use of its natural resources arouses sympathetic interest in Canada, where our water-powers, so different in their physical and climatic characteristics to those of Australia, have always been a source of great solicitude and have seen much development; and are destined to be still more efficiently utilized.

COAL SHORTAGE AN OUTCOME OF DEFICIENT TRANSPORTATION.

Now that the real reason for the inadequate supply of United States bituminous coal coming into Central Canada is admitted by everybody to be deficient transportation, it may not be amiss if we recall that this fact was brought out and emphasised in the symposium of papers on the fuel problem read before the Canadian Mining Institute at the Annual Meeting in Toronto almost five months ago.

Mr. M. A. McInnis of Montreal in his paper on "Coal Transportation" pointed out that, under ordinary conditions of traffic movement, the province of Quebec was not badly situated in regard to coal sup-

ply, having, because of its superior transportation facilities, which apply both to the U.S. rail connections and the water-route for Nova Scotia coal, only seasonal difficulties to contend with in coal transportation.

"Our greatest difficulty in importing coal," stated Mr. McInnes, "occurs at what is known as the "Niagara Gateway. Canadian roads at this point are "unable to accept freight at the speed and in the "quantity offered by American roads. Ontario points "must take more coal by water, and adequate unload-"ing and storage facilities must be developed to allow "this to be done." "Transportation," emphasized Mr. McInnis, "is the weak link in the chain." Other papers in this symposium, which dealt with coal production in Alberta, Saskatchewan and Nova Scotia, made the same point. Unfortunately, no discussion took place on the group of papers, and the publicity which it was hoped to give to the fuel supply question was not obtained. Th desirability of full discussion and adequate publicity of the Institute's proceedings is now apparent, particularly when these touch upon matters of public policy.

While civil peace exists in North America there is not, nor can there be, any actual physical shortage of coal. The capacity of the bituminous coal mines of the United States and Canada has never been tested. Few who know the facts will dissent from the statement that if the collieries in the United States and in Canada worked to their full output capacity they could produce bituminous coal at the rate of one thousand million tons annually.

The Canadian Manufacturers' Association, some two years ago, appointed a standing Fuel Committee, primarily with the idea of fostering the production of coal in Canada, and educating the public to the necessity of lessening, as far as that may be found possible, Canada's dependence on the United States for bituminous coal supply. In this respect the C.M.A. has shown the way to the Canadian Institute of Mining & Metallurgy, a body not less interested in securing a less hazardous supply of a commodity without which neither mining nor metallurgy could be carried on. Is not the Institute a fit and proper body to advise the Government as to the best means to bring about stability in our coal supply? The suggestion is made that the Government of Canada would probably welcome counsel and aid from the Council of the Institute—as did the Government of the United States welcome assistance from a sister society under like circumstances—in regard to a problem that will bother our children as much, if not more, than it bothers this generation.

We believe the fuel problem presents to the Institute not only an obvious opportunity for usefulness, but a pressing patriotic duty. Following up a previous suggestion, if it should be that the Government at Ottawa sees the necessity to establish a permanent body to work out a solution to the problem that is actually our chief national handicap, the co-operation of the committee of the Manufacturers' Association with a committee of the strength and ability that the Institute could produce should provide that multiplication of counsel in which wisdom is reputed to reside.

GRAPHITE IN CANADA.

Report No. 18, Graphite, its Properties, etc., by Fritz Cirkel, has long been out of print and there has been much enquiry for an authoritative publication on graphite occurrences in Canada which is now met by the publication by the Mines Branch of a monograph by Hugh S. Spence that deals with the history, occurrence, mining, concentration and uses of graphite, all with particular reference to Canadian resources.*

The production of graphite in Canada in 1919 was, with the exception of 1911, the smallest recorded since 1909. Inasmuch as graphite was one of the "war minerals" this was to be expected, but considering the demand for the mineral, which to quote the export, "is employed in so many branches of industry that the supply can hardly meet the demand," if concentration methods can be devised to take full advantage of the comparatively high graphite content of Canadian ores, the industry should prove permanent. The Report states the opinion of prominent New York graphite importers, that Canadian crucible flake graphite in order to compete with the American graphite market when normal conditions are restored, will have to be produced at a price of about five cents per pound.

*Graphite, by Hugh S. Spence, Mines Branch Report No. 511, 1920.

LIMITATIONS OF GOVERNMENT ASSISTANCE TO A MINING ENTERPRISE.

Tin-mining in Cornwall reaches back to the beginnings of British history, but recently the industry has fallen on evil days. By a process that is becoming natural and well-recognised in mining circles the suggestion has taken form that rehabilitation of the industry could be effected by consolidation of operation of the mines, which would enable modern machinery to be installed and economy in crushing and concentrating of the ores. The Board of Trade was asked whether, in the event of such a consolidation being undertaken, which would involve the raising of new capital, the British Government were prepared to assist by a loan.

The reply of the board of Trade is interesting as stating in clear terms the extent to which a government is justified in granting monetary assistance to

a mining industry, and is, in essential part, as follows:

> "Though more economy in working costs might be secured by a scheme of amalgamation, it appears to be clearly established that the only possibility of the maintenance of some of the Cornish mines on a remunerative basis lies in the discovery of new lodes as the result of development work; but it has been definitely stated by those concerned that it is not possible for them to raise any of the capital necessary for such development. His Majesty's Government fully appreciate the difficulties in which the industry is placed and the unfortunate consequences which may follow the closing down of the mines, but, after carefully reviewing all the circumstances, in view of the present position of the national finance, the unwillingness of private enterprise to invest further capital in the undertakings in question and the uncertainty as to whether any development work is likely to place the industry on a permanently sound basis, His Majesty's Government regret that they do not see their way to ask this House to vote financial assistance in this case."

It does not necessarily follow, however, that the refusal of government aid will mean the closing of those tin mines that possess intrinsic value.

BOOK REVIEW.

MINES AND THE SPECULATIVE INVESTOR. J. A. Gallard. Publisher, Walter R. Skinner, 11-12 Clements Lane, London (Eng.). Price 7s 6d, 63 pp. Linen Boards.

This little book is the collection of a series of articles which originally appeared in the "Financial Times" of London from the pen of Mr. Gallard, the Mining Editor of that paper for seventeen years, and is intended as a guide to the mining share markets for the non-technical investors.

Mr. Gallard notes that recent years have seen a considerable addition to the ranks of those who participate in Stock Exchange operations with the object of increasing their capital. The reason for this development on a scale in excess of ordinary appears to. lie in the increase in the taxation of incomes Whereas in years gone by many people were content to invest their capital to yield them an income from dividends, the tendency of late has been to purchase shares in the hope of capital appreciation rather than for dividends since the former is not taxable.

The book has been prepared with the laudable object of elucidating the salient features of mining operations and methods of mining finance for the benefit of those "who being neither mining engineers nor mining financiers, have, so to write, only a casual acquaintance with mines and mining companies."

"Almost invariably" states the author, "mining share operators—at any rate among the public—are optimists, and many of them seem to have accentuated imaginative faculties; otherwise it would be difficult to account for the values placed on some shares from time to time. 'While there's life there's hope' is evidently a favorite motto of the speclulative investor in mines." Mr. Gallard is to be congratulated on his restraint.

The scope of the book is indicated by the chapter heads, which include such subjects as "Prospects and Mines," "Factors in Valuing Mines," "Ore Reserves," "The Life of a Mine," etc.

The chapter on "Engineers' Reports" includes a quotation from Mr. Walter McDermott regarding "old friends we meet in numberless reports, which seem to need a little protection against excessive wear and tear," to wit.

a. A true fissure vein
b. Increasing width in depth
c. Increasing richness as depth is attained
d. Junction of veins
e. Ore in sight
f. Proximity to a rich mine
g. Failure from mismanagement

Mr. McDermott's penetrating comment on the correct and incorrect use of these familiar phrases is good reading.

Mr. Gallard pleads for more publicity of the affairs of mining companies, and with regard to periodical reports and statistics, correctly assumes that "if statistics are not provided the shareholders will know the administration is not anxious to be closely examined."

The author has had twenty years' experience of the journalistic side of mining and connection with the Stock Exchange, and his conclusions appear to be that the chief hindrance to mining investment and reputable mine promotion is lack of accurate publicity, a great part of which he attributes to the apathy of shareholders.

The opinions expressed with regard to the profitableness of re-opening old mines, the usefulness of finance and exploration companies, and the good results of amalgamation and reconstructions, are not enthusiastically favorable.

BRITISH FUEL ENGINEER FAVORABLY IMPRESSED BY ALFRED PEAT BOG.

Profesor Pierce F. Purcell of Dublin University, says that the Alfred peat bog near Ottawa gives the greatest promise of commercial success of any plant he has ever seen. The enterprise is at present in the experimental stage. Up to the end of 1919 the scheme had cost about $110,000, the expenses being equally borne by the Dominion and Provincial Governments. Last year twenty thousand tons of peat were turned out, finding a ready sale in Montreal and Ottawa. The price in the latter city is $6 per ton.

PERSONAL.

Mr. H. Mortimer Lamb, the Secretary-Emeritus of the Institute, is fruit-farming at Burnaby Lake, near Vancouver City, and is much benefited in health by outdoor occupation. Mr. Lamb has recently been appointed Secretary of the British Columbia Division of the Institute, taking the place of Mr. Charles Camsell, the Deputy Minister of Mines, now resident in Ottawa. Mr. Lamb is still, as always, interested in advancing the welfare of the Institute and increasing its activities.

Relative Safety of Gauzes for Miners Lamps

Requirements of the United States Bureau of Mines Covering Flame Safety Lamp Gauzes — Description of Test of Steel, Brass and Copper Fabrics — Steel is Superior for High Temperatures — Comparative Efficiency of Various Lamps.

Flame safety lamps have been used for about one hundred years in coal mines where a dangerous accumulation of explosive mine gas (methane) might occur, and thus render the use of ordinary unprotected flame lamps dangerous. Flame safety lamps are not only used for illumination, but also for detecting the presence of dangerous percentages of methane mixed in the air of the mine.

The safety of the lamp depends chiefly upon the cooling qualities of the wire gauze used to permit free circulation of the air through the lamp. If one enters a part of the mine where methane is present in the air, the methane enters the lamp and, coming in contact with the wick flame, is ignited, and continues to burn within the gauze without igniting the methane surrounding the lamp. If the air within the mine is travelling at a velocity of several hundred feet per minute the burning gases may be driven through the gauze by the air current. If the gauzes are properly designed and of the proper material these burning gases will be so cooled as they pass through the gauze that they will not cause an ignition of the gas surrounding the lamp. In order to test the effectiveness of a given safety lamp, tests are made in moving explosive mixtures of gas and air arranged to simulate mine conditions.

The Bureau of Mines investigated many features relative to the safety of flame lamps, and in 1915 established an official schedule known as "Schedule 7," whereby flame lamps having certain prescribed qualifications would be approved as permissible for use in gaseous mines.

Among the schedule regulations are the following requirements covering flame safety lamp gauzes:

"The lamps must be provided with double gauzes or with some other adequate arrangement serving the same purpose. Every gauze must be of steel or best charcoal annealed iron wire of not larger than 27 Brown and Sharpe gauge (0.014 inch in diameter), with 28 meshes to the lineal inch (784 to the square inch), nor less than 29 Brown and Sharpe gauge (0.0125 inch in diameter), with 29 meshes to the lineal inch (841 to the square inch)."

Frequently the use of brass or copper as a flame lamp gauze fabric was advocated, and one company thinking that the kind of material had no bearing on safety, without notifying the Bureau, substituted brass for steel in lamps stamped with the Bureau's approval.

The gauze specifications outlined above, relative to material and construction, were, in the main, based upon European experience and practice and upon reports of European investigations.

The purpose of the investigation herein reported was to conduct a limited number of check tests in order to determine to what extent European result should apply to American types of flame lamps and, consequently, whether or not the present gauze specifications of Schedule 7, needed revision.

The selection of gauzes for the tests included steel, brass and copper. Steel is used quite widely in the American type of flame safety lamps, used in general service, brass has been used to some extent for lamps designed for the use of officials and inspectors, and copper has been used by surveyors because of its non-magnetic properties.

The tests chiefly involved the subjecting of the lamp, equipped with one of the several gauze materials under investigation, to currents of explosive gas and air moving in a horizontal direction, the lamp being suspended in the path of the air mixture. The lowest probable velocity at which an explosion would result was ascertained for each gauze material. This data was secured with respect to the several types of lamps and with respect to different percentages of gas in the air mixture. Tests were likewise made using the same gauze in successive trials to determine the effect of oxidation as affecting the safety of a given gauze material. Physical measurements were made to check the dimensions of the gauze material used, and measurements were made of some of the gauzes before and after tests to determine the charge in physical condition due to oxidation. The tabulated results of the tests can be obtained on application to the U.S. Bureau of Mines.

The behaviour of the different gauze fabrics has, in a general way, checked the results obtained by foreign investigators. When the differences in the materials tested, together with possible differences in the test conditions are considered it is remarkable that these results, in so many cases, follow so closely the conclusions of European investigators.

For conditions of high temperature, steel proved superior to either brass or copper. For low temperatures, the advantage of steel over brass or copper is small. Brass or copper might be preferred by some, although one who knows the insecurity of such gauzes at high temperature might be unwilling to trust them even though the probability of high temperatures was remote.

Brass proved more satisfactory than copper. However, it should be remembered that the brass gauzes tested were of a good quality material, having a high proportion of copper and, therefore, may have given much better results than would have been obtained with some other brass.

In concluding the tests on the gauze fabrics under various possible conditions of service, there were certain points brought out very forcibly with respect to the comparative safety of different types of lamps. The least safe of all the lamps tested is the single gauze unbonneted lamp of the Davy type. In fact when compared with a bonneted lamp of modern design it should not be classified as a safety lamp. The condemnation of the Davy lamp as a safety device for present day conditions does not belittle the great work done by Davy. On the other hand almost every modern lamp uses for its protection principles advocated by Davy.

*By L. C. Islsey (Electrical Engineer, Bureau of Mines), and A. B. Hooker (Junior Electrical Engineer, Bureeau of Mines).

The double gauze unbonneted lamp is somewhat safer than a single gauze lamp, but not dependable in high velocity air mixtures.

The single gauze bonneted lamp proved safer than either type of unbonneted lamp, the omission of a gauze being more than offset by the bonnet.

The safest lamp tested was the double gauze bonneted lamp. In such lamps there is the protective features if the single gauze bonneted lamp, with an additional safety or another gauze in case either gauze of a pair should become damaged in any way. (Although in this investigation the Hailwood combustion-tube type of lamp was not tested, previous tests by the Bureau have shown it to be equally safe as compared with a double gauze bonneted lamp of the Koehler type).

One object of the investigation was to determine whether the gauze specifications of Schedule 7 needed revision. The results indicated that present specifications, while perhaps not sufficiently detailed, were laid on a sound foundation and a lamp meeting these requirements would have a high standard of safety. It may later be deemed best to permit the use of brass gauze in bonneted lamps, but until the subject is investigated further that schedule lamps only should be admitted as permissible for use in gaseous mines could well be added as a step toward greater safety.

The possibility of using monel-metal or nickel for flame gauze has been suggested, since these materials have a higher melting point than steel, have about the same heat conductivity and resist oxidation at atmospheric and high temperatures. Whenever time permits these materials should be investigated.

SOME SOURCES OF HELIUM IN THE BRITISH EMPIRE

Early in 1915, Dr. J. C. McLennan, head of the Department of Physics in Toronto University, was requested by the Board of Invention and Research, London, to investigate the helium content of the various natural gas supplies within the Empire, it having been suggested that if a sufficient supply of helium gas could be obtained it would prove more suitable than hydrogen for use in lighter-than-air flying machines, owing to its inert character. The British Admiralty has authorized Dr. McLennan to make public his investigations, and the manuscript being offered by him to the Mines Branch for publication, on the recommendation of Dr. A. W. G. Wilson, the engineer in charge of investigation of chemical industries it has been published as Bulletin No. 31 (publication number 522). The Bulletin has several sections, the larger one dealing with the helium content of the natural gases of Canada. Section 2 is devoted to determinations of the radio-activity of the natural gases of Canada, and other sections deal with helium contents of natural gases from New Zealand, from various localities in England and with a gas from Pisa, Italy.

Dr. McLennan's investigations, which involved some new departures in physics, and the designing of new apparatus, have demonstrated that the natural gas from the Bow Island district of Alberta contained the highest percentage of helium observed in any of the natural gas samples tested, and these included every known source in Canada, and in addition the outside localities previously mentioned.

The possible uses of helium are only just commencing to be discovered, but in addition to its use in aeronautics, it is suggested for use in gas-filled incandescent lamps and gas arc-lamps.

Dr. McLennan in his preface states:—"The solu-"tion of the problem of producing helium in large "quantities was, before the beginning of the war, one "which would have been considered by many vision-"ary and chimerical, but through the enthusiastic "support and financial aid received from the British "Admiralty, and from the Bureau of Mines and Naval "and Air Boards, Washington, the possibility of pro-"duction on a large scale has been realized."

Incidentally, the Report is an excellent survey of the gas wells of Canada, and is fully illustrated by maps showing the petroleum and gas wells, and pipe lines established in producing districts.

Dr. McLennan's Report records a distinct scientific achievement, with very practical results in application. The prominent part taken in the investigation by Canadian workers is a matter for legitimate pride, and from this standpoint, as well as because the investigation has established the existence and availability of an entirely new natural resource in Canada, the Mines Branch has done well to give the Report to the public.

EXPLORING FOR RADIUM ORE IN BUTT TOWNSHIP

Last summer the annuouncement that pitchblende, an important ore of radium, had been discovered in Butt township, Ontario, caused a number of prospectors to visit the area. Several claims were staked, but comparatively little work was done on these claims because the most promising discoveries were still undeveloped. A number of the claim owners did some exploring work, but most of them have been unable to raise funds to thoroughly test the properties.

There being so little information available to prospectors for radium, it is not surprising that they are anxiously waiting for the results obtained when the known deposits are opened up. It is stated that some of the claims are now being thoroughly explored. If good results are obtained in developing one deposit, there should soon follow vigorous prospecting throughout the area.

The formations in which the pitchblende occurs in Butt township are not of a type that the Northern Ontario prospector regards highly. The rocks are granite and diorite gneisses. The pitchblende occurs in dykes of coarse pegmatite that cut the gneiss. Prospectors for precious metals in Ontario have had little cause to value highly such pegmatite dykes. In Eastern Ontario some such dykes yield feldspar or mica in commercial quantities, but the Northern Ontario prospectors cannot be expected to do much work on such dykes until one of them is proven to contain appreciable quantities of precious minerals. It is to be hoped that the results of development of the Butt pitchblende deposits will be satisfactory for it is very likely that there are many such deposits in Ontario.—R.E.H.

The Kingston Smelting and Refining Company, Limited, has been granted incorporation by the Ontario Government with power to lease or purchase mines and to engage in a general mining and smelting business. Among the incorporators are Alexander MacKinnon of Kingston and E. D. Chaplin, J. M. Israel, J. P. Aguayo and V. S. Gavito of New York. The authorized capital is $200,000.

The Business of Radium

By HAMILTON FOLEY,
Standard Chemical Co., Pittsburgh, Pa.
(From "Chemical Age.)

The United States is the foremost radium producing country in the world. This ascendency has been gained notwithstanding that five hundred tons of American ore is required to produce the one gram of radium that has been obtained from five or six tons of European ore. A gram is about a thimbleful.

The recovery is made with regularity and precision. In the different steps in the process and in even the most general statement of the difficulties that have to be overcome, there is a new chapter of American contribution to chemical progress. There is also much to show why the market price of radium is $120,000 a gram.

The radium ore fields of the United States are in the southwestern part of Colorado and south-eastern Utah. They cover a territory of about eight hundred square miles. This district is about sixty-five miles from any railroad and so mountainous that in many places there is a rise or fall in the local trails of two thousand feet in a mile.

Prior to the World War carnotite ores from these Colorado deposits were shipped abroad for French and German production of radium on a small scale. The embargoes on shipping stopped this export completely, although it had been falling off in quantity.

The recovery of radium in this country, as a commercial proposition, began in 1911, when the Standard Chemical Company, of Pittsburgh, was organized by Joseph M. Flannery, for the express purpose of mining carnotite ores and producing radium. Up to the present time it has produced almost one-half of the estimated supply of radium in existence.

Transport of Radium Ore.

The infinitesimal radium content of the ore, making necessary the handling of enormous volume and weight of ore, the remoteness of the deposits from civilization and the long freight haul from Colorado to Pittsburgh, enforced efficiency methods to a high degree. Pack animals transport the hand-sorted ore in 100 lb. bags from the various chains to the concentrator. Here high grade ore is separated from ore of quality uneconomical to remove as such from the ore district. Milling reduces 500 tons of the hand-sorted ore to 125 tons in a pulverized condition, containing about 4 per cent of uranium oxide. The concentrate in 100-lb bags is transported by wagon, train or motor truck 65 miles to a railroad at Placerville, Colo.; thence 2,500 miles to Canonsburg, Pa., near Pittsburgh, where the Standard Chemical Co. operates a reduction plant for the recovery of the radium, uranium and vanadium.

The vanadium finds a ready sale as an alloy for high speed tool steel and the experimental work being done with it as an alloy for use in other classes of steel suggests that it may be more generally adopted.

Reduction.

The chemical treatment of carnotite concentrates at Canonsburg, involves greater difficulties than the collection and first concentration of the ore. In part these difficulties inhere in the treatment of an exceedingly finely divided material; in greater part, they involve working out efficient processes for the recovery of a material present in so small a proportion as one part in a hundred million, this being, approximately, the concentration of the radium in these concentrates. As they are further reduced chemically these concentrates yield what is called "raw sulphate." This consists, essentially, of silica together with sulphate of radium, barium, calcium, iron and aluminum. After freeing this mass from impurities and transforming to a soluble salt, there is obtained a soluble radium chloride.

Plant Control.

The reduction plant keeps trace of the minute modicum of radium in the ore in process of reduction by the application of the most refined scientific measurements known. These measurements make it possible to know just where and in what quantity the radium is at all stages of the work. Remembering that when it reaches the reduction plant there is only one portion of radium for very hundred million portions of ore and that if this small quantity is not watched for very closely it may be lost and with it all the expense that has attended the shipment of five car loads of ore all the way across the continent, the details by which it is followed may not be without interest. Every day the reduction plant sends to the laboratory at Pittsburgh, samples of each batch of ore it is proposed to handle for the first time that day, samples of each batch of ore in each stage of the reduction process and samples of each batch of residue it is proposed to discard. Chemists reduce these to solution. If there be any radium in any or all of these solutions it will generate the gas known as radium emanation. Inasmuch as this emanation emits the rays emitted from radium and as these rays carry electrical energy, each sample in turn is placed in an electroscope so the electrical energy it may liberate may be ascertained.

The electrical energy from equal quantities of radium is always the same by comparison, therefore, of the electrical energy obtained from any one of these samples with that obtained from a known quantity of radium, it is a matter of accurate calculation to know the quantity of radium in the batch of ore represented by the sample.

While scientifically trained minds know that the emanation from a gram of radium is not larger in volume than the head of a pin, it may surprise some readers to know that the measurements described detects with extreme accuracy quantities of radium as small as a billionth of a gram, or one five hundred millionth of a pound avoirdupois; and that such extremely minute measurements are made not once, but sometimes twenty and even thirty times a day in the laboratory of the Standard Chemical Company.

Radium Products.

In the form of radium barium chloride the one-half ton of concentrates that is left after the Canonsburg reduction plant has eliminated the rest of each mass of five hundred tons of ore, is brought to the laboratory at Pittsburgh. Here by successive fractional crystallizations of the radium chloride, and at a later stage, of the bromide, most of the radium is obtained in a salt containing over 90 per cent of pure radium

bromide. A second or smaller amount of radium in the form of a salt of five to ten per cent purity is also obtained. By further chemical treatment the bromide is converted into the sulphate or the chloride and in the therapeutic use of radium these two salts find the largest use. The lower grade material, because of greater ease in handling and weighing out small portions with a definite radium content, finds use in the commercial world in the manufacture of the radium luminous compound more popularly known as luminous paint.

Volume of Production.

The first radium obtained in the United States was obtained in 1913 in the laboratory of the Standard Chemical Company. Since then the production of this company has been as follows:

	Grams (Radium Element)
1913	2.1
1914	9.6
1915	1.7
1916	5.0
1917	7.0
1918	13.6
1919	11.8
Total	50.8

Writing of the production of radium by this company, a scientific writer has recorded the opinion that:

"In the midst of industries whose output is measured in thousands or millions of tons, an industry whose total output in nearly five years is about one ounce, is likely to seem small, yet this production of radium by the Standard Chemical Company of Pittsburgh is the most notable in the world. This is more than a third of the estimated stock of the world's high purity radium, and to the efforts of this one company belongs the credit of starting and so establishing the manufacture of radium from low grade ore so that the medical and scientific professions may count upon an ever increasing supply."

In the ore fields the Standard Chemical Company maintains a force of several hundred men. Nearly as many are required at the plant at Canonsburg. In the laboratory at Pittsburgh there is another large staff. The activity of all of these men is necessary to make it possible for the radium in any quantity of ore to be obtained about three months from the time the ore was first mined.

Radium Standards.

Radium preparations in the United States are spoken of and measured in terms of radium element. Until recently European scientific men have adhered to the term radium bromide. Crystalline radium bromide when pure contains only 53.6 per cent of radium element. This fact and the method of measurement of radium preparations in Europe prior to the adoption of an international radium standard, had not a little to do with the earlier unsatisfactory work with radium. There was no common standard. The original method of measuring radium, consisted in comparing its activity with that of uranium. During the fourteen years this system of measurement prevailed scientific men spoke of radium as "two million times more active than uranium." Trained minds, of course, understood that what was meant was that the quantity of electrical energy emitted in the rays of the radium, small though it was, was two million times greater than that contained in the rays from uranium. Such a ratio of comparison was entirely unsuitable for use especially with small quantities, and about 1912, by common consent, Madame Curie was asked to prepare what would be an international radium standard. This is deposited at Paris. Duplicates are in the leading capitals of the world, and radium preparations are now measured by comparing the electrical energy carried by the gamma rays from the preparation to be measured with the energy carried by the gamma rays of the international standard, or one of the certified duplicates of it. In 1914, the United States Bureau of Standards at Washington obtained a certified duplicate of the international radium standard and practically all quantities of radium in this country have been measured by comparison with it.

Uses of Radium.

In the industrial world interest in radium has always been limited by the small amount available. This was especially true of the ten years following its discovery. During that period some attempt was made to use the action of radium in causing a spontaneous and continuing luminescence in substances such as zinc sulphide, to make what is called luminous paint. In the United States attempts were also made to manufacture a similar product, but prior to 1913 this effort was practically negligible.

Radium and radium minerals are not generally luminescent. Tubes containing radium glow from impurities present which the radiations from the radium cause to give light. The World War created a most unexpected demand for radium. The necessity of illumination that would not betray presence to the enemy in the various branches of the fighting service made radium luminous material the most satisfactory and dependable light. The demand for the luminous watch dial alone raised one use for this material to a fair-sized industry.

Radium Therapy.

Therapeutically, there has been a gradual and steady increase in the use of radium since 1912. With this increased demand the production of radium has kept pace. The earlier over-enthusiastic statements of the value of radium in the treatment of cancer have not been wholly confirmed and radium is far from being the panacea in the treatment of diseases. Nevertheless the use of radium in certain types of advanced inoperable cancer gives palliation by the relief of pain and freeing from foul smelling discharges. This degree of palliation can be attained by no other treatment and, if used for this purpose alone, radium would be considered invaluable. In other types of cancerous growths radium has produced cures and surgeons throughout the world are gradually admitting that radium is a necessary adjunct in the treatment of cancer, giving in some cases more satisfactory results than any other treatment.

TAR SANDS RESERVED ALONG ATHABASCA RIVER.

An Order-in-Council reserves the lands along the Athabasca containing the tar sand from sale, settlement or other disposal, the Order being based upon a recommendation made by Mr. Meighen when he was Minister of the Interior.

The Government's action is taken to indicate that some means of utilising the tar sands has been worked out, or that a solution of the problem of concentration is in prospect.

REVIVED INTEREST IN COAL MINING IN INVERNESS CO., CAPE BRETON

A revival of interest in coal mining in Inverness County is being brought about by the heavy demand for coal and the high selling prices obtainable at this time.

Inverness County has for a good many years been slipping backwards in coal production, and it is a part of the Nova Scotia coalfields that more than any other has suffered from imaginative promoters, unwarranted capital investments and unskilful management. Much more money has been sunk in coal mining in Inverness County than has ever been recouped.

About ten years ago there were three companies working in the county, namely, the Inverness Coal & Railway Co., the Port Hood & Richmond Coal Co. and the Mabou Company. The Mabou Colliery was flooded in 1909 because an opening was made in the seam at a point where only 110 feet of strata intervened between the roof of the seam and the bottom of the sea. The strata was moreover not of a character to warrant the opening, even with a much thicker cover. The flooding of the Mabou mine was distinctly the result of poor judgment.

The Port Hood Colliery was flooded in 1911, the water entering at a point where pillars were being drawn in the lowest level, the solid cover intervening between the roof and the sea bottom being 942 feet. The inrush in its initial stages is estimated to have amounted to 3,000 gallons of water per minute. The water is salt, and there is a small daily rise and fall of the water in the time corresponding to a delayed reflex of the tidal action along the shore line. The connection with the sea is admitted, but the nature of the connection has always been a matter of debate and remains undetermined.

For some time, Messrs. Malcolm Beaton and associates have been mining coal from the Port Hood seam in a rise area above sea-level, and it is now reported that an attempt will be made to pump out the flooded mine. There is reason to believe that with pumps of large capacity the mine may be unwatered, or, in other words, the presumption of success is sufficient to warrant the attempt, if the financial arrangements can be made. The writer has never been able to credit the possibility of a vertical break 942 feet in depth communicating directly with the sea, or that such a break could occur from the extraction of a seven-foot seam of coal. The delayed reflex action of the tides on the water in the mine indicates that the point of initial entrance of the sea-water lies between high and low-water mark, and would also appear to indicate that the channel of entrance was a restricted one. The level above the one that was first flooded was very extensively robbed of its pillars, so much so as to raise the presumption of a "crush" and a shattered condition of the roof above. The stratification of the coal seam and the accompanying shale is inclined seawards, and the bedding planes of the strata lying immediately above the coal seam crop successively between high and low water mark along the shore. It is reasonable to presume a percolation of water along all the outcropping bedding planes, and the accumulation of a considerable body of water in the crushed area. When the pillar was drawn at a point which was approximately the lowest in the mine, this body of water continued downwards along the lines of stratification and under much pressure due to its head, broke through the weakened roof rapidly inundating the mine, which was not provided with any water lodgment and had small pumps with a capacity of only 110 gallons per minute. It was not proved that the inundation was uncontrollable, and, writing solely from a technical standpoint without regard to financial questions, it has not been proved that the mine cannot be unwatered.

From a financial point of view, it is doubtful whether any large expenditure on pumping is warranted, and probably a new submarine winning in solid coal, leaving a barrier against the flooded workings, may some day be undertaken.

The Inverness Colliery has for some time been operated under conditions of much physical difficulty, and, in view of the financial condition of the company, which was for years in the hands of the bondholders, much credit must be given to the ex-General Manager, Mr. John Macgillivary, for keeping the property in operation through some very trying years. With new management, relieved of some of the heavy interest charges that were formerly carried, the property may do well so long as selling prices and demand remain good.

There are important undeveloped inland coal seams in Inverness County, and it is understood there is a posibility of a consolidation of these with properties already operating.

The same reasons that forced a consolidation of the independent companies in the Sydney coalfield exist in favor of a complete consolidation of the Inverness County companies, where, because of physical conditions, the costs of coal production must always be relatively higher than they are in the Sydney field. The chief market of the Inverness coals is the domestic trade of the Maritime Provinces, in particular of Prince Edward Island, a purpose for which the coal is better suited than for metallurgical uses.—F.W.G.

COAL MINERS' WAGES IN NOVA SCOTIA.

The Royal Commission appointed to investigate wages and working conditions in the coal mines of Nova Scotia is taking evidence.

The demands of the miners were presentd to the Commission at its opening session in Glace Bay on July 21st. Their far-reaching character may be gathered from the following summarised list.

Closed Shop Conditions Asked.—Under the term "self-determination" the men ask for a drastic form of the "closed shop," the clause reading: "That each local union shall have complete jurisdiction in union matters over the mine or plant where its members are employed, and may determine by the vote of its members at any of its regular meetings whether any new employee shall become a member of the union." A recent strike was called to force non-union men to join, so that refusal of the union to allow a new employee to join is equivalent to selection of workmen. The union asks that this right of "self-determination" shall not be abridged by any official of the employing company.

Working Conditions.—Better distribution of miners' tools, better air-pressure, abolition of "pushing," or manual movement of mine cars are asked. Four rooms to each machine cutter, and not more than two miners in each working place are demanded. The employer is asked to bear all onus of machinery breakdowns and accidents preventing work. Any man reporting for work, and not receiving work that day is to be compensated. If pit stops before 11 a.m. all day-paid

men are to be paid a half shift, and if pit runs till 12.30 before stopping, day-paid men to receive a full shift. Penalizing extra rates are asked for all night-work, and extra tonnage rates are asked for double-shifted places. Riding rakes are asked to be placed in operation in all collieries after twelve o'clock each day, so that men who finish early, that is after five hours' work, can go out of the mine. A maximum of 25 feet for shovelling down coal in a working place is asked. Time and a half for overtime and double time for Sundays and holidays is asked. $6.00 per day is asked for new work, pending the agreement upon a tonnage rate, and men doing company work in default of ability to obtain a helper are to be paid $5.50 per day.

Increased Wages.—One dollar flat increase for all day-paid men, and 24 cents per ton increase on existing tonnage rates is asked. Yardage rates, dead-work and timbering rates to be increased 25 per cent. Where through a shortage of men, two men do the work of three, it is asked that time and a half be paid.

This is probably the most drastic demand ever presented to the coal operators in Nova Scotia. The wage increases asked are not so important as the alterations asked in working conditions, particularly those clauses of the demands intended to prevent double-shifting of the mine and night work, and the other clauses limiting the number of men in a working place, and asking for four rooms for each machine cutter. These demands, in actual practice, involve an enlargement of the number of working places, or expansion of the mine workings; accompanied by a restriction upon production limiting the productive use of the mine workings and equipment to the working time of the individual miner, which, as is plainly contemplated by the demand for riding rakes after twelve o'clock, may not be more than five hours in each twenty-four hours.

In no other coalfield in the world do the conditions under which the mines are operated call for so large a number of working places, for so few producing miners, for so few hours in the working week. In the submarine districts, it is already impossible to keep the development work sufficiently in advance of the producing faces, and the extension of working territory has become a pressing problem, inasmuch as it involves greater expenditure in haulage, ventilation, upkeep, examination, transport of men and materials, and every item in underground costs. The submarine districts can only be profitably worked under a system that will concentrate the working area, reduce the haulage, pumping, ventilation timbering and upkeep to a minimum, and enable the mine equipment to be utilized for at least sixteen hours out of each twenty-four, not 30 hours a week, as is only too often the case today. If the Nova Scotia collieries are to compete against districts which more completely utilise the capital investment sunk in the colliery plant and development, it will be necessary to introduce similar methods in Nova Scotia; and, if the policy of the United Mine Workers should debar the local operators from adopting ordinary commonsense systems of mine operation, then the collieries cannot compete against districts which, in addition to more intensive production methods, have far more favorable natural conditions.

The increase in wages is the least of the burdens that complete acceptance of the miners' demands regarding working conditions would entail upon coal production and its cost.

SOME NECESSARY CHARACTERISTICS OF THE EFFICIENT MINE OFFICIAL.

By J. R. McNeill, Sydney Mines.

A great deal has been said relative to the efficiency of a mine official and still a great deal can be said. I wish to point a few characteristics that in my opinion go to make a successful and efficient mine official, and more specifically a man fitted to be an Underground Manager or Overman.

An efficient mine official must be a good organizer. He must have the knack of putting the right man in the right place. It is no small task to match men so as to give the best results working together. It requires the exercise of the best judgment on the part of the official. To succeed well with the men and avoid the many troubles that arise in mines, an official must have a mild temper and a way that will draw men to him and make them his friends. It must be recognized that all good workmen have minds of their own and do not relish being "bossed" by a man who makes this feature his most prominent characteristic. Men do not need to be "bossed" so much as to be acquainted with the details of the work to be done. An official who gives instructions in plain, simple language will get more and better work done than the "boss" who gives his orders in a commanding tone, designed to impress on the workmen the importance of his position.

Again an official should understand his manager or superintendent, learn his nature so as to interpret his ways and manner, which will often avert trouble arising from misunderstanding each other. There should be perfect harmony between the manager and his under officials. They should be in his confidence. When officials co-operate with one another they produce greater economy and increase the output of the mine.

The efficient mine official must understand and have a practical knowledge of mining methods and mining machinery. He should be able to judge of what a fair day's work is in coal mining. He must be strictly honest with his employer and with the men under his charge. While he must watch every cent of outlay, he must see that full time is given each man in the performance of his work; and faithfully fulfill all his obligations and promises. He must not fail to make improvements in ventilation, drainage and haulage, when he believes the outlay will bring good results for the money expended. In the daily operation of the mine he must keep his eyes constantly on every detail relating to the safety of the men. There should be no waste of material, which is often the case where the official is careless or inefficient.

To sum up my opinion of what constitutes an efficient mine official is: That he is one who can produce a maximum tonnage of clean marketable coal, of maximum quality at a minimum cost with due consideration for the safety and welfare of the men under his charge, and the safety, proper ventilation and maintenance of the mine under his charge. He must be fair, impartial and honest in all his dealings with everyone.

MINERAL PRODUCTION OF BRITISH COLUMBIA.

1919 and 1918 Figures Compared.

That the monetary value of the mineral output of British Columbia for the year 1919 was $33,296,313 as compared with $41,782,474 for 1918 is shown by the official figures given in the Annual Report of the Minister of Mines, which has just been issued and is now available for distribution.

The decrease, while considerable, is not serious when placed against the greater decline in mineral production shown by returns from the various States south of the line where the mining industry is an important factor. In fact from this viewpoint it is indicated that this Province did not feel to the same extent the falling off in demand for metals following the cessation of war.

An interesting comparative table is published which, in part, follows:

Quantities and Value of Mineral Products for 1918 and 1919.

	1918		1919	
	Quantity	Value	Quantity	Value
		$		$
Gold, placer, ounces	16,000	320,000	14,325	286,500
Gold, lode, ounces	164,674	3,403,812	152,426	3,150,645
Silver, ounces	3,498,172	3,215,870	3,403,119	3,592,673
Lead, pounds	43,899,661	2,928,107	29,475,968	1,526,855
Coper, pounds	61,483,754	15,143,449	42,459,339	7,939,896
Zinc, pounds	41,772,916	2,899,040	56,737,651	3,540,429
Coal, 2240 lbs.	2,302,245	11,511,225	2,267,541	11,337,705
Coke	188,967	1,322,769	91,138	637,966
Miscellaneous Products		1,038,202		1,283,644
		41,782,474		33,296,313

One interesting feature of the above is the interest shown in silver production, reflecting the increased quotations for the metal and, to some extent, the opening up of promising northern fields. Another worthy of note, but not of such an encouraging nature especially from an industrial standpoint, is the marked decline in coke manufacture. That, however, no doubt will be remedied as new mining projects, now in the development stage, are further advanced.

The report includes the usual detailed accounts of mining activity during the year in the several districts of the Province by the Resident Mining Engineer.

THE GREAT CANADIAN WEAKNESS

Ottawa reports refusal by Canadian manufacturers of huge orders from Australia and Brazil, owing to the shortage of coal. Canada's foreign trade, at the very period when the contest for world markets has begun steadily drops until the country soon may once more be creating debits abroad.

And Canada possesses undeveloped coal deposits of untold richness and value! A great source of wealth remains inactive; like money foolishly left buried in Canada's backyard, while factories throughout the Dominion take what coal they can get from the United States or go without.

Every new day brings its pointed reminder of the grave loss Canada suffers owing to her failure to use her own coal. It is the great national weakness which threatens this country with the loss of much to which Canadian war prestige entitles this generation.—Montreal Star.

CANADIAN ABRASIVE CO., BRITISH COLUMBIA

The Provincial Department of Industries of British Columbia has loaned the sum of $22,000 to the Canadian Abrasive Co., which will manufacture sand, emery and other abrasive papers. This industry has hitherto been controlled by manufacturers in the United States, and it is understood the industry is a new one in Canada. The abrasive materials used will be obtained locally, and the works will be in Victoria. Paper made in a local paper-mill will be used. The plant is regarded as an experimental one.

Natural abrasives, more particularly corundum from Ontario, have been produced in Canada during the past twenty years, and the production of artificial abrasives in electric furnaces is an important industry at Niagara Falls.

ADVERTISING ALBERTA COAL

The Government of Alberta is continuing its advertising of Alberta coal, and in a recent issue gives a series of common queries regarding Alberta coal with the correct answers. Some of the more arresting statements made are as follows:—The Province of Alberta uses Alberta coal entirely, Saskatchewan uses it for half its needs, and Manitoba is using more every year. Alberta has mines equipped to furnish 12,000,000 tons of coal a year. There is now mined about 6,000,000 tons year.

In years to come, if copies of such advertisements are in existence, they will be interesting proofs of what our descendants will find it extremely hard to believe, to wit, that it was once necessary to advertise that Western coal is suitable fuel for domestic use. After all, the Alberta Government is only taking a leaf out of the book of the anthracite operators, who not so many years ago, found it necessary to carry on a campaign of advertising to prove that anthracite would burn. In many western towns, the choice of fuel lay between domestic soft coals and imported anthracite, and the anthracite man got there first. It seems almost laughable now, but no later than the Spring of 1917, at a fuel conference called in Ottawa by Sir Geo. E. Foster, considerable incredulity was expressed by Winnipeg delegates of the suitability of Alberta coal for domestic purposes in Winnipeg, and the Alberta men waxed very wroth at an assumption which they frankly could not understand.

Our Northern Ontario Letter

THE SILVER MINES.

The prospective Cobalt silver area of Cobalt was added to on July 20th, when, by an Order-in-Council passed by the Ontario Government, the Gillies Limit was thrown open for prospecting. Intimation of the decision first came on July 17th, through press dispatches. This resulted in many prospectors not being on hand to share in any advantages that may result. The greater percentage of prospectors engaged in this part of Northern Ontario are either doing assessment work on their claims at this season or are on prospecting expeditions. The lack of due consideration for these most active of the prospecting fraternity has aroused a large amount of criticism in the North. It is common knowledge that during the war a movement was set on foot to have the Limit thrown open for prospecting, but a reconsideration caused these lands to be left tied up pending the return of the men from overseas, so as to give all an opportunity to share in whatever might be found. Only a small and practically valueless part of the territory was then opened. In spite of this early consideration for all concerned, the present government has in local opinion shown disregard for all and has dealt unfairly with prospectors. This, whether the Gillies Limit ever yields an ounce of silver, or not.

Production from the McKinley-Darragh is being maintained at an average of between 55,000 and 60,000 ounces of silver monthly. The indications are that output for the whole of 1920 will have a value of about $800,000. Current net profits are adequate to meet current dividend requirements of 3 per cent. quarterly, in addition to which the treasury surplus amounts to more than a full year's dividend requirements. The mine, up to June 31st, has produced 18,907,250 ounces of silver, and has paid its shareholders $5,821,591 which is equal to 262 per cent. on the company's issued capital. This output has been the result of doing a little over twelve miles of underground work, and from an area little more than fifteen-acres in extent.

Ore from the dumps of the Kerr Lake mine is now going to the Dominion Reduction plant for treatment. An average of from 125 to 150 tons are being treated daily. It is still too early to estimate the importance of this source of revenue, but from the returns so far the treatment of from 75,000 to 100,000 tons of this low grade material indicates a fair margin of profit. The price of silver will, of course, have a vital bearing on the extent of the profit to be derived from this source.

On August 1st the Coniagas will disburse a dividend of 2½ per cent., amounting to $100,000. This makes a total of $400,000 paid so far this year, and brings the grand total up to $10,040,000. The mine is producing at the rate of between 800,000 and 900,000 ounces of silver annually, and has produced a total of over 28,000 ounces. Ore reserves are being maintained about three year's in advance of the present rate of output.

The Mining Corporation has commenced the erection of campbuildings on a group of claims in the township of Butt. It is planned to carry out a considerable amount of surface exploration.

Recent information from Butt township, tends to indicate that the radium-bearing material is high grade, but that it occurs in more or less widely separated patches. The question of commercial success, it is said, will probably depend upon whether the pitchblende, which contains the radium element, occurs in patches close enough together to make mining feasible.

Premier Drury, having stated that the present Government has investigated the Department of Lands and Forests and found it "positively rotten", and that the Department of Mines may be the next in line for investigation, has aroused mining men to such an extent as to cause a general demand for the investigation to be made at as early a date as possible. The great majority of leading mine operators in Ontario stand sponsor for this statement to the Ontario Correspondent of the "Mining Journal":—

"Mining interests are strongly of the opinion that there is nothing to hide in so far as the mines are concerned and that all their operations and dealings with the Department of Mines has developed nothing that might be considered embarrasing on the widest possible investigation and are taking the stand that not only do they welcome such an investigation, but that, suspicion having been aroused by one in so responsible a position as that of the Premier of this Province, that necessity now demands an investigation and such is asked at the earliest possible moment."

The Ontario Mining Association, through Balmer Neilly, Secretary-Treasurer, has used the Government to institute a search of records and general investigation at once, mining men not desiring to remain under the stigma of suspicion created by the Premier's unreserved announcement.

Work is well under way on the White Reserve mine at Maple Mountain in the Elk Lake district. Work has been confined to close to surface, but it is now planned to re-open the 140-ft. level. A new motor boat has been placed under the water route from Latchford to Lady Evelyn Lake, and has improved transportation facilities.

It is stated that financial arrangements have about been completed for re-opening the Paragon-Hitchcock property at Elk Lake, some New York capital having been secured. It is also reported that the Laurier Mining Company with property in the township of James, is being re-opened and that a small steam-driven mining plant is being installed. The enterprise is backed by Sarnia business men. The address of the company is Elk Lake, Ontario.

A Cobalt mining company as well as United States mining men have made an examination of the Delvin property in the Elk Lake district, and interested parties believe there is fair promise of this promising silver prospect being re-opened.

Ore and Bullion Report.

During the week ended July 23rd, five Cobalt companies shipped six cars containing approximately 463,650 pounds of ore. Following is a summary:—

Shipper	Cars	Pounds
O'Brien	2	129,795
Northern Customs	1	96,800
La Rose	1	87,400
McKinley-Darragh	1	83,657
Coniagas	1	65,998
Totals	6	463,650

Bullion.

During the corresponding period, the Mining Corporation was the only bullion shipper, sending out a large consignment containing 99 bars weighing 110,-224 fine ounces.

THE GOLD MINES.

Everything seems to point toward a continued increase in activity in the gold mining areas. Dividend disbursements from the leading mines continue at the usual rate, while work on outlying properties is taking on increased proportions. On August 11th the Hollinger Consolidated will pay its usual eight-weekly dividend of one per cent., amounting to $246,000. Labor is still reported to be considerably below requirements.

Cabled advice is expected shortly from London in connection with the recent offer made by a Toronto syndicate to underwrite 600,000 shares of the Porcupine V.N.T. Mines treasury stock. The offer was graded, 15 cents each to be paid for 200,000 shares, 30 cents each for 200,000 and 50 cents each for 200,000 shrares. It is believed the offer will receive favorable consideration, in which case the necessary working capital would be made available, and the property could then be placed on a producing basis.

At a depth ranging from 100 to 200 feet below the tenth level on the Dome Mines adjacent to the Dome Extension property, a large amount of ore containing average values of upwards of $10 to the ton has been cut by short diamond-drill holes driven from the tenth level. The management considers it probable that this body dips easterly into the Dome Extension. From these facts, it is generally believed the Dome will take over the Dome Extension property in September. It is learned that a meeting of the directors of the Dome will be held in August. Provided the deal goes through the holder of Dome Extension shares will receive one share of Dome for each thirty shares of Dome Extension held. One of the diamond drill holes shows an ore body 17 feet wide and containing $25.41 to the ton. Another hole shows the presence of an ore-body 19 feet wide and containing $18.84 to the ton. One hole shows 40 feet of $7.63 ore and nine feet of $20.03 ore. These figures are all entirely official.

During the month of June, according to the regular annual report of Manager R. C. Coffey to the president and directors, the Lake Shore mine treated 1,535 tons of ore and recovered $37,546, the average recovery being $24.46 from each ton treated.

This compares with 1,636 tons in May from which $41,-187 was produced. In explanation of the slightly lower tonnage is the following note in the report: "The low tonnage was due to the electric power being off 8.2 per cent. of the possible running time."

For the first six months of the current year, the output from the Lake Shore mine has totalled $244,-710, or at the rate of nearly half a million a year, the average production being $40,785 monthly. Complete official figures up to June 31st show that the mine has produced $923,394 since commencing production in March, 1918, and that the million mark will be reached by about the end of August.

Capitalized at $2.000 000 made up of 2,000,000 shares of the par value of $1 each, and treating ore averaging over $24 to the ton, and producing an average of $40,000 a month, conservative unofficial estimates place the present earning power of the Lake Shore at a little over one per cent. net profit every thirty days, one per cent. amounting to only $20,000 or a little less than fifty per cent. of gross production.

Of outstanding importance in connection with the mine, is the recent decision to extend the underground workings from a depth of 400 feet to at least 800 feet, with an intermediate level at a depth of 600 feet.

On the Dome Mines, at a depth of 850 feet, some very spectacular ore is being encountered, some of the ore being equally as rich as that found at surface and which in the early days was called the "golden sidewalk."

One of the leading gold mining companies of Parcupine recently sent a representative to Montreal for the purpose of hiring newly arrived immigrants. It has been found, however, that nearly all of these men are coming from Europe to fill pre-engagements. One whole boat load had been previously engaged to work on one of the leading Canadian railways. It is believed, however, that as these new arrivals gradually work out their passage, they will begin to find their way into all lines of work.

During the fiscal year ended April 30th, the Teck-Hughes treated 17,277 tons of ore of an average grade of $8.60 to the ton and recovered $127,771. Before providing for financial charges on bonds, and extraordinary expense in connection with a labor strike, the operating costs amounted to $6.01 a ton. The scheme to re-organize the company in such a way as to retire the $500,000 bond issues as well as $70,000 of defaulted interest, is progressing and is likely to take the form of a large increase in issued shares.

The Tough-Oakes mine is still idle, pending the arrival of scrip in the new company, the Kirkland Lake Proprietory, 1919. The stock was mailed from London early this month, and its arrival will enable the holders of Tough-Oakes shares to transfer into the new company on the basis of two shares of Tough-Oakes for one share of Proprietary. Once this transfer is made, work will be commenced.

Delayed equipment for the Hunton-Kirkland mine has arrived and is being installed, thus making it unnecessary for the company to borrow equipment temporarily from the Elliot. The new plant will be ready to operate within the next week or so.

The first diamond-drill hole on the Carveth property in the township of Thomas lying east from Night Hawk Lake has been completed, and the consulting engineer, Mr. Horace F. Strong is at the property making an examination and report.

A deputation of mining men from the Kirkland Lake, Larder Lake and Boston Creek districts presented a request to the Ontario Government to build a branch line of the T. and N. O. Railway from Swatiska to Kirkland Lake, with the final object in view of extending it east through Lebel and Gauthier townships to the Argonaut mine, and finally to Larder Lake. The premier told the deputation the Government would consider the matter provided the mine owners were willing to allow government engineers to enter the mines and report on the resources. If these warrant the road, it will be built. The Kirkland Lake companies appear to be agreed that such should be done, and the mines will permit inspection. As regards Larder Lake, however, the only operation is the Associated Goldfields, and it is known that this company on a former occasion ignored such a suggestion from the Ontario Government. In the meantime, the Canadian Light Railway Construction Company is endeavoring

to secure rights to construct a light narrow gauge line to Kirkland Lake. It is believed no definite action will be taken until such time as the mines grant official consent to the governments proposal to inspect all important properties.

PERSONALS.

Mr. J. S. De Lury, professor and acting head of the department of geology in Manitoba University has been appointed to represent the mining industry on the Bureau of Industrial Research now being organized in Manitoba. Professor De Lury is a graduate of the University of Toronto. He was in 1906 on the staff of the Ontario Bureau of Mines. He resigned to accept an appointment as professor at the University of Idaho and was there for some years before returning to Canada and joining the staff of the University of Manitoba. He is at present making investigations in the Rice Lake gold area, Eastern Manitoba.

Mr. Jas. McEvoy is returning to Toronto after completing an examination of coal properties in Alberta. His address will be Gorge St. Arcade, Toronto, where he established an office before going west.

Mr. Cyril Knight of Toronto is one of the candidates for the position of secretary of the Canadian Mining Institute. He acted as secretary at the March meeting in Toronto. Mr. Knight is at present making geological investigations at Cobalt for the Ontario Bureau of Mines. Mr. Knight is well known here and in the United States for his work in Pre-Cambrian areas.

Mr. J. C. Gwillin, for many years professor of mining engineering at Queens University is reported to be still in poor health. His many friends, including a large number of former students regretted to learn that he has not sufficiently recovered to permit him returning to his former duties. He resigned the professorship at Queens sometime ago.

Mr. M. W. Hotchkin is operating the Colonial silver mine, Cobalt, under lease. Mr. Hotchkin was superintendent at the Tough-Oakes gold mine some years ago and recently in charge at the molybdenite mine at Quyon, Quebec.

Mr. John T. Stirling is reported to be recovering from his recent serious illness. Mr. Stirling is chief inspector of mines of Alberta and is one of the best informed persons in Canada on Alberta coal mines. He is an active member of the Canadian Mining Institute and has represented his district on the Council of the Institute for several years.

Mr. J. B. Tyrrell of Toronto is in the Rice Lake gold area, Manitoba. Mr. Tyrrell is consulting engineer for some of the companies developing properties in this area.

Mr. E. P. Mathewson is returning to New York after spending some time at the Anyox smelter, the Granby Company's plant which treats the ore from the Hidden Creek copper mine.

Mr. D. A. Dunlap, vice-president of Hollinger Consolidated Mines, has returned to Toronto.

Mr. H. H. Sutherland is returning to Toronto after being for some months in England.

Mr. Richard Pearce of Cobalt is in Toronto. He has been recently visiting the Lightning River gold area.

TORONTO MINING STOCKS.

Following are the average quotations for gold, silver and miscellaneous stocks on the Standard Stock Exchange, Toronto, for week ending July 24:

	High.	Low.	Last.
Silver:			
Adanac Silver Mines, Ltd.	3	2⅞	2¾
Bailey	4½	3½	3½
Beaver Consolidated	43	42½	42½
Crown Reserve	25	23½	25
Gifford	1⅜	..	1⅜
Great Northern	2½	..	2½
Hargraves	2	..	2
Kerr Lake	3.50	..	3.50
La Rose	40	38	38
McKin.-Dar.-Savage	57	55	55
Mining Corp. of Can.	1.95	1.85	1.85
Nipissing	9.90	9.75	9.75
Ophir	1⅝	1½	1⅝
Peterson Lake	13½	13	13
Silver Leaf	2	..	2
Temiskaming	35	..	35
Trethewey	30	28	28
Gold:			
Apex	1½	..	1½
Atlas	12	..	12
Dome Extension	29½	25	27
Dome Lake	5	4⅞	5
Dome Mines	11.50	11.00	11.40
Gold Reef	2 6-10	2½	2¾
Hollinger Cons.	5.70	5.55	5.55
Hunton Kirkland G.M.	11½	10	11
Inspiration	3¾	..	3¾
Keora	16½	16	16
Kirkland Lake	50	48	49½
Lake Shore M. Ltd.	1.20	1.19	1.19
McIntyre	1.90	1.82	1.90
Moneta	9	..	9
Porcupine Crown	29	26½	26½
Porcupine V.N.T.	24¼	22	24¼
Preston East Dome	2¼	2	2¼
Schumacher	21	19	21
Teck-Hughes	11	8½	8½
Thompson Krist	9	7¾	7¾
West Dome	6 6-10	6½	4½
West Tree Mines Ltd.	5	..	5
Wasapika Gold M. Ltd.	11½	10½	10½
Miscellaneous:			
Ajax Oil	30	..	30
Eureka	30	..	30
Petrol Oil	1.35	1.15	1.17
Vacuum G.	28½	27	27

METAL QUOTATIONS.

Fair prices for Ingot Metals in Montreal July 28th 1920.

	Cents per lb.
Copper, electro	24¼
Copper castings	23¾
Tin	57
Lead	10½
Zinc	10¾
Aluminum	36
Antimony	10

A Toronto newspaper states that coal-mining is a cumbersome process, and that the chief hope of relief lies in the development of electrical power and its application to heating purposes.

It is a faint hope. The application of electricity to domestic and industrial heating has a very limited field, and it is a most expensive and wasteful method of utilising even the electricity developed by water power.

BRITISH COLUMBIA LETTER

Stewart, B.C.

The road work to be undertaken by the Provincial Government in the Portland Canal District will be started and carried forward with all possible expedition under the supervision of G. A. Young, of the Public Works Staff. Perhaps the most important of his season's operations will be the construction of a road from the Premier Mine to provide transportation facilities for the Big Missouri and Mineral Hill Claims. Repair work on the Bear River Road already has commenced and there is much trail clearing and improving arranged for both in the Salmon River and Bear River sections, special attention being given the tributaries of the Bear, along which there is much prospecting and mineral improvement.

A strong lead of a good grade of ore is said to have been struck on the Unicorn Group of Mineral Claims, Salmon River, and ore of high grade has been brought into Stewart from the Glacier Creek Property. An open cut has been driven 20 feet on the latter and is in mineral carrying galena and iron sulphides.

Rossland, B. C.

The Josie Mine was closed temporarily recently, but only until another copper furnace was blown in at the Trail Smelter of the Consolidated Mining & Smelting Co. Considerable shipments of ore from the Mandy Mine, Le Pas, Manitoba, together with the usual run of company and custom ore, more than overtook the then furnace capacity of the plant.

Trail, B. C.

Vancouver (B.C.) Board of Trade recently arranged that a party of its members should make a tour of interior British Columbia in order that businessmen of the Coast City should be brought into closer touch with the activities of residents of other parts of the Province and the natural resources of other districts. The result is that an affiliation of the Boards of Trade of Eastern and Western British Columbia has been effected and one of the first joint efforts is to be to secure a market for the surplus zinc production of the Trail Smelter of the Consolidated Mining and Smelting Company.

During the war the Company went into the production of zinc on a large scale. Now, with an annual output of 20,000 tons of this metal and the total annual requirements of Canada not exceeding 10,000 tons, some profitable means of disposing of the excess must be found and, also, if possible, some avenue through which the greater output of the Company's plant, if worked to its full capacity, can be marketed.

Vancouver has promised its assistance in the solution of this problem.

The tourists included in their itinerary most of the mining centres of the Kootenays, among them Slocan City, New Denver, Denver Canyon, Silverton and Sandon. They found throughout the silver belt but little mining activity, in a comparative sense, because of of the trouble still persisting between operators and miners regarding the recognition of the labor organization known as the One Big Union. Generally, however, the trip is having the important effect of creating a better spirit between the two sections of the Province and assuring, for the future, more co-operation and team work.

Trail, B. C.

The ore receipts at the Trail Smelter for the week ending July 7th were 9,035 tons. This creates a record for the year. Of the total the contribution of the company's properties amounted to 7,218 tons, which also is a record.

Nelson, B. C.

Four of the levels of the Blue Bell Mine, Riondel, B.C., are being unwatered by a pump just installed and constructed at the Nelson Iron Works from drawings furnished by S. S. Fowler, manager of the New Canadian Metal Co., Ltd. As soon as this is accomplished the levels will be actively mined. Last year the Blue Bell shipped to the Trail Smelter 1,249 tons of crude ore and 36 tons of concentrates. To date the property is credited with shipments aggregating 730 tons.

Sandon, B. C.

In order to side track the famous slide on the Cody road to the Noble Five Mine a "cut-off" is to be constructed, work on which will commence shortly. The Washington, Argo Fraction, Majestic, Hope, Black Colt, Silver Hill, Cinderella, Chicago and Climax are properties situated in the Sandon District on which development is in progress this season.

Princeton, B. C.

The Princeton Mining & Development Co. is proceeding with the work of placing its mine property, situated five miles east of Princeton on the Great Northern Railway, on a permanent shipping basis. There are three full claims on which the ledge has been opened by three tunnels, varying in depth from 48 to 480 feet. The vein is reported to have been traced for about 4,500 feet on the surface and the operators assert that they have a large body of concentrating ore averaging 4 per cent in copper and 1 ounce in silver. A three drill compressor now is in use by means of steam power and another is to be installed electric power to be secured from Bonnington Falls by tapping the line running to the Copper Mountain Mine of the Canada Copper Co. The intention is to instal a concentrator later on.

Considerable interest is evident in British Columbia in the annual report of the Canada Copper Co. This shows that, with a share capital of $5,441,046 and a bonded indebtedness of $2,920,650 there was a dividend distribution of $622,518 for the year 1919, as compared with $3,625,247 in 1918. The Company invested in nineteen properties in British Columbia last year. Both the Greenwood Smelter and the Motherlode Mine have been dismantled. On construction at the Copper Mountain Mine and the Concentrating Mill at Allenby $1,112,000 was expended. Work on the Mill and the Railway to the Mine is making good headway. It was held up by labor trouble, otherwise it is likely that 2,000 tons of ore a day now would be coming from the Mine to the Mill. The ore will be concentrated to a 25 per cent. copper content and the concentrates will be shipped to Trail B.C. to be refined.

The quarterly report of the Chief Inspector of Mines for British Columbia shows that fatalities in the coal and metalliferous mines over that perod totalled five, four in coal mines and one in the metal mines. In the corresponding period last year fatalities were two in coal mines and one in the metalliferous mines. For

the first six months of the year coal mine fatalities numbered eight compared with two in the same period last year and in the metal mines one as compared with a like number in 1919. Coal mine fatalities up to June 30, were distributed as follows:—Two in the mines of the Canadian Western Fuel Co. at Nanaimo, two in the Coal Creek Mines of the Crow's Nest Pass Coal Co., one in the Reserve Mine of the Canadian Western Fuel Co. and one in each of the mines of the Crow's Nest Pass Coal Co. at Michel, No. 4 and No. 6 Mines of the Canadian Collieries (D) Ltd. Four miners were killed by falls of rocks, two by falls of coal, one by mine cars and one by falling material in shaft. The single fatality in metal mines occurred at the Nickel Plane Mine, Hedley District.

To obtain first hand information regarding the accident which resulted fatally at least in two instances, to five men forming the rescue team of the Pacific Coast Coal Company's Black Diamond Mine, State of Washington, Hon. Wm. Sloan, Minister of Mines for British Columbia, instructed James McGregor, Chief Inspector of Mines, to visit the scene of the occurrence and to personally follow any investigation that might be instituted. The circumstances, as given by press dispatches, are that the team, equipped with rescue apparatus, entered an abandoned mine, known to be filled with black damp, to ascertain the depth of water necessary to be cleared and incidentally for the purpose of drill. As the men did not return within reasonable time another rescue party was called with the result that two of the first party were found fatally overcome and the other three in serious condition. Mr. Sloan explains that he is interested because it is of importance to the coal miners of this Province that all the available details should be known.

It as learned subsequently that there were three deaths, two being members of the first party to go underground and the other victim being a member of the second and the rescuing party. As to the former it is stated that the cause of their loss was lack of an adequate supply of oxygen in their apparatus. No explantion has been ventured as to the reason for the death of the third man. An inquest, it is understood, has not been considered necessary.

W. H. Armstrong, for the past three years director of coal operations for the Province of Alberta and the Southeast of British Columbia, denies the charge that the Dominion Government has been attempting to force the coal miners to enter a foreign (U.M.W. of A.) organization. Mr. Armstrong states that the United Mine Workers, which is in affiliation with the American Federation of Labor, three years ago entered into a two year agreement with the Western Canada Coal Operators Association. The agreement was carried out amicably on both sides and at its expiration was extended a year without formal renewal. On April 1st last theagreement was formerly renewed, but a provision for the "closed shop," which did not exist in the old agreement, was made. Formerly, the operators, if they so desired, could employ non-union men but under the new agreement the demand for the closed shop principle was recognixed. An agreement between the men and the operators, such as is common in many other industries, was made for the collection of dues. The wage scale is based on the selling price of coal which is now, for instance, at Drumheller, Alberta, $6.10 per ton at the pit mouth. This agreement was ratified by the men by a vote of nearly three to one. "So far as the Dominion Government is concerned" said Mr. Armstrong, " it had nothing whatever to do with the arrangement between the United Mine Workers and the operators. The agreement was solely between the men and the employers and statement by the O.B.U. or others to the contrary was beyond the facts." Mr. Armstrong added that the mines were all working and the men apparently were satisfied with the scale of wages and the conditions.

The coal operators of the Province of Alberta resent the statement published in Eastern Canada that the mines of Western Canada already market all their product. They state that the facts are that all domestic coal mines of Alberta, owing to lack of orders, are working to only 25 per cent of their capacity. This applies particularly to Drumheller.

A reconnaissance party representing the Grand Trunk Pacific Railway is making a survey of a route of railway incidentally, would open Coal Fields, Northern B.C. Such a railway, incidentally, would open up a section rich in copper and silver-lead mineral resources. Its chief object, however, would be to develop the coal area which is extensive.

Mr. H. S. Monroe, the new General Manager of the Granby Consolidated Mining & Smelting Co., is quoted as stating that the coking ovens recently installed at Anyox for handling the coal of the Cassidy Collieries, Vancouver Island, have proved a success. From 420 tons a day of this coal there are being produced 300 tons of metallurgical coke and the by-products include 5,000 gallons of coal tar, 800 gallons of motor fuel and 5 tons ammonium of sulphate daily. The coal tar is shipped to a Vancouver Company for the manufacture of creosote, while the ammonium sulphate is available for the production of artificial fertilizer or the preparation of other ammonium salts for industrial uses. It further is pointed out that present rate of consumption of Cassidy coal, namely 420 tons a day, is the capacity of the ovens while the percentage of by products recovered is high. This statement sets at rest the assertions made that the Vancouver Island coal had proved a failure in the production of metallurgical coke in by-product ovens and that the Company had been compelled to resort to the importation of Eastern British Columbia or Alberta coal.

The appointment of John Macdonald, of Middlesboro, B. C., and John G. Biggs, of Cumberland, B. C., to vacancies on the staff of the Chief Inspector of Mines of the Province is announced by Hon. Wm. Sloan, Minister of Mines.

These positions were thrown open, respectively, through the death of H. Lancaster, Inspector of Mines in the Fernie District, as a result of an automobile former Chief Inspector of Mines, and the promotion accident, and by the retirement of George Wilkinson, to his place of James McGregor, the present Chief.

Both the new officials possess all the necessary qualifications and besides are men of long practical experience in connection with mining in this Province. Mr. Macdonald was eleven year in the differet coal fields of Scotland, two years in the State of Ilinois, and has been identified with coal mining in the Nicola Valley Field, B. C., for the past ten years. Mr. Biggs started coal mining in the Newcastle District, England

as a young man, and for many years has been associated with the business in a practical way. In England he acquired a 2nd Class Certificate and on coming to this country was soon in possession of 1st and 2nd Class Certificates. He has been Secretary of the Board of Examiners in the Cumberland District for about five years.

WAGE INCREASE TO ALBERTA MINERS.

An agreement has been come to between the United Mine Workers in Alberta and the operators which is to remain in operation until March 1922. The increases are retroactive to April 1st 1920.

The details are arranged on the basic agreement of 27 per cent. increase in contract tonnage rates in the bituminous fields and 20 per cent. on dead work, which includes the occupation of timbering and handling of refuse; 24 cents a ton increase in the lignite fields and 20 per cent. on "dead" work, and all day wages increased 27 per cent. The miners are also to receive $1.17 a day cost of living bonus. The increased rates will mean that a contract miner can earn between $7 and $10 a day, while day workers will run from $2.97 to $5.58 for boys and $5.58 to $7 for men.

The eight-hour day will be observed on the surface and eight hours from bank to bank in the mines.

INTERNATIONAL PULP AND PAPER ACQUIRE NEW BRUNSWICK COAL MINES

The International Pulp and Paper Co., has purchased the properties of the King Coal Co., the Northfield Coal Co., and A. D. Taylor near Minto, N.S., for a consideration reported to be in the neighborhood of $150,000, and a first shipment has been made to the new pulp mill at Van Buren, Maine.

The New Brunswick coal seam—as there is only one—is an example of the relative value of coal in districts where its occurrence is scarce. The New Brunswick seam would not be looked at in one of the Nova Scotia coal fields, but occurring as it does at a point distant from any other source of coal, and, owing to its shallow depth being comparatively easy to mine, it is a valuable local asset, with a restricted zone of distribution, and, if extensively worked, not a long life, as coalfields go. The seam nowhere exceeds two feet in thickness, and is usually under this thickness, and the cover does not exceed fifty or sixty feet.

FIND NICKEL AND COPPER CLOSE TO LAC DU BONNET, MAN.

The Winnipeg Free Press announces that Nickel and the copper deposits essentially similar to the Sudbury type are to be found in the vicinity to Bear Lake, near the Maskwa river, not far from Lac du Bonnet, according to Dr. R. J. Colony, of Columbia university, who, with E. McDonald, also of New York, and J. S. De Lury, professor of geology, University of Manitoba, has just returned from an intitial survey of the deposits.

No development work has been done, Dr. Colony said, but from what has been seen of the minerals, prospects appear unusually good. Many claims have already been staked and assessments made, and it is thought that development of the claims will be started before long. Dr. Colony and his party are leaving on another expedition into the Long Lake country in the early part of next week, to make further investigations.

TUNGSTEN ORES: IMPERIAL INSTITUTE MONOGRAPH.

The monograph on tungsten ores in the series of Imperial Institute Monographs on Mineral Resources, which has just been published by Mr. John Murray, has been prepared for the Mineral Resources Committee by Mr. R. H. Rastall, M.A., F.G.S., University Lecturer in Economic Geology, Cambridge, and Mr. W. H. Wilcockson, M.A., F.G.S., Lecturer in Geology in the University of Sheffield. It is divided into three chapters, the first containing a general account of tungsten ores, their characters, occurrences and origin. their mining and concentration, valuation and price, with a brief description of the metallurgy of tungsten and its employment in steel manufacture and other purposes, with a short discussion of the composition and characters of the remarkable non-ferrous alloys of which it is a constituent. The second chapter contains a detailed account of the geological features of tungsten deposits, and the mining and production of tungsten ores within the British Empire, including numerous statistical tables of output; while in the third chapter the tungsten resources of the rest of the world are treated in a similar manner. The relations of the British Empire and United States output to the world's total and the production of tungsten ores in the chief producing countries of the world are also shown by means of graphs,

The table giving the world's production of tungsten ores for the years 1910-1917, arranged by countries, shows that the British Empire produces a very large proportion of the total supply. Until about 1910 the United States headed the list, but about that time Burma rapidly came to the front and for several years showed the largest total. In 1916 the United States experienced an extraordinary tungsten boom, when prices soared to unprecedented heights and production was greatly stimulated. This in its turn stimulated the production in various South American States, especially Bolivia and Argentina. Before the war the smelting of tungsten ores was mainly in German hands, and the greater part of the British ore was sent to Germany for treatment. The enormous development of the manufacture of munitions in this country and elsewhere led to a great demand for high-speed steel for cutting tools, and a syndicate of thirty of the largest steel manufacturers at Sheffield formed a company to undertake the preparation of tungsten metal at Widnes. This company also acquired an important mine in Burma. The manufacture of metallic tungsten and of ferrotungsten was also undertaken on a large scale by several other firms in this country, in order to provide high-speed steel and other products for the needs of the British and Allied armaments. In order to ensure a sufficient supply or ore and to regulate the markets, the export of tungsten ore from within the Empire to foreign countries was forbidden by agreement of the various Governments concerned and the price was controlled. At first the rate was fixed at 55s. per unit (1 per cent of WO_3) per ton for concentrates of 65 per cent, and upwards, afterwards raised to 60s. per unit. This usually worked out to about £200 per ton for good average concentrates. As was naturally to be expected, the world's production of tungsten increased largely during the war years, rising from 8,000 tons or thereabouts in 1914 to over 20,000 tons in 1917. One of the most remarkable features was the sudden development of output in

China, from sources of which little is known, the output for 1918 being over 4,000 tons.

In the British Isles wolfram is a by-product of the tin mines of Cornwall, and the big demand for it proved of great importance to many of these mines. Strenuous efforts were made to keep up the output of both metals in spite of scarcity of labour owing to the demands of the army authorities for men. Several promising new occurrences were developed, and old ones resuscitated. By far the most important feature of the Imperial production of tungsten in the last few years was the great development of the Tavoy district in Tennasserim, Lower Burma, which in 1917 exported no less than 4,553 tons of concentrates. The greater part of this appears to be from various forms of superficial deposits, though lode-mining is now making important progress. In the Malay States, both Federated and Unfederated, as well as in the intervening Siamese territory, the geological conditions are very similar, though here tungsten is subordinate to tin. An important quantity of ore also comes from Queensland and New South Wales, with lesser amounts from Tasmania and New Zealand, the latter Dominion producing mainly scheelite. Some unimportant resources have also been discovered in South Africa, especially in Rhodesia.

The chief European producer in Portugal, while large resources undoubtedly also exist in Spain, where the geological conditions are very similar. In both these countries methods are primitive and often wasteful, and a good deal of smuggling undoubtedly went on during the war.

The tungsten resources of South America are undoubtedly very large, the ore occurring in large quantities along with tin in the mineralised belt of the Andes, especially in Bolivia and Peru; this appears to be of Tertiary age, while the tin-tungsten ores of Western Argentina are of much earlier date, being associated with Palaeozoic granites. The mines of Argentina before the war were controlled by German interests.

The tungsten ores of the United States, situated mainly in Colorado, California and Nevada, show a remarkable contrast to those of the rest of the world, in that they are not associated with tin. The largest producing districts of all are Boulder County, Colorado, where the ore is wolframite, and the Atolia district of California, where it is mainly scheelite. The third producing State is Nevada, while smaller quantities have come from Arizona, Utah, Idaho, Missouri, Montana, South Dakota and Alaska. In the latter only the ore is associated with tin.

The foregoing brief summary indicates the sources from which at the present time supplies of tungsten ore are mainly obtained. Occurrences of little or no commercial importance in many other parts of the world are briefly touched on in the monograph, because in some they show points of scientific interest, and some of them may in the future be found worthy of further development. From a detailed study of the geological features of all known occurrences, one point stands out clearly, namely, that tungsten ores almost invariably owe their genesis to masses of intrusive igneous rock, in nearly all cases granite. Exceptions to this rule are few and important. Almost all the important occurrences are associated with tin, and commonly accompanied by ores of copper, arsenic and molybdenum. It is a curious fact that the world's largest producing districts in Colorado and California should be almost the only exceptional and unusual occurrences.

The monograph concludes with a bibliography giving references to all the important publications on tungsten ores that have appeared up to the end of 1918.

OBITUARY

JOHN MACOUN, BOTANIST

The death at the age of ninety years is announced from Sidney, British Columbia, of Professor John Macoun, botanist, naturalist and a pioneer explorer of the Canadian West, and one of the old guard of the Geological Survey, in which for many years he was Assistant Director and Naturalist.

Prof. Macoun was born in Ireland in 1831 and came to Canada in 1850 with his mother and two brothers, settling near Campbellford, Northumberland Co., Ontario. From 1863 to 1879, Prof. Macoun was teacher of Botany and geology at Albert University, Belleville. In 1872 he accompanied Sir Sandford Fleming across Canada on the surveys for the proposed railway to the Pacific, and commenced a series of journeys and explorations that made him an acknowledged authority on the natural history of the West.

In 1875, on a second expedition to the Coast, Prof. Macoun nearly died of hunger, but was rescued near Fort Chipewyan by an Indian who gave him fish and potatoes. In 1882 he joined the Geological Survey.

Prof. Macoun was a Fellow of the Linnean Society, and an original Fellow of the Royal Society of Canada. His catalogue of Canadian birds is the authority on this subject. The Winnipeg "Free Press" in editorial mention of Prof. Macoun's death refers to him as "Canada's greatest botanist." The Victoria "Times" states that "His death leaves a vacant place among that brilliant roster of the men of the Canadian Geological Survey who gave to Canada the story of the West in the unvarnished lore of science." In the death of Prof. Macoun, writes the Victoria paper "the country has lost a distinguished public servant, the Province a highly esteemed citizen, and the cause of science a capable and zealous investigator."

EMANCIPATION OF MINING COMPANY'S PROPERTIES BONDED BY VANCOUVER SYNDICATE.

Acting as the agent of a group of Vancouver business men, Dr .Edwin T. Hodge was bonded for a sum said to be in excess of $100,000 the properties of the Emancipation Mining Company.

The Emancipation Mine is situated a little over one hundred miles from Vancouver on the Kettle Valley Railway (C.P.R.).

The claims bonded comprise thirteen and a fraction surveyed claims situated between the upper portion of Emancipation Mountain and the valley of the Coquahalla River. Most of the development work has been done at an elevation of 2,670 feet, or 1,200 feet above the railway tracks.

A small amount of development on these properties has yielded very high-grade ore. Selected mining along the veins has yielded 1,250 tons of rock which has averaged $28.57 per ton. Of the high-grade material, 118 tons is stated to have yielded values exceeding $300 per ton.

The property is as yet only a prospect, but it is regarded as a promising one, and from a transportation point of view it is unusually accessible.

An Improved Self-Sharpening Bit for Coal-Cutter Chains

By C. E. KING.

Great progress has been made during the past fifteen years in increasing the efficiency of the coal-cutting machine, but little or no improvement has been made in the cutting chain. Realizing that the cutting ability of a mining machine depends largely upon the cutting chain, the Link-Belt Company's engineers have, during the past seven years, made a very exhaustive study of this method of mining coal, and have developed an improved cutting-chain which is proving successful.

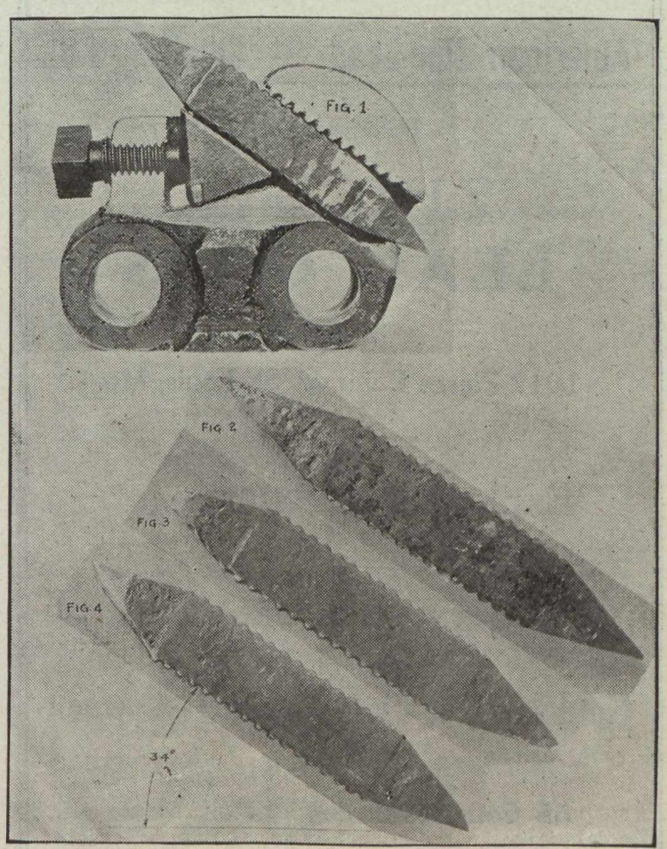
The writer who has been active in the development of this chain, believes that the principles involved will be of interest to all engaged in the preparation of coal at the mine, and takes opportunity to describe the improved cutting-chain, only recently placed on the market.

The vital elements which govern a successful coal-cutting chain are:

(a) The angle at which the bit engages the coal. The bit must have sufficient cutting clearance to eliminate the excessive friction which is caused by a dull cutting edge dragging the coal. The bit should cut, and not scrape.

(b) The ability to hold the bit in this desired position.

(c) The chair must be so proportioned and manufactured that it will withstand the hardships im-



posed when encountering pyrite concretions, and hard dirt bands in or adjacent to the coal seam.

The principal feature of the Link-Belt chain is the self-sharpening bit. The angle at which the bit engages the coal is such that, while the top side of the bit is wearing from contact with the body of the coal, the bottom side of the bit point is being sharpened. A sharp cutting edge is always available by merely turning the bit over sidewise. This sidewise turning of the bit can be repeated until the point of the bit becomes quite blunt; and as the bits are double pointed, they can be turned endwise when one end has become dull.

Figure 1 shows the assembled lug in partial section. The edges of the bit are corrugated, and fit into corresponding corrugations in the lug, thus eliminating all possibility of slip. An effective method of clamping the bit is the insertion of a malleable-iron wedge between the bit and set-screw. This wedge relieves the set-screw of the vibrating action of the bit, thus eliminating the annoying tendency of the set-screw to work loose. This is an important factor, since three to five per cent of the ordinary bits drop out of the lugs because of the set-screw working loose. Also, the point of the set-screw is not injured, as it is in cases where it engages in the hard steel bit. The set-screw is a snug fit in the lug, and a comparatively light pull on the set-screw is sufficient to hold the wedge and bit in place. The set-screw is not twisted off by the destructive pressure always required when it directly engages a smooth bit. Though very accessible for repairs, the wedges can not drop out of the lug, even if a bit is dislodged. There is ample room between the end of the wedge and the casting to release the bit, and the cutting dust finds a ready exit through the escapement hole provided for this purpose in the lug.

The advantages gained by this method of clamping the bit are:

1. Ability to hold the bit in its desired position.
2. Reduction of the loss of bits occasioned by set-screws working loose.
3. Prolonged life of the set-screw.
4. Increased efficiency of the machine men.

Figures 2, 3, and 4, show the bits in their working position. The bit shown in Figure 2 is in its forged condition, and ready to be replaced in the lug. Figure 3 show the same bit after it has cut approximately three times the amount of coal cut by the ordinary or curved type of bit. Note that the point has been worn similarly to a point obtained by holding the bit against an emery wheel. If the same bit be turned over, as shown, in Figure 4, a sharpened edge with renewed cutting clearance is presented.

The correct cutting angle is always assured, since its position in the lug link is fixed; and as the bit is straight, less of skill and time is required by the bit sharpener. The ability of the bit to sharpen itself is dependent entirely upon the angle at which it engages the coal. Steel of ordinary grade is used for the bits, and unusual tempering methods are required.

The lugs are cast from special steel. The chemical analysis and heat treatment of this casting have been developed by a very careful investigation of results obtained in actual service. The lugs are hot pressed to size (not machined), so as to improve the physical condition of the metal before heat treatment. The wearing surfaces are case hardened.

The strap links are made from a medium-carbon steel, drop forged. All engaging surfaces are accurately machined to fit the guides.

The chain has seven positions, the assembly or lacing of the chain being governed by the nature of the coal to be cut.

Chains can be supplied for all existing machines, and used without altering the cutter arm or sprockets.

It is claimed this chain will give greater production, with less power and prolonged life of bits and chain.

Coal is, and will continue to be, the main source of heat, light, power and fertilization of the earth, apart from the Sun. It is indeed fossil sunlight, and has no known substitute.

The Canadian Miners' Buying Directory.

Acetylene Gas:
Canada Carbide Company, Ltd.
Canadian Fairbanks-Morse.
Prest-O-Lite Co. of Canada, Ltd.

A.C. Units:
MacGovern & Co.

Agitators:
The Dorr Co.

Air Hoists:
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited.

Alloy and Carbon Tool Steel:
H. A. Drury Co., Ltd.
International High Speed Steel Co., Rockaway, N.J.

Alternators:
MacGovern & Co.

Spielman Agencies, Regd.

Aluminium:

Amalgamators:
Northern Canada Supply Co.
Mine and Smelter Supply Co.
Wabi Iron Works.

Antimony:
Canada Metal Co.

Antimonial Lead:
Pennsylvania Smelting Co.

Arrester, Locomotive Spark:
Hendrick Manufacturing Co.

Arsenic White Lead:
Coniagas Reduction Co.

Assayers' and Chemists' Supplies:
Dominion Engineering & Inspe tion Co
Lymans, Limited
Mine & Smelter Supply Co.
Pennsylvania Smelting Co.
Stanley, W. F. & Co., Ltd.

Ash Conveyors:
Canadian Link-Belt Company

Ashes Handling Machinery:
Canadian Mead-Morrison Co., Limited
Canadian Link-Belt Co., Ltd.

Assayers and Chemists:
Milton L. Hersey Co., Ltd.
Campbell & Deyell
Ledoux & Co.
Thos. Heys & Son
C. L. Constant Co.

Asbestos:
Everitt & Co.

Balls:
Canadian Foundries and Forgings, Ltd.
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works.
The Hardinge Conical Mill Co.

Ball Mills:
Hardinge Conical Mill Co.
Hull Iron & Steel Foundries, Ltd.
Mine and Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works.

Balances—Heusser:
Canadian Fairbanks-Morse Co., Ltd.
Mine and Smelter Supply Co.

Babbit Metals:
Canada Metal Co.
Canadian Fairbanks-Morse Co., Ltd.
Hoyt Metal Co.

Ball Mill Feeders:
Fraser & Chalmers of Canada, Ltd.
Hardinge Conical Mill Co.
Hull Iron & Steel Foundries, Ltd.

Ball Mill Linings:
Hardinge Conical Mill Co.
Hull Iron & Steel Foundries, Ltd.

Belting—Leather, Rubber and Cotton:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Link-Belt Co., Ltd.
The Mine & Smelter Supply Co.
Northern Canada Supply Co.
Jones & Glasco.

Belting:
R. T. Gilman & Co.
Gutta Percha & Rubber, Ltd.

Belting—Silent Chain:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que.
Jones & Glassco (Regd.)

Belting (Transmission):
Goodyear Tire & Rubber Co.

Belting (Elevator):
Goodyear Tire & Rubber Co

Belting (Conveyor):
Goodyear Tire & Rubber Co
Gutta Percha & Rubber, Ltd.

Blasting Batteries and Supplies:
Canadian Ingersoll-Rand Co., Ltd
Mussens, Ltd.
Northern Canada Supply Co.
Canadian Explosives, Ltd.
Giant Powder Co. of Canada, Ltd.

Bluestone:
The Consolidated Mining & Smelting Co.

Blowers:
Canadian Fairbanks-Morse Co., Ltd.
MacGovern & Co., Inc.
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Ltd.

Boilers:
Northern Canada Supply Co.
Canadian Ingersoll-Rand Co., Ltd.
Marsh Engineering Works
MacGovern & Co., Inc.
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
The John Inglis Company
Wabi Iron Works.

Blue Vitriol (Coniagas Red):
Canadian Fairbanks-Morse Co., Ltd.

Bortz and Carbons:
Diamond Drill Carbon Co.

Boxes, Cable Junction:
Standard Underground Cable Co. of Canada, Ltd.
Northern Electric Co., Ltd.

Brazilian Rough Diamonds:
Diamond Drill Carbon Co.

Brazilian Mica:
Diamond Drill Carbon Co.

Buggies, Mine Car (Steel)
Hendrick Manufacturing Co

Brazilian Ballas:
Diamond Drill Carbon Co.

Brazilian Rock Crystal:
Diamond Drill Carbon Co.

Brazilian Tourmalines:
Diamond Drill Carbon Co.

Brazilian Aquamarines:
Diamond Drill Carbon Co.

Bridges—Man Trolley and Rope Operated—Material Handling:
Canadian Mead-Morrison Co., Limited

Bronze, Manganese, Perforated and Plain:
Hendrick Manufacturing Co.

Buckets:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co., Limited
The Electric Steel & Metals Co.
R. T. Gilman & Co.
Hendrick Manufacturing Co.
Canadian Link-Belt Co., Ltd.
Marsh Engineering Works
Mussens, Ltd.
MacKinnon Steel Co., Ltd.
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Buckets, Elevator:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.

Cable—Aerial and Underground:
Canada Wire & Cable Co.
Northern Canada Supply Co.
Standard Underground Cable Co. of Canada, Ltd.

Cableways:
Canadian Mead-Morrison Co., Limited
Fraser & Chalmers of Canada, Ltd.
Mussens, Ltd.
The Wabi Iron Works
R. T. Gilman & Co.

Cages:
Canadian Ingersoll-Rand Co., Ltd., Montreal, Que
Northern Canada Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Mine & Smelter Supply Co.
Mussens, Ltd.
The Wabi Iron Works

Canadian Miners' Buying Directory.—(Continued)

Cables—Wire:
Standard Underground Cable Co of Canada, Ltd.
Canada Wire & Cable Co.
Fraser & Chalmers of Canada, Ltd
Northern Electric Co., Ltd.
Osborn, Sam'l (Canada) Limited.
R. T. Gilman & Co.

Cable Railway Systems:
Canada Wire & Cable Co.
Canadian Mead-Morrison Co., Limited.

Cam Shafts:
Canada Foundries & Forgings, Ltd
Hull Iron & Steel Foundries, Ltd

Car Dumps:
Sullivan Machinery Co.
R. T Gilman & Co.
Canadian Fairbanks-Morse Co. Ltd
Canadian Mead-Morrison Co., Limited.

Carbide of Calcium:
Canada Carbide Company, Ltd

Cars:
Canadian Foundries and Forgings, Ltd
Canadian Ingersoll-Rand Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
John J. Gartshore
MacKinnon Steel Co., Ltd.
The Electric Steel & Metals Co
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.
Marsh Engineering Works
Mine and Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd
Mussens, Limited
R. T. Gilman & Co.
The Wabi Iron Works

Car Wheels and Axles:
Canadian Car Foundry Co., Ltd.
Burnett & Crampton
Hull Iron & Steel Foundries, Ltd
John J. Gartshore
Marsh Engineering Works, Ltd.
Osborn, Sam'l (Canada) Limited.
The Electric Steel & Metals Co
The Wabi Iron Works

Carriers (Gravity):
Jones & Glassco

Castings—Brass
The Canada Metal Co., Ltd

Castings (Iron and Steel)
Burnett & Crampton
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd
Osborn, Sam'l (Canada) Limited.
The Electric Steel & Metals Co.
The Wabi Iron Works

Cement and Concrete Waterproofing:
Spielman Agencies, Regd.

Cement Machinery:
Northern Canada Supply Co.
Hadfields, Limited
Hull Iron & Steel Foundries, Ltd.
Osborn, Sam'l (Canada) Limited.
Fraser & Chalmers of Canada, Ltd
Canadian Fairbanks-Morse Co., Ltd
The Electric Steel & Metals Co
R. T Gilman & Co.
Burnett & Crampton

Chains:
Jones & Glassco
Northern Canada Supply Co
Canadian Fairbanks-Morse Co., Ltd
Canadian Link-Belt Co., Ltd.
Greening, B., Wire Co., Ltd.

Chain Drives:
Jones & Glassco (Regd.)

Chain Drives—Silent and Steel Roller:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que.

Chemical Apparatus:
Mine and Smelter Supply Co

Chemists:
Canadian Laboratories
Campbell & Deyell
Thos. Heyes & Sons
Milton Hersey Co.
Ledoux & Co.
Constant, C. L. Company

Chrome Ore:
The Electric Steel & Metals Co.
Everett & Co.

Classifiers:
Mine and Smelter Supply Co.
Mussens, Limited
Fraser & Chalmers of Canada, Ltd
The Wabi Iron Works
R. T. Gilman & Co.
The Dorr Company

Clutches:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que

Coal:
Dominoion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters:
Osborn, Sam'l (Canada) Limited.
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd

Coal Crushers:
Canadian Mead-Morrison Co., Limited
Canadian Link-Belt Co., Ltd.

Coal Mining Explosives:
Canadian Explosives, Ltd.
Giant Powder Company of Canada, Ltd.

Coal Mining Machinery:
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd
Osborn, Sam'l (Canada) Limited
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.
Marsh Engineering Works
Hadfields, Ltd.
Hendrick Mfg. Co.
Fraser & Chalmers of Canada, Limited
Mussens, Limited
R. T. Gilman & Co.

Coal and Coke Handling Machinery
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Co., Ltd.

Coal Pockets:
Canadian Mead-Morrison Co., Limited.

Coal Pick Machines:
Sullivan Machinery Co.

Coal Screening Plants:
Canadian Link-Belt Co., Ltd.
Canadian Mead-Morrison Co., Limited.

Cobalt Oxide:
Coniagas Reduction Co.
Everitt & Co.

Compressors—Air:
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.
MacGovern & Co., Inc.
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
The Mine & Smelter Supply Co

Concrete Mixers:
Canadian Fairbanks-Morse Co., Ltd
Northern Canada Supply Co.
Gould, Shapley & Muir Co., Ltd.
MacGovern & Co., Inc
Mussens, Limited
R. T. Gilman & Co.

Condensers:
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Northern Canada Supply Co
MacGovern & Co., Inc.

Concentrating Tables:.
The Mine & Smelter Supply Co
Deister Concentrator Co.
The Wabi Iron Works

Converters:
Northern Canada Supply Co
MacGovern & Co., Inc.

Conveyors—McCaslin Gravity Bucket:
Canadian Mead-Morrison Co., Limited.

Contractors' Supplies:
Canadian Fairbanks-Morse Co., Ltd

Consulters and Engineers:
Hersey Milton Co., Ltd

Conveyors:
Canadian Link-Belt Co., Ltd.
The Mine & Smelter Supply Co.
Jones & Glassco (Regd.)

Conveyor Belts:
Gutta Percha & Rubber, Ltd.

Conveyor Flights:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co., Ltd

Conveyor—Trough—Belt:
Canadian Fairbanks-Morse Co., Ltd
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.
Mussens, Limited
Jones & Glassco (Roller, Belt and Chain)
Hendrick Mfg. Co.
The Wabi Iron Works

Conical Mills:
Hardinge Conical Mill Co.

Copper:
The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co

Couplings:
Hans Renold of Canada, Limited, Montreal, Que

Cranes:
Canadian Fairbanks-Morse Co., Ltd
Canadian Mead-Morrison Co., Limited
Canadian Link-Belt Company
R. T. Gilman & Co.
Smart-Turner Machine Co.

Crane Ropes:
Allan Whyte & Co
Canada Wire & Cable Co.
Greening, B., Wire Co., Ltd.

Crucibles:
Canadian Fairbanks-Morse Co., Ltd.
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd
Hull Iron & Steel Foundries, Limited Hull, Que
Osborn, Sam'l (Canada) Limited.

Crude Oil Engines:
Swedish Steel & Importing Co., Ltd

Crushers:
Canadian Fairbanks-Morse Co., Ltd
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
Hardinge Conical Mill Co.
Osborn, Sam'l (Canada) Limited.
The Electric Steel & Metals Co., Ltd.
R. T. Gilman & Co
Lymans, Ltd.
Mussens, Limited

Canadian Miners' Buying Directory.—(Continued)

The Mine & Smelter Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Cut Gears:
Hans Renold of Canada, Limited, Montreal, Que.

Cyanide:
American Cyanamid Company.

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.

D. C. Units:
MacGovern Co.

Derricks:
Smart-Turner Machine Co.
Canadian Mead-Morrison Co., Limited.
Marsh Engineering Works
R. T. Gilman & Co.
Canadian Fairbanks-Morse Co., Ltd.
Mussens, Limited

Diamond Drill Contractors:
Diamond Drill Contracting Co.
E. J. Longyear Company
Smith & Travers
Sullivan Machinery Co.

Diamond Tools:
Diamond Drill Carbon Co.

Diamond Importers:
Diamond Drill Carbon Co.

Digesters:
Canadian Chicago Bridge and Iron Works

Dies:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Ltd.

Dredger Pins:
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited

Dredging Machinery:
Canadian Steel Foundries, Ltd.
Canadian Mead-Morrison Co., Limited.
Hadfields, Limited
Hull Iron & Steel Foundries, Ltd.
R. T. Gilman & Co.

Dredging Ropes:
Allan, Whyte & Co.
Greening, B., Wire Co., Ltd.
R. T. Gilman & Co.

Drills, Air and Hammer:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.
The Mine & Smelter Supply Co.
Mussens, Limited

Drills—Core:
Canadian Ingersoll-Rand Co., Ltd
E. J. Longyear Company
Standard Diamond Drill Co.
Sullivan Machinery Co.

Drills—Diamond:
Sullivan Machinery Co.
Northern Canada Supply Co.
E. J. Longyear Company

Drill Steel—Mining:
H. A. Drury Co., Ltd.
Hadfields, Limited
International High Speed Steel Co., Rockaway
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
Swedish Steel & Importing Co., Ltd

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Northern Canada Supply Co.
Sullivan Machinery Co.
Osborn, Sam'l (Canada) Limited.
The Wabi Iron Works

Drills—Electric:
Canadian Fairbanks-Morse Co., Ltd
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills—High Speed and Carbon:
Canadian Fairbanks-Morse Co., Ltd
Osborn, Sam'l (Canada) Limited.
H. A. Drury Co., Ltd.
Hadfields, Limited

Dynamite:
Canadian Explosives
Giant Powder Company of Canada, Ltd.
Northern Canada Supply Co

Dynamos:
Canadian Fairbanks-Morse Co., Ltd
MacGovern & Company

Electors:
Canadian Fairbanks-Morse Co. Ltd
Canadian Ingersoll-Rand Co., Ltd
Northern Canada Supply Co

Elevators:
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Co., Ltd.
Sullivan Machinery Co.
Northern Canada Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
Jones & Glassco (Regd.)
Mussens, Limited
The Wabi Iron Works

Engineering Instruments:
C. L. Berger & Sons

Engines—Automatic:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
Fraser & Chalmers of Canada, Ltd.

Engines—Gas and Gasoline:
Canadian Fairbanks-Morse Co., Ltd.
Alex. Fleck
Fraser & Chalmers of Canada, Ltd.
Osborn, Sam'l (Canada) Limited.
Sullivan Machinery Co.
Gould, Shapley & Muir Co., Ltd.
MacGovern & Co., Inc.
The Mine & Smelter Supply Co

Engines—Haulage:
Canadian Ingersoll-Rand Co., Ltd., Montreal, Que.
Canadian Mead-Morrison Co., Limited.
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd.

Engines—Marine:
Canadian Fairbanks-Morse Co., Ltd
MacGovern & Co., Inc.
Swedish Steel & Importing Co., Ltd.

Engines—Steam:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
R. T. Gilman & Co.
MacGovern & Co., Inc.
Fraser & Chalmers of Canada, Ltd.

Engines—Stationery:
Swedish Steel & Importing Co.

Engineers:
Canadian Fairbanks-Morse Co., Ltd
Fraser & Chalmers of Canada, Ltd.
General Engineering Works
The Dorr Co

Ferro-Alloys (all Classes):
Everitt & Co.

Feed Water Heaters:
MacGovern & Co

Fire Fighting Supplies:
Gutta Percha & Rubber, Ltd.

Flashlights—Electric:
Spielman Agencies, Regd.

Flood Lamps:
Northern Electric Co., Ltd.

Flourspar:
The Consolidated Mining & Smelting Co
Everitt & Co.

Forges:
Canadian Fairbanks-Morse Co., Ltd
Northern Canada Supply Co.

Forging:
Canadian Mead-Morrison Co., Limited.
Canadian Foundries and Forgings, Ltd
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.

Frogs:
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd
John J. Gartshore

Frequency Changers:
MacGovern & Co., Inc.

Furnaces—Assay:
Canadian Fairbanks-Morse Co Ltd.
Lymans, Limited
Mine & Smelter Supply Co

Fuse:
Canadian Explosives
Giant Powder Company of Canada, Ltd
Northern Canada Supply Co

Gaskets:
Gutta Percha & Rubber, Ltd.

Gears:
Hans Renold of Canada, Limited, Montreal, Que
Jones & Glassco (Regd.)

Gears (Cast):
Hull Iron & Steel Foundries, Ltd
Canadian Link-Belt Co., Ltd.

Gears, Machine Cut:
Canadian Fairbanks-Morse Co. Ltd.
Canadian Steel Foundries, Ltd.
The Electric Steel & Metals Co.
The Hamilton Gear & Machine Co
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Granulators:
Hardinge Conical Mill Co.

Grinding Wheels:
Canadian Fairbanks-Morse Co., Ltd.

Gold Refiners
Goldsmith Bros

Canadian Miners' Buying Directory.—(Continued)

Gold Trays:
Canada Chicago Bridge & Iron Works

Hose (Air Drill):
Goodyear Tire & Rubber Co
Gutta Percha & Rubber, Ltd.

Hose (Fire):
Goodyear Tire & Rubber Co
Gutta Percha & Rubber, Ltd.

Hose (Packings)
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.

Hose (Suction):
Goodyear Tire & Rubber Co
Gutta Percha & Rubber, Ltd.

Hose (Steam):
Goodyear Tire & Rubber Co
Gutta Percha & Rubber, Ltd.

Hose (Water):
Goodyear Tire & Rubber Co
Gutta Percha & Rubber, Ltd.

Hammer Rock Drills:
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
The Mine & Smelter Supply Co.

Hangers and Cable:
Standard Underground Cable Co. of Canada, Ltd.

High Speed Steel:
Canadian Fairbanks-Morse Co. Ltd.
H. A. Drury Co., Ltd.
Osborn, Sam'l (Canada) Limited.
Hadfields, Limited
International High Speed Steel Co., Rockaway

High Speed Steel Twist Drills:
Canadian Fairbanks-Morse Co., Ltd.
H. A. Drury Co., Ltd.
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.

Hoists—Air, Electric and Steam:
Canadian Ingersoll-Rand Co., Ltd
Canadian Fairbanks-Morse Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Jones & Glassco
Canadian Mead-Morrison Co., Limited
Marsh Engineering Works
Northern Canada Supply Co.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works
R. T. Gilman & Co
Mussens, Limited
Canadian Link-Belt Co., Ltd.

Hoisting Engines:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
The Electric Steel & Metals Co.
Mussens, Limited
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd
Canadian Mead-Morrison Co., Limited
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd
The Mine & Smelter Supply Co.

Hoisting Towers:
Canadian Mead-Morrison Co., Limited

Hose:
Canadian Fairbanks-Morse Co., Ltd
Gutta Percha & Rubber, Ltd
Northern Canada Supply Co

Hose (Steam, Air, Water):
Gutta Percha & Rubber, Ltd.

Hydraulic Machinery:
Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited
MacGovern & Co., Inc.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Industrial Chemists:
Hersey, M. & Co., Ltd

Ingot Copper:
Canada Metal Co., Ltd
Hoyt Metal Co.

Insulating Compounds:
Standard Underground Cable Co. of Canada, Ltd.

Inspection and Testing:
Dominion Engineering & Inspection Co.

Inspectors:
Hersey, M. & Co., Ltd

Jacks:
Canadian Fairbanks-Morse Co., Ltd
Can. Brakeshoe Co., Ltd
Northern Canada Supply Co
R. T. Gilman & Co.
Mussens, Limited

Jack Screws:
Canadian Foundries and Forgings, Ltd

Laboratory Machinery:
Mine & Smelter Supply Co.

Lamps—Acetylene:
Dewar Manufacturing Co., Inc.

Lamps—Carbide:
Dewar Manufacturing Co., Inc.

Lamps—Miners:
Canada Carbide Company, Limited
Canadian Fairbanks-Morse Co., Ltd
Dewar Manufacturing Co., Inc.
Northern Electric Co., Ltd.
Mussens, Limited

Lamps:
Dewar Manufacturing Co., Inc.

Lanterns—Electric:
Spielman Agencies, Regd.

Lead (Pig):
The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co.

Levels:
C. L. Berger & Sons

Locomotives (Steam, Compressed Air and Storage Steam:
Canadian Fairbanks-Morse Co., Ltd.
H. K. Porter Company
R T. Gilman & Co
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited

Link Belt
Canadian Fairbanks-Morse Co. Ltd
Northern Canada Supply Co.
Jones & Glassco

Machinists:
Burnett & Crampton

Machinery—Repair Shop:
Canadian Fairbanks-Morse Co., Ltd.

Machine Shop Supplies:
Canadian Fairbanks-Morse Co., Ltd.

Magnesium Metal:
Everitt & Co.
Hull Iron & Steel Foundries, Ltd.

Manganese Steel:
Canadian Steel Foundries, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited
Osborn, Sam'l (Canada) Limited.
Hull Iron & Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd
The Wabi Iron Works

Metal Marking Machinery:
Canadian Fairbanks-Morse Co., Ltd

Metal Merchants:
Henry Bath & Son
Geo. G. Blackwell, Sons & Co.
Coniagas Reduction Co.
Consolidated Mining & Smelting Co. of Canada
Canada Metal Co.
C. L. Constant Co.
Everitt & Co

Metallurgical Engineers:
General Engineering Co., New York
The Dorr Co.

Metallurgical Machinery:
General Engineering Co., New York
The Dorr Co.
The Mine & Smelter Supply Co.

Metal Work, Heavy Plates:
Canada Chicago Bridge & Iron Works

Mica:
Everitt & Co.
Diamond Drill Carbon Co.

Mining Engineers:
Hersey, M. Co., Ltd.

Mining Drill Steel:
H. A. Drury Co., Ltd.
Osborn, Sam'l (Canada) Limited.
International High Speed Steel Co., Rockaway, N

Mining Requisites:
Canadian Steel Foundries, Ltd
Dominion Wire Rope Co., Ltd.
Hadfields, Limited
Osborn, Sam'l (Canada) Limited.
Hull Iron & Steel Foundries, Ltd
Fraser & Chalmers of Canada, Ltd
The Electric Steel & Metals Co.
The Wabi Iron Works

Mining Ropes:
Dominion Wire Rope Co., Ltd

Mine Surveying Instruments:
C. L. Berger & Sons

Molybdenite:
Everitt & Co

Monel Metal (Wire, Rod, Sheet and Foundry Metal):
International Nickel Co.

Motors:
Canadian Fairbanks-Morse Co., Ltd.
R. T. Gilman & Co.
MacGovern & Co.
The Mine & Smelter Supply Co
The Wabi Iron Works

Canadian Miners' Buying Directory.—(Continued)

Motor Generator Sets—A.C. and D.C
MacGovern & Co.

Nails:
Canada Metal Co.

Nickel:
International Nickel Co.
Coniagas Reduction Co.
The Mond Nickel Co., Ltd.

Nickel Anodes:
The Mond Nickel Co., Ltd.

Nickel Salts:
The Mond Nickel Co., Ltd.

Nickel Sheets:
The International Nickel Co. of Canada
The Mond Nickel Co., Ltd

Nickel Wire:
The Mond Nickel Co., Ltd.
The International Nickel Co. of Canada

Oil Analysts:
Constant, C. L. Co

Ore Handling Equipment:
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Co., Ltd.

Ore Sacks:
Northern Canada Supply Co

Ore Testing Works:
Ledoux & Co.
Can. Laboratories
Milton Hersey Co.
Campbell & Deyell
General Engineering Co., New York
Hoyt Metal Co.

Ores and Metals—Buyers and Sellers of:
C. L. Constant Co.
Geo. G. Blackwell
Consolidated Mining and Smelting Co. of Canada
Oxford Copper Co.
Canada Metal Co.
Hoyt Metal Co.
Everitt & Co.
Pennsylvania Smelting Co.

Packing:
Canadian Fairbanks-Morse Co., Ltd
Gutta Percha & Rubber, Ltd.

Paints—Special:
Spielman Agencies, Regd.

Perforated Metals:
Northern Canada Supply Co.
Hendrick Mfg. Co.
Canada Wire and Iron Goods Company.
Greening, B., Wire Co.

Permissible Explosives:
Giant Powder Company of Canada, Ltd.

Pig Tin:
Canada Metal Co., Ltd.
Hoyt Metal Co.

Pig Lead:
Canada Metal Co., Ltd.
Hoyt Metal Co.
Pennsylvania Manufacturing Co.

Pillow Blocks:
Canadian Link-Belt Company

Pipes:
Canadian Fairbanks-Morse Co., Ltd.
Canada Metal Co., Ltd.
Consolidated M. & S. Co.
Northern Canada Supply Co.
R. T. Gilman & Co.

Pipe Fittings:
Canadian Fairbanks-Morse Co., Ltd.

Pipe—Wood Stave:
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.

Piston Rock Drills:
Mussens, Limited
Mine & Smelter Supply Co.

Plate Works:
John Inglis Co., Ltd.
Hendrick Mfg. Co.
The Wabi Iron Works
MacKinnon Steel Co., Ltd.

Platinum Refiners:
Goldsmith Bros.

Pneumatic Tools:
Canadian Ingersoll-Rand Co., Ltd.
R. T. Gilman & Co.

Powder:
Giant Powder Company of Canada, Ltd.

Prospecting Mills and Machinery:
The Electric Steel & Metals Co.
E. J. Longyear Company
Standard Diamond Drill Co.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, L
The Wabi Iron Works

Pumps—Pneumatic:
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Sullivan Machinery Co.

Pumps—Steam:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
The Electric Steel & Metals Co.
The Mine & Smelter Supply Co.
Mussens, Limited
Northern Canada Supply Co.
Smart-Turner Machine Co.
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Pumps—Turbine:
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Pumps—Vacuum:
Canadian Fairbanks-Morse Co., Ltd
Smart-Turner Machine Co.
The Wabi Iron Works

Pumps—Valves:
Canadian Fairbanks-Morse Co., Ltd.

Pulleys, Shaftings and Hangings:
Northern Canada Supply Co.
Canadian Fairbanks-Morse Co., Ltd
The Wabi Iron Works

Pulverizers—Laboratory:
Mine & Smelter Supply Co.
The Wabi Iron Works
Hardinge Conical Mill Co.

Pumps—Boiler Feed:
Smart-Turner Machine Co.
Northern Canada Supply Co.
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
Mine & Smelter Supply Co.

Pumps—Centrifugal:
Canadian Fairbanks-Morse Co., Ltd
The Electric Steel & Metals Co.
Smart-Turner Machine Co.
Canadian Mead-Morrison Co., Limited.
Canadian Ingersoll-Rand Co., Ltd.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

Pumps—Diaphragm
The Dorr Company

Pumps—Electric
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited
Smart-Turner Machine Co.

Pumps—Sand and Slime:
Canadian Fairbanks-Morse Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Mine & Smelter Supply Co.
The Electric Steel & Metals Co.
The Wabi Iron Works
mart-Turner Machine Co.

Quarrying Machinery:
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited
Mussens, Limited
R. T. Gilman Co.

Rails:
Hadfields, Limited
John J. Gartshore
R. T. Gilman & Co.
Mussens, Limited

Railway Supplies:
Canadian Fairbanks-Morse Co., Ltd

Refiners:
Goldsmith Bros.

Riddles:
Hendrick Mfg. Co

Roller Chain:
Hans Renold of Canada, Limited, Montreal, Que
Canadian Link-Belt Co., Ltd.

Roofing:
Canadian Fairbanks-Morse Co Ltd
Northern Canada Supply Co.

Rope—Manilla:
Osborn, Sam'l (Canada) Limited.
Mussens, Limited

Rope—Manilla and Jute
Jones & Glassco
Northern Canada Supply Co
Osborn, Sam'l (Canada) Limited
Allan, Whyte & Co

Canadian Miners' Buying Directory.—(Continued)

Rope—Wire:
Allan, Whyte & Co.
Canada Wire & Cable Co.
Dominion Wire Rope Co., Ltd
Greening, B. Wire Co.
Northern Canada Supply Co.
Mussens, Limited

Rolls—Crushing
Canadian Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd
Hull Iron & Steel Foundries, Ltd.
Osborn, Sam'l (Canada) Limited.
Hadfields, Limited
The Electric Steel & Metals Co.
Mussens, Limited
The Wabi Iron Works

Samplers:
Fraser & Chalmers of Canada, Ltd
C. L. Constant Co.
Ledoux & Co.
Milton Hersey Co.
Thos. Heyes & Son
Mine & Smelter Supply Co.
Mussens, Limited

Scales—(all kinds):
Canadian Fairbanks-Morse Co., Ltd

Screens:
Greening, B. Wire Co.
Hendrick Mfg. Co.
Mine & Smelter Supply Co
Canada Wire and Iron Goods Company.
Canadian Link-Belt Co., Ltd.

Screens—Cross Patent Flanged Lip:
Hendrick Mfg. Co.

Screens—Perforated Metal:
Hendrick Mfg. Co.

Screens—Shaking:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.

Screens—Revolving:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.

Scheelite:
Everitt & Co.

Separators:
Canadian Fairbanks-Morse Co., Ltd.
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

Shaft Contractors:
Hendrick Mfg. Co.

Sheet Metal Work:
Hendrick Mfg. Co.

Sheets—Genuine Manganese Bronze:
Hendrick Mfg. Co.

Shoes and Dies:
Canadian Foundries and Forgings, Ltd
H. A. Drury Co., Ltd.
Fraser & Chalmers of Canada, Ltd.
Hull Iron & Steel Foundries, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works

Shovels—Steam:
Canadian Foundries and Forgings, Ltd
Canadian Mead-Morrison Co., Limited.
Osborn, Sam'l (Canada) Limited.
R. T. Gilman & Co.

Ship Bunkering Equipment:
Canadian Mead-Morrison Co., Limited.

Silent Chain:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que.

Silent and Steel Roller:
Canadian Link-Belt Co., Ltd.
Jones & Glassco (Regd.)

Siline:
Coniagas Reduction Co

Saline Refiners:
Goldsmith Bros.

Smelters:
Goldsmith Bros.

Sledges:
Canada Foundries & Forgings, Ltd

Smoke Stacks:
Hendrick Mfg. Co.
MacKinnon Steel Co., Ltd.
Marsh Engineering Works
The Wabi Iron Works

Special Machinery:
John Inglis Co., Ltd.

Spelter:
The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co

Sprockets:
Hans Renold of Canada, Limited, Montreal, Que.
Canadian Link-Belt Co., Ltd.
Jones & Glassco (Regd.)

Spring Coil and Clips Electrico:
Canadian Steel Foundries, Ltd

Steel Barrels:
Smart-Turner Machine Co.
Fraser & Chalmers of Canada, Ltd

Stamp Forgings:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Ltd.

Steel Castings:
Canadian Brakeshoe Co., Ltd.
Canadian Steel Foundries, Ltd.
Fraser & Chalmers of Canada, Ltd.
Osborn, Sam'l (Canada) Limited.
Hull Iron & Steel Foundries, Ltd.
The Electric Steel & Metals Co.
Hadfields, Limited
The Wabi Iron Works

Steel Drills:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Northen Canada Supply Co.
The Electric Steel & Metals Co.
Osborn, Sam'l (Canada) Limited.
Canadian Ingersoll-Rand Co., Ltd.
Mussens, Limited
Swedish Steel & Importing Co., Ltd.

Steel Drums:
Smart-Turner Machine Co.

Steel—Tool:
Canadian Fairbanks-Morse Co., Ltd.
H. A. Drury Co., Ltd.
N. S. Steel & Coal Co.
Osborn, Sam'l (Canada) Limited.
Hadfields, Limited
Swedish Steel & Importing Co., Ltd.

Structural Steel Work (Light):
Hendrick Mfg. Co.

Stone Breakers:
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
Osborn, Sam'l (Canada) Limited.
Mussens, Limited
R. T. Gilman & Co.
The Wabi Iron Works

Sulphate of Copper:
The Mond Nickel Co., Ltd.
Coniagas Reduction Co.

Sulphate of Nickel:
The Mond Nickel Co., Ltd.

Surveying Instruments:
C. L. Berger

Switches and Switch Stand:
Canadian Steel Foundries, Ltd.
Mussens, Limited.

Switches and Turntables:
John J. Gartshore

Tables—Concentrating:
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.

Tanks:
R. T. Gilman & Co.

Tanks—Acid:
Canadian Chicago Bridge & Iron Works
The Mine & Smelter Supply Co.

Tanks (Wooden):
Canadian Fairbanks-Morse Co., Ltd.
Gould, Shapley & Muir Co., Ltd.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.
The Wabi Iron Works

Tanks—Cyanide, Etc.:
Hendrick Mfg. Co.
Pacific Coast Pipe Co.
MacKinnon Steel Co.
Fraser & Chalmers of Canada, Ltd.
Mine & Smelter Supply Co.
The Wabi Iron Works

Tanks—Steel:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Canadian Chicago Bridge & Iron Works
Marsh Engineering Works
Osborn, Sam'l (Canada) Limited.
MacKinnon Steel Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
Hendrick Mfg. Co.
The Wabi Iron Works

Tanks—Oil Storage:
Canadian Chicago Bridge & Iron Works
The Mine & Smelter Supply Co.

Tanks (water) and Steel Towers:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Chicago Bdidge & Iron Works
Gould, Shapley & Muir Co., Ltd.
MacKinnon Steel Co.
Mine & Smelter Supply Co.
The Wabi Iron Works

Tires—Auto, Truck and Bicycle:
Gutta Percha & Rubber, Ltd.

Canadian Miners' Buying Directory.—(Continued)

Tramway Points and Crossings:
Canadian Steel Foundries, Ltd.
Hadfields, Limited

Transits:
C. L. Berger & Sons

Transformers:
Canadian Fairbanks-Morse Co., Ltd
R. T. Gilman & Co.
Northern Electric Co., Ltd.

Transmission Appuiances:
Jones & Glassco (Regd.)

Transmission Machinery:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Limited, Montreal, Que.
Jones & Glassco (Regd.)

Troughs (Conveyor):
Hendrick Manufacturing Co.

Trucks—Electric:
Canadian Fairbanks-Morse Co., Ltd.

Trucks—Hand:
Canadian Fairbanks-Morse Co., Ltd.

TTrucks:
Canadian Fairbanks-Morse Co., Ltd.

Tubs:
Hadfields, Limited

Tube Mills:
The Electric Steel & Metals Co.
Fraser & Chalmers of Canada, Ltd.
Hardinge Conical Mill Co.

Tube Mill Balls:
Canada Foundries & Forgings, Ltd.
Fraser & Chalmers of Canada, Ltd.
Hull Iron & Steel Foundries, Ltd.

Tube Mill Liners:
Burnett & Crampton
Fraser & Chalmers of Canada, Ltd
Hull Iron & Steel Foundries, Ltd.

Turbines—Water Wheel:
MacGovern & Co.

Turbines—Steam:
Fraser & Chalmers of Canada, Ltd.
MacGovern & Co.

Twincones:
Canada Foundries & Forgings, Ltd

Uranium:
Everitt & Co.

Weighing Larries:
Canadian Mead-Morrison Co., Limited.

Welding—Rod and Flux:
Prest-O-Lite Co. of Canada, Ltd.
Imperial Brass Mfg. Co.

Welding and Cutting—Oxy-Acetylene:
Prest-O-Lite Co. of Canada, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Imperial Brass Mfg. Co.

Wheels and Axles:
Canadian Steel Foundries, Ltd.
Hadfields, Limited
The Electric Steel & Metals Co.
The Wabi Iron Works

Winches—Power Driven:
Canadian Mead-Morrison Co., Limited.

Winding Engines—Steam and Electric:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Marsh Engineering Works
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
Mussens, Limited
R. T. Gilman & Co.
The Wabi Iron Works

Wire:
Canada Wire & Cable Co., Ltd.
Greening, B. Wire Co.

Wire—Bare and Insulated:
Canada Wire & Cable Co.

Wire Rope:
R. T. Gilman & Co.
Canada Wire and Iron Goods Company.
Canada Wire & Cable Co.
Dominion Wire Rope Co., Ltd.

Wire Rope Fittings:
Canada Wire and Iron Goods Company.
Canada Wire & Cable Co.

Wire Cloth:
Northern Canada Supply Co.
Greening, B. Wire Co.
Canada Wire & Iron Goods Company

Wire (Bars and Insulated):
Standard Underground Cable Co. of Canada, Ltd.
Northern Electric Co., Ltd.

Wolfram Ore:
Everitt & Co.

Woodworking Machinery:
Canadian Fairbanks-Morse Co., Ltd.

Zirconium:
Everitt & Co.

Zinc:
The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co.

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Canada Metal Co., Ltd.
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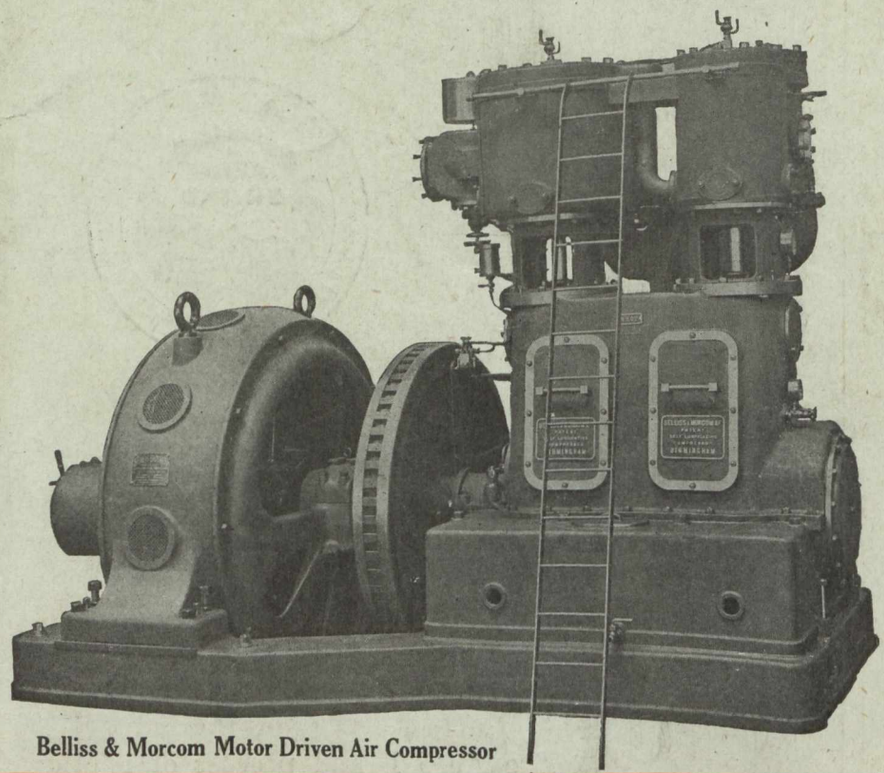

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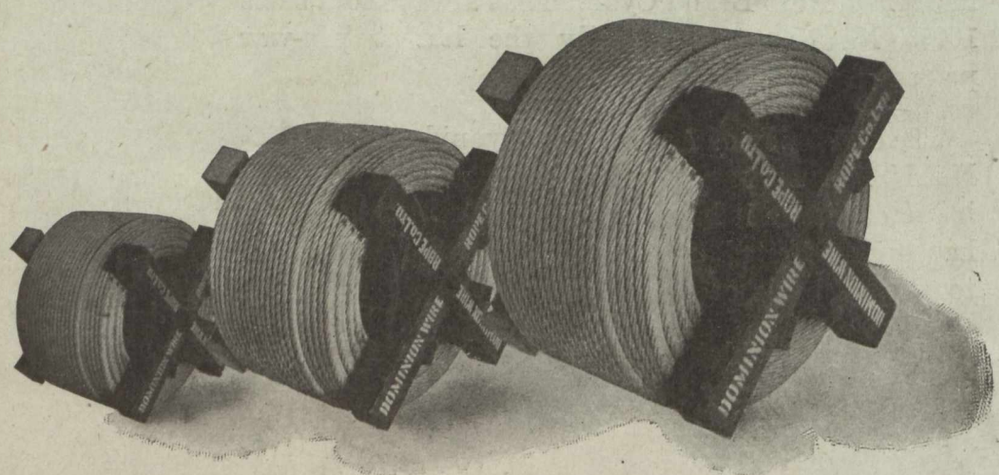

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