

CANADIAN MINING JOURNAL

Vol. XLI.

Gardenvale, P. Q., August 20, 1920.

No. 33.

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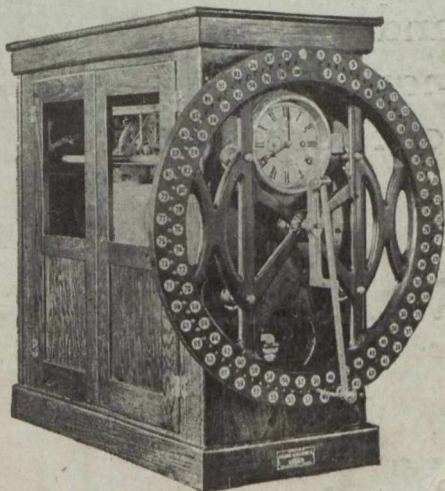
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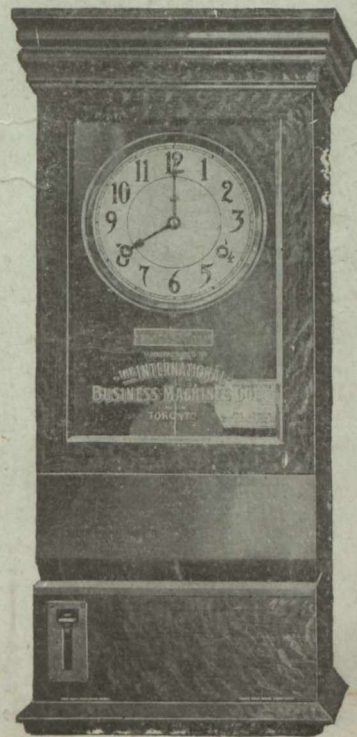
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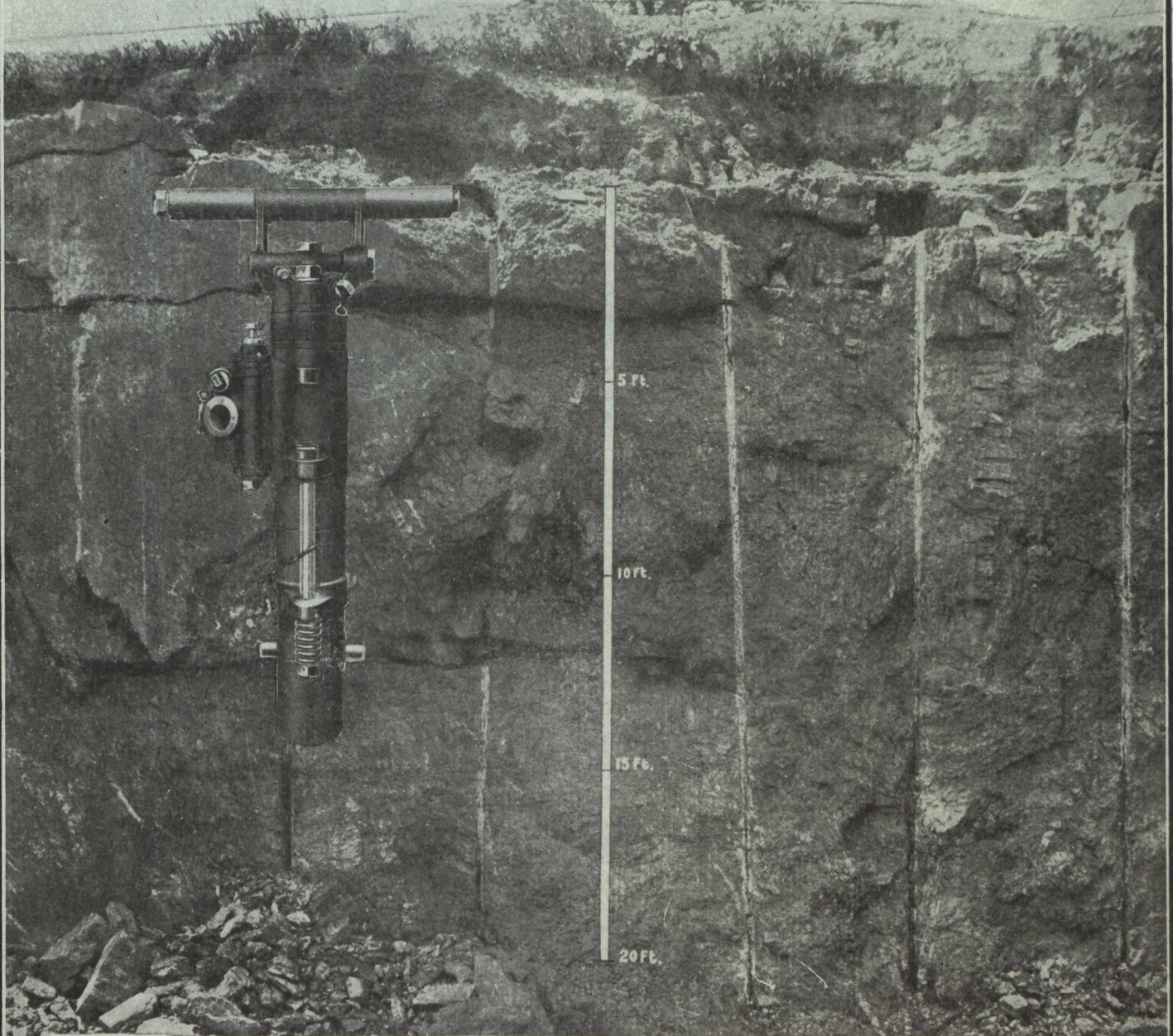
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Recent Publications

Iron Ore Occurrences in Canada, Vol. II. Compiled by E. Lindeman, M.E., and L. L. Bolton, M.A., B.Sc. Introductory by A. H. A. Robinson, B.A.Sc.

The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (British Columbia). Vol. V., by W. A. Parks, Ph.D.

Peat, Lignite and Coal; their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Mineral Production Reports, by J. McLeish, B.A.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

The Value of Peat Fuel for the Generation of Steam, by J. Blizard, B.Sc.

Analyses of Canadian Fuels. Parts I to V, by E. Stansfield, M.Sc., and J. H. H. Nicolls, M.Sc.

Clay Resources of Southern Saskatchewan, by N. B. Davis, M.A., B.Sc.

Summary Report of the Mines Branch, 1918.

The Mineral Springs of Canada. Part II., by R. T. Elworthy, B.Sc.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory.—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

GEOLOGICAL SURVEY

Recent Publications

Summary Report. The annual Summary Report of the Geological Survey is now printed in parts. Applicants should therefore, state what particular geologist's report is required, or what subjects they are interested in.

Memoir 105. Amisk-Athapapuskow Lake district, by E. L. Bruce.

Memoir 108. The Mackenzie River basin, by Charles Camsell and Wyatt Malcolm.

Memoir 110. Preliminary report on the economic geology of Hazelton district, British Columbia, by J. J. O'Neill.

Memoir 111. The Silurian geology and faunas of Ontario peninsula and Manitoulin and adjacent islands, by M. Y. Williams.

Memoir 113. Geology and mineral deposits on a part of Amherst township, Quebec, by M. E. Wilson.

Memoir 114. Road material surveys in the city and district of Montreal, Quebec, by Henri Gauthier.

Memoir 115. Geology of Matachewan district, Northern Ontario, by H. C. Cooke.

Memoir 116. Investigations in the gas and oil fields of Alberta, Saskatchewan and Manitoba, by D. B. Dowling, S. E. Slipper and F. H. McLearn.

Memoir 117. Geology and ore deposits of Ainsworth mining camp, British Columbia, by S. J. Schofield.

Museum Bulletin 30. Gabbros of East Sooke and Rocky Point, by H. C. Cooke.

Map 164A. St. John, New Brunswick. Topography.

Map 183A. Harricanaw-Turgeon basin; Abitibi, Timiskaming and Pontiac, Que. Geology.

Map 185A. Sandon (Slocan and Ainsworth Mining Divisions). Topography.

Map 1584. Blairmore, Alberta. Geology.

Map 1691. Buckingham, Hull and Labelle counties, Quebec. Geology.

Map 1705. Thetford-Black Lake area, Quebec. Topography.

Map 1707. New Glasgow, Pictou county, N.S. Topography.

Map 1712. Foothills of Southern Alberta, St. Mary river to Hig:wood river. Geology.

Map 1724. Sheep River, Alberta. Geology.

Map 1726. Athapapuskow Lake region. Geology.

Map 1739. Portions of Bristol, Onslow, McNab, Fitzroy and Torbolton townships, Quebec and Ontario. Geology.

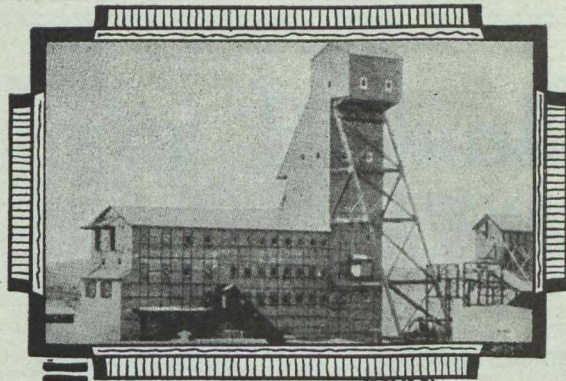
Map 1742. Ainsworth, Kootenay district, B.C. Geology.

Map 1793. Matachewan, Timiskaming district, Ontario. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

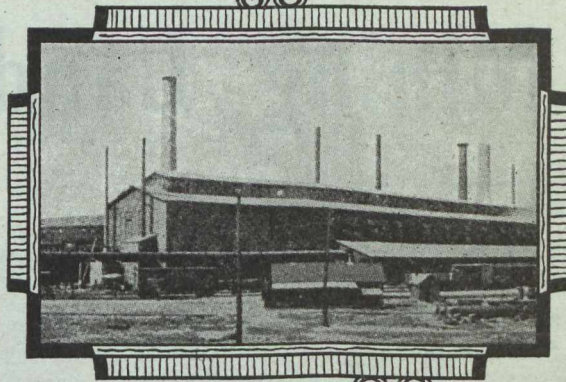
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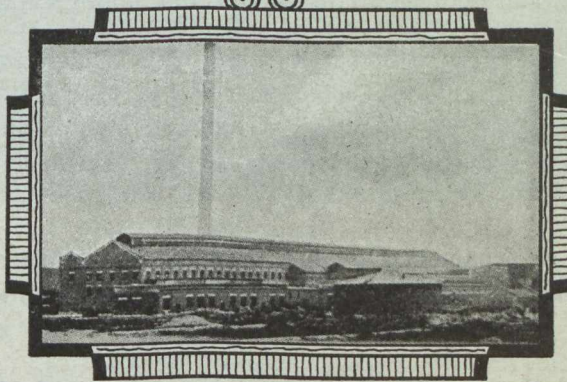
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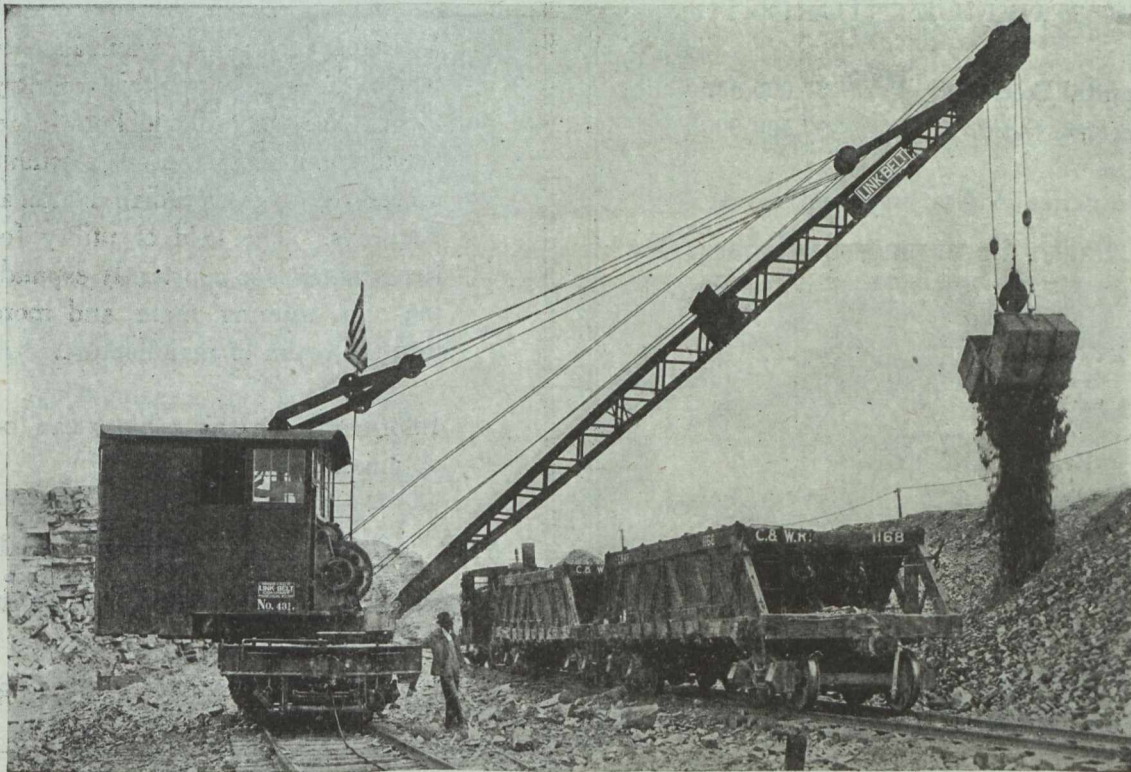
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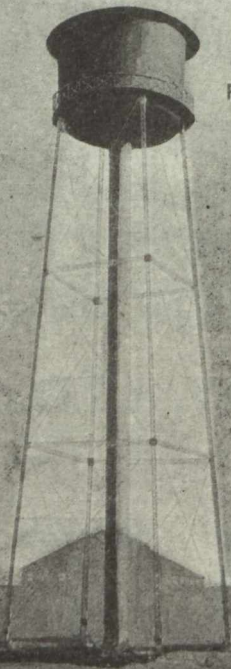
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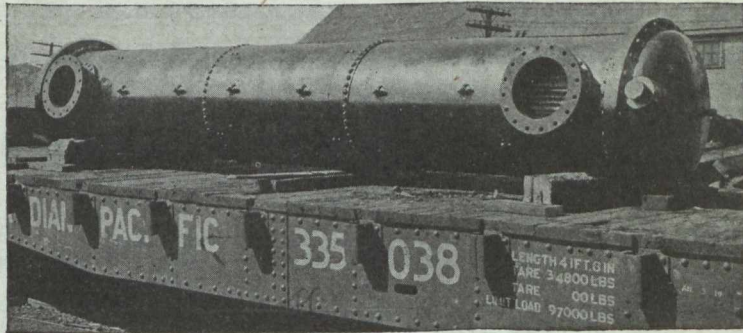
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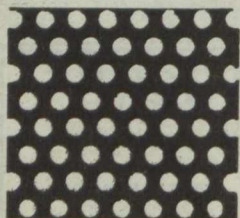
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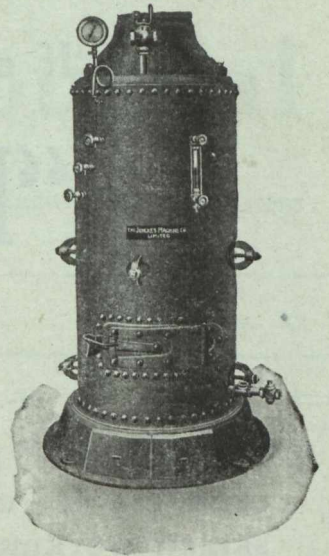
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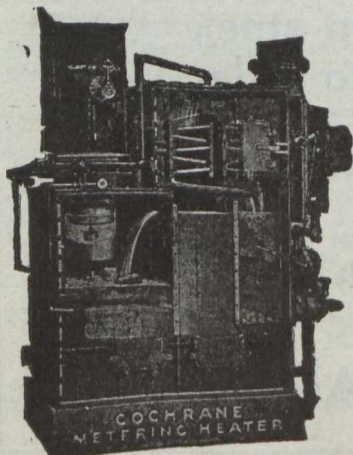
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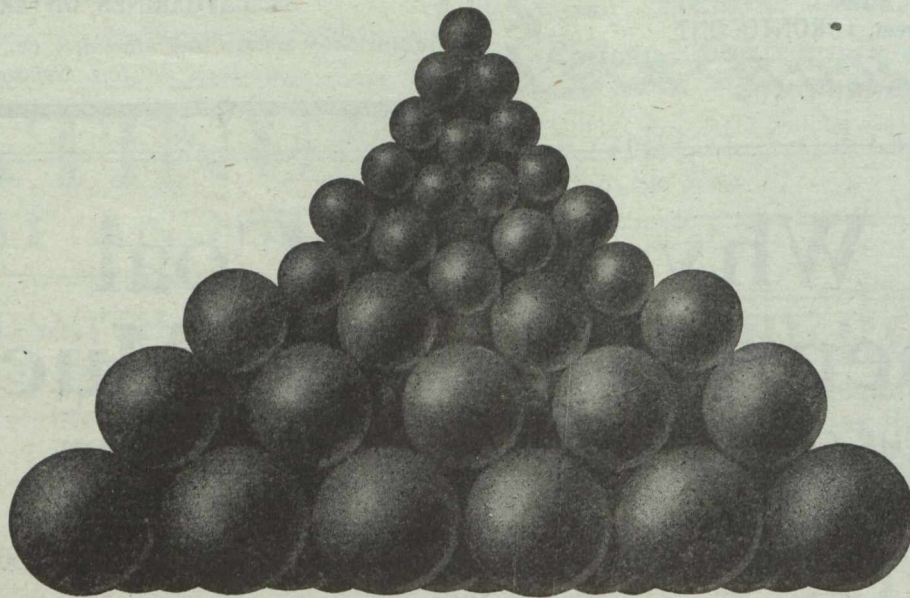
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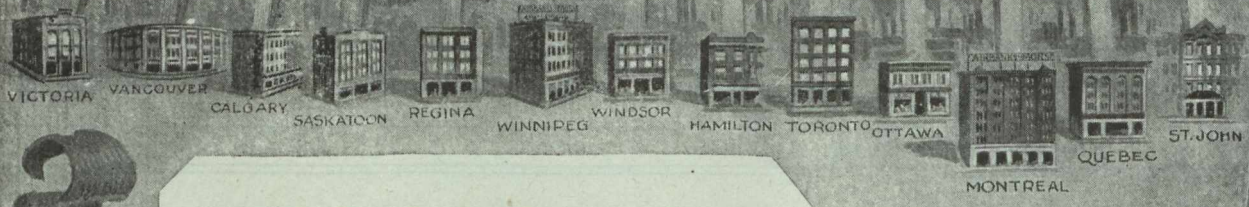
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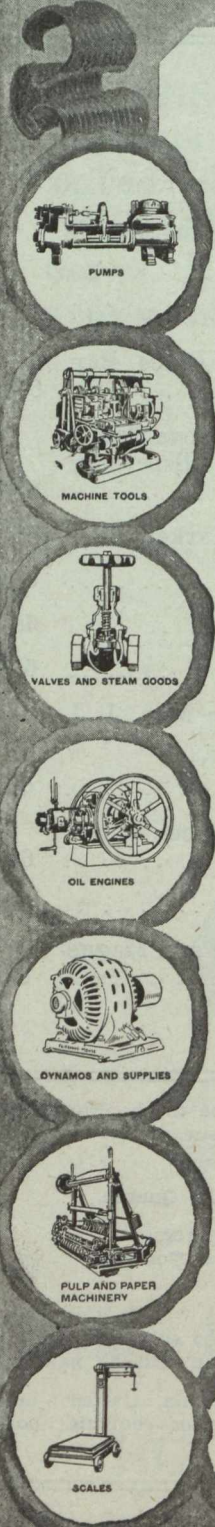
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EDITORIAL

SOME FIRST-HAND DEFINITIONS OF THE THEORY OF THE O.B.U.

The newspapers have contained little about the notable debate which took place in Winnipeg on August 6th between exponents of the rival doctrines of the O. B. U. and the American Federation of Labor, but it occupied the attention of three thousand persons for three hours in hot weather, and elicited some definition of O. B. U. theories that will bear quotation.

Jos. Knight, who opened the debate for the O. B. U., and who was more remarkable for his venom than his logic, said: "The O. B. U. is not a national organization. That is absurd. An organization of the working classes as a class cannot be national. . . . What has the O. B. U. done? It has permeated the mind of the working classes of Canada in a manner that they will not get over, and tomorrow the O. B. U. will have the whole thing."

The representative of the American Federation of Labor, W. H. Hoop, defending the policies of the allied craft unions said this form of organization supplied "that merit which enables the worker to pool and use his economic power within the limits of the constitution, and carries with it the dictatorship of the proletariat whenever they desire to express it at the ballot box; whereas the O.B.U., throwing aside all weapons other than the big stick of direct action, treats society as an enemy, seeking to subdue various sections by dictatorship."

John Houston, speaking for the O. B. U. quoted a conversation with a tramcar driver, who advised "All you have to do to win that debate is to point the attention of the audience to the fact that the bosses, the politicians, the newspapers, and all the organizations and institutions of society are against the O. B. U. If the working class cannot see that an organization which meets with all that hostility is in their interests, then they cannot see anything at all." Mr. Houston's own point of view he stated to be a firm belief "that when a man takes part in the Labor movement, and while doing so he enters into relations or bargains or receives any favors from the bosses, he is a traitor to the working class."

The speakers of course said much more, but the quotations selected sufficiently disclose the fatal gulf between those who desire to mend society as it is now constituted, and those who desire to end it. Mr. Knight and his confreres have correctly diagnosed the O. B. U. movement as the deadly enemy of "the institutions of society" and as anti-national. This

gentleman, in his rebuttal speech, said further: "Oh fellow-workers, the simplicity of the whole thing! Here you are, the workers of Winnipeg. You organize in your own units. Express yourself through your Council, and the workers of Winnipeg will have control of their own affairs. There it is in simplicity—the O. B. U."

"Their own affairs"—and, everybody else's. We grant the simplicity, but there's the rub.

Those who advocate the complete domination of the "working classes" also arrogate to themselves the definition of the term, accompanying their advocacy with a denial of the right of any other class to exist. When they also postulate that all those are traitors who enter into communication with those inhabitants of the world that are not included within the self-determined definition of workers, they disclose themselves as the relentless and irreconcilable enemies of society. Can society, the general community of mankind, which includes the workers and all others be blamed if it recognises its would-be assassin and defends itself?

The A. F. L. speaker said the O. B. U. was "out to smash the State," and that when "the nature of the real thing was seen by the State, there could be no compromise." Which seems to be a fair expression of the position and responsibility of the State towards "all the organizations and institutions of society" that the O. B. U. conceives to be the enemy of the worker.

INCREASED RAILWAY CHARGES.

The apologists for increased railway charges are making use of rather far-fetched instances to illustrate how lightly the increases of railway rates will be felt. Elaborate calculations are being made on the increased freight charges upon a tailored suit of woollen goods, and other finished articles whose value consists much more in labor than in material cost.

It is not in package freight and express shipments that increased railway rates will be most fundamental and widespread, but in the effect of increased rates upon heavy raw materials shipped in bulk, such as coal, iron-ore, petroleum, and bulk foodstuffs.

An increased freight charge upon coal will successively and cumulatively add to the cost of every manufactured article at every progressive stage of manufacture. The manufactured articles into which the cost of coal does not enter, and enter very largely, are completely negligible. In fixing freight rates, therefore, it is desirable that the least possible increase shall

be made in the carrying charges of raw materials, and in particular the transportation costs of coal.

No reasonable person will deny that the railways must have more revenue if they are to continue to fulfill their proper function. The mining industry, as the great producer of raw materials, stands to lose more than any other branch of industry if our transportation system break down through lack of financial strength, and all who understand the elementary requirements of prosperity in mining industries include efficient transportation facilities among them. The railway companies will not meet with any biased or thoughtless opposition from mining men to such rate increases as the Railway Commission may concede to be required to meet increased wages and increased costs of material, but there seems a possibility that the use of finished manufactured articles as typical instances of the effect of the expected increase of railway charges discloses a solicitude for manufactured goods in relation to freight charges that may imply a lack of realization of the far-reaching effects of freight increases on raw materials, and, in particular, on coal.

These remarks refer, of course, to those instances where it is necessary to transport coal by rail. Wherever it is possible coal should be transported by water. The railways admittedly do not like freighting coal, and regard it as a necessary nuisance, and—wherever a competitive or alternative water-route exists—the objection of the railways should not be disregarded. There are indeed railways in Canada whose running costs would be much lessened if they developed water transportation for locomotive coal to a larger carrying capacity than it has yet reached.

BRITISH LABOR AND POLISH FREEDOM.

Despite the biased and incomplete cabled reviews on which Canadian readers have to base their opinions of British politics, it has for sometime been clear that Britain would not declare war upon Soviet Russia. Britain has other fish to fry, she is dead-tired of war and war's consequences, and there is a widespread disinclination in Britain to interference in other people's political experiments.

Therefore the hysterical demand of the Laborites that there should be no war with Russia has fallen rather flat, and the country is generally amused at one section threatening revolution to obtain what is the very general desire of all the people.

The action of the Labor Party is not logical. They state first: "We are not concerned with the form of the Russian Government. We have no concern about the merits or demerits of Bolshevism." Later the Council of Action was instructed to remain in being until, among other things, "recognition of the Soviet Government" is secured. Recognition and approval

of a constituted government are usually regarded as inseparable. It is one thing to protect against military interference in national affairs, and another thing to solemnly approve a foreign government.

These phases of the event should not however obscure the gravity of the step taken by organized labor, which, as it is characterised by H. J. Thomas himself, is "a desperate and dangerous method" and a "challenge to the whole constitution of the country."

The danger consists in acceptance by the Labor Party of a theory that was precisely enunciated by Robert Williams, who said to the assembled delegates: "I tell you solemnly and seriously that you are infinitely more representative than the House of Commons, and you may be summoned to sit permanently as a Committee of National Safety." Those outside the ranks of organized labor may challenge this statement as being untrue, and the issue will then be straitly drawn. The interpolation of the Russian situation will then be recognised as distinctly irrelevant and merely confusing the true issue.

The decision of organized labor to form a Council of Action, which is merely another term for a Revolutionary Committee, doubtless is a reflex of the Miners' Congress at Geneva, and is a sign of the growth of the international movement in labor politics, and the temporary discount of national sentiment that is a natural result of comparing of notes between representatives of European nationalities after the dreadful experiences of war.

If the labor groups in all civilized countries unite in denouncing war they will find few opponents of their course, and there is no doubt that a general strike of coal miners would most effectually paralyse all war effort. Labor has a long way to go yet, however, before it can guarantee national rights and national independence against aggression by autocrats, either monarchial or ostensibly proletarian, or against the armed forces of uncivilized races and those nations that while they have accepted Western civilization have not accepted Western ethics. The British workman is secure in his nationality and in his island, but closer proximity to chaos and the kindergarten of child races that are at this time experimenting with forms of government in eastern Europe and western Asia would modify his enthusiasm in the singing of the "Internationale."

The taste of British laborites for Russian methods is as mysterious as the bygone enthusiasm of certain literary circles for Russian literature, and it is a singular turn of events that links Ludendorf with the British worker against Poland and Lloyd George. Considering the momentous nature of the laborites' decision to adopt direct action one could wish they had chosen a more definite issue, but, for the peace of Britain, it is perhaps fortunate the issue is clouded and not urgent.

ASSOCIATED GOLDFIELDS.

The proposal to give railroad facilities to the Larder Lake gold area is one that especially interests shareholders of Associated Goldfields. This company has issued a report on its property which would indicate that the company has resources for conducting mining operations profitably and on a large scale. A railroad covering the area would derive much business from an industry of the magnitude contemplated.

The Ontario Government owns the railroad from North Bay to Cochrane, the Temiskaming and Northern Ontario Railway, and a branch line from this railroad is asked for. The railway commissioners have indicated a willingness to consider the proposal provided a report on the property is made by Government engineers. Up to date there has been no announcement as to whether the company is willing to have the mine examined by the Mines Department. The usual examinations by inspectors of mines and geologists of the Bureau of Mines do not include sampling systematically of properties or the expressing of opinions as to their commercial possibilities. The examination called for would be of a different character from that of the customary ones.

In view of the expenditures involved in the construction and operation of branch lines the stand taken by the Government officials seems a reasonable one. It is to be hoped that the company will so regard it.
—R.E.H.

ORIGIN OF THE SURBURY NICKEL ORES.

The origin of the nickel-copper ores of the Surbury district has been much discussed. Those who are interested in the subject will do well to read the opinion of a recent worker on the problem published in an article in the July bulletin of the Canadian Mining Institute. This writer states that geological work at the mines has disclosed facts that indicate the origin of the ore by its intrusion in molten condition along a plane of shearing in the footwall rocks adjacent to the norite, after the latter had solidified. The writer presents some evidence in support of his view, but does not discuss the subject fully.

The evidence offered is hardly sufficient to shake the faith of those who believe the localization of the orebodies to be primarily the result of differentiation in the norite magma. It is reasonable to suppose that the cooling of the molten mass would take a very long time and that during that period there would be much cracking of solidified portions and subsequent sealing of the cracks by dyke-like masses.—R.E.H.

Leland D. Adams of the Weedon Mining Company is visiting Canada. Mr. Adams, who resides in California, expresses himself as well satisfied with recent developments at the mine.

CORRESPONDENCE.

To the Editor of the Canadian Mining Journal.

Dear Sir:

In your issue of July 30th inst. you have an article on the Graphite in Canada. You have had a number of articles on this mineral during the last year or two. I do not think any of the writers of the articles are well posted about this mineral, especially in the Province of Ontario. I know that there is in Ontario, as yet virgin, mountains of sand and gravel, carrying silver flake graphite for the purposes you mention, that is for the making of crucibles and for pencils and for powder, just as pure as any found in Ceylon and I am sure as any found in the United States, and superior to the Black Donald of Renfrew, but up to the present no one seems to want them. Then you go on to say if concentration methods can be devised to take full advantage of the high graphite content of Canadian ores, the industry should prove permanent. Well sir, I own and control four patents, patented in Canada and in the United States. With any of them I can clean and separate Graphite, Gold, Silver, Lead, Zinc, Molybdenite, as easy and perfectly as blowing chaff out of wheat—I have a perfect process.

And I can clean and concentrate for cents per ton what by any other process costs as many dollars per ton. My process and my machine have no equal in the world, but Sir do you know that some of our mine owners, and mine managers, know so little about minerals, and the machinery required to clean and separate the minerals from the matrix that they think there is no machine will do it?

And they are using that rotten filthy dirty process—the Hun's process—oil flotation or still worse, cyanide, that is both dangerous and unhealthy. Any of your readers can see my Patents at any time, and they are in a class by themselves, as there is nothing yet patented in their class. Hoping you will find a place in your valuable paper for this.

I am very truly,

M. J. Paterson, Sr. E.M.

66 Churchill Avenue,

Toronto, August 9th, 1920.

BOOK REVIEW.

THE MINES HANDBOOK. The Mines Handbook and Copper Handbook for 1920, Vol. XIV, 6 by 8½ by 2½ inches. 1992 pages. Cloth Boards. Price \$15.00. Published and compiled by Walter Harvey Weed, New York City.

The latest edition of this standard compilation covers the mining industry of the world for 1918, 1919 and the first quarter of 1920. It is announced that the Handbook will hereafter be published annually, delay in issuing the 1920 volume having been caused by labor troubles and paper shortage.

The Handbook contains statistical information regarding the production, consumption and United exports and imports in all commercial metals. The scope of the work is comprehensive, covering as it does the metal mining industry of the world, and the information, so far as we are in a position to check it from the references to Canadian and Newfoundland mining operations, is complete and accurate.

This Handbook is a necessity in the library of consulting mining engineers, metal brokers, dealers in mining equipment and supplies, and all who are interested in mining, more particularly in America.

The Concentration of Graphite Ores--Past and Present

By R. C. ROWE, Buckingham, Quebec.

I.—Introduction.

Some day, someone may write a complete history of the graphite industry of this country. The result will be interesting, and instructive, inasmuch as it will illustrate the remarkable and devious wanderings of the human mind in search of a certain definite result.

It is quite beyond the scope of this paper to attempt to explore the various backways and byeways of metallurgy that graphite has, in the past travelled. Only generalities can be dealt in.

Canadian graphite occurs principally in more or less flat flakes ranging in size from one-eighth of an inch in diameter to microscopical dimensions, disseminated throughout the rocks of its occurrence. Its specific gravity is in the vicinity of 2.2. That of its accompanying gangue is around 2.6.

Refined graphite enters into many phases of our everyday life; but its chief use is in the manufacture of crucibles. Only the largest flake is used for this purpose, and, as this material is the most valuable, the efficiency of a process for concentrating graphite is, to some extent, governed by the amount of crucible flake produced.

For example: Consider two mills each operating with a recovery of 85 per cent. One, however, produces 110 lbs. of crucible flake per ton of ore treated, while the other produces only 100 lbs., the remainder of the production, in each case, being made up of finer grades. The mill producing 110 lbs. of crucible flake would be considered the most efficient and, would probably remain a better paying proposition, even if its recovery dropped 5 or 10 per cent below that of the other. Thus it is obvious that a high recovery figure does not always mean a paying graphite proposition.

The small difference in the specific gravities of graphite and its accompanying gangue, makes it difficult to concentrate the mineral by any methods that have gravity as their underlying principle, and it will be readily understood that it also aggravates certain problems that are familiar to all mill men. In fact, the average millman, inexperienced in the mineral, upon tackling its concentration, finds himself in a veritable land of topsy turveydom where precepts and precedents often fail. He finds concentrates where he is used to finding tailings. He finds settling tanks that don't always settle. He finds values, to alarming amounts, in overflows, and other places where they have no earthly reason to be. He finds his elusive mineral floating in the air about him, and polluting the country side. In fact, after a while, he begins to think that there is graphite everywhere in the wide world, except in the one place where it should be, namely, the bags at the end of his often intricate pulp flow.

These introductory remarks will show, to some extent, the obstacles that have had to be overcome by the old operators. Couple to the physical characteristics of the mineral, erratic market conditions, and less modern machinery, and, in the light of latter-day knowledge, one can see that the whole thing was more or less futile.

It is to be regretted, however, that those who have

gone before, have left us little record of their endeavours, and apparently few, if any, records of results have been kept.

Thus it is that, doubtless, much of the futile ground covered once, has been covered repeatedly since, and the bitter lessons of failure have had to be relearned again and again.

II.—The Past.

Briefly, all efforts in concentrating graphite, up to the introduction of the flotation process, may be considered commercial failures.

The first graphite mill in this country apparently started to operate about fifty years ago. I have talked with an aged individual who remembers that his first job in life was to carry whiskey for the mill crew of this particular venture. From local tradition, and Government records, we learn that there was a considerable amount of activity in graphite about this period.

The concentrating device used was the well known buddle, and, as this was a more or less standard machine, graphite, in its infancy, did not stray far from the well beaten paths of common practice.

The flow sheets in use may be broadly described as follows: The ore was broken in crushers and stamps, and roughly classified. The resulting products were then fed to buddles. Buddling resulted in three products: Concentrates, middlings, and tailings. Middlings were re-treated in buddles, concentrates were treated with buhr stones and screens.

The use of buhr stones and screens has survived, and still forms a part of graphite milling practice; but the use of the buddle has died completely. It is obvious that, with such a small difference in the specific gravities of values and gangue, the buddle could never be an efficient concentrating device for graphite; but in one case its use survived until a short time ago, when it was superseded by oil flotation. Only remarkable local conditions, however, rendered this possible.

The general use of the buddle persisted for some years before it was finally abandoned as a failure, and, after its abandonment, graphite for a time departed completely from accepted practice. Each operator appeared to follow his own particular line of experimentation, and the ramifications to which fancy lead are extraordinary.

It would be useless to attempt to describe all the machines and devices employed. Some worked on the gravity principle, among which might be listed, air jigs, air float machines, and various wet concentrators. Some operators delved into electrostatics. In one case a bulk oil process was tried. Mr. H. P. H. Brumell evolved a surface tension machine. This apparently was not successful, though the use of devices, employing surface tension, continued in use, largely in Alabama, right up to the advent of the flotation process.

One operator, in the Buckingham district, tried for two years to design, and perfect, a machine that depended upon the flat shape of the flake for concentration. In other words, he endeavoured to make every individual flake follow the particular laws of dynamics that govern aeronautics. The outcome of

numerous experiments is shown in Figure I, and it is given here as an illustration of this phase of the graphite industry.

The ore pulp, rendered fairly dilute, was fed at the point A, and, forming a thin film, ran down the incline B. During the journey the flakes of graphite were presumed to acquire, and maintain, a position parallel to the surface B, and, upon striking the water level C, they were supposed to volplane as it were across the space G to the overflow lip D, where they were discharged to the small screen E, and removed by any suitable means. The gangue particles, being granular, sank in the space G, and were discharged through the valve F. Water level was regulated by the tailings valve.

Theoretically, the principles involved were fairly sound, and in practice some of the flakes did volplane across the clear space, and were duly collected; but, again, some of them didn't, and the proportion that did was very, very much smaller than the proportion that didn't.

About this time a dry process of rolling and screening was receiving a good deal of attention, and its adoption in Canada became almost universal. Here

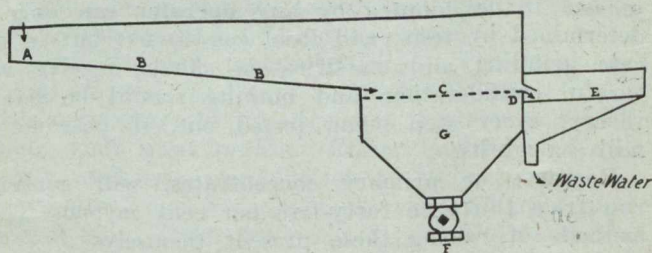


FIG. 1.

again the shape of the flake was taken advantage of, and here again the principles involved were fairly sound—up to a point.

The broad lines of the flow sheets usually adopted were somewhat as follows:—The ore was dried in either kilns or rotary driers, and was ground by the usual dry methods to minus 20 mesh. In this form it was fed to small high speed flour rolls. The theory simply was that, the flake, being flat and tough, would pass through the rolls uninjured, while the gangue being granular, with the exception of any mica present, would be pulverised to dust, and could thus be removed by screening. The rolled material was passed over a forty mesh screen. This yielded a fairly clean flake. The throughs were dusted over an eighty mesh, and then passed to another battery of rolls, after which the material was scalped over sixty mesh, the throughs being again de-dusted, and further treated with rolls and screens.

The principles upon which the process rested have long been recognized. The first graphite mill in Canada used buhr stones and screens for the final treatment of concentrates, and the latest uses rolls and screens for the same purpose; but there is a vast difference between treating a high grade concentrate, and a ten to twelve per cent ore. In the first case the destruction of valuable flake is small, and the wear and tear on rolls and screens is negligible, while in the latter the destruction of flake is enormous, and the cost of wear and tear becomes a most formidable item. In practice it was found that, with the roll and screen method, a large proportion of the graphite

was broken up, and therefore passed out with the dust. The large quantities of floating dust in the air of the mills caused trouble with bearings and belts. Recoveries were low, operating efficiencies were low, costs for repairs and renewals were high, and so the process inevitably languished, and eventually died.

While the roll and screen process was dying out, a plant using wet crushing, grinding, classifying, and tabling machinery was designed and built. In this process the very slight difference between the specific gravities of graphite and its gangue caused many troubles; but the plant may be considered the most successful one working on disseminated ores up to the advent of the use of oil flotation on graphite ores.

The flow sheet was roughly as follows: The ore was broken in jaw crushers, and ground in a ball mill and tube mill. The resulting product was then sized in screens and hydraulic classifiers, and passed to a series of tables, which produced concentrates, middlings, and tailings. Middlings were re-ground and re-tabled. Concentrates were filtered, dried and then passed to a finishing plant consisting of rolls and screens.

The recovery of crucible flake was high, and the operating efficiency was high. The plant, consequently, has run fairly continuously for some years, and latterly flotation has been installed. The construction of this plant marked the return of graphite to the more or less beaten paths of milling practice, and during the war several other plants adopted the gravity process. All other plants, however, installed dry gravity tables, and the processes were dry throughout.

Reports of the results of these mills differ; but they all eventually closed down. It is the opinion of the writer that the enormous cost of repairs and renewals was largely responsible for this. High costs, and low operating efficiency appear to be factors accompanying every dry process.

The use of gravity methods for concentration, brought into discussion a point that had, apparently, escaped notice before, or if it had not escaped notice had, at least, not been raised, namely the intimate intercrystallization of graphite and its accompanying rocks. It was found, through careful examination of table middlings that, even at most minute sub-divisions, graphite and gangue were still to be found clinging to one another. This is a most important point in considering the application of the flotation process to graphite ores, and it will be treated in a subsequent portion of this paper.

The use of standard gravity tables, for the concentration of graphite, marks the last phase of the past. The use of the oil flotation process belongs to the present; but before passing from the past to the present it might be remarked that it is singular that the flotation process was never discovered by the early graphite operators. Fine graphite will often float without the aid of oils, and on every tailing pond big blobs of graphitic froth may be seen. It seems remarkable that, to none of the numerous operators came that flash of inspiration that would have bridged the gap between those floating blobs of mineralized froth and a new process.

Frank Elmore saw the imprint of an oily hand marked out by collected copper slime, and from this germ of thought one phase of the flotation process was born. Graphite operators, for years, actually saw the mineral laden bubbles that were, eventually, to

revolutionize metallurgy, and they, even though searching for a process to solve their troubles, failed to grasp the significance of what they saw. So are epochs born—and so are they lost.

III.—The Present.

The flotation process is now being generally adopted for the concentration of graphite ores. Its adoption has, however, been somewhat slow, and graphite is probably one of the last of the amenable minerals to which the process has been applied.

It was probably the remarkable results obtained by flotation upon molybdenite that first drew wide attention, in this country, to the possibility of applying the process to graphite. Concentrates running ninety per cent MoS_2 were obtained by flotation, and, as graphite much resembles molybdenite in appearance, a widespread idea became prevalent that graphite concentrates running ninety per cent graphitic carbon could be obtained by oil flotation in every day milling practice.

If such were the case, the milling of graphite would be a very simple operation. This idea still persists in some quarters, and the writer ventures to assert at this point that a graphite concentrate averaging ninety per cent carbon, obtained by flotation alone, in ordinary milling operations, is a myth. Such a concentrate has been obtained in the laboratory, and it will, undoubtedly, be obtained again; but anyone hoping to produce such a result in milling practice is pursuing an ignis fatuus.

In a very broad sense, it may be stated that the flotation process presents a solution of the vexing problem of economically concentrating graphite. The operator contemplating the installation of the process has one solid rock to cling to: Froth flotation produces a clean tailing. Given the correct ore pulp conditions, he may rest assured on this point; but from here on nothing is stable.

Mechanical or pneumatic machines give practically the same results. The former giving a shade better tailing, while the latter generally shows a slightly better concentrate.

Mr. Chas. Spearman remarked in a recent article upon graphite published in *The Canadian Mining Journal*, that the problem was more one of grinding than of concentrating. I, for one, agree with him upon this point. As pointed out previously, Canadian graphite, as a general rule appears to be very intimately associated with its accompanying rocks, and no system of wet grinding appears to free the particles of graphite completely from the accompanying gangue. It must be borne in mind, when considering this point, that sliming must be avoided. Preservation of flake is one of the graphite mill man's chief objects.

Under existing methods the product of any grinding plant may be roughly classified as follows:—

- a. Free flakes of graphite.
- b. Flakes of graphite with small pieces of attached gangue.
- c. Particles of gangue with small pieces of attached graphite.
- d. Free gangue.

This classification is more noticeable in undecomposed ores. Decomposition appears to free the flake in a manner impossible to duplicate mechanically. Tests run on such ores often give remarkable results that cannot be duplicated upon undecomposed ores, and, for this reason, it is desirable that all tests, in

connection with flow sheet design, should be run on ore taken from below the zone of decomposition.

According to flotation practice, classes "a" and "b" and part of "c," of the above classification, will float. This is entirely desirable from a recovery point of view; but it tends to produce a dirty concentrate.

Thus, it will be gathered that the purity of a graphite flotation concentrate is in direct proportion to the degree of liberation of flake accomplished by grinding, and that the degree of concentration attainable by flotation is governed by factors which are, in themselves, quite apart from the process under discussion.

The ideal machine for preparing graphite pulp for flotation would be one that would pulverize all gangue and yet leave the flakes of graphite intact. Such a machine does not exist, and probably never will. The only remaining alternative is to pick the machine that will accomplish the grinding with a minimum destruction of flake. Here a diversity of opinion is met with. Some engineers prefer ball mills, some rolls. Among those preferring ball mills there is a further split; one faction favouring peripheral discharge mills, while the others can only think of centre discharges. It is therefore impossible to lay down any rule in connection with this most important point. The ultimate scheme to be adopted by any operator can only be determined by tests, and local conditions; but in any case grinding and classification should receive very careful consideration, and nothing should be left to theory, every step being tested out, if possible, by mill scale tests.

Rougher, or primary concentrates, will generally run from thirty to forty-five per cent carbon. Three methods of raising these present themselves:

- (1) Successive floatings, returning tailings for re-treatment.
- (2) Stage grinding and floating.
- (3) Tabling.

The first consists of a series of cleaners, and is undoubtedly the simplest; but it is doubtful whether it will, under any circumstances, result in a really high grade concentrate.

In the second method the entire primary concentrate is reground in a pebble mill, and refloats, the concentrate obtained by refloating being again ground, and further floated. This may be carried on indefinitely, as the successive regrindings and refloatings are all operated in closed circuit. A high grade concentrate is the inevitable result; but the destruction of valuable flake must be tremendous. The destruction of flake occurring during tube mill grinding is a much debated point. Many claim that the loss is negligible; but the writer has found that, in a thirteen foot mill, fourteen per cent of the flake was ground to minus 150 mesh. This with a dilute pulp, and a special large discharge.

The third alternative—tabling—appears to be best suited to general requirements. Theoretically, the free flake, having a different specific gravity to flake carrying attached gangue, would be taken off, and thus saved from the chances of tube mill grinding, while the tailing containing un-free flake would be returned for regrinding and refloating. But practice does not altogether bear out theory. It is difficult to quite break the primary froth, and an oil streak, which passes straight down with the head water on the table, is the result. This oil streak looks rather fine; but it entraps a proportion of un-free flake and gangue and a lowering of the table concentrate is the

direct result. Careful selection of flotation oils may do much to alleviate this condition; but, in any case the old troubles, due to slight differences in specific gravities, are present.

By any of the above methods a concentrate ranging from sixty-five to eighty-five per cent graphitic carbon may be obtained. A fair average is 75 per cent.

After dewatering, and drying, the usual finishing methods may be followed. The plant employed usually consists of a series of buhr stones and screens. In some cases rolls are substituted for the buhr stones.

Apart from the general lines touched upon in the foregoing, many difficulties crop up. Froth collects, and builds up, in all sorts of odd and unexpected places, and it is particularly difficult to dispose of overflows without losing graphite.

It will be observed, from the foregoing, that no golden rules have been laid down. One can only generalize, and that all too broadly. It cannot be too strongly emphasized that every graphite ore is a problem. Two ores, that appear exactly alike, will yield vastly different results with the same treatment. For this reason, every contemplated step in a flow sheet should be thoroughly tested, and nothing should be left to theory, and nothing to chance.

To continue our generalizations:—Treatment I. should yield good results on a soft friable ore.

With undecomposed gneissic ores treatments 2 and 3 should yield good results. Either might be advantageously used, or a combination of both.

Treatments 1 and 3 undoubtedly yield a higher proportion of No. 1 flake, while No. 2 probably results in a higher grade combined concentrate.

As stated elsewhere in this paper, it may be found justifiable to sacrifice a small percentage of recovery, if the sacrifice involves an increase in the amount of crucible flake produced per ton of ore treated. In this connection it may be remarked that, the finer the grinding, the higher is the flotation recovery. The amount of grinding best suited to commercial and metallurgical requirements can only be determined by careful observation over periods, though careful testing will indicate the limits within which the ideal must lie.

In conclusion it may be remarked that the trend of thought, regarding graphite and the flotation process, is distinctly optimistic; but it must be pointed out that the graphite industry on this continent has, in the past, suffered through an acceptance of certain optimistic lines of theory. Mills have been built on theory alone, and it was not until the mill failed that the weakness of the theory was shown. The application of the flotation process to graphite is a tricky thing, and a too easy acceptance of theory may easily end in failure.

The advisability of testing has been emphasized in this paper, and, in conclusion, it may well be emphasized once more. Prove every step, if possible by mill scale tests. Look upon theories with suspicion. Remember that a few hundred dollars spent in tests may save many thousands—and failure.

The U. S. Geological Survey reports 2,430,000 tons of gypsum mined in the United States in 1919, an increase of 373,000 tons over the production of 1918, reflecting the resumption of building construction.

SALT MINING AT MALAGASH, NOVA SCOTIA.

About twenty tons of salt daily are being produced here. The deposit of potash-bearing mineral which was reported occurs near the surface, and while its analysis is promising, it is not considered as representative of the continuation of the deposit when it reaches a depth where atmospheric and surface influences are not felt. Sinking is being carried on in the salt vein itself, and the possibility of finding more valuable material is regarded as quite probable.

THE IRON ORE MINES AT WABANA, NEWFOUNDLAND.

The Scotia Mine is producing 1100 tons daily, of which 98 per cent is machine-loaded ore. There are now eight mechanical loaders in the submarine territory, namely, four Thew shovels, two Myers-Whaley loaders, and two Armstrong loaders. The use of mechanical loaders is being found of much advantage in advance work, the rate of progress of headings and leading places being much helped thereby.

The sale of ore for outside shipment has not yet resumed pre-war volume. It is reported that the Dominion Steel Corporation is about to ship ore to Middlesboro, England. This Company has not hitherto sold much ore to outside parties, but the Scotia Company was in previous years a heavy outside shipper. There is little doubt that with the reduction of freight rates likely to take place the shipment of ore to Europe, and to the United States, will assume important proportions once more.

COAL SHORTAGE AND PRODUCTION.

A Glace Bay Viewpoint.

Papers in Montreal and other parts of the upper provinces are urging upon the Dominion government the importance of increased production at the Cape Breton collieries in view of the shortage of coal which threatens to assume famine proportions before the winter is well under way.

It would be interesting to know how the government would proceed about getting more coal out of the mines in Cape Breton. The various managements have been trying to do that for the last couple of years and have not yet succeeded in making any appreciable headway. By the Dominion coal company, the principal producer, a steady average of 10,000 or 11,000 tons a day is being maintained and with the utmost exertions it seems to be impossible to get above that figure, taking it month by month. Once a week or so it rises to over 12,000 but this hardly ever happens two days in succession. Before the war production at these collieries often rose to over 20,000 tons a day.

If the government could provide the management with several thousand skilled mine workers it would be doing something practical to help out the coal situation as it would enable the management among other things to open new mines or speed up production at those in process of development. But if Montreal is depending on increased production in Cape Breton, as things look now it will go without fuel this winter.—Glace Bay "Gazette."

Coal Export Embargo will Injure Nova Scotia Coal Trade

Inverness County Especially Threatened.
By The Editor

The circumstances under which the S.S. "Lord Dufferin" loaded with coal at Port Hastings, Cape Breton Island, has been allowed to proceed to Holland illustrates exactly the possibilities for injury to the Nova Scotia coal trade that accompany the export embargo now in force. The cargo in question was loaded by the Inverness Railway & Collieries Company, a re-organization of the Inverness Coal & Railway Company with some added properties. This reorganization was planned and has been carried out to take advantage of the favorable export market now existing, and the willingness of foreign purchasers to send ships for loading. Just previously to the re-organization there seemed every likelihood that the Inverness Colliery would be compelled to close down, and, as everybody in that district knows, if it once closed down, it would not be re-opened. There is one other coal mining operation in Inverness County, also the result of the existence of an export market. Neither operation is large enough to permit of the ownership of large steamers, and the rail shipment from the Inverness collieries places them at a great disadvantage as compared with f.o.b. cash business.

During the war the profits of the Inverness Coal & Railway Company were most rigidly held down by the Fuel Controller. The property is a most difficult one to work, the face of the deeps being some 6,000 feet out to sea, and the haul from the workings to the surface is one of the most difficult in Nova Scotia. The survival of the property in an operating condition has been possible only through most rigid economy and the existence of a good demand for coal in recent years. Under these circumstances the re-organization of the property, the coming in of new capital, the acquisition of adjoining properties, and the excellent export market offering has caused much rejoicing in Inverness County, where during recent years, the inhabitants have seen mine after mine disappear from the operating list, and have seen once prosperous mining towns full of empty houses with boarded-up windows.

The assistance which can be given to the Canadian domestic coal supply by the production of Inverness County is entirely negligible, and the entire output of the county in recent years has not exceeded 200,000 tons annually.

Apparently the authorities have seen the injustice of enforcing the embargo in the case of the Inverness collieries, and it is to be hoped that not only will it be removed so far as these mines are concerned, but that the Government will encourage the intensive mining of coal in Inverness County for export purposes. It is not for the good of Canada, nor will it appreciably assist in relieving the existing bituminous coal shortage in Canada, that an industry that has declined for many years should be throttled at the first signs of revival. Neither will the people of Inverness see the justice of a policy that threatens to impoverish them in the day of opportunity to relieve the needs of a market that in other times has not afforded the local industry any help.

If the Government at this time prevents the Inver-

ness collieries from undertaking profitable business that will enable it to lay aside reserves against the evil times that are coming, then it should assume financial responsibility for the future of the properties, and should undertake to dispose of the output of the collieries at a price that will yield them a fair profit for an indefinite period ahead.

During the coming Winter and particularly during the Spring season, when the drift-ice will prevent water shipments of coal, the collieries will either have to bank out coal or remain partially idle. If the collieries, as was suggested by the Fuel Controller, can be given long-term advance contracts for railway coal by the Government, with a guarantee that the coal will be taken away in the shipping season, then it would be possible for the mines to work all winter without interruption, thereby largely increasing the annual output of coal.

Any Government that undertakes to control an industry must accept concomitant responsibility for that industry. It is pertinent to recall that the issue of the "Canadian Mining Journal" of this date in 1919 quoted the plea made by Mr. D. D. Mackenzie, M.P., for the larger allotment of the coal purchases of the Canadian National Railways to Nova Scotia coal mines, which was withheld because United States coal was cheaper. Mr. Mackenzie wrote to Mr. Hanna, in part, as follows:

"I must with all respect, yet with all insistency, impress upon you the necessity of coming to the assistance of these men by purchasing the article which they produce, whether or not it may be more expensive than the same article imported from a foreign country."

It is this policy of ignoring domestic coal mines in favour of the United States when coal is cheap and plentiful, and of restricting the profits and expansion of these mines when coal is dear and scarce that has brought the Nova Scotian collieries to their present state of low production tonnage, high production cost and a generally unstabilized condition.

It is quite certain that if the Inverness Collieries had been required to depend upon the Canadian National Railways or upon the Montreal market for a market and disposal of their coal output there would have been neither new capital or re-organization of old properties, but, just so soon as under the stimulus of good demand at remunerative prices, the interest of investors is quickened it is discovered that domestic requirements must take precedence of all other demands.

Any and every course that will stimulate coal production in Canada is commendable. It seems an elementary proposition that the way to relieve a coal shortage is to produce more coal, but it is nevertheless a proposition that has never been grasped by the successive governments of Canada. Any and every course that restricts coal production is to be condemned, and restriction of production, both present and future, will result from the export embargo. At the same time the domestic situation will not be greatly helped.

NEW YORK ADVICES ON ASBESTOS MARKET.

Since our last letter regarding the Asbestos situation, prices have advanced for all grades, some grades only slightly and others to a greater extent. This is only natural when one stops to consider the enormous demand which is evidenced by the fact that there are to-day 7,750,000 passenger cars and trucks on the roads, and the fact that automobile manufacturers expect a production of 2,000,000 cars and trucks for this year.

In addition to this, the enormous building construction going on all over the world is almost double what it has ever been before at any time. This is due to the fact that practically all building construction both here and in Europe was stopped during the war. Besides the extraordinary building construction that is going on in this country, England, France and Italy, there is additional reparation and construction work going on in the devastated districts of France, Italy and Belgium.

The steamship trade is also consuming large quantities. Not alone for the new tonnage which is being produced, but also owing to renewals of practically all the steamers that were operated during the war. Owing to the scarcity of steamer space from 1914 until the Armistice was signed nearly all steamers were kept in service continuously and renewals and repairs were put off until recently.

Considering that the output at the Mines has decreased instead of increased it is readily understood that the Asbestos market is going to hold firm with the probability of prices still going higher for a considerable period.

TORONTO COAL PRICES.

Toronto, August, 18.—Prevailing coal quotations are as follows :

Mine run \$14.25 to \$14.50 f.o.b. Toronto; smokeless coal \$14.50 to \$15.00; hard coal \$8.00 to \$11.50 gross tons at mines. American funds. The demand is not stiff but practically no coal is coming in, the shipments being diverted to the Great Lakes for consumption in the North West.

METAL QUOTATIONS.

Fair prices for Ingot Metals in Montreal August 19th 1920. (For shipment from stock, and in less than car-load lots.)

	Cents per lb.
Copper, electro	24 ¹ / ₄
Copper castings	23 ³ / ₄
Tin	55 ¹ / ₂
Lead	10
Zinc	10 ¹ / ₂
Aluminum	35
Antimony	9

A NEW USE FOR MAGNESITE.

It is reported by the Engineering and Mining Journal of New York that Mr. H. F. Wierum has been experimenting with ground magnesite as a substitute for lime in making egg shells. He finds that hens using magnesite produce a very superior grade of shell, having superior insulating and wearing facilities. Those who found magnesite useful in the shell industry during the war will be pleased to find that it is also useful in the original shell industry. It is another example of how the old established industries have been helped by the hunt for substitutes.

Our Northern Ontario Letter

THE SILVER MINES.

In the silver mining fields of Northern Ontario, as a result of success achieved in the South Lorrain, Gowganda and Elk Lake districts, the output of the metal may be maintained for a much longer period than had the industry depended entirely upon the Cobalt mines alone.

At Cobalt, too, the new developments on such properties as the Bailey Silver Mines, the Colonial, Prince Davis and Lumsden offers promise of adding to the number of producing mines.

According to official advice to the "Mining Journal" an ore shoot just encountered at the 350-ft. level of the Bailey Silver Mines shows a width of from four to five inches and contains high silver value, some of the ore containing from 2,000 to 4,000 ounces to the ton. The high grade is being bagged, while the lower grade material is being made available for treatment in the company's own mill. The work of transporting medium-grade ore to the mill will commence just as soon as the short railway siding is completed. This should not be later than about the middle of September.

Perhaps the most interesting official advice received during the week is that dealing with the success being met with on the Keeley Silver Mines, in South Lorrain. Although this property remained idle for a number of years, and was not re-opened until a few months ago, it is understood the ore in sight is estimated to contain close to \$1,000,000 in silver. Not only has the ore encountered been found to contain high values, but the ore-shoots are comparatively wide. One main ore-shoot is stated to be from four to five feet in width, and contains average silver values ranging from 30 to 100 ounces to the ton. In the meantime, the work of constructing a new mill is making satisfactory progress and the company expects to be treating ore at the rate of 80 tons daily some time during the closing quarter of the current year.

During the month of July the Nipissing mine produced silver at the rate of close to \$6,000 every twenty-four hours. In his regular monthly report to the president and directors, Hugh Park, manager, states that during the period, the Nipissing produced \$182,111, and shipped residue and bullion from Nipissing and custom ores of an estimated net value of \$129,315. Mr. Park states there were no unusual underground developments, but that the usual success was achieved in opening up new narrow veins.

A new order issued by Hon. Beniah Bowman, Minister of Lands and Forests, grants general working permission on all mining claims staked on the Gillies Limit. The Limit was thrown open on July 20th, with the understanding that the holders of claims would have to make application for and receive permission to do assessment work before undertaking any development work, but the new order directs that on and after July 20th it will not be necessary to make such application. Incidentally this will tend to shorten the time within which the first instalment of work falls due.

Up to the present only two mining disputes have resulted from staking of claims which occurred in July on the Gillies Limit. This is in sharp contrast to 1912 at the time a small part of the territory was

thrown open when as many as half a dozen disputes arose in connection with one claim.

Some small nuggets of native silver have been found in a narrow vein on the Garvey claims in the Gowganda district, in the vicinity of Smoothwater Lake. The find is characteristic of many others made in this field.

A large number of mining men will attend a general meeting of the members of the Ontario Mining Association to be held this week at Sudbury. The meeting commenced August 17th and will last for three days. Mine managers and presidents of mining companies representing perhaps ninety per cent of the mines of the Province will attend the meeting. In view of this being the first general meeting since the new organisation became fully established, it promises to be of outstanding importance. From this rate forward, the activities and the influence of the Association appears destined to be extensive. Not only will it serve as a means of comparing mining achievements, but the organisation aims to cooperate with the Ontario Government in such a way as to make available much valuable data, and stands ready to offer suggestions which may be considered beneficial to the industry.

THE GOLD MINES.

What is considered to be one of the most hopeful signs in connection with the gold mining industry of Northern Ontario is the report this week that the Hollinger Consolidated has secured fifty English miners. It is believed that if a slack period in mining has actually set in in England, and if the Hollinger has secured fifty men, it is not unreasonable to suppose that many more may be obtained in the same manner. Should such prove to be the case, it will remove the only obstacle standing between the gold mines of this country and maximum production.

The gold mines in the aggregate have a greater quantity of ore in sight than ever in the past, and their milling facilities will permit them to treat more than 6,000 tons every twenty-four hours. These two factors would come into full play in the event of an adequate number of men being secured. For this reason, therefore, too much importance cannot be attached to the reports that men are being obtained from the British Isles.

An announcement of importance to the shareholders of the McIntyre-Porcupine has just been made, and conveys the information that the company has decided to enter into another venture, this time in a coal mine in Alberta. It is stated by president J. P. Bickell that one property has been purchased and an option has been secured on another, and that the Temiskaming Mining Company may also be asked to take part of it. The Blue Diamond property at Brule, Alta, has been purchased, and a fifteen year option is held on the Canadian Coalfields property. Just how the report will be received by the shareholders of the McIntyre-Porcupine and the Temiskaming Mining Company remains to be seen and will be governed largely by the report presented prior to voting on the question.

The Miller Independence Mines of Boston Creek announce a stock offering of 46,000 shares, and restricts the right to participate in it to the present stockholders. This company received permission from the Department of Securities of the state of Ohio, about one year ago to sell not more than 100,000 treasury

shares at \$3.80 per share. Of this amount 54,000 shares were sold at that figure. The present offer is calculated to again strengthen the treasury and at the same time offer an opportunity for the present stockholders to reduce the average paid for shares.

Work at the mine is proceeding in a satisfactory way and the face of the main cross-cut at the 500-ft. level is believed to be within about 70 feet of the downward continuation of the main orebody. In the meantime, work has been resumed in the inclined shaft at a point closer to surface with the object of blocking out the high-grade ore shown at that horizon.

KIRKLAND LAKES ANNUAL MEETING.

That a fine body of ore had been recently discovered on the 400-foot level was an announcement made by President Frank L. Culver, at the annual meeting of the Kirkland Lake Gold Mining Company, Limited, held in Toronto on Tuesday of this week. The development has not proceeded sufficiently as yet to indicate the extent of the ore body, but it is believed to carry values ranging from \$200 to \$300 a ton. In the President's survey of the operations it was pointed out that the principal development consisted in the sinking of the main shaft to the 900-foot level. In this respect Kirkland Lake is the pioneer in the way of depth operation in the Kirkland Lake Camp. The results obtained are most encouraging as the porphyry formation is found to exist at the 900-foot depth. Mr. Culver made it clear that the company had never carried on what is described as selective mining, and stated that such a policy would always be avoided. It was also stated that the proposed amalgamation between Kirkland Lake, the Orr and Teek-Hughes Mines would receive consideration at the hands of Kirkland Lake only on the basis of actual values. All of the old board of directors were re-elected.

CARTWRIGHT GOLDFIELDS.

Surface exploration of the property of Cartwright Goldfields, Limited, which lies north east of Matheson, Ontario, is bringing good results. Last week another vein carrying free gold was discovered. It lies near one of the veins that is now being stripped. Work on the latter vein was begun a few weeks ago and good values have been found in the samples taken as the work progresses.

The Cartwright property is close to Painkiller Lake. It is easily reached by wagon road from Matheson on the L. and N. O. Railway.—R.E.H.

THE PREMIUM ON GOLD.

At a meeting of the Commercial Club in Salt Lake City on July 23, Mr. H. N. Laurie of the American Mining Congress outlined the proposal which would provide for a premium of \$10 per ounce on newly mined gold. This proposal is being placed before U. S. Congress by Representative McFadden.

At present Canadian gold producers are benefitted by a premium on gold arising from the fact that gold can be sold in Canada on the same basis as U. S. currency. This means that gold in Canada is worth considerably more than the \$20.67 per ounce at which it is quoted.

Putting Canadian Iron Ore on the Map

By J. J. O'Connor

If Canada is to keep place with her competitors for world trade, if her great fleet of merchant ships are to be kept employed in carrying our own products to world markets, if she is to pay her debts out of her own resources, she must develop her enormous deposits of iron ore, in order to occupy that industrial independence that will enable her to compete successfully for the foreign trade that is so vitally necessary to her future.

A glance at the past shows that all that is needed to make Canada a leader in mineral production, is well directed, and sustained effort on the part of Government and people, in the exploitation of her vast store of mineral wealth. In 1886 Canada's mineral production amounted to \$2.23 per capita, in 1917 it had reached \$23.12 per capita. If iron ore production had made the same advance as all other minerals, if imported iron ore had been displaced by domestic ores, and if the enormous importations of iron and steel products—now in the neighbourhood of \$175,000,000 annually—had been displaced to a great extent, by our own manufactured articles, as they very well might have been, our mineral production would show a vastly increased sum per capita.

That this industrial independence may be brought about, is but reasonable to suppose, in the light of what is being done in other iron fields, by our neighbours in Minnesota, where millions of tons of iron ore are being beneficiated annually, and millions of dollars are being expended in the installation of plants for the magnetic separation and concentration of low grade iron ores, similar to our own.

The province of Ontario is wholly dependent on United States ores, with the exception of the extremely small percentage of domestic ores now being charged to the furnaces of this province.

The Ontario Government is directly interested in the industrial development of its own estate. The Federal Government is equally interested in the up-building of an iron and steel industry in Canada, adequate to its needs, therefore, they should co-operate in demonstrating the commercial feasibility of converting our low grade ores into a desirable product for furnace use.

The Bureau of Mines, Toronto, and the Mines Branch, Ottawa, should make a joint, and thorough investigation of what the Mesabi Iron Company have done in their experimental plant, at Duluth, and what they are now doing at Babbitt, Minn., as a result of the experiments carried on at Duluth, where they produced thousands of tons of ore that met the highest furnace requirements.

Skillings' Mining Review, an outstanding authority on Minnesota iron ore, in a recent issue, says, in part: "The work of pouring concrete for the foundations for the first mill unit of the ore treating plant of the Mesabi Iron Company, at Babbitt, Minn., will be begun early next week, and the work of erecting the steel for the superstructure will be begun about August 15th. Four hundred men are employed by the company at Babbitt, and the immediate vicinity, in the extensive preparations necessary to whip this new and important iron mining enterprise into shape for production. The company will enter the shipping list

with its product at the opening of navigation next spring. This initial unit has an estimated capacity for treating 3,000 tons of ore per day, but it will occasion no surprise if the over-run is considerable. The size of the new mill will be total length 1350 feet, and width 130 feet. The plant consists of five sections laid out to give continuous process. But to return to the mill that is being erected out there in the wilderness of the Eastern Mesabi. The Minneapolis Steel Machinery Co. has the contract for the steel. While people are vastly interested in the fact that the Mesabi Iron Company is spending about three million dollars on the Eastern Mesabi, the real basis of this interest lies in the fact, that the expenditure is being made to establish on a broad commercial basis, an advanced principle in magnetic separation. Magnetic separation is the principle on which this costly development is being founded, and this Company has produced separators that are expected to do their work more efficiently than any heretofore built. The modus operandi is as follows: Mine, crush, grind to powder and separate the ore from the rock, and form the concentrate into clinker by the sintering process, for blast furnace use. The final clinker will be a very high grade iron ore, free from moisture, free from all deleterious elements, such as sulphur or titanium, and dust. There are billions of tons of low grade magnetic ore, or taconite, on the Eastern Mesabi. The Mesabi Iron Company alone controls, or owns outright, many hundreds of millions of tons itself, in the 20 square miles it has taken over. It would seem that the Mesabi Iron Company had fully worked out its problems in metallurgy, when one considers the success of the first cargo of the product of the low grade magnetic ores, which was produced in the experimental plant at Duluth. As far as can be seen all problems of the future were met in the production of the first cargo. Assuming that to be the case, the Company seems destined to become one of the chief factors in the future of the iron ore industry of Lake Superior. It has brought into being an enormous mass of iron bearing material that gives every promise of lengthening for a very great many years, the life of the iron, mining industry of Minnesota. W. G. Swart, general manager, in charge at Babbitt, Dwight E. Woodbridge, of Duluth is in charge of the company lands."

With this experience before us, and the success it has met with, it would seem idle to not take advantage of the opportunity of investigating this great enterprise, and determining its adaptability to our own ores. Both Governments have the necessary machinery at hand, for making such an investigation. Added to this, is the highly satisfactory results in magnetic separation, obtained by Prof. Stansfield, of McGill University, recently. It is to be hoped that this matter may not be longer deferred, and that immediate action may be taken. The Tariff Commission would do well to look into the question of the vast tonnage of iron ore, and iron and steel products imported annually, and its effect on the commerce of the country.

Pottery products in the United States during 1919 are reported to have reached a value in excess of any previous year. The value of manufactures in 1919 is estimated at \$76,140,000 comparing with \$63,911,793 in 1918. The increase over 1918 is of course largely made up of higher values as measured by cost, but no figures are available regarding quantities.

British Columbia Letter

Stewart, B. C.

R. K. Neil, part owner of the Premier Mine, Salmon River, Portland Canal District, in discussing operation on that property, stated that cyanide plant, with a capacity of 00 tons a day, is being installed and would be ready for use early next year.

There are some 100 claims staked in the Marmot River section of Portland Canal and on many development work is in progress. George Clothier, government mining engineer, recently made a tour of inspection through the district with a view to ascertaining the extent of the necessary road and trail improvements. The B. C. Exploration Company is heavily interested in this section and Dr. W. L. Uglow, geologist for the Company, has completed an examination and is preparing a report, together with maps, describing his investigations and giving his conclusions. P. D. I. Honeyman, for the same Company, has a small crew of men at work on the Salmon River Lode Mining Co's property, situated near the Big Missouri Group.

Among the properties under development in the Bear River Valley, Portland Canal, are the Bayview, situated just back of Stewart, from which a trial shipment is to be made soon; the Lakeview, which is being worked by Al. Harris on behalf of P. Welch and associates; the Fitzgerald Group, which is to be explored by diamond drill by the Algonican Development Co.; and the Nabob and Redtop Groups.

Alice Arm, B. C.

The Dolly Varden Mine is shipping an average of 150 tons of ore a day and preparations are being made for the extension of the railway to the Wolf Group of the Claims situated a short distance north of the mine. The Toric, Tiger, Musk, Silver Horde, Climax and other prospects are being opened up. Surface stripping is taking place on the La Rose Group with satisfactory results and good showings are reported on the Wild Cat, North Star and Royal Groups.

Hazelton, B. C.

John D. Galloway, resident engineer at Hazelton, B. C., has left on a tour of inspection of various mining properties in the Cariboo District. He is engaged incidentally, in the collection of an exhibit of the minerals of northern sections of the Province which is to form a part of a large British Columbia mineral display in England.

There is considerable placer mining work in progress in the Dease Lake, McDame's Creek, Thebert Creek, and Telegraph Creek districts of Northern British Columbia this season. On Thebert Creek George Adams, a well known hydraulic operator of the Atlin Camp, has been at work since early in the year. A. St. Clair Brindle, a mining engineer, has returned after accompanying a party representing the Princess May Mining Co., of Vancouver, to McDames Creek. They took in an hydraulic outfit.

Quesnel, B. C.

Once again R. T. Ward, of the Bullion Placer Leases, Cariboo, has been heard of in connection with litigation. Having won his long drawn out suit with John Hopp it was thought that the operation of the

long disused property would follow without delay. Some or Mr. Ward's associates, however, challenged his right to retain control or the management of the project. For a time it looked as though there might be another sustained fight through the courts. However it now appears that a settlement, said to be generally satisfactory, has been reached and that the famous property soon will be put on an operating basis.

Prince George:

Good reports have been received concerning the showings obtained on a property situated near Prince George and known as the Hole-in-the-Wall. Samples have been brought in containing values in gold, silver and copper and it is said that the two outcrops from which these were taken have been uncovered by stripping. The property is to be inspected by a competent engineer.

Nelson, B. C.

Considerable development is taking place on mining properties situated on Lightning Peak and the Provincial Government is having a road surveyed from Deep Creek to the Peak. It is likely that a trail will be constructed and prospectors and operators interested are confident that it will not be long before the mineral resources of the section are sufficiently well proven to justify the building of a wagon road.

The possibilities of the development of gold mining on a considerably larger scale than at present in British Columbia was the subject of an address by Dr. Edwin T. Hodge, formerly professor of geology in the University in British Columbia, delivered recently at Nelson. To a number of interested mining men he explained that there was a belt in this Province similar to that of California extending from Bridge River in the north southwards across the Fraser River into the Skagit basin in the State of Washington. It is cut by numerous dykes and in places quartz veins have been prospected and shown to contain gold. Only in a few places have been mined to any extent. One of these places is in the Coronation and Pioneer Mines on Bridge River and another in the International Group on the boundary line. Dr. Hodge, however was of the opinion that the richest showings were in the central portion and in this connection he mentioned the Emancipation Mine, which was bounded recently and is to be developed. The British Columbia Belt was described as similar to the Motherlode Belt of California and "whether considered in a generalized way or considered from the standpoint of the minute and detailed study of the individual deposits there are a good many reasons to believe that within the Province a series of gold mines will be developed which will rival those of California.

Among the properties under development on Lemon Creek, Slocan, is the Barnett, where a force is engaged in stripping the veing and driving a tunnel. There are two of these, that on which work is in progress, being in a distance of 80 feet and the other 70 feet. Both are in ore which carries values in gold and silver, chiefly the former.

The Silversmith Mine, formerly the Slocan Star, promises to be one of the heaviest producers of the

Kootenays. The annual report, just issued, shows that the gross receipts from the sale of ore for the year ending May 31st were \$205,996.68, the margin over operating expenses being \$14,358.83. It is pointed out that this latter showing may not appear to be adequate but its comparative meagreness is explained by the necessity "to spend large sums for timber, raising and opening up various stopes in order that the ore could be economically mined." Perhaps the most significant statement is that "it is estimated that sufficient stoping ground has been developed to last seven years at the present rate of production."

Kaslo, B. C.

On his return from a tour of the Kaslo District, R. done preparatory to a thorough examination of the conditions are improving. George H. Aylard and Associates have taken a bond on the old Wellington Mine and the tunnels are being cleaned out and other work done preparatory to a through examination of the property. On the South Fork of Kaslo Creek the Silver Bear is being opened up by a small crew of men. Not only is development being carried out underground but a considerable amount of surface work is being done. Some ore is being taken out at intervals and at present a car load is sacked and ready for shipment. The Index, Revenue and Liberty Hill Groups also are receiving attention. The Cork-Province at present is idle but it is understood that the owners expect to be able to complete financial arrangements shortly for the resumption of operations.

R. A. Grimes, manager of the McAllister Mine, Three Forks, is responsible for the statement that the labor trouble which has been interfering with mining activity in the Slocan and other parts of the Kootenay is being overcome. Illustrating the improved conditions he points out that a considerable force is engaged on the Noble Five; that the same is true of the Queen Bess; that the Rambler-Cariboo again is the scene of real work; and that the Rosebery-Surprise is operating. He has been able also to increase his crew on the McAllister and the threatened walk-out at the Blue Bell, Riandel, is said to have been averted. There is as a result, Mr. Grimes asserts, a feeling of renewed confidence and optimism among the operators.

Trail, B.C.

Ore receipts at the Trail Smelter of the Consolidated Mining & Smelting Co. for the final 10 days of the month of July were the greatest for any similar period this year. They totalled 12,862 tons, bringing the aggregate for the year to date up to 181,157 tons.

Nelson, B.C.

The Provincial Prospectors' Protective Association continues to gather strength. Local organizations representing the Grand Forks and Smithers Districts have made applications to the central body for copies of the constitution, and there is every reason to believe that they will become affiliated. It has been decided that the Provincial Attorney General shall be asked what action will be taken to protect prospectors' cabins and caches from the depredations of thieves. It appears that members of the Association have been put to expense and annoyance in many instances by finding their headquarters in the hills rifled on returning from their periodical trips.

The Perrier Gold Mines, Ltd., of Nelson, recently incorporated with a capitalization of \$250,000, announces that the development of the Perrier, situated on Cottonwood Creek, will be proceeded with. The property has been opened up to the extent of two shafts, one being 120 feet deep with a northerly drift 200 feet in length from the bottom. There are two feet of good milling ore in the shaft and a similar width in the face of the drift. The smaller shaft, 40 feet deep, has been sunk in four feet of milling ore. The latter is said to be similar to the product of the Athabasca and the Granite-Poorman, from 60 to 70 per cent of the gold being free milling. While there is a considerable body of ore blocked out, no stoping has been done as yet, the ore shipped having been taken out in the course of development. The present equipment includes a 150-ton milling plant, a compressor, a friction hoist and an hydraulic pump, this being operated by water power brought through a 2,500-foot eight-inch wooden pipe.

Stewart, B.C.

Word from the Salmon River Section, Portland Canal, indicates that a fresh body of ore has been uncovered at the Premier Mine. The strike has been made in No. 2 Tunnel at a depth of about 600 feet and assures the active operation of the mine for an indefinite period. It is believed that this development is responsible for the recently announced decision to install a cyanide plant on the property. There now are more than 150 men employed in and about the mine, and good headway is being made with the concentrator foundations and the pipe line.

One of the two diamond drills on the Big Missouri has been closed down, that at work on the E. Pluribus Claim being continued. This is the claim on which high-grade ore is being opened up.

The Northern Light and Spider Groups on Salmon River and the Fitzgerald Group on the Bear River are being thoroughly explored by the Algonic Development Co., whose operations are the most extensive of any other one concern interested in the district, with the exception of the Premier Mining Co.

Vancouver, B.C.

John Hopp, well-known as an hydraulic placer operator in the Cariboo, states that, while British Columbians interested in this phase of mining appreciate the Provincial Government's action in relieving them partially from taxation and the payment of royalty, they still are seriously handicapped. With camp supplies, fuel and wages doubled in cost, the gold mining companies are hard hit at being compelled to market their product at an arbitrary figure. "We miners," he said, "only wish that gold would be left free to have its price fixed by the law of supply and demand. The arbitrary price of \$20.27 an ounce for fine gold hits us very hard. Only the best conducted plants can afford to operate, and many placer men are just holding on and not operating." Dealing with the season's conditions he stated that the water has been late this year, and that to make it worse there is a very rapid run-off which probably would limit the season to 90 days. Usually he gets his plant in operation by May 12, but this year work did not begin until June 1.

Victoria, B.C.

The Geological Survey of Canada has issued its an-

nual summary report of the geological survey work in British Columbia, and the Yukon during 1919. It contains an account of the explorations of W. E. Cockfield in the Ogilvie Range, Yukon, who also writes of the Mayo District in the same area. J. J. O'Neill deals with the Salmon River District, B.C.

Apropos of the new monograph on Graphite by H. S. Spence of the Dominion Mines Branch, it may be noted that in British Columbia graphite has been discovered at Alkow Harbor and on Dean Channel in the Bella Coola District. In the Fort Steele District it has been found on Matthew Creek, Marysville. A vein about two feet wide and running 25 per cent graphite was uncovered there about four years ago. In neither body nor values, however, is the vein a commercial proposition. Some years ago two carloads were shipped from Harrison Lake, but nothing further has been developed there. These are the only reputed discoveries. In the Bella Coola District the mineral occurs in minute flakes associated with pinites in a matrix of heulandite. It runs 23 per cent. in graphite. The Marysville deposit occurs on a contact of diorite and mica schist in a disseminated matrix of earthy silicates.

Moyie, B. C.

It again is reported that the St. Eugene Mine is to be put on a shipping basis by the Consolidated Mining & Smelting Co. The heavy tonnage from the Sullivan at Kimberley to the Trail Smelter is said to necessitate wet ore from the St. Eugene to act as a flux. The St. Eugene has produced over 5,000,000 ounces of silver and 229,000,000 lbs. of lead, valued at more than \$10,000,000. When the St. Eugene closed down in 1910 it was reported that the ore deposits had played out but it is said that there are big bodies of ore still in reserve. A small crew of men is at work.

Trail, B. C.

Ore receipts at the Trail Smelter of the Consolidated Mining & Smelting Co. of Canada for the week ending July 21st were 7,061 tons, bringing the total receipts for the year up to 168,295 tons. For the first time for some years the Velvet Mine of Rosslund appears among the list of properties shipping ore to the smelter. The Silver Bear, of Kaslo Creek, also is one of the shippers.

Grand Forks, B. C.

The Copper Farm Group, situated about five miles below Princetown on the Great Northern Railway, is being developed by the Princetown Mining & Developing Co. and is expected to become a regular shipper. There are three full claims on which the ledge has been opened by three tunnels. The vein has been traced for about 4500 feet on the surface and the operators assert that they have a large body of concentrating ore averaging 4 per cent. in copper and one ounce in silver. A three drill compressor has been installed and is now operating by means of steam power and another is to be installed shortly.

Vancouver, B. C.

J. W. D. Moodie, for many years general manager of the Britannia Mines, has resigned. He has been succeeded by B. B. Nieding, a well known mining man of the Pacific Northwest.

T. C. Botterill, formerly assistant superintendent of the Surf Inlet Mine, has accepted the superintendency of the Emancipation Mine, operated by the Liberator Mining Company.

THE COAL MINES.

The Canadian Collieries (D) Ltd., has adopted a forward policy in connection with the development of its coal holdings on Vancouver Island. J. M. Savage, General Manager, and Thomas Graham, General Superintendent, have decided that the Extension field shall be opened up to a greater extent than at present. There is coal at Extension and coal at the head of Oyster Harbor and there is every reason to believe that there is coal under the Haslam flats lying between these points. Several boreholes have been put down in this territory and all have shown coal or coal indications. A workable seam, however, has yet to be found and the Company will make another effort to this end, it being the intention that new boreholes shall be commenced without delay. The Company's new mine at South Wellington now is a regular producer and it also possesses a coal field at Sable River, near Union Bay, which will have attention soon. Messrs. Savage and Graham declare that the factors that have prevented the Company's aggregate output mounting very materially are lack of labor and uncertain market conditions. At present, however, there is no doubt about the market. The demand for the fuel produced by the collieries of Vancouver Island is brisk, in confirmation of which may be instanced the recent shipments to Sweden and other foreign parts and the prospect of further development of this overseas trade. Therefore it is the intention to proceed with development and to produce to the maximum capacity of the field having regard to the labor available.

With reference to the recent indications that a strong European market is about to be established for British Columbia coal it is interesting to note that the "S. S. Robin Goodfellow," of the Robin Line Steamship Co., a subsidiary of the Skinner and Eddy Corporation, of Seattle Wn., after loading at the bunkers of a Vancouver Island Coal Company will leave for a South American port.

Following the reaching of a settlement of wage and other questions between the Mine Operators and Employees in Eastern British Columbia and Alberta Coal Fields it was thought that a period of industrial peace was assured. Broadly speaking there is no reason for believing that this assumption will not be justified. There already has been, however, one slight rift in the lute. It occurred at Fernie, B. C. All the men with two exceptions had signed up with the U.M.W. of A., as it was through this organization that the agreement had been made with the Operators. When the two referred to it is stated that the U.M.W. of A. refused to accept them as members. Whether this is correct or no there is no doubt of what ensued. The miners refused to go to work the next day as a protest and a deputation waited on the management of the Crow's Nest Pass Coal Co. to make known the grievance. The next day, however, they went back to work pending an adjustment of this difference. The mines at Michel are in full operation, which statement applies to most of the mines of District 18 (U.M.W. of A.) which takes in a part of Eastern B.C. and the whole of the Province of Alberta.

The Coalmont Collieries, in the Nicola-Princeton Coal Field, mainland of British Columbia, soon will be well equipped with the plant necessary to permit a greater output and regular shipments to the waiting Vancouver and other adjacent domestic markets. The stations for the tramway that will bring the coal from the pitmouth to Coalmont are erected with the exception of the terminals. The little town at Coalmont will house the families of the miners and the married men will be able to spend their week-ends at home, bunks and meals being provided in addition for all hands near the pitmouth. At present some 150 tons a day are being produced, transport being furnished by motor truck over the hill road.

In a recent address to the members of the Vancouver (B.C.) Board of Trade W. R. Wilson, president and general manager of the Crow's Nest Pass Coal Co., Fernie, B.C., emphasized the desirability of the businessman having a clear knowledge of the fundamental basis of the chief manufacturing industries of the Country and in this connection referred to the conditions under which the iron and steel industry was operated in Canada and the United States. He spoke of the lamentable duplication of transportation and the high costs that were added to the finished product as a result of these charges. He said:—

"The iron ores that are smelted in Pittsburg are chiefly produced in the State of Wisconsin and are brought to Pittsburg by these stages of transportation: First, by rail to the lakes from the mines; second, across the lakes by steamer to the different points on the east side of the lakes; then, again, distributed by rail to different smelter points. Then, after these three stages of traffic manipulation, the ores are smelted in various forms of crude iron and steel are shipped from Pittsburg to various points in Ontario and Manitoba for further manufacturing processes.

"Following this manipulation of transportation of iron ores and iron those engaged in the iron trade production in Ontario and Manitoba, through the lack of fuel in these Provinces, again go to Pennsylvania or Virginia to purchase the coal and coke fuels they use in the finishing processes of reducing the crude iron to marketable form.

"In these duplicated processes of transportation of the crude metals and transportation of fuels the manufactures of Ontario and Manitoba possibly absorb about \$12 excess per ton in all the finished products they make, which can only be regarded as a serious economic handicap to those engaged in these particular industries in provinces which do not possess suitable fuel deposits for these purposes.

"Then the people of the West, who have so far failed to take advantage of their own natural resources are called upon to purchase the products of iron and steel that are manufactured in the East, not only at excessive cost of production, as just illustrated, but to pay for repeated mileage costs of transportation, which have become involved in a system of production that is founded on either an oversight or a misconception of the sound basic principles of industry.

"In the Fernie District we have coal deposits that are, at least equal to the best coals on the continent. The coal bedding, in some instances, is accompanied with exigencies that I have never seen in any other coal fields on this continent, which peculiar characteristics may be briefly referred to as follows:

"When these mountains were lifted from the original lines of formation, which upheaval approximately lifted the structural bedding in some parts of the areas of the district from 500 to 3,000 feet higher than they were originally, considerable crushing and contortional twisting in the structural mass occurred, which violent forms of crushing developed dynamic heat of various degrees of intensity. These forces volatilized the coal beds to a certain extent, also volatilizing the beds of shale that intervene between the different beds of coal. These violent crushing mass pressures, acting upon the sandstone, shale and coal measures of the district may be estimated at 2500 to over 3000 feet in thickness, also developed indefinite and artificial rent lines in the whole structural mass.

"In some portions of the fields, rent lines appear to have been formed, thereby making it possible for the intense gas pressures to escape as the process of volatilization went on. In other portions this form of relief fracture does not appear to have occurred, hence in certain districts of the field intense pent-up pressures of the gas appear to have been formed in the small voids and cracks and cavities that have been created during the general upheaval.

"In some instances these small pent-up pockets of gas may be estimated to have assumed a pent-up force of about 210,000 pounds per square foot, or about 1458 pounds per square inch. These difficulties, while of a very unusual nature in coal mining, are carefully approached and through the medium of excessive care may be safely dealt with."

Coal mining operations will be commenced at the new coal field near Lampman, Saskatchewan, Canada, within the next sixty days. This field is being developed by the Farmers Coal Mining Co. Ltd., a company owned and operated by the farmers of the district. The shaft already has been sunk to a depth of 170 feet and the coal bed lies at a depth of 210 feet. This coal has been shown from analytical tests to have a calorific value of more than 12000 British thermal units, and is of high grade. When fully developed the mine will have a capacity of 1,000 tons a day. This will take some time, however, as it will be necessary to do a large amount of work in channelling and tunnelling away from the shaft before maximum capacity can be reached. In the meantime the work is being hurried and coal will be brought to the surface within the next two months.

Coal production returns for the month of July, as far as are available, indicate that the collieries of British Columbia apparently are satisfactorily meeting recent heavier demands of the trade. The figures follow:

Nicola-Princeton Field.

	Tons
Middlesboro Collieries Co., Middlesboro	6,918
Fleming Coal Company, Merritt	2,626
Coalmont Collieries Co., Coalmont	1,984

Vancouver Island Field.

Canadian Western Fuel Co., Nanaimo	55,399
Canadian Collieries Ltd., Comox	41,089
Canadian Collieries Ltd., So. Wellington	8,904
Canadian Collieries Ltd., Extension	15,342
Pacific Coast Coal Mines, So. Wellington	7,680
Nanoose-Wellington Coal Co., Wellington	3,079
Granby Cons. M. S. & P. Co., Cassidy	9,019

JOHN STEWART MacARTHUR.

A TRIBUTE BY DR. W. A. CALDICOTT.

(In The Journal of The Chemical, Metallurgical and Mining Society of South Africa.)

The members of our society will learn with much regret that J. S. MacArthur, whose name is familiar throughout the mining world as the inventor of the cyanide process, has recently died in consequence of complications following upon a chill.

John Stewart MacArthur was the son of a Scotch clergyman, and began work early in life as an apprentice in the laboratory of the Tharsis Sulphur and Copper Company of Glasgow. Later he entered the service of the Cassel Gold Extracting Company as chemist (1871-86, eventually becoming its technical manager (1886-93), and subsequently managing director until 1897. It was during his service with this company that he, with Dr. Forest and others, undertook during his leisure hours the series of systematic researches for a hydro-metallurgical process of lixiviating gold ores, which resulted in the first practical application of a dilute alkaline cyanide solution as a gold solvent, and of zinc shavings, at first plain and later lead-coated, as a precipitant of the dissolved gold.

Apart from patent specifications, the first published authoritative account of the MacArthur-Forrest process of gold extraction is contained in an article published by J. S. MacArthur in the "Journal of the Society of Chemical Industry" on 31st March, 1890. After describing the practical application of the process, the paper concludes with the following words:—"I confidently predict that cyanide of potassium, hitherto used only to polish amalgamated plates, will take front rank as chief agent in gold extraction." The events of the last thirty years have amply fulfilled this prediction; and further, most silver ores in Mexico, which is the chief source of silver, have for years been treated by means of the cyanide process. The many million ounces of gold and silver yearly extracted by means of the cyanide process have, apart from their direct influence upon the mining industry, produced wide and far-reaching effects upon the whole monetary and economic systems of the civilised world.

The cyanide process was demonstrated in South Africa upon a variety of gold ores, concentrates and tailings in 1890 at the battery of the Salisbury G. M. Co. Later this pioneer work of the Cassel G. E. Co. was taken over by the African Gold Recovery Syndicate, which eventually became the African Gold Recovery Company. Following these novel and successful demonstrations, the use of the process rapidly extended in the Transvaal and the whole mining world, as its superiority over competitive methods became realised. To the gold mines it meant the conversion of embarrassing tailings into dividends, and the payability of mines otherwise unprofitable. Some of MacArthur's reminiscences of this period were given in the December, 1908, issue of our journal.

Subsequently, in 1896, the Transvaal patents were the subject of an historical lawsuit, which resulted in their cancellation on the ground of prior scientific knowledge, although no gold had ever been previously extracted on a commercial basis from ores by means of cyanide solution. A recent tribute to MacArthur's work in this direction is contained in Dr. H. H. Green's

presidential address before the last meeting of the South African Association for the Advancement of Science in the following words:—"Thus the development of the whole mining industry of the Witwatersrand, and the very coming into existence of the city of Johannesburg, was conditioned by a laboratory observation made originally by a pure chemist, and developed by a mineralogical chemist—who, it may be added, did not get enough out of his patent to enable him to abandon his practice. The cyanide process for the extraction of gold from low-grade ores and tailings makes just that difference between profitable and unprofitable production of gold in South Africa, and without it the industries of the Witwatersrand would never have reached their present development."

Following on the last of his visits to the Rand, MacArthur engaged for many years in ordinary professional work on gold and copper as a consulting metallurgist. His practice involved repeated visits to Portugal and the United States, as well as numerous investigations and researches. In January, 1913, he published a paper in our journal on winz wafer precipitation, and during the war until his death he devoted himself to the extraction of radium at Balloch, on Loch Lomond, for military watches and compasses.

To his sturdy independent Scottish characteristics and chemical knowledge MacArthur added a remarkable insight and tenacity of purpose and a kindly consideration for those with whom he was associated. The world is the poorer through his death in the loss of a good chemist, a famous inventor, and an honorable, upright man.

In addition to having been for many years an honorary member of our society, MacArthur was awarded in 1902 the gold medal of the Institution of Mining and Metallurgy, and the well-known text book, "Rand Metallurgical Practice," was dedicated to him by the authors in the following terms:—

To
JOHN STEWART MACARTHUR.

Whose pioneer researches and introduction in 1890 of the Cyanide Process as an essential feature of Rand metallurgical practice have rendered possible the successful treatment on scientific principles of low-grade banket ore, and have been a prime factor in establishing the Witwatersrand Goldfields as the premier gold producer of the world.

GOWGANDA.

The revival of interest in the Gowganda silver area, due in part to the development of the Castle property by the Trethewey Company is still dampened by the lack of suitable transportation facilities. The proposed light railway would help the district considerably, but there seems no prospect of it being built this summer.

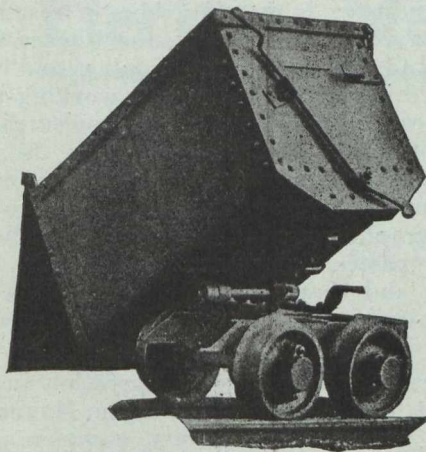
The reported new discovery at the Miller Lake-O'Brien, the premier mine of the district, doubtless originated with the shipping to Toronto of a large specimen of very rich ore.

The high price obtainable for silver should encourage those interested in Gowganda properties. They have however had many difficulties to contend with.

It is rumored on the street that an English company has acquired a large interest in the Trethewey on the strength of developments at the Castle property.—R.E.H.

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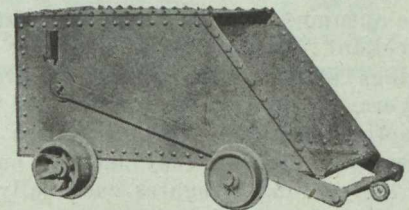
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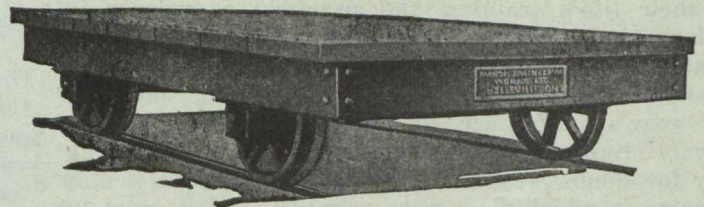
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THE SECOND INDUSTRIAL CONFERENCE. Views of the Canadian Institute of Mining and Metallurgy.

In all probability, the Minister of Labor will call a second Industrial Conference, to meet at Ottawa during the autumn. Few will gainsay that it is, in theory, an excellent plan to bring together periodically in gatherings of this kind representatives of industrial employers, of employees, and of the general public. In practice, however, the usefulness of such a conference must depend very largely on the degree to which the various delegates can really speak authoritatively for the class they are supposed to represent. The labor delegates, representing organized and unionized labor, can be depended upon to act as a single unit. They are agreed upon what labor wants, and by their life's training and practical experience in such matters, they are both prepared and qualified to state their views or demands of labor upon any question which may arise. On the other hand, at last year's conference it was evident that the employers' representatives were in a position to speak only for themselves, or at most for the one particular industry in which they were engaged, and it must be admitted that, in general, they did not display a sufficiently intimate knowledge of the wider aspects of the various labor problems that came up for discussion. The delegates representing the general public, also, could do no more than express their opinions as individuals, and in no sense did they fairly represent the class for whom they appeared—a class that surely is as vitally interested in the establishment of harmonious industrial relations as are either the employers or the employees. A conference so constituted cannot possibly go very far towards solving permanently the problems underlying industrial unrest. It might be compared with a match in which a team of amateurs, who have never previously played together, is pitted against a well trained professional team. No matter how able and resourceful the former may be individually, their lack of understanding and combination places them at a great disadvantage, and the game must suffer. So with the conference, and unfortunately there is, on very important points, sufficient antagonism between employers and employees to render the parallel all the closer. Since there must be two sides, let them be evenly matched and determined to play the game. As was stated in the *Bulletin* in commenting on last year's conference, "if industry it to benefit to the fullest possible extent from such meetings as the recent Conference, it is essential that representatives of employers as well as employees should be in a position to speak authoritatively for the interests for whom they appear.

NOTES ON MINING OF MICA, GRAPHITE AND MAGNESITE IN QUEBEC.

(From Bulletin of C. I. M. & M.)

The demand for Canadian mica continues to be good; the prices are quite satisfactory, and in consequence the mines of the Lièvre-Gatineau region are very active. The Blackburn mica mine, at McGregor lake, one of the very few underground mica workings in the country, has now reached a depth of 250 feet on a slope of 60 deg. The Wallingford mines, at Perkins, are getting out some remarkably large sheet-mica, a great proportion of which is shipped to Eng-

land. Canadian mica is of the variety phlogopite, possessing elasticity and dielectric properties unattained in the other varieties. The province of Quebec produced last year over 80 per cent of the Canadian output of this mineral.

The graphite industry is showing signs of resuming activity. After a year of inactivity, the Quebec Graphite Company, Ltd., has re-opened its mines and completely remodelled its mill, which is now working with the Callow process as the basis of its concentration practice. Oil flotation methods appear to be the process to which the Buckingham ores are most amenable. The Quebec Graphite Company has also gone into the manufacture of graphite products, such as flake lubricants, graphite pastes, pipe-joint compounds and foundry facings, and they intend to extend this list to include graphite greases, stove polish, electrodes and paints.

All the magnesite quarries are in operation in the Grenville district. The Scottish-Canadian Magnesite Company, which has installed a very complete and modern plant for the production of dead-burned magnesite, is now turning out a product that finds a ready market in the United States, in Canada and in Europe. The North American Magnesite Company has also built a very complete mill at Calumet, but, unfortunately, the starting has been delayed by the non-delivery of some of the machinery. In the meantime, the quarry has been active and the rock shipped, as in the past, to the Longue Pointe cement plant, where it is dead-burned in the rotary cement-kilns. The International Magnesite Company, operating in Harrington township, is producing calcined magnesia, used in the manufacture of flooring cement. The consideration, by the Senate of the United States, of the Magnesite Bill, which passed Congress in October last, imposing a duty of $\frac{3}{4}$ c per lb. on dead-burned magnesite entering the United States, has been postponed until next December.

TALCUM FIGHTS FIRE.

Talcum powder, a leading ingredient of vanity cases, was recently used in putting out a fire which otherwise would have burned down a coal tar products plant in Cincinnati, Ohio. The blaze which had caught a huge tank of naphthalene was smothered by dumping upon it fifty-pound sacks of the well-known complexion aid.

In a yard near the burning plant where tanks containing 300,000 gallons of oil, but as the fire was checked they were not touched by the flames, according to an account in the current number of the *Journal of Industrial and Engineering Chemistry*. This is the first time that a cosmetic has been applied with puffs to the bright face of danger.

A large deposit of metallic arsenic is reported on Alder Island, one of the smaller islands of the Queen Charlotte group. Several claims have been staked covering the entire island, and samples taken indiscriminately give returns from 18 per cent. to 24 per cent. arsenic, while the locator states it is possible to obtain specimens of the almost pure mineral. This is the first deposit of the kind on record in British Columbia, although for years arsenic has been produced as a by-product from the arsenopyrite ores of the Hedley Gold Mining Company.—From the *Journal of Industrial and Engineering Chemistry*.

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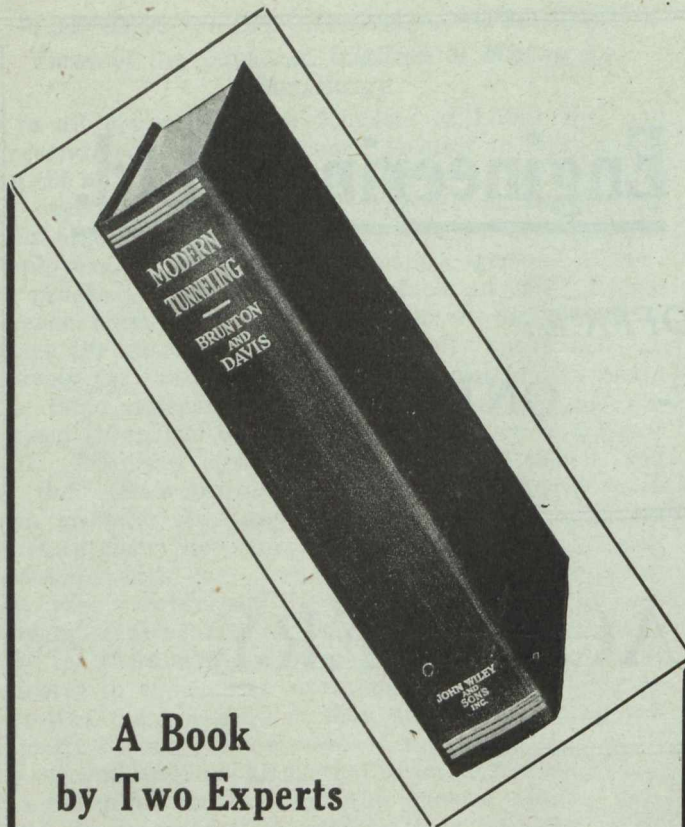
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**What the N.Y. "Times" says about
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From the statement in the N.Y. "Times" of July 4, 1920, by the Dean of the Columbia School of Mines, and Arthur F. Taggart, Professor of Ore Dressing.

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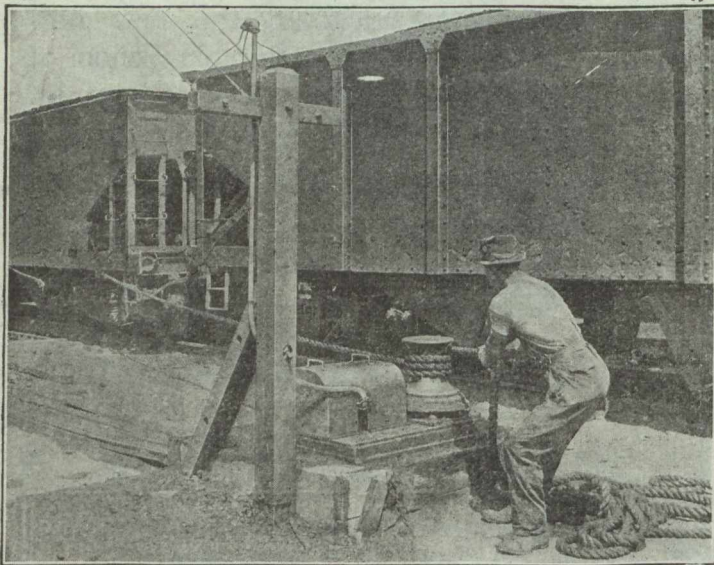
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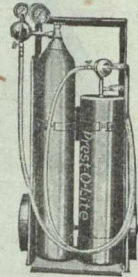
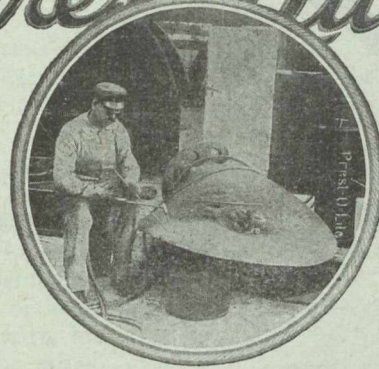
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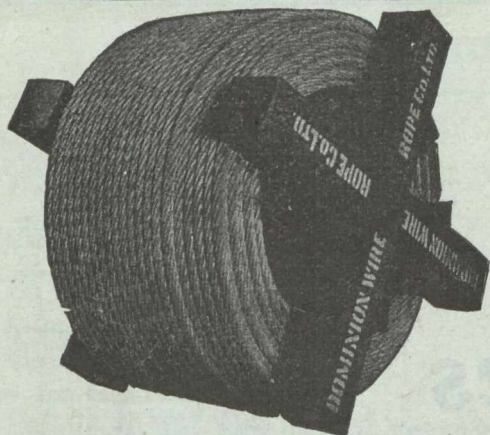
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Canadian Miners' Buying Directory.—(Continued)

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, Q.

Coal:

Dominion 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, Q.

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.

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

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Cobalt Oxide and Metal

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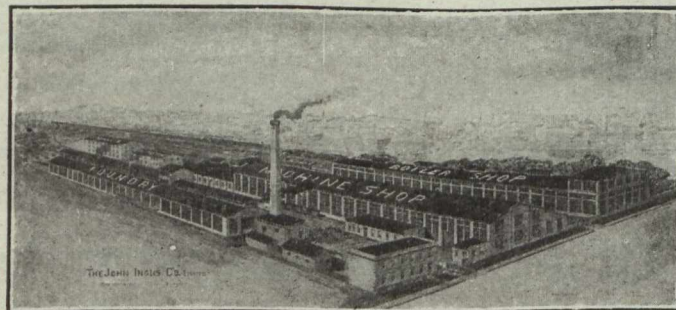
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Canadian Miners' Buying Directory.—(Continued)

- 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
- Ejectors:**
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., Ltd.
- Engineers:**
General Engineering Co., New York
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 & Glasco
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.
Canadian Link-Belt Co., Ltd.
Northern Canada Supply Co.
Jones & Glasco
- 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. I. 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:
Spelman 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
Smart-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.)

Silene:

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 Electric:

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.
Northern 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 Bridge & 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 Apparatus:
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.

Zincconium:
Everitt & Co.

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

Zinc Spelter:
Canada Metal Co., Ltd.
Joyt Metal Co., Ltd.

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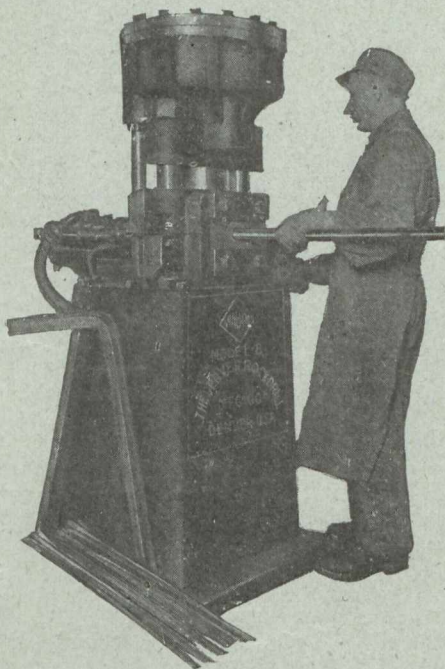
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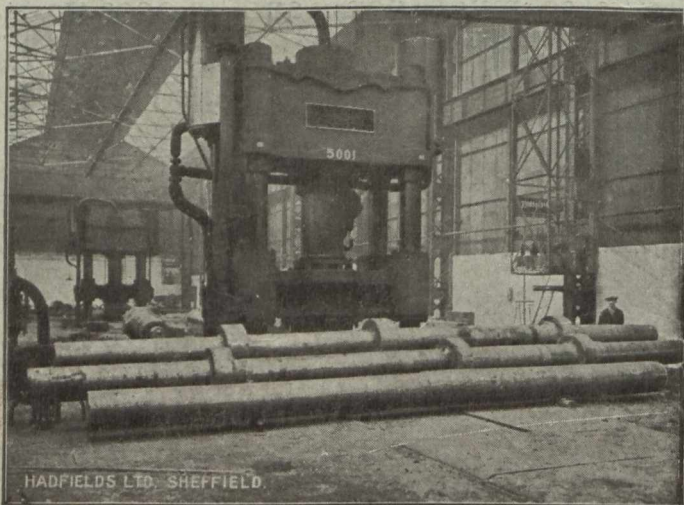
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