

CANADIAN MINING JOURNAL

Vol. XLI.

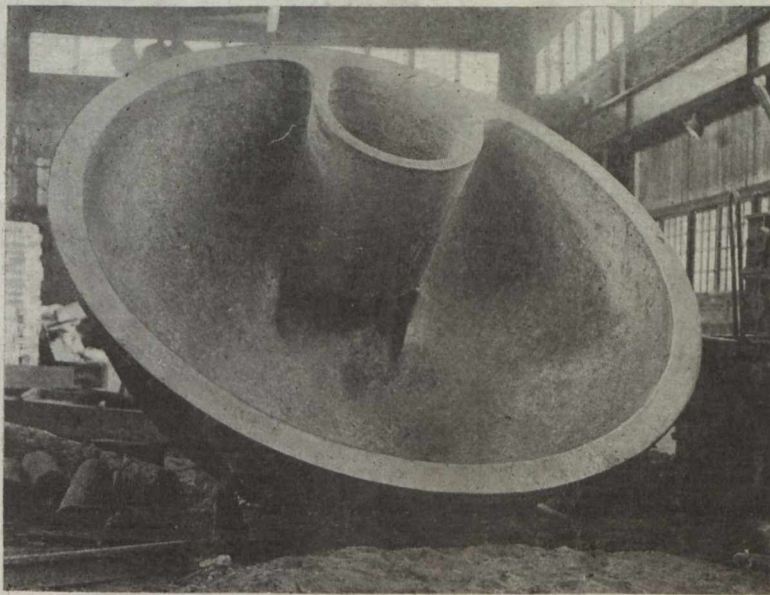
Gardenvale, P. Q., June 11, 1920.

No. 23.

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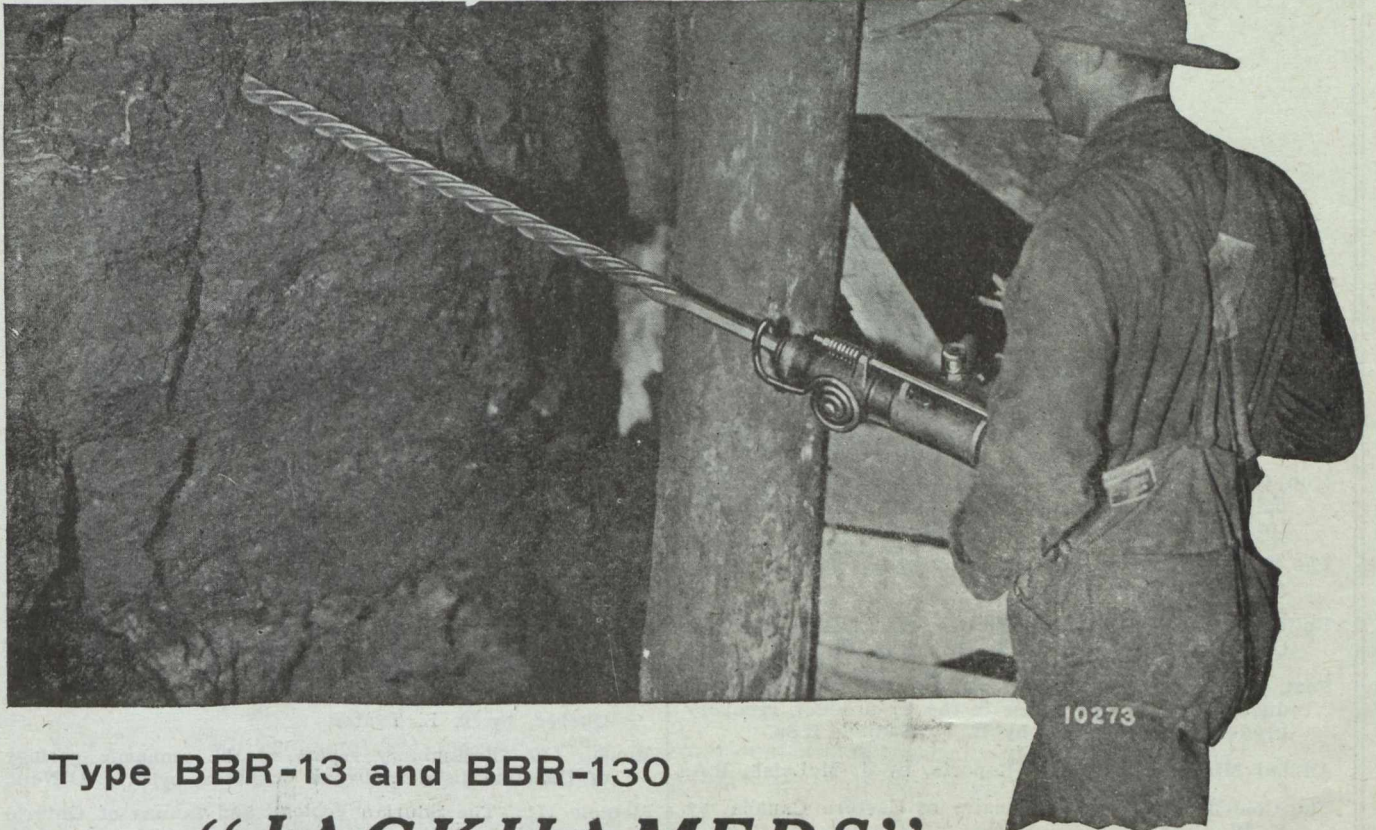
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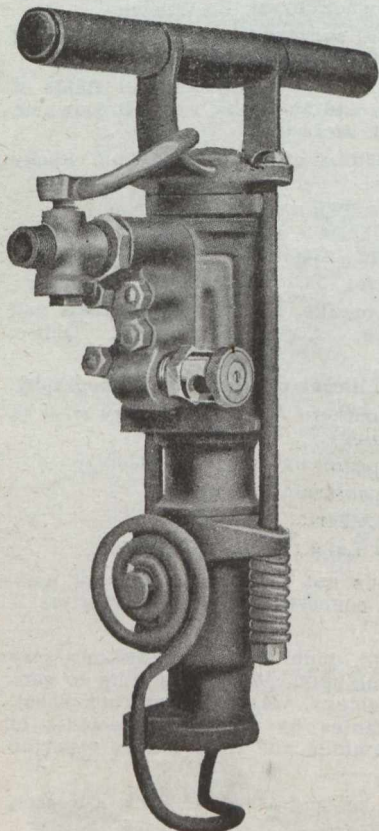
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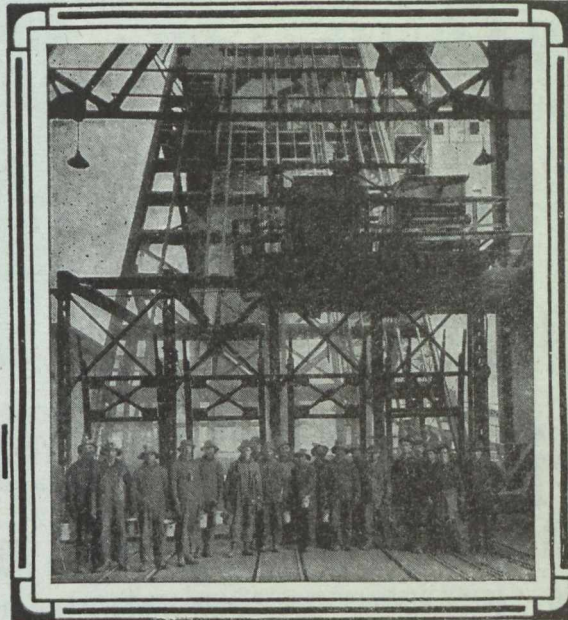
Recent Publications

- 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 Cam-sell and Wyatt Malcolm.
- Memoir 109. The Harricanaw-Turgeon basin, northern Quebec, by T. L. Tanton.
- 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 112. Geology of the district belt of southwestern Alberta, by J. S. Stewart.
- 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 116. Investigations in the gas and oil fields of Alberta, Saskatchewan and Manitoba, by D. B. Dowling, S. E. Slipper and F. H. McLearn.
- 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 1585. Mackenzie River basin. Geology.
- Map 1680. Portions of Grenville, Harrington, Chatham and Wentworth townships, Argenteuil county, Quebec. Geology.
- Map 1708. Bridge river, Lillooet district, B.C. Topography.
- Map 1712. Foothills of Southern Alberta, St. Mary river to Hig-wood river. Geology.
- Map 1714. The Niagara peninsula, Ontario. Geology.
- Map 1715. The Ontario peninsula. Geology.
- Map 1724. Sheep River, Alberta. Geology.
- Map 1726. Athapapuskow Lake region. 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.
- Communications should be addressed to The Director, Geological Survey, Ottawa.



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

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

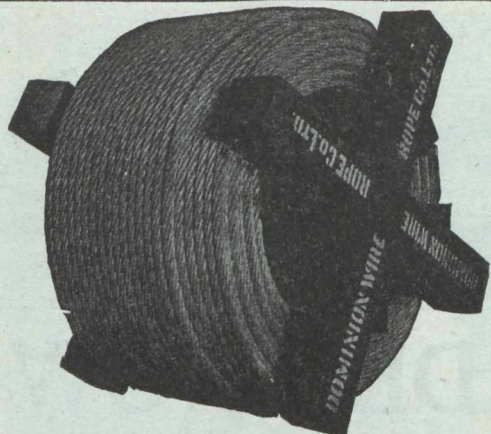
The prospector can go almost anywhere in the mineral regions in his canoe; the climate is invigorating and healthy, and there is plenty of wood and good water. Hydro-electric power is available in many parts of the Province, and many undeveloped water-powers remain to be harnessed. A miner's license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

For list of publications, illustrated reports, geological maps and mining laws, apply to

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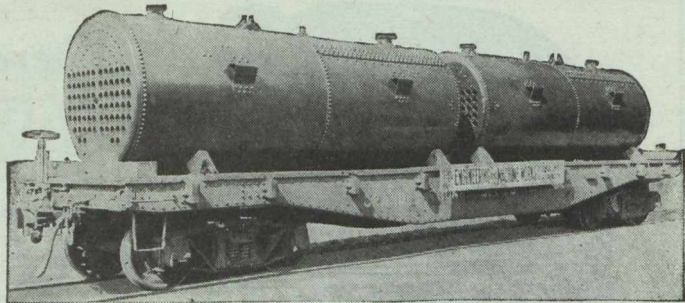
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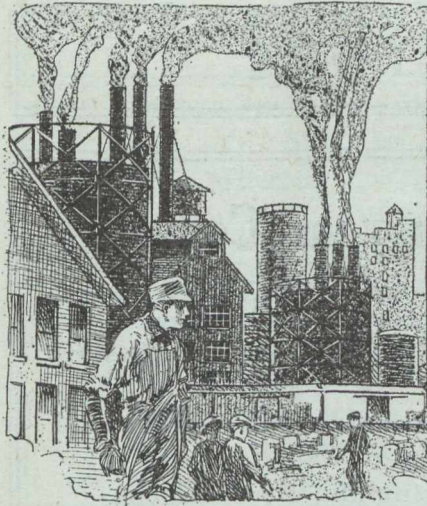
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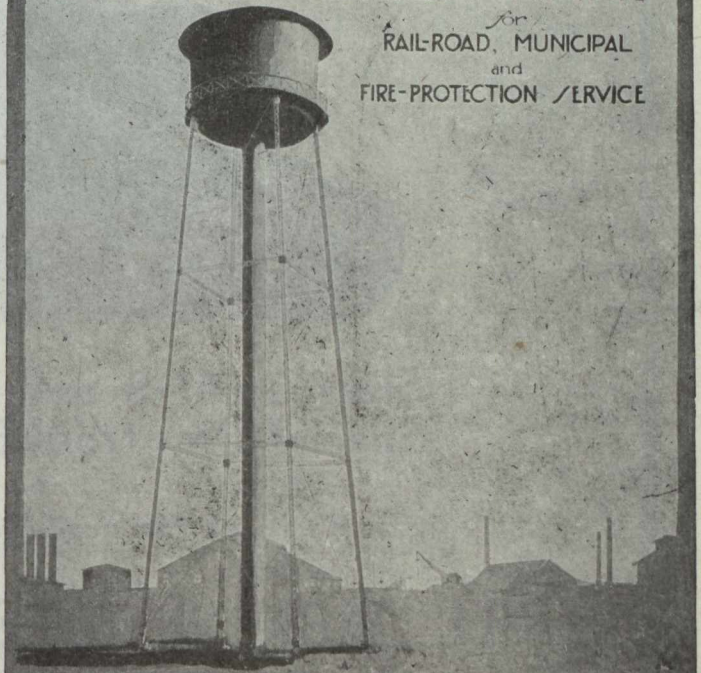
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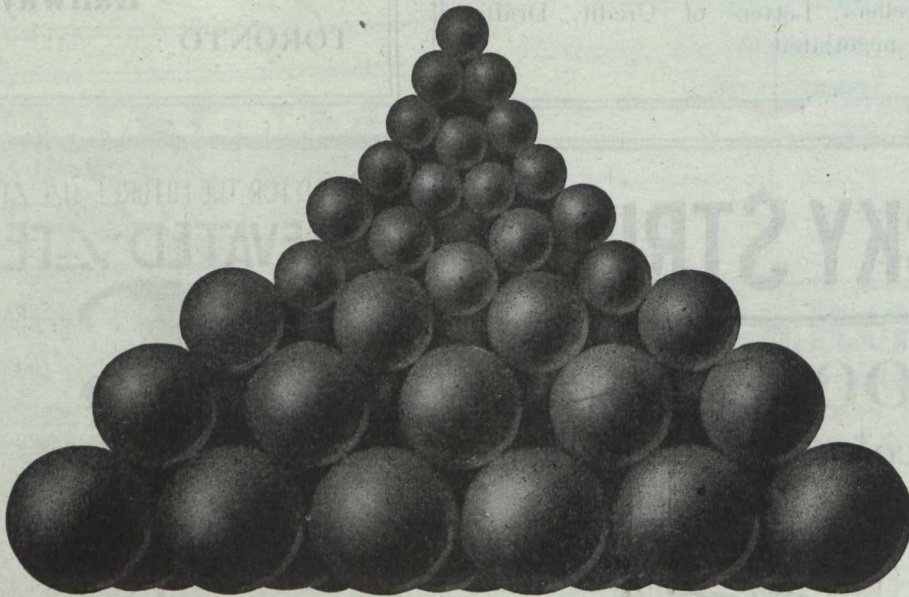
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VOL. XLI.

GARDENVALE, P.Q., June 11, 1920

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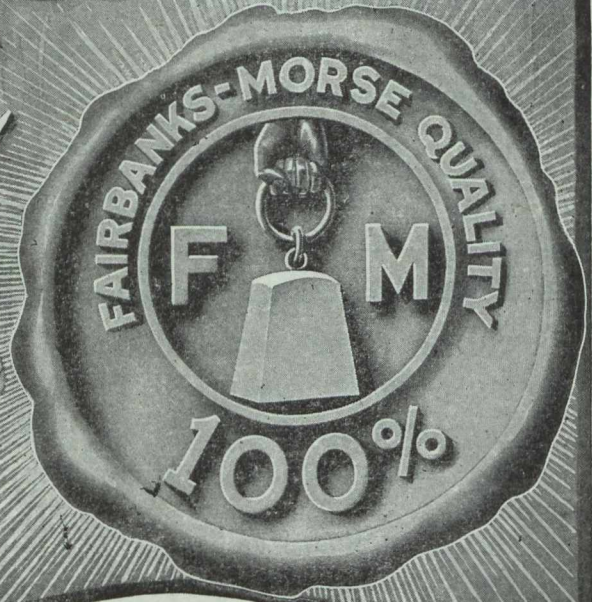
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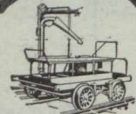
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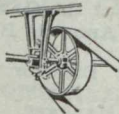
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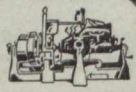
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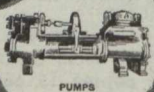
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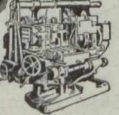
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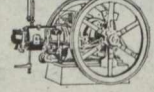
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EDITORIAL

The Training of Mining Engineers

In our issue of May 21st, Professor Haultain of Toronto University, asked for criticism of the regulations applying to students in the Department of Mining Engineering in that University. Candidates for the degree are required to present satisfactory evidence of having had at least six months' practical experience in work connected with mining, metallurgy or geology, for which they must have received regular wages. It is not often that those who sit in the chairs of learning at our universities ask criticism from the layman. Perhaps it is a stray eddy of the wind from Russia?

The question raised by Prof. Haultain has almost as many possibilities for discussion as the tariff, and it is one that very largely occupied the proceedings of mining societies in Britain during the past year. In Britain the difficulty was not so much to give theoretically trained men acquaintance with the actual practice of mining, but to give some theoretical knowledge to men fully acquainted with the practice of mining. Here it may be remarked that the college-trained mining engineer is somewhat of a rarity in Britain, more particularly in coal mining. The practice has been to article young men to reputable mining engineers for a term of years, during which period the aspirant is given an opportunity to learn every branch of coal mines direction, including the commercial side of the business and such by-ways as the work of the warehouse, the time-office and the traffic office. Concurrently with his daily work at the mine, the student is required to study and to take his certificates of competency for the various grades of official mine positions. Briefly, the training of the mining engineer at British collieries is theory superimposed upon practice, and, while university training is by no means under-rated, it is given a secondary place in the training of the mining engineer, or at

least, in that most responsible man, the certificated colliery manager. In Canada, this course of training sometimes places the old-country mining engineer at a disadvantage, as he is not the possessor of a university degree, nor, in British mining circles is he expected to be.

We believe that the regulation of the University ask the very minimum of practical knowledge from the aspirant for a mining degree, but we do not quite understand why it should be necessary to stipulate that during the required probationary period of practical work the student should have received "regular wages." In some instances this would pre-suppose a philanthropic spirit on the part of the employer. It is the work, and not the remuneration, that is of practical value to the student. If he needs the money the student himself will see to it that he receives "regular wages." There have been budding financiers among students before now.

Also we suggest that instead of ruling out mine-office work as a qualification, students should be encouraged, in addition to the practical work, to spend some time in the commercial side of mining. Many mining engineers sadly need education in the economic side of their profession. It is not less essential that the fully educated mining engineer should be able to intelligently analyse a cost-sheet or interpret a financial statement than that he shall be able to read a blueprint. In his actual lifework it will probably advantage the mining engineer more to be able to calculate the ultimate cost of the material he is mining than to know how to make an ultimate analysis of its chemical composition, or to be able to specify its exact stratigraphical occurrence.

We suggest that our readers should follow Prof. Haultain's suggestion and discuss this many-sided question in the columns of the "Journal."

Dominion Coal Company Offers Scholarships to Employees

It is announced from Glace Bay that the Dominion Coal Company will offer annually two scholarships at McGill University to employees. In this connection the Dominion Coal Company follows the example of the International Nickel Company and the Granby Consolidated Mining & Smelting Company. We hope that the adoption of the granting of schol-

arships by such a representative group of Canadian mining companies will lead to an even more widespread and general acceptance of the principle.

In the issue of the "Journal" for 24th December last there was noted in this column a plan adopted by fourteen of the largest mining companies in Australia by which bursaries at the Universities of Mel-

bourne and Adelaide were provided for students in mining and metallurgy. Provided the students selected respond to their opportunity, the associated companies undertake to provide him with a suitable position with an initial salary of not less than £250 per annum.

The employees, and the children of the employees of the mining companies in Canada, have been placed at a disadvantage in educational opportunities by the remoteness of the mining centres from seats of learning, which to some extent explains the tendency for the more ambitious men to move to metropolitan centres. The paucity of suitable applicants for official positions, and the lack of understudies to officials in responsible charge of important departments is a matter that concerns the mining companies very intimately and is reflected in their balance-sheets. While the provision of bursaries for selected students is a proper and commendable thing, which the "Journal" would be the last to appear to disparage, we do not think it will solve the real problem of mining education, which is to extend the scope and the influence of the universities to the sons of the miner, the minor official, and the clerical employees of the mining companies. For this reason we cannot agree with the present campaigns for the augmentation of the endowments of denominational universities in Nova Scotia, so far as the training of technical workers is concerned. If the people of the Maritime Provinces could agree among themselves upon one centre of technical training, would concentrate their energies upon equipping such a centre as it should be equipped, then something might be done to bring the staff and equipment of such a centre into close and permanent touch with the technical workers of the Province. The denominational colleges could then proceed to develop as schools of ethical culture, freed from the hopeless endeavour to maintain engineering laboratories and faculties entirely beyond their means, and the Maritime Provinces might under such circumstances redeem itself from the shame and consequences of such inadequate provision for the technical training of its workers as has hitherto distinguished it. The Nova Scotia Government has done much by its mining schools, but its revenues are inadequate to allow of the extension of the mining schools to suit present-day standards and requirements. Technical education is costing enough in Nova Scotia, but the money and energy spent is being dissipated to little purpose, and, from the point of the mining companies is money and energy lost, as it does not reach the homes of their workmen. For example, there is as yet no means by which a promising student of the provincial mining school can take a short course at any of the places where engineering science is taught in Nova Scotia, and in the whole Island of Cape Breton, which has 100,000 inhabitants and produces eighty per cent

of the coal output of Nova Scotia, there is no technical school, nor any institution of learning containing scientific equipment superior to that of the average town high-school. The circles of university instruction and the life of the mining population of Nova Scotia do not anywhere intersect, which fact we believe to be a drawback, and a condition calling urgently for a remedy.

THE FINE ARTS VERSUS STYRACOSAURUS ALBERTENSIS.

In order to make room for specimens of the fine arts in the Victoria Museum at Ottawa the members of the Geological Survey have been asked to clear out the fossils in the Hall of Vertebrate Paleontology, at the Museum, which contains, among other unique fossil remains, the complete skeleton of the great horned dinosaur from the Cretaceous of Alberta, of which the Geological Survey is justly proud. The suggestion is made to the Paleontological Branch that if the dinosaur is allowed to remain where it is, as is very desirable in order to avoid damage in removing it, it should be boxed up. As the Ottawa "Journal" remarks, "the value of a boxed-up dinosaur for museum purposes is apparent."

We would not care to comment upon the incident, except it is just another of those little indications of non-appreciation of the work of the Geological Survey that we have noted in these columns from time to time. The work of the Survey is not understood, therefore it is despised. Possibly some itinerant scientist will come across the "boxed-up" dinosaur and express himself as Samuel Butler did about the pantless Discobolus in Montreal. If the right of the Paleontological Branch to continue its exhibits in the Victoria Museum is to be taken away, then it were a pity to have disturbed the dinosaur from its age-long rest in Alberta, and in justice, the bust of Logan and the boulder on which it is placed should be removed from the entrance to the Museum. Perhaps, if Ottawa does not want the dinosaur, the Province of Alberta, or the United States, might welcome it. That is where most of the geologists have gone anyway. If the Styracosaurus could use his frontal horn and his bony mane there might be another kind of clearance in the Museum.

"ALL LEAVE IS STOPPED."

Rudyard Kipling was some time ago described in the "Atlantic Monthly" as a seer of "remarkable rightness," and we believe him to be happier in his interpretation of the British mind than in his analysis of the Canadian mind, if recent cabled reports of a late work are true—which they probably are not.

Some recent remarks of Mr. Kipling in the "Times" upon the national evolution of the Englishman (the word is Kipling's) have such general application, and

ring so true, that we believe they should be widely quoted. "What will he do in the future?" asks Mr. Kipling, and answers: "We are too close to the dust of the main battle to see clearly. We know that England is crippled by the loss or wastage of a whole generation. Her position from the civil point of view is that of our armies in the worst days of the war—that is to say, *all leave is stopped for every man who can stand up to his job*, no matter how sick or stale he may be, and there is undreamed of pro-motion for untried men, who, merely because they are not dead, will have to face heavier responsibility, longer hours, and criticism that will certainly not grow milder as the years pass."

Mr. Kipling's tonic sentences are equally applicable to all the British peoples, and it is a singular tribute to his acknowledged position as a seer and poet of the Empire, that, even when he descants upon the characteristics of the Englishman, and thereby deliberately limits his pen, we feel a secret umbrage at the limitation. Not since Mr. Kipling penned, "Stand up and meet your fate" has he written anything so true as this call to hard work and the acceptance of responsibility.

OIL PROPAGANDA.

In this issue are published editorials from the "Mining Journal" and "Petroleum Times," of London, which express fairly the attitude of British mining men towards the restrictive policy of the various governments of the Empire in connection with oil concessions. The "Mining Journal" expresses its belief that propaganda—by the oil interests presumably—is being directed at the present time towards inducing a modification of present restrictive policies, and states that if the big oil interests reached an agreement "it is impossible to suppose that the policy would not be modified." Which is to say that if the oil interests remain dissatisfied the widespread propaganda we have previously deprecated in these columns will continue in an aggravated form. This is indeed a pleasant prospect for international amity.

An example of this particular irritant is the editorial of the "Engineering & Mining Journal," of May 29th on the "Petroleum Drama," which, while it may be unexceptional reading for citizens of the United States, is not acceptable to Canadian readers.

The Canadian point of view, if we are able to interpret it, is that we do not desire to see the friendship between this country and the United States endangered by a propaganda that is based on untruths and issues from the offices of commercial rivals. At the same time, we would suggest to the editors of United States periodicals catering to Canadian circulation, remembrance of the fact that Canada is an important factor in the British Empire.

AMERICA AND GREAT BRITAIN'S OIL POLICY.

The report which has during the present week been transmitted by President Wilson to the American Senate in response to an enquiry by the Senate as to what restrictions were placed upon American enterprise in developing the oil resources of the world, has not unnaturally caused considerable stir in international oil circles. We might even go further and say that by reason of several of the statements which are contained therein, and which have been prepared by the Secretary of State, the report is viewed in a seriousness which only reveals itself when it is closely studied. For the first time, in regard to Great Britain's oil policy, we see the writing on the wall, and even as Belshazzar at his feast in scriptural times saw the solemn warning which those mystic letters foretold, so let us hope Great Britain will exercise due care in the moulding of its Imperial oil policy lest, as Mr. Francis E. Powell put it last week, it should antagonise too greatly irritate too much those sources which have served her so well in the past.

This is not the time to deal in detail with the very important negotiations which have been in progress (despite Mr. Bonar Law's denial) for a long time past between the Government and our friends, the Shell-Royal Dutch group by which this Empire will be in the position of having inalienable supplies of oil for its future needs. Such a consummation will have far-reaching results, and if it achieves the ends in view, then there is ample justification for its adoption. But there are two methods by which this can be secured, and we venture to suggest that in regard to the Mesopotamia oil regions which are admittedly vast in extent, the absolute exclusion of all American interest is not a policy of wisdom. Our great organizations in the oil industry to-day have risen to their present proud positions not solely by reason of grasping opportunity when it presented itself, but rather by managerial control and far-sightedness in appreciating the force of and meeting strong competition. Thus, then the presence of American interests in the new oilfields of Mesopotamia cannot be a source of weakness to our own Imperial oil policy, but will be a factor of strength and one which will have a most beneficial effect upon our relations with the United States.

That the United States takes somewhat of a distorted view of Great Britain's world hold on oil, is not to be wondered at seeing the misleading statements that have freely been circulated through the press of late by certain writers, who, in order to clothe their own speculative oil propositions with some degree of importance, have glibly written of the not distant time when the United States would have to come cap in hand to this country for its oil supplies.

Such statements are not opinions based upon optimism, for there is nothing in Great Britain's oil policy as at present moulded to even suggest this; they are made obviously, as we say, to bring importance to an enterprise which, registered not in this country but in Canada, is out to make at least a show for the millions which are already sunk in it.

While there are feelings that Great Britain is out to capture all the great oilfields of the world, the serious fact prominently stands out that to-day there is produced in regions under the British flag only about one-fiftieth of the crude oil production of the world. If only this fact is fully appreciated, it will be seen what a very long way we have to go before there can be any suggestion of our even controlling sufficient supplies of oil to meet our own demands.

And even with the development of the great fields in Mesopotamia it must take several years before any appreciable amount of oil is available for our home needs; therefore, it behooves us as a Nation to so mould our Imperial oil policy that it shall not create discord among those interests upon which we so greatly depend to-day—"Petroleum Times."

OIL ECONOMICS AND POLITICS.

We have insisted for a long time past on the immense seriousness of some of the issues which underlie the fuel industry. Hitherto these have been viewed mainly in relation to coal and its derivatives, but there is also a wide range of anxieties connected with the other branch—petroleum. In certain directions these problems meet and overlap, apart altogether from the question of competition and substitution of one source of power for the other. On this occasion it is some of the questions connected with the oil industry which claim attention. It is obvious from the activity of the cables that the forces of oil are mobilizing. What exactly that means very few persons can entirely perceive, though the consumer has a shrewd idea that in the long run it is he who will pay the cost of the campaign. Experience of, and participation in, the oil industry has come to this country comparatively late, and we have not, therefore, the experience in traditions which exist in regard to it, such as have long existed in the United States, and, to a lesser extent perhaps in the Caucasus. A centralised oil control has so long been recognized in America that, rightly or wrongly, the Oil Trust in popular imagination represents the most brilliant achievement in trustification and the practice of the arts of monopoly and its satellite, business politics or "lobbying." It is possible that the reputation of the Standard in these respects has achieved an eminence which does less than justice to other industrial organizations, but it undoubtedly exists, and imparts an atmosphere into the domain of oil which is an important factor in considering the world's situation and the position of the other competitors or participants in international business. Some appreciation of the atmosphere which exists in the oil world, combined with a recognition of the intense concentration subsisting, is a necessary preliminary to any serious study of the subject, and it largely explains why even those who have a close acquaintance with the matter find it most difficult at the present time to align the protagonists and penetrate their designs. A moment's reflection will convince any of our readers that, as all commercial struggles are designed for the benefit of the participating interests, where these are individually powerful, at any moment competition may give way to agreement, and the foes of yesterday may be allies—nay, even the master combination—of to-morrow.

At the present time there appear to be three leading groups in the oil world: the Standard, the Shell-Dutch, and the Anglo-Persian. The relations between these cannot be known. Obviously they must touch at many points, and as co-operation, where possible, is a general desideratum, they must have understandings on many subsidiary points, such for instance, as common interests affecting transport and marketing. Beyond this we know that the Anglo-Persian Oil is bound by marketing contracts with the Shell which do not ex-

pire until 1922, while it is a matter of common report that a price agreement between the Standard and the Shell also exists, coupled possibly with the usual agreements as to spheres of interest. Such understandings do not necessarily preclude extreme antagonisms on the main fronts, but they always offer the prospect of compromise and agreement on big issues, based on the recognition of the fact that combination is economic and competition is wasteful. In the magnitude of resources these three groups vary greatly, the Anglo-Persian Oil being only able to claim any place in the sun through the fact that the British Government is the chief proprietor, and on the assumption that the Cabinet consider it to our interest to maintain an independent producer in consonance with the principles enunciated by Mr. Winston Churchill at various times, and on the view that independent State enterprise of this kind is the matter of settled policy to which the resources of the British Empire should be directed. Such an assumption is, however, by no means unquestionable. During the war we had the remarkable arrangements come to by the Petroleum Committee designed to give a monopoly of oil production in this country to the Pearson interests which have since been absorbed into the Shell, and all kinds of rumours have been circulated in the Press and Parliament recently of "patriotic" offers by the Shell group to place their great organization at the disposal or combination which has had experience of bureau- or combination which has had experience of bureaucracy during the war can be conceived to desire to thrust themselves under departmental control with any conviction that the industry or business which they have created is going to benefit thereby, and we may be pretty certain that if such propositions have been made the active control would be in the hands of the Shell and not of the Admiralty, or whatever department is selected for the responsibility. As we read the situation, therefore, any such negotiations would be along the lines of an extension of the policy already adopted in regard to the monopolization of any possible oilfields in this country.

Thus far we have glanced at the problem from the internal point of view of organization within the industry itself, but the aspects of the problems which are offering themselves at the moment are perhaps rather national than international, and though very possibly the national movements are merely a move in the game of the big operators, it would be presumptuous to regard them as nothing more than that. During the last two or three weeks we have witnessed the beginning of a political agitation in America, which is almost certainly the precursor of further action, and which was clearly foreshadowed in a leading article in the Journal of February 7, commenting upon an official demand from the head of the United States Geological Survey for action by the United States Government. Recent issues of the Journal have recorded various alarmist statements by leading oil authorities of the United States as to the exhaustion of crude stocks, and these have been emphasized by advances in prices, despite the protests of Federal Commissions and State authorities, to say nothing of the general public. The facts as regards the increasing seriousness of the growing excess of consumption over production in the United States admit of no doubt. Following the statistics of the world's production in 1918, given in our issue of February 14, when the United States' output was approximately 356,000,000 barrels.

it is stated that the production last year was 376,000,000 barrels, but the consumption was 413,000,000 barrels. The result is that whereas the crude stocks in California four years ago were over 60,000,000 barrels, at the beginning of March last they were rather less than 29,000,000 barrels, and at the present rate of consumption the stocks should be completely cleared out in another year. Moreover, the consumption is growing monthly. In 1918 the average rate of consumption of Californian crude was 279,576 barrels, in the second half of 1919 it was 292,278 barrels, in January last 301,100 barrels, and in February 304,120 barrels. The Standard Oil Co. are now installing new processes, which will provide for the cracking of about 30 per cent of their current fuel oil production, so that while the immense demand for petrol may to some extent be met, fuel for ordinary power plants will be to that extent diminished. Such being the state of affairs in the United States one of two things—or possibly both—will happen. Exports will be partly embargoed or the price will be sharply raised.

It is just at this point that the more strictly national aspect of the business asserts itself. Mr. Otis Smith, in the paper which we printed on February 7 last, emphasized the fact that the United States must either restrict her domestic supply to home requirements or must secure large sources of supply abroad. He pointed out that the British Government had adopted a restrictive policy in regard to foreign undertakings in territories under the British flag, and suggested that the American Government should make up its mind whether it would insist on the open door or the export embargo. In speaking thus Mr. Otis Smith was voicing protests and opinions which have been current in American oil and business circles for a considerable time past, and the British Government certainly cannot be surprised at their making their appearance. Free trade and equal opportunities for foreign capital has been a cardinal principle of British commercial policy for nearly a century past. With the growing interference, however, of various departments in commercial matters—especially in mining—a distinct change of attitude has presented itself to foreign observers. The Indian service, which is peculiarly subject to reactionary influences, was perhaps the first to exhibit this policy in restrictions upon the alienation of mining land to foreigners. The idea, however, was speedily extended to oil, where the Trinidad leases formed a precedent upon which American attention quickly fastened. Since then these tendencies have had a further advertisement through Mr. Hughes' policy in Australia, while that peculiarly futile piece of legislation, the Non-Ferrous Metals Industry Act, impressed American opinion connected with the mineral industry most vividly. We are not concerned here to argue the preponderating advantages of a general policy of free trade or of protection. Undoubtedly, however, protection begets countervailing measures, and ultimately impairs international relations, and this effect must be weighed up among the disadvantages of a change in our traditional commercial policy, in view particularly of our dependence on foreign nations for so much of our raw products. No doubt much of the rising tide of protests in America, which appears to be directed against this country to the exclusion of others like France, which has developed a promising petroleum supply in North Africa (which is closed down for eventualities), is unreasonable. We may naturally point out that

America was offered the mandate for the Turkish Dominions, and refused, it, although, as American papers then pointed out, they were denying themselves the development of mineral interests in those regions. We are on even stronger ground, perhaps, in refusing to permit indiscriminate exploitation of national territory in a country so unstable as Persia at the present time, but these considerations will not avail to prevent America considering her own interests first, and the possibility of steps to restrict free imports of some essential commodities, especially lubricants, must be considered. At the same time, as the Petrol Profiteering Committee pointed out recently, it is not to the interests of the big American concerns to restrict their business here. They have large sums of money locked up in distributing media—trucks, reservoirs and tanks—and restrictions on supply would in the long run tend to diminish their preponderant influence in the control of our markets. It is, therefore, intelligible that propaganda should be directed at the present time towards inducing the Home and Dominion Governments to modify their restrictive policy as regards participation in the exploitation of the oil resources of the Empire, and it is impossible to suppose that the policy would not be modified if the big oil interests reached an agreement.—The "Mining Journal," London.

OBITUARY.

Hon. James Dunsmuir.

With the death of James Dunsmuir there passes a dominant figure in British Columbia development, and a man whose life, together with that of his father Robert Dunsmuir, covers the story of the growth of mining, finance and railway building in British Columbia from their beginnings. James Dunsmuir and his father were representatives of that band of forceful Scots whose names are linked with the Hudson's Bay Company, the Canadian Pacific Railway and the Bank of Montreal.

James Dunsmuir was born in Fort Vancouver, in 1851, two years later than the first attempt of the Hudson's Bay Company to open coal mines on Vancouver Island. Robert Dunsmuir was soon an outstanding figure in the young coal trade of the Island, and became eventually the largest owner of coal-lands there. Young Dunsmuir entered his father's business at the age of 17 years, eventually succeeding him as president and chief stockholder of the Union and Wellington collieries and of the Esquimalt and Nanaimo Railway, which properties he later sold to MacKenzie and Mann and the Canadian Pacific Railway.

From 1900 to 1902, Mr. Dunsmuir was Premier of British Columbia, and was Lieutenant-Governor from 1906 to 1909. Like other men of the dominant Scotch-Canadian type to which he belonged, Mr. Dunsmuir was a generous, but discriminating donor to hospitals and educational institutions.

BRITISH COLUMBIA MINE INSPECTOR KILLED.

William Lancaster, Inspector of Mines for the Kootenay District of British Columbia was killed on May 29th by an automobile accident. He had been Inspector of Mines for three years, being previously Assistant Manager of the Coal Creek Mine of the Crow's Nest Pass Coal Co.

"Longwall" Mining and Coal Conservation

J. H. CUNNINGHAM.*

A prominent mining man has remarked that when a coal miner is once inoculated with "Longwall" he is forever after immune against future attacks of 'Room and Pillar.' While this statement is perhaps slightly overdrawn, since its author was evidently a "Longwall" enthusiast, yet the fact remains that a "Longwall" miner when selecting a method of working will generally view the situation first from the "Longwall" standpoint and then resort to some other method only after finding that conditions are totally unsuited to his particular system. This point of view may not be as prejudiced as it at first appears. For a person who has actually found a superior way of doing a thing, is undoubtedly the best judge of whether his new method is better than the old; and for this reason a miner who has once experienced the numerous advantages of "Longwall" when worked under suitable conditions, is very loath to change to any other system, unless the conditions make the use of "Longwall" prohibitive. The remarks which follow are not intended however to introduce a controversy between "Longwall" and "Room and Pillar," for both systems have their own advantages under certain conditions, but they are designed merely to point out the considerations which should govern the use of the former and to emphasize the connection existing between the use of "Longwall" and the conservation of the coal resources of the country.

The application of "Longwall" mining is of course governed by certain natural conditions existing in the coal seam itself, and in the overlying strata. Any seam of a hard or medium hard nature, varying in thickness from 30 inches to 6 feet, with a good roof and floor lying from 300 to 3000 feet below the surface, is capable of being worked "Longwall" provided it is not badly faulted; and the success of the operation depends entirely upon how these conditions are made use of. Some operators prefer to add that the seam should also have a low inclination, but there are so many examples of "Longwall" worked successfully in seams of high inclination that this does not appear to be essential.

A good roof for "Longwall" is the same as for any other method of mining, but in addition it should be of a material that shoots well and is suitable for building rock walls. The floor also should be fairly hard so that it will not "creep" readily when the pressure comes on it. Above the working roof the most suitable measures consist of alternate strata of sandstone and shale. If they are all sandstone it makes a good enough roof, but after a break once occurs the fissures extend too far and there is too much opportunity for them to gather water. With shale piles intervening fissures are kept from spreading, and with any subsidence of the measures the shale strata open out and help to cushion the weight so that the effects of the subsidence are not felt at any great distance above the coal seam.

The preliminary development in connection with the seam need not be discussed here since the shaft sink-

ing, opening out of pit bottom and arrangement of shaft pillar will be attended to in the same way, irrespective of whether it is to be worked "Longwall" or by some other method. "Longwall" proper therefore may be started as soon as the main roads have reached the boundary of the shaft pillar, and there should be sufficient information available at that time to indicate how the work should be opened out. While the shaft was being sunk the thickness and nature of the overlying strata have been ascertained, and while driving the various roads from the pit bottom to the boundary of the shaft pillar there has been an opportunity to find out the nature and thickness of the seam and the direction of the cleat. If the seam is hard, the direction of the face which is to be laid out should run nearly parallel with the cleat and if it is medium hard, the face may proceed "half on". In some instances, it has been found feasible even to work "Longwall" in a fairly soft seam by keeping the face going "end on". Another feature which helps determine the direction of the face, is the direction of the joints in the roof strata. These of course, should not run parallel with the face.

In continuing main roads after the shaft pillar is passed, two methods are followed. One is to protect these roads by pillars of a suitable size for the purpose of maintaining a tight air-course and insuring height for the roadways. The other is to begin extracting all the coal as soon as the shaft pillar is left behind and carry the main roads forward through the waste and depend upon the excellence of the roadside packs to insure having a proper air-course. The latter method certainly entails more brushing for height than the former, but it is contended that the advantage of having all pillars removed from the area of the "Longwall" operations will in time more than offset the temporary disadvantage of higher cost for brushing. And it is also true that the first cost of the pure "Longwall" roadway may not be any greater than the cost of driving in the solid, in spite of the brushing entailed, since where the complete extraction method is followed, the main road is also a part of the working face and carries the same mining rate as the regular face does. In this way the high yardage rate for level and headway driving is done away with.

One of the most frequent mistakes made in "Longwall" come from not giving proper attention to the contact zone existing between the solid coal and the "Longwall" waste. And here is probably the best place to consider this phase of the question, because the whole system of "Longwall" has often been condemned as unsuitable, simply because proper precautions were not taken in starting off the work. As soon as "waste" is opened beyond solid coal, there is bound to be a subsidence of the roof. How much there will be depends upon how tightly the waste is stowed in the area included within the contact zone. If the method of complete extraction of pillars on main roads is followed, special care is necessary in building the pack walls next to the shaft pillar and the waste should be stowed as near solid as possible. This will reduce the breakage of the roof measures to a minimum and will also prevent air leakage which would otherwise occur at this point. In continuing the perman-

*A paper read before the Mining Society of Nova Scotia, May 1920, Glace Bay Meeting.

ent roads a greater thickness of packwall should be used than on the secondary roads for the double purpose of making it tight from an air course and also for maintaining its height for both haulage way and air course for some time to come. What the thickness of the roadside packs should be will depend largely upon the depth of the seam from the surface, and the roadways as first laid off should be a little wider than required for a finished roadway, since the roof weight is bound to push the walls out a few inches into the road. When a double-track road is necessary, it is sometimes well to consider if two narrow roads had better not be built than a single wide one, and allow the outgoing traffic to travel on one road, and the incoming traffic on the other. The upkeep of two single roads will in many cases be less than on one wide double road.

In the case of a "Longwall" road running alongside of a pillar, the coal rib should never be used for one side of the road. Immediately against the pillar there should be a well-built packwall from 10 to 20 feet thick, so that the road will be formed with packwalls on each side of it. This will cushion the weight on the road and throw the loose end of the broken roof in the waste, rather than directly over the roadway.

In turning off secondary roads care should be taken to strengthen the turns. This may be done by using a timber packwall in the case building, stone is not of the best and in case there is any doubt about the roof. If these roads are also to be used for haulage purposes, the same precautions should be taken with them as with main roads, only to a lesser degree.

In breaking off the "gateways" or short roads leading directly to the face, the distance between centres will depend largely upon the thickness of the seam and on the amount of building available and also upon the method of dealing with the coal at the face. A glance at the origin of this system will throw light upon the practice to be followed.

"Longwall" originated in the north of England, and was devised as a measure of necessity. Many of the thick seams in that part of the country had been worked out and it became necessary to operate the thinner seams in order to hold up the production. No particular difficulty was met with in operating these thin seams by the "Room and Pillar" method, although it was found in order to do so a considerable increase in both the mining and day-paid labor was necessary and during a portion of the day rock had to be hoisted instead of coal, all of which made it very difficult for the thin seams to compete with the thicker seams still operating. The "Longwall" system was therefore devised to increase the daily production of the miners and also to provide stowage for the rock instead of sending to the surface, and it was found in addition that the stored rock could be used to support the roof and to assist in making the coal face work properly.

Gateways therefore came to be broken off at such distances so that the waste would absorb all the rock brushed down in providing the necessary height for the gateways. In seams varying from 4 to 6 feet in thickness it has sometimes been found advantageous to lay a temporary track for the mine cars along the face and lead out the coal directly and thus reduce shovelling to a minimum. In order to do this a good roof is necessary so that the roof supports can be kept back some distance from the face. If this system can

be followed, gateways can be placed further apart and a considerable saving made in brushing. In a thinner seam the same result is sometimes attained by the use of face conveyors travelling between two consecutive gateways.

But the system most commonly used is to load the mine cars as they stand at the face in the gateway. In applying this system it is evident that the gateway must be kept sufficiently close so that excessive shovelling will be eliminated. Where the direction of the face is on the "level" it is customary to divide the face equally on both sides of the gateway for loading the coal. Or if the direction of face is inclined it is divided so that the long shovel is on the rise side of the gateway and the short level on the low side.

With these preliminary considerations disposed of, we now come to the actual working of the "Longwall" face. The method of mining employed may be either by hand or by machine, but owing to the comparative scarcity of skilled "Longwall" hand-miners in this country, it is probable that any development of the "Longwall" method will be by the use of continuous cutting-machines. The "post" or other types of reciprocating machines are useful for some of the auxiliary work, but they are not suitable for steady cutting along the face. The selection of the motive power used for the machines depends upon whether the seam is gassy or not. If it is gassy, compressed air should be used, but if not, electric power is more efficient and satisfactory. The type of cutter used on the machine depends upon the hardness of the material to be cut. If the coal is very hard the disc type will be found strongest. In some workings this type is even used for mining iron-stone. If the coal is medium hard, the chain type will probably give the best satisfaction. In a soft seam or one in which the coal is apt to settle, and jam the cutter, the best type is the bar machine. This latter type has also been found very satisfactory in seams where the floor is uneven since the bar is more flexible than the other cutters and will ride more easily over the irregularities in the pavement.

The length of cutter-bar used, or in other words the depth of the undercut, depends upon the hardness of the coal. This may vary from 4 to 6 feet and should be graduated so as to prevent the coal from falling and clogging the machine before the cut is properly made. When used properly, the depth of undercut can be made of great assistance in working the coal so that very little explosive need be used. In many instances the coal will fall in large blocks without the use of any explosive, although in such cases light shots have to be put in the coal after it is down to break it up so that it can be loaded out.

In undercutting a hard seam, especially where the roof is also hard, very little spragging of the coal after the machine will be necessary, whereas in a medium or soft seam sprags or breakers should be set fairly close to the cutter as it moves along the face. The purpose of this is twofold; first it prevents the coal from settling on the machine and secondly it assists in breaking the coal so that it does not come down in blocks too large to be handled.

The ease with which coal comes down after it is "mined" depends also upon the nature of the roof. A hard roof does not "give" immediately after the coal is undercut and the face therefore needs to stand awhile before it is worked, so that it will get the benefit of the roof pressure. On the other hand, a flexible

roof will begin to bend and exert pressure almost as soon as the undercutting is completed.

For these reasons, under a hard roof the face should not be advanced as rapidly as under a soft roof, otherwise a part of the advantage gained from roof pressure will be lost. The main idea is to advance the face rapidly enough to keep the roof stratum bending and still prevent it from breaking. "Breaks" will occur from time to time but they should be controlled so that they will ease themselves in the waste rather than over the working places. When excessive weighting shows in the roof on the gateways, it is sometimes beneficial to stiffen up the roadside packs and leave a waste space between the packs without any support. This has a tendency to throw the "break" in the waste and thus relieve the weight on the road. For this reason standing timber should never be left in the waste, since it prevents regular subsidence and throws additional weight on the roadways and face instead of allowing it to come where it will not do any damage. It might be noted here that the distance between the packs and the face has a great influence on how the coal will work. If the roof bends easily and breaks the coal down freely after it is undercut, the packs should be kept close up to the face, whereas if the roof is stiff and is slow in exerting pressure on the face, the packs should be kept farther back so as to give the roof a better chance to work.

It will be seen from the forgoing remarks that a considerable amount of skill is necessary in handling a "Longwall" face properly, and each face must be made a subject of study in itself. It is probable that this reason accounts largely for the backwardness in undertaking "Longwall" operations.

Having sketched the main points to be considered in "Longwall" mining, let us briefly point out its application to coal conservation. In the first place it provides for complete extraction of the seam as compared with a system of partial extraction under the "Room and Pillar" method. Under the last-named system as a rule more coal is left standing in pillars than is taken out in the first working, and it is only in rare instances that these pillars are completely recovered. Even if they are ultimately recovered, here has been a continued loss in them year after year, due to a certain amount of crushing and spalling of the coal. Also when they are finally worked there is a larger percentage of slack produced than there was in the first working. With "Longwall" there has been no chance at all for deterioration since the face is kept fresh continually.

"Longwall" will produce a larger percentage of round coal than any other system, since there is always a loose end to work on, thus permitting a smaller quantity of explosive to be used, and being able to make use of the roof weight the quantity of explosive required is still further reduced. A reduction of explosive means a lower mining rate and also a conservation of materials used in explosives.

With a continuous face producing coal, rather than a number of separate faces separated by pillars, it is possible to have a greater concentration of work. This feature reduces the cost of supervision as well as the haulage costs. For example, a "Longwall" headway with gateways broken off on the level need only be half the length of a room and pillar headway producing the same tonnage, provided that in the last-named case half the coal is left in pillars. This will

permit the use of less rope, fewer rails, smaller haulage engines and less rolling stock.

Ventilation of the mine is also much simplified, and can be carried on more efficiently and with a smaller quantity of air. The nature of the face permits it to be swept continuously with a stream of fresh air reaching all parts of the face equally instead of having it travel up one side of a room and then back the other side and then passing through a crosscut and traveling up one side of the next room before it reaches the face again. In other systems, for seams of the same thickness, there is a greater frictional loss in ventilation than in "Longwall" and in the case of deep seams, the additional heat generated from the crushing of pillars occasions an increased temperature which must be met by increasing the volume of air. All of these losses lead us back to the economic use of power. A saving in power means a reduction in steam consumption, which also means a saving in the quantity of coal used. Additional power saving also is possible in the operation of the mining machines, especially where the heavier types are used. These machines require power to load and unload them and power to transport them to the next place, whereas in "Longwall" practically all the power they consume is for productive work. The removal of machines from one place to another entails other losses as well. If half the time in the shift is used in moving and setting up the machine, both men and machines are engaged in unproductive work during half their time.

Besides saving coal and explosives and haulage material, and all other materials incident to power production, "Longwall" leads to a considerable saving of timber. With a good roof practically no timber at all is required overhead in the gateways, especially if the roof can be arched, and the only timber necessary on the sides is at the turns of the road and perhaps on occasional timber pack in case it is necessary to stiffen up the rock wall. At the face a certain amount of timber is necessary to protect it while working, but as fast as the pack walls are built up this timber should be withdrawn. It can generally be used several times over and when no longer fit for face timber, it will do for building packs. With the rapid depletion of our forests, the mine-timber problem will become increasingly difficult each year. Up to the present there has not been a great demand in Nova Scotia for the smaller sizes of timber, such as are commonly used for mine timber, but with the advent of pulp mills at both ends of the Province, consuming hundreds of cord of this size of timber every day, the situation will be different and the cost of mine timber will in a short time go much higher than it is today. Therefore, the necessity for adopting a mining system wherever possible which requires a smaller quantity of timber is apparent.

In a locality where there is a large and cheap supply of timber available, it is sometimes possible to work "Longwall" under rather unusual conditions. The writer has in mind an operation in Western Canada where the thickness of the seam varied from two to ten feet and which would ordinarily not be considered suitable for "Longwall", because, in addition to the variation in thickness, the roof was not particularly good and the seam in many places contained several thick layers of soft dirt, which was not suitable for packs, but because of a plentiful supply of timber, the packs were built entirely of timber set skin to skin alongside the roadside and the dirt from the

seam was stowed behind the timber packs.

Another set of conditions permitting the use of "Longwall", but a little out of the ordinary, may be noted. In a seam where the roof is only fair but where the floor contains good building material, it is feasible to leave the roof unbroken and support it on timber resting on top of the pack walls and then brush the pavement in order to secure the necessary height and to provide sufficient material for building the walls.

There are also a number of other special conditions apart from the standard conditions required which will permit the working of the seam by "Longwall," but space does not permit of them being referred to at this time. It may be noted however, that there are two main varieties of "Longwall" which differ only in general principles, but not in detail. These are "Longwall Advancing" and "Longwall Retreating." We have been considering the former since it is in most common use. In "Longwall Retreating" the main roads are driven through the solid to the boundary as quickly as possible, and the face is opened out first at the boundary instead of near the shaft bottom. This system will probably pay even better than the other in the long run, but it requires a much longer time, to get up a large output than by the other method. To compensate for this loss however, the cost of production will be less, because the roadways are easier to maintain and the wastes as they are formed are forever being left behind. In "Longwall Advancing" when the workings open up clear of the shaft pillar, a large output can be produced in a comparatively short time. Sometimes a balance is struck between the two systems, and one side of the pit is opened up for "advancing" and the other for "retreating." Or a further variation is sometimes introduced by laying off the pit in large panels, each of which is surrounded by its own pillars, and then each panel is worked out individually by "Longwall." A very successful example of this system is found in Lancashire. The seam is from 6 to 7 feet in height and contains a rock band one foot in thickness in the centre of the seam. A section of the mine was laid off in panels, and the main roads and gateways were "driven in" the full height of the seam. The bottom half of the seam between the gateways was worked "Longwall" and the bottom bench of coal and the rock band were taken out in the first working, and the top bench of coal left for the roof. After the boundary of the panel has been reached, the top bench of coal was bought back by "Longwall Retreating." In the second part of the work, one of the principal advantages was the ease with which the coal could be loaded out. When retreating the tops of the mine cars as they stood in the gateways were on a level with the floor from which the coal was loaded.

In the excellent paper which was presented by Mr. Herd yesterday, the subject of Hydraulic Stowing was discussed. This expedient is feasible of course for either "Room and pillar" or "Longwall" mining but even without it, "Longwall" can be practiced in under-sea workings with very little danger, provided there is sufficient cover and the roof measures are suitable. What is probably the most successful "Longwall" operation in the Dominion today is carried on as a sub-sea operation. I refer to the workings in the Newcastle seam in No. 1 shaft at Nanaimo. "Longwall" was started in the bottom seam of this colliery in the year 1904, and to date the "Longwall" production has totalled about 3,000,000 tons. This is in addition to the

output from the Douglas seam which lies above it and is much thicker. Practically all of the "Longwall" operations have been submarine with a covering varying in thickness from 400 to 600 feet. The subsidence noted to date is only from a foot to 18 inches and the seam has an average thickness of three feet six inches.

Within the limits of a paper it is impossible to give an adequate idea of either the advantages or the problems of "Longwall" operation, and for anyone who is particularly interested in the subject, the only way to become satisfied is to visit an actual operation. So far as the writer is aware, the best demonstration of a seam that contains all the elements of successful "Longwall" operation in this district is found at Sydney mines, in the bottom seam or Jubilee Colliery. Practically all the ideal conditions noted in this paper are there present, and although the development is not yet very extensive, the preliminary work already done has been carried on in a very thorough and careful manner, and it will probably before long take its place as one of the principal "Longwall" operations in the country.

When this is accomplished, the introduction of "Longwall" operations in other seams of similar nature in the Cape Breton field will soon follow, and a development take place in some of the submarine areas which will result in the saving of thousands of tons of coal a year, that would otherwise be left standing in pillars and probably lost, not only to this, but to all future generations.

THE MCGILL SUMMER SCHOOL OF MINES AT TRAIL, B.C.

The mining class of McGill University, which arrived here last week-end in their private car were not idlers while here, but on the contrary were a most industrious class.

All during their stay they took advantage of the opportunity of seeing how practical mining was done in the big gold-copper producers of the Consolidated Mining and Smelting Company of Canada, Limited and the Le Roi No. 2, "Josie" mine.

Officials of these companies took great interest in giving the young fellows who will devote their future lifework to the development of the mining industry, in showing them every in-and-out of the game.

The students remained here until Monday when they went to Trail where they have been studying the smelting industry which is conducted on a large scale at the Sister City.

Last Saturday evening they were guests of the members of the Rossland club at a smoker arranged in their honor and a most enjoyable time was had.

Today the party will disband at Trail, some returning East, while others will take positions with the Consolidated Company of Kimberley and at Trail, several going to the McGillivray Creek Coal and Coke Co., at Coleman, Alberta, where they will remain during the summer vacation.

Sunday the Rossland Tennis Club was host to the visitors, and some good tennis was enjoyed. Monday evening, the young men were guests of the Great War Veterans, many of them being returned men, at the Victoria Day dance given by the veterans.

Friday evening at Trail a dance was given in their honor by the school staff, which was largely attended, a number being present from this city.

Quite a number of informal dinner parties were also

tendered Prof. Bell and members of his class while they were here.

Altogether the young men found their visit most instructive and enjoyable and are loud in their praise of the hospitality extended them while here and at Trail.—“Rossland Miner.”

THE MEASUREMENT OF GEOLOGICAL TIME.

The new sixpenny English monthly “Discovery,” founded by a Committee of distinguished scientists, and edited by Dr. A. S. Russell as a medium for the dissemination of new scientific knowledge in non-technical and understandable form, contains in the April issue an interesting article on the measurement of geological time by Dr. Arthur Holmes, Lecturer in Geology at the Imperial College of Science and Technology, South Kensington.

Dr. Holmes states that earlier attempts to deduce the duration of geological time from the temperature gradient of the earth's crust, on the presumption that it represented a simple cooling from a molten state, were made in ignorance of the existence of radio-activity, and of the fact that the earth contains within itself supplies of potential energy, which, liberated as heat, counterbalance the external loss by radiation. The discovery of radio-activity not only revealed with dramatic suddenness the unjustified restrictions which had been placed upon geologists, states Mr. Holmes, but it led directly to the elaboration of the most elegant and refined method of measuring geological intervals of time that has yet been devised. Each fresh uranium-bearing mineral is now regarded as a natural chronometer registering time by the atoms of helium and lead that are produced unceasingly within it year after year. Lead is taken as representing the stable end-product of the uranium family, and, when series of minerals of different geological ages are compared, it is found that the ratio of lead to uranium increases with the geological age. The interesting suggestion is made that the lead-ratio may be used to determine the geological age of rocks the stratigraphical position of which is not accurately determined. The oldest mineral hitherto analysed appears to be a zircon from the lower Pre-Cambrian of Canada. This gives an age of 1,580 million years, but as it is based on a single analysis, it can only be considered to give an approximate estimate of the time that has elapsed. Mention is made of a zircon from Mozambique, the lead-ratio of which is calculated indicates an age of 1,430 million years. This zircon is assigned to Middle or Lower Pre-Cambrian age solely on the ground of the lead-ratio shown by analysis.

The article states that correlation of the Pre-Cambrian formations in different parts of the world has long been one of the most difficult problems with which the geologist has been faced. The methods of lead-ratios, however, “has already done good service in leading the way towards a world-wide solution.”

The concluding paragraph of the article may be quoted in full, as follows:

“In conclusion it may be pointed out that the age of the earth is likely to be greater than, say, 1,600 million years, for the oldest known igneous rocks are themselves intrusive into sedimentary formations which in turn must have been derived from still older rocks. The latter may possibly have been the original crust of the earth, but of this no certain trade has ever been detected. Now, is in Hutton's day, geologists can still find no vestige of a ‘beginning.’ Astronomical considerations have shown

“however, in recent years that the new demands on geological time are not too high. The movement of the solar system across the void of space from its supposed birthplace in the Milky Way is a journey for which something approaching 3,000 million years is a dynamical necessity. Supporting this figure is an estimate by Dr. Harold Jeffreys of the age of the solar system. From a consideration of the present orbital elements of Mercury and their evolution, he finds that the requisite order of time is roughly 3,000 million years. Thus the earth recedes into an inconceivable remoteness far beyond the bounds of geological investigation, and there we must forsake her, and invite the astronomer, whose laboratory is the universe, to carry the story back still further.”
—F.W.G.

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PROSPECTING FOR RADIUM ORES IN BUTT TOWNSHIP

Mr. W. J. Lennox, of Toronto, who is interested in claims in Butt township where radium ore was found last year reports that a few men are at work on different claims. At the original discovery, Mr. Wm. Elliott did some work during the winter. Mr. Albert Trafford of Sundridge is working steadily on his claims which lie a short distance west of the Elliott. Mr. James Elliott did some work on his claim in the winter. Mr. Charles Bullock of Chicago, has three men at work. Ryan and Mann are working their claims. Mr. Lahay of Kearney, has opened a deposit on his claim near the village. Others are doing some assessment work. The Mining Corporation which was reported to have taken over the property north of the Elliott is not yet doing any exploration.

The discovery of radium ore in Butt township aroused considerable interest last fall, for such ore is very valuable. It occurs in the form of pitchblende, a black, lustrous heavy mineral, in pegmatite dykes. Mr. Lennox says that during the past few months numerous samples from several claims have been tested and found to be radio active.

R. E. H.

GRANBY CONSOLIDATED.

Reorganizing Its Western Management.

Boston—A reorganization of its western operating management has been started by the Granby Consolidated Mining, Smelting and Power Co. F. M. Sylvester has been succeeded in general charge by H. S. Monroe, who had been in the Nevada copper fields prior to his new appointment. Mr. Sylvester has been a vice-president with the title of managing director. This position has been abolished and Mr. Monroe will be known as the general manager. It is understood that Mr. Sylvester will resign as vice-president.

E. P. Mathewson has been appointed consulting engineer. He has seen service with the American Smelting & Refining Co. and the Anaconda Copper Mining Co. During his regime the Anaconda Co. did extensive work in readjusting and enlarging its smelting capacity.

An inspection of Granby was first made by Mr. Mathewson last February. He made recommendations following that trip which will now be carried out.

Within the past dozen years Granby has made two complete changes in its mine management. Several years ago J. P. Graves, one of the pioneers in the company, who was also a large stockholder, was relieved as general manager and later resigned as director.

THE WASAPIKA GOLD MINE,

By R. E. HORE

The accompanying diagram illustrates the method of development of the Wasapika ore deposit.

There was exposed on surface a strong gold bearing quartz vein striking north across one of the company's claims, and extending on to others north and south. The exposure is on the face of a rock outcrop which dips into low wet ground. The footwall portion of the deposit is well exposed for several hundred feet, but the hanging wall portion is hidden under the wet ground.

After careful channel sampling of several hundred feet of the surface exposures, the manager, Mr. G. R. Rogers, decided to sink a vertical shaft to test the deposit at depth. This shaft was started on high ground west of the depression.

At 100 ft a cross cut was run east from the shaft and through the deposit. It was here found that there is a large hanging wall quartz portion in addition to the footwall quartz portion which is exposed on sur-

face. A sericitic, carbonate bearing gray schist forms part of the deposit.

Sampling in the 100 ft. crosscut showed that the footwall quartz portion, with some schist, carries about \$12. gold per ton for a width of 5 feet. The schist in the deposit generally shows only \$1 or \$2 in gold. Quartz stringers in the schist carry good values, but the schist itself is of no value. Samples from the hanging wall quartz gave varying results, running from \$3 to \$11. It may prove an important additional source of ore; but comparatively little is yet known about it as there is no opportunity for sampling it at surface. The footwall quartz here showed high values in silver as well as in gold and it is worth mentioning that there appears to be more silver than gold in the Wasapika ore. Assayed samples carrying an ounce of gold per ton carry about three ounces of silver per ton.

After the completion of the 100 ft crosscut, shaft sinking was resumed and the ore deposit was recently encountered in the shaft at about 160 ft. and crossed diagonally. About one half of the material hoisted from this depth down to 204 ft. was quartz. Preliminary sampling indicates good values in both hanging wall and footwall quartz, but again little in the schist.

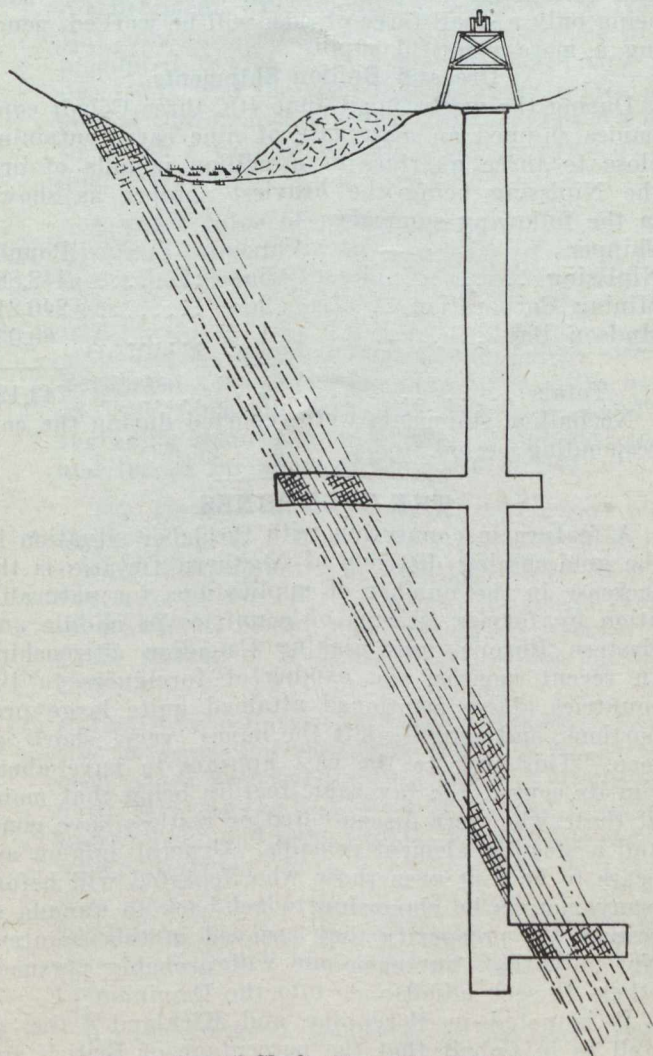
At 204 ft. a crosscut has been run west through the deposit. Preliminary sampling indicates good values here also. It is interesting to note that the presence of silver in larger amount than the gold has again been determined. A sample of quartz from the first round at the 204 ft. level carrying a little under one ounce of gold per ton carries three and a half ounces silver per ton.

The company proposes to proceed with development by drifting along the footwall quartz portion of the deposit. This will give further desired information and make the openings needed for mining the ore and will at the same time give easy access to the hanging wall quartz, which can be tested by short crosscuts.

The Wasapika Consolidated Mines, Ltd., is a recently organized company which took over, a few months ago, the property of Wasapika Gold Mines, Ltd. and also three adjoining claims lying along the strike of the deposit. The new company has continued the work begun by the old company. Mr. Geo. R. Rogers, a mining engineer with long experience in gold mining, is president and general manager.

IMPERIAL OIL COMPANY'S PROGRAM.

The Imperial Oil Company has planned a programme of oil exploration in Western Canada of considerable dimensions, and larger than was projected at the beginning of the season. There are now nine drilling rigs in different parts of Saskatchewan and Alberta, ranging from the vicinity of the 49th parallel of latitude to close to the Arctic Circle. It is understood that no very definite results have been attained as yet, but early information on the subject is looked for soon. The party that wintered on the Mackenzie River is being relieved by others who were expected to leave Peace River crossing during the latter part of May. Besides the well that is being sunk in the far North, there is a drilling rig near the Great Slave Lake: three drilling parties are operating in southwestern Alberta, near the foothills, one of which is not far from the international boundary: one well is being drilled in Southwestern Saskatchewan, near Consul: another is located in Eastern Alberta, near Czar, and there are two others in central America.



Cross-section of Shaft, Wasapika Gold Mine

Northern Ontario Letter

THE SILVER MINES.

Cobalt mining interests evince considerable concern over a new Bill which has just been presented to the United States Senate by Senator Henderson, which has for its purpose the establishment of a government fund for the assistance of the silver-producing mines of the United States, the plan being to loan money to the producers so as to enable them to hold their bullion for sale at such times as the demand is strong.

It is quite common knowledge that a large proportion of the world's silver comes from low-grade mines, and that the bear raid on the price serves only to cause curtailment of this source of supply. As a consequence, only such high-grade silver mines as those in Cobalt are able to operate profitably. The situation is one which promises to still further reduce the visible supply of the metal until there is required another upward movement in price to encourage the low-grade mines to operate. Either this, or the cost of material and labor going into silver production will have to decline. In any event, the conditions necessary to cause the low-grade silver mines to operate steadily are bound to bring added prosperity to the mines of Cobalt, where even now the margin of net profit being realized is large.

Announcement is made to your correspondent that the Bailey Silver Mines will join the shipping list within one month, and this will mark the commencement of regular shipments. It is officially stated that the amount of silver ore in sight is such as to assure steady and comparatively large production for some months. Also, that with a number of veins awaiting development, together with considerable undeveloped territory, the indications are that a big future lies ahead of the mine.

The Mining Corporation of Canada has declared a dividend of 12½ cents a share, payable June 15th, and amounting to \$207,455. This makes a total of \$6,943,220 paid by the Mining Corporation and component companies. The company is also reported to be negotiating for control of the West Dome Mine at Porcupine, which lies adjacent to the Dome Mines on the West. It is also unofficially reported that a bid is being made for an option on the Ritchie Veteran claim which adjoins the West Dome on the South.

The lease on the cyanide equipment in the Buffalo mill secured by the Coniagas Company is to be made use of as quickly as possible. It is proposed to re-treat some 40,000 tons of Coniagas tailings by cyanidation. The lease does not include the flotation equipment in the mill on the Buffalo mine.

Officials of the Peterson Lake declare that a shipment of high grade ore is now being assembled, it being estimated that close to \$50,000 can be taken out, which amount should finance operations for the balance of the year. It is also stated that the arrangements to have the old tailings pile re-treated by oil flotation by the Dominion Reduction Company having been completed, this work should commence by about the end of July. At the annual meeting of the company held last week, the following board of directors was elected:—W. A. Lamport, president, Toronto; J. E. Carter, Vice-president, Guelph; E. Barelman, Guelph; W. H. G. Browne, Toronto; A. G. Cumming, Toronto; D. E. Kennedy, Teeswater; C. A. McLean, Toronto; A. H. B. Moore, Niagara Falls, N. Y.; C. M. Nickel,

Toronto. P. M. Goff was re-appointed secretary-treasurer.

Good headway continues on the Oxford-Cobalt. The shaft has now reached a depth of about 100 feet, and will be continued to a depth of 150 feet at which point lateral work will be carried out. It is also proposed to continue the shaft to the underlying diabase-keewatin contact, and to cut stations at regular intervals of each 75 feet.

The Crown Reserve Mining Company is stated to have acquired an option on the Hylands-Offor group of claims, situated in the township of Whitney, and lying adjacent to the Porcupine-Keora. It is the plan of the company to explore the claims by diamond drill.

The Lafayette Silver Mines, Limited, has been incorporated for the purpose of taking over mining claims G.G.-4101 and 4102, situated in the Gowganda silver area. The company is composed of business men of Buffalo who propose to carry on an aggressive program of development work, and who announce that they have engaged the services of Newton Bigbee to manage the work, and that camp building is to commence this month. The head office of the company is at 130 Franklin Street, Buffalo, N. Y.

The first carload of steel for the construction of the light narrow-gauge railway from Elk Lake to Gowganda has arrived on the ground, and the indications are that work is to be carried on aggressively.

Announcement is made that work has been resumed on the White Reserve property in the Maple Mountain section of the Elk Lake district. For the time being only a small force of men will be worked, pending a more plentiful supply.

Ore and Bullion Shipments.

During the week ended June 4th, three Cobalt companies shipped an aggregate of nine cars containing close to three quarters of a million pounds of ore, the Nipissing being the heaviest shipper as shown in the following summary:—

| Shipper | Cars | Pounds |
|-----------------------------|------|---------|
| Nipissing | 5 | 442,880 |
| Mining Corporation | 3 | 240,215 |
| Hudson Bay | 1 | 60,034 |
| Totals | 9 | 743,129 |

No bullion shipments were reported during the corresponding period.

THE GOLD MINES.

A feature in connection with the labor situation in the gold mining districts of Northern Ontario is the increase in the number of applications for naturalization by former citizens of countries in middle and Eastern Europe, now seeking Canadian citizenship. In recent months, the exodus of foreigners to the countries above mentioned attained quite large proportions, and actually left the mines very short of men. This trek to the east appears to have about run its course, the favorable feature being that many of those who were discontented or restless have gone, and a steadier element remains. General opinion appears to be that even those who departed will before many months be clamoring to get back to Canada to resume the prosperity they enjoyed in this country. Not only that, but each one will probably persuade others to seek admittance into the Dominion.

It is noted in Porcupine and Kirkland Lake, as well as in Cobalt that the percentage of British and

American born citizens is on the increase, and that immigrants from the British Isles are already finding their way to the mine in encouraging numbers. This is particularly true of Cobalt.

Mining men and prospectors have expressed considerable disappointment over the fact that the draft bill to establish "The Mining Court of Ontario" has been shelved until the next session of the Ontario Legislature. The Bill had for its object the creation of a Mining Court, with a duly appointed Judge instead of a Commissioner as at present. It would give such a Judge the power to try all mining disputes whether having to do with either patented or unpatented mine claims, instead of dealing only with unpatented claims as at present. It is stated that the Minister of Mines, Hon. H. Mills, will pay a visit to the mining districts at an early date and will endeavor to secure the consensus of mining men and prospectors as well as of members of the legal profession, so as to be enabled to deal intelligently with the bill at the next session.

During the month of April, according to the regular monthly report by manager R. C. Coffey, the Lake Shore mine produced \$35,388. During the period 1,860 tons of ore were treated, the average gold recovery being a little over \$19 to the ton, and an average of 62 tons of ore being treated daily. This is the highest tonnage record so far in any one month in the company's history. The Lake Shore has declared a dividend of 2 p. c., payable June 18th. The disbursement will amount to \$40,000. A feature of this announcement is the fact that former dividends amounted to 2½ p. c. The company pays interim dividends, and the reduction as above shown is of no special significance unless it should indicate a decision to go on a regular dividend paying basis of 2 p. c. quarterly.

A small force of men is at work on the Granby-Kirkland property in the township of Lebel and surface exploration is showing up a number of promising veins.

On the K. Ayoub group of six claims, situated in Bernhardt township, adjacent to the north boundary of Teck township, free gold has been found in encouraging quantities in a vein several feet in width and traced for about three hundred feet.

The Ontario Government is proceeding with the construction of a bridge over the Blanch River, following the completion of the wagon road from Boston Creek to Skead. It is believed the large proportion of traffic to Skead will not go by way of Boston Creek instead of from Englehart as was formerly the case.

The Ontario Bureau of Mines continues to be aggressive in connection with field work. A report has just been issued by Cyril Knight, assistant provincial geologist, covering the Ben Nevis Gold Area, lying between Larder Lake and Lake Abitibi, which holds out encouraging prospects.

A report on the geology of the Fort Matachewan Gold Area has been issued by the Geological Survey, Ottawa, the work having been prepared by Dr. H. C. Cooke.

At the Bidgood property, at Kirkland Lake, the

main shaft has reached a depth of 160 feet and is being driven at the rate of over three feet per day. It is expected to have it completed and timbered to the 300-ft. level before the end of July.

At the 100-ft. level about 28 feet of cross-cutting was required to tap the vein which showed a width of from 12 to 15 feet and with considerable visible gold.

Diamond drilling is being discontinued on the Fort Matachewan Gold Mines, pending the completion of arrangements for electric power from a plant to be installed on the Montreal River.

A load of supplies, containing among other things about one ton of dynamite which was being transported to the Thesauris property by Jim Nelson, was caught in a bush fire and was destroyed by fire and explosion. The loss will be over \$5,000.

THE NIPISSING MINING COMPANY.

By J. A. McRAE

A review of the position of the Nipissing Mine may be of interest at this time. Its reduction plant represents the most advanced stage of existing practice, and annually produces not much less than one-third of the total silver production of the entire province of Ontario. Also, it is rated as being one of the leading, if not the actual leader among the silver producing mines in the British Empire.

Since its discovery in 1904, the Nipissing has produced approximately 58,000,000 ounces of silver up to the opening week of June, 1920. The value of the production amounts to over \$39,150,000.

To illustrate how stable is the physical condition of the mine, it is interesting to note that production first reached \$2,000,000 a year in 1909, and for the eight years ended with 1916 averaged a little over \$2,500,000 each year. In 1917 the production increased to \$3,338,682.41, and, in 1918 actually amounted to \$4,040,446.10. In 1919, despite the labor strike which caused a loss of over two months, the gross production amounted to \$3,752,083.60, or at a rate actually the best in the company's history.

As regards the present physical condition of the mine, the official reports issued each month show an output of \$1,501,521 for the first four months of 1920, or at the rate of \$4,504,563 annually.

The company owns 840 acres right in the heart of the Cobalt camp, and, although no doubt the most highly mineralized areas have been drawn upon, yet so large is the area and so great the possibilities as to assure a further long life to the mine. The increasing value of the production from year to year seems to constitute genuine evidence in this respect.

With an authorized capital of 1,200,000 shares, the company actually has upwards of 12,000 shareholders, showing that the average holding of each shareholder is around 100 shares, and offering reasonable indication that the net profits realized are being widely distributed. The company has disbursed a total of \$21,240,000 in dividends, an amount equal to \$17.70 a share, or equal to 354 per cent on the company issued capital, which has a par value of \$5 a share. In addition to this was a net surplus of \$4,372,952.33 at the beginning of 1920.

The jewellers protest that the fifty per cent luxury tax will kill their business. Is not that the intention of the tax?

NOVA SCOTIA NOTES.

Coal Production.

May was a short month, there being five Sundays and two idle days, making a month of only 24 working days. The 1st of May was declared a protest "strike" by the U.M.W. against the action of the courts in the trials of the Winnipeg strikers. This particular action caused much local condemnation, but it did not have much real effect on production, as the first of May was a Saturday—a short day—a fact that doubtless entered into the calculations of the U.M.W. leaders, who have shown themselves to be adepts at obtaining effective publicity very cheaply, being well assisted in this regard by the local newspapers and their metropolitan correspondents.

The Wage Schedule Committee of the U.M.W. has been in session in Halifax considering ways and means of enforcing their newest demand for a 25 per cent increase in wages. The U.M.W. leaders are steadily reaching their goal, which is the acceptance by the Nova Scotia operators of a wage scale convention, representative of the miners and the operators in the Nova Scotia district as a whole, modelled on the practice of the bituminous coal districts in unionized fields in the United States. To this end the U.M.W. are suggesting the appointment of a Royal Commission, charged with settlement of the wage question as a whole, which it is stated the leaders consider preferable to Conciliation Boards sitting consecutively upon the cases of the several companies and their employees. The suggestion that has been made, and duly reported to and commented upon in the newspapers, that the coal-cutters should reduce their production by half in case the coal operators prove disinclined to concede the request for a further increase in wages, is of course merely a *ballon d'essai*, being a rather belated example of the "Ca canny" policy so well-known and so thoroughly discredited by experienced trade unionists.

The output of the Cape Breton Mines of the Dominion Coal Company during May totalled 256,874 tons, which compares with 261,338 tons in April, and with 244,718 tons in May, 1919.

The production of the individual collieries was as follows:

| Colliery | Tonnage. |
|----------|---------------|
| 1 | 25,780 |
| 2 | 46,271 |
| 4 | 27,002 |
| 5 | 8,162 |
| 6 | 18,281 |
| 9 | 22,318 |
| 10 | 9,904 |
| 11 | 13,853 |
| 12 | 14,272 |
| 14 | 15,254 |
| 15 | 10,970 |
| 16 | 11,688 |
| 17 | 2,370 |
| 21 | 11,785 |
| 22 | 14,528 |
| 24 | 2,885 |
| | ————— 256,874 |

The feature of these figures is the increasing production from No. 11 Colliery and No. 24, both Emery Seam collieries, the excellent output from No. 22, and

the increase shown by No. 17 Colliery. The production of June, 1919, was very small, being only 224,000 tons, and the outputs for the current month should exceed this figure by 50,000 tons. In this event, the production for the half-year will approximate 1,608,000 tons, against 1,538,000 tons in the first six months of 1919.

NEW ENGLAND'S COAL PLIGHT.

New England at the beginning of summer faces a coal outlook so disturbing that Gov. Coolidge urges appointment of a fuel administrator in Massachusetts. Apparently Mr. Storrow returns from abroad just in time to resume his war time post of that nature. He comes back with gloomy opinions on the coal prospect.

This situation is in nowise the result of underproduction, it being possible for the bituminous mine operators to expand their production from the 550,000,000 to 600,000,000 tons yearly they now output to a billion tons, if necessary. This, however, pre-supposes adequate transportation facilities, so that the coal can be loaded as fast as it is mined, for none of the bituminous companies has storage facilities at the mine.

The primary stricture, therefore, which is cutting off the coal supply, and thus forcing up the price, is the tie-up of the roads which serve the bituminous regions. In addition, the railroads which serve New England have brought in practically no bituminous coal for months. They have, to be sure, handled considerable bituminous, but practically all of it has been for their own use.

Coal dealers declare that they have had hundreds of cars shipped to them, which have been confiscated by the railroads for their own use, almost without exception. It takes more than six months, in some cases, to determine who has seized a car of coal. Sometimes a road will commandeer coal for the account of another, necessitating long delays to find the final recipient. It is oftentimes a matter of months to find who will pay and what the price will be. As a consequence, local coal dealers declare that their books are in an absolute tangle.

Being thus deprived of its possible coal supplies by rail from Pennsylvania district, there was brought in the supplies from Hampton Roads by water freight. Hampton Roads, it is pointed out, was originally nothing but a shipping point for New England coal by water. There was practically no coal sent abroad from there, although something like 4,000,000 or 5,000 tons was sent in one of the war years. With the suspension of English and Continental mine production in quantity, however, foreign buyers have invaded the American market, willing to pay any price for the coal to keep their factories going.

The result of this bidding is that it is now impossible to buy bituminous at Hampton Roads for \$13.00 or \$13.50. It is going overseas at the rate of 1,200,000 to 1,500,000 tons a month, and coal men say we are heading for \$20 or \$25 a ton bituminous coal unless the export is restricted.

In addition to that, congestion at Hampton Roads is so bad and the railroad tie-up so severe that coal coming from there carries a demurrage charge of \$3 and sometimes \$6 and \$8 a ton, due to the time the vessel has to wait for its load; this is in addition to a water freight rate of \$2.75 per ton (it was in the neighborhood of 55 cents a ton a few years ago) and a tax of 3 per cent on the demurrage.—"Boston News Bureau."

BRITISH COLUMBIA LETTER.**Alice Arm, B. C.**

A syndicate has been formed to explore and, if investigation proves satisfactory, to develop the Royal Group of Mineral Claims adjoining the Dolly Varden Mine. This property consists of seven claims held under a \$100,000 bond. It is conveniently situated as to transportation, a short aerial tramway being all that would be necessary to connect it with the Dolly Varden Railway.

A settlement of the strike of employees of the Dolly Varden Mine has been effected. It is stated that practically all the demands of the men were granted. Mines will be paid at the rate of \$6.25 a day; muckers, \$5.75; and trackmen \$5.75. The union scale will apply to cooks, mechanics, etc.

Queen Charlotte Islands.

George Clothier, government mining engineer, has returned after an examination of some prospects of the Queen Charlotte Islands. He went over a free milling gold property situated near Skidegate on the west coast of Moresby Island and states that it possesses some fair quartz but that further development is necessary. The Ikeda Mine near Jedway is to be opened up this season and it is reported that a concentrator is to be installed. Quantities of high grade copper ore have been shipped at various times and there now is a good deal of comparatively low grade ore on the dump which, if facilities were available at the mine for treatment, might be handled at a profit. Surface work is being done on the Southeastern Mine in the same section and another property near Jedway is being inspected and reported upon by representatives of the American Smelting and Refining Co.

Nelson, B. C.

The McAllister Mine at Three Forks is under active development with promising prospects. R. A. Grimes, manager, states that the Slocan strike did not close down the work he has underway. This mine may be expected to join the shippers of the silver zone of British Columbia at an early date. Some first-class ore has been uncovered and those interested are so well satisfied with the outlook as to be considering the installation of further plant.

It is proposed by the British Columbia Prospectors' Association that delegates to the International Mining Convention to be held at Nelson shall be taken on a tour of the mining sections of East Kootenay. The suggestion is that the trip be divided into two or three sections, one travelling up the St. Mary's valley to the Sullivan Mine, the Stenwinder, North Star and a number of other properties and another setting off for the Windermere district.

Princeton, B. C.

Preparations for the commencement of operations at Copper Mountain by the Canada Copper Corporation are well advanced. Trains already are running between Princeton and Allenby on the Copper Mountain Branch of the Kettle Valley Ry. The concentrator has been completed and but waits the power which is being brought over a high power line from Bonnington Falls by the East Kootenay Power and Light Co. A large brick power station has been constructed. H. R. Van Wagenen, the Company's general manager, has returned from Denver Colo., and it is expected that

the mine and mill will start work either next September or October.

Rossland, B. C.

The Velvet Mine, situated near Rossland, is being re-opened by H. E. Innes, of Sandon, B. C. Some months ago it was taken over by the Granby Consolidated Mining and Smelting Co., and the mine was unwatered and worked for a short time. The Company, however, then ceased operations. It is well equipped and, if Mr. Innes is successful in making it a producer, it should become a valuable addition to the shippers of the camp.

Vancouver, B. C.

The Eureka Mine, near Hope B. C., is to be put under development by Messrs. Foley, Welch and Stewart. The property is situated in Silver Creek and machinery and supplies are being shipped now in order that work may commence as soon as weather permits.

Before the expiry of official business hours on the 31st of May of each year all miners' licences granted under the Mineral Act of the Province of British Columbia must be renewed. To hold mineral claims, or to operate in mineral in any form, all individuals, groups of individuals, or joint-stock companies must be possessed of such a licence. It is at the basis of the mining laws of the Province Section 12 of the Mineral Act reading "Subject to the provision hereinafter stated no person or joint-stock company shall be recognized as having any right or interest in or to any mining property unless he or it shall have a free miner's certificate unexpired." For this reason it is of first importance that the renewal is obtained within the time limit which explains the rush facing the mining recorders throughout the Province every year during the month of May. This year has been no exception to the rule and, although the official figures are not yet available, it is probable that the number of licences issued will equal the best twelve months on record.

Princess Royal Island.

Announcement has been made of the purchase by the Tonopah Belmont Development Co. of the Princess Royal Property, situated near the company's mines. Plans have been completed for the carrying out of comprehensive development during the summer.

MR. W. R. WILSON APPOINTED PRESIDENT OF CROW'S NEST PASS COAL CO.

Succeeding the late Elias Rogers, Mr. W. R. Wilson has been appointed President of the Crow's Nest Pass Coal Company. Mr. Wilson has been General Manager of the Company for a number of years, and has been 2nd vice-President and a director of the Company for about a year.

Mr. Wilson's family record covers the period of coal-mining activity in Canada. His father sunk the shafts of the General Mining Association at Sydney Mines in 1867, and his son is in charge of one of the newest and certainly the finest colliery in Canada, that of the Granby Consolidated Company at Cassidy's, Vancouver Island. Mr. Wilson's own ability in his profession is evidenced by his new appointment. He is much valued member and a Councillor of the Canadian Mining Institute.

Mr. Wilson's headquarters will be at Fernie.

MANITOBA LETTER.

By C. A. Millican, Winnipeg.

The first crew to go into the Rice Lake District since the break-up on Lake Winipeg left on the 1st. of June for the Gabrielle property. The crew which includes five geological students from the University of Manitoba will commence active exploration work on this property at once. The Gabrielle will not install any heavy machinery until next winter, but a great amount of surface stripping will be done as well as the existing drifts on both shafts being extended. The management of this property have decided to confine all their energies this summer to exploration work on a large scale, and it is expected that Mr. J. B. Tyrrell will make a very comprehensive report on all surface and underground showings about the end of June.

For the information of those who may be visiting the Rice Lake gold fields this summer, we might mention that the summer route now being established is via the Hole River, and from Winnipeg the easiest way to reach this territory is as follows:—

Winnipeg to Riverton, C.P.R. Ry. (practically all supplies can be procured at the latter point).

Riverton to Lower Rapids on Hole River, Tug or Launch. (5 hour journey). Guides may be arranged for at the Hole River settlement, but canoes are scarce.

Hole River settlement to Mining District, by canoe. (1 to 2 days trip). Very good hotel accomodation is now available at Riverton, and by leaving Winnipeg in the afternoon an early start can be made from Riverton the following morning, reaching the canoe route on the Hole River by early afternoon. By July or August the new road being built by the Provincial Government should be quite passable for wagons as for as Clearwater and Caribou Lakes. As pointed out before canoes should, if possible, be arranged for before leaving Winnipeg.

For general information we are publishing herewith a list of Mining Companies with headquarters at Winnipeg. These Companies are, or will be, carrying on active operations this year.

Gabrielle Mines Ltd., 207 Scott Block, Winnipeg.

Gold King Mines Ltd., 846 Somerset Blk., Winnipeg.

Marigold Mining Co., Ltd., 618 Mc. Intyre Blk., Winnipeg.

Bellevue Mining Co., Ltd., 806 Union Bank Bldg., Winnipeg.

Commonwealth Gold Mines Ltd., 236 Curry Bldg., Winnipeg.

Pan Extension Gold Mine Co., Ltd., 220 Curry Bldg., Winnipeg.

Gold Pan Mines Ltd., 200 Trust and Loan Bldg., Winnipeg.

Golden Vein Mines Ltd., 315 Paris Bldg., Winnipeg.

Brooklyn Mines Ltd., 509 Paris Bldg., Winnipeg.

Boulder Gold Mines Ltd., 1203 McArthur Bldg., Winnipeg.

Bruce Consolidated Gold Mines Ltd., 101 Tribune Bldg., Winnipeg.

Northern Copper and Nickel Mines Ltd., 704 Merchants Bank Bldg., Winnipeg.

Laura Mines Ltd., 502 Mc. Intyre Blk., Winnipeg.

Pas Consolidated Mines Ltd., 220 Curry Bldg., Winnipeg.

Reahill Gold Mines Co., Ltd., 220 Curry Bldg., Winnipeg.

Angus McDonald Mines Ltd., 200 Trust and Loan Bldg., Winnipeg.

Adanac Collieries Ltd., 315 Paris Bldg., Winnipeg.
Western Dominion Collieries Ltd., 807 Paris Bldg., Winnipeg.

It is expected that several new Companies will be incorporated this summer, especially in connection with operations in the Rice Lake District. It is expected that an information bureau will shortly be established by the Overseas Development Corporation, Ltd., Scott Blk., Winnipeg.

It now looks as though considerable interest will be taken in the Lac. du Bonnet district where several experienced prospectors are now busy exploring the copper deposits. Excellent showings have been uncovered along the Winnipeg River but just to what extent copper values exist is still an unknown quantity. On two of the properties diamond drilling will be continued this summer.

Further tests are being made in connection with the recent oil discoveries in the Dauphin District. Whether oil exists in commercial quantities has not yet been ascertained, although samples analyzed have shown the traces to be of good quality.

In view of the coming Provincial elections, it is interesting to note that the Norris Government have given an unqualified promise to assist in opening up Manitoba's hinterland and assist in every possible way in furthering the development of her unknown resources as well as those now being prospected and explored. In this connection it is to be keenly regretted that Eastern interests have continued to balk any real effort to rush the Hudson Bay Ry. to an early completion. Apart from giving Western Canada a near-by ocean port the completion of this line will hasten to a remarkable degree in the opening up of several thousand square miles of country which, from present indications, may yet produce enormous values in minerals, pulp and water power.

SAFETY NET UNDER CONCRETE DISTRIBUTING CHUTE REDUCES FALLING STONE ACCIDENTS

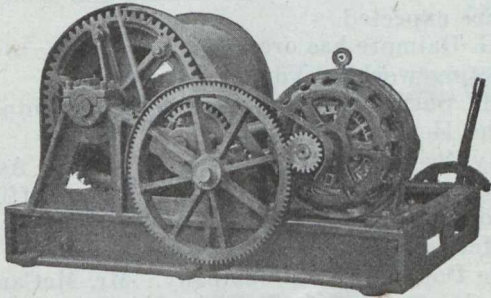
To catch large stones jumping out of chutes used for distributing concrete and so avert injury to men below, a safety net has been used successfully on a large construction job under way at one of the plants of E. I. du Pont de Nemours & Co. At four-foot intervals a $\frac{3}{4}$ -inch angle iron is fastened across the chute, extending outward a foot on each side. Through holes at the ends of each angle iron a wire is run parallel with the chute and one foot distant on each side. A chicken wire screen, $\frac{3}{4}$ -inch mesh, is fastened to these wires and thus suspended below the chute. This interesting information is contributed by Mr. F. L. Hurlbutt of the Du Pont Company.

Not a single fatal accident occurred among the industries of Worcester, Mass., during 1919 as compared with an average of five fatalities yearly during the preceding three years. In commenting on this, the press of Massachusetts says: "One of the most potent influences in bringing about this new condition is the National Safety Council, a thriving branch of which in Worcester has been actively engaged in furthering the good work."

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and in either Steam Power or Electric Power



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From the little 10 Horse Power size for prospectors or small mines to the massive 50 Horse Power size, one of our 7 sizes should be just right for your mine.

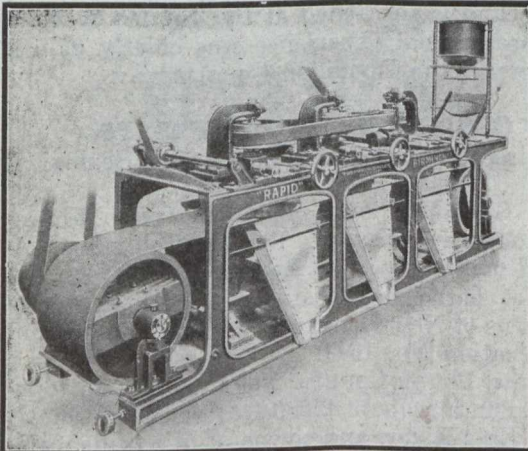
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TORONTO NOTES

Mr. A. D. McMillan, C. P. R. Toronto, has returned from a ten days visit to the Hughes-McElroy and Mondeau mines. On the latter property cross-cutting at the 250 foot level, and drifting operations are in progress with promising results. Mr. McMillan states that he observed signs of increasing activity in the Gowganda area.

Shareholders of the Black Lake Asbestos Corporation met in Toronto on May 26th when there was considerable manoeuvring on the part of the buyers of Black Lake securities, for position. When the meeting adjourned practically nothing had been done towards deciding the control of the company. The President, R. F. Massie, declared for the present directors:

“Our position is that we are practically trustees for the shareholders and bondholders and we want to do the best we can for them. If either Mr. Jacobs or the Corporation makes a proposition, we will consider which is the more favorable.” President Ross of the Corporation defended the legal proceedings to upset the previous offer of purchase by saying that it was the right of the shareholders to receive due notice of such an offer, which had not been given in that case until the meeting came together. He said that the Corporation’s experience in the asbestos mining industry should enable it to operate the Black Lake property to advantage. During the meeting Mr. R. S. Cassels announced the resignation of himself and Mr. A. L. Malone from the directorate. Mr. John D. Kay was appointed to fill one of the vacancies.

GEOLOGICAL SURVEY PARTIES ENGAGED ON MAPPING PORT ARTHUR SHEET.

(By J. J. O'CONNOR.)

Dr. T. L. Tanton, of the Geological Survey, Ottawa, is out with a party of five men, engaged in mapping the Port Arthur sheet, which ties on to the Shebandowan sheet. Dr. Tanton expects to be in the Field during the months of June, July, August, September and October.

Percy E. Hopkins, M.E., of the Ontario Bureau of Mines, has gone to the Big Duck area, north of Schreiber, with a party of four, for the purpose of making an examination of the gold claims located in the Autumn of 1919, about six miles north of Schreiber. He will map in detail the whole area, including the Big Duck Lake field. Mr. Hopkins expects to be engaged there from June to August.

Prof. A. L. Parsons, of the University of Toronto, has gone to the Kaministiquia iron belt, with a party, for the purpose of his investigations, for the Ontario Bureau of Mines.

Strong representations were made to the Hon. Harry Mills, Minister of Mines, by a Port Arthur deputation in December last, urging him to cause these surveys to be carried out this summer. The Hon. Mr. Mills, was found to be in hearty accord with the suggestions made, and is now implementing them. He is at present in the district, and is evincing the keenest interest in the work of placing this necessary information in the hands of prospectors and investors.

The work of unwatering the Silver Islet Mine, began this morning. At six o'clock, the water had been lowered to a depth of fifty feet.

RESEARCH FELLOWSHIPS OFFERED BY THE SCHOOL OF MINES, UNIVERSITY OF IDAHO.

In co-operation with the United States Bureau of Mines and the Idaho Bureau of Mines and Geology, the University of Idaho offers in the School of Mines a number of fellowships. These fellowships are open college graduates who have had good training in mining, metallurgy, or chemistry, and who are qualified to undertake research work. The income of each fellowship is \$900 a year for the twelve months beginning July 1st., 1919.

Fellows will register as students in the University of Idaho and become candidates for the degree of Master of Science in Mining or Metallurgy (unless this or an equivalent degree has been earned.) Their class work will be directed by the heads of the departments of construction, but the greater portion of their time will be spent in research work under the direction of the Bureau of Mines staff resident at the University. The purpose of this work is to undertake the solution of definite problems confronting the mining and metallurgical industries of the state of Idaho. For 1920-21 the following subjects are being considered:

- (1) Flotation—with especial reference to differential separation of various minerals.
- (2) Treatment of the complex gold-silver ores of the state.
- (3) Ore Dressing problems.
- (4) Mining problems.

Applications, with copy of college record, statement of professional experience, and names and address of three references will be received up to June 15, 1920. The applications should be addressed to Francis A. Thomson, Dean, School of Mines, Moscow, Idaho.

PERSONALS

Mr. A. R. Whitman of New York, who was for some years at Porcupine and Cobalt is in Toronto this week on his way to Alaska. Mr. Whitman was at one time geologist for the McIntyre Company and later for several Cobalt silver mining companies.

Mr. W. E. Simpson, manager of the Miller-Independence mine at Boston Creek is in Toronto.

Several application for the position of secretary of the Canadian Mining Institute are said to have been made. Two or three come from Ottawa and some from the west are expected.

Mr. C. G. Daimpre has organized a company to carry on prospecting work in Northern Ontario.

Mr. F. L. Sutherland has returned to Toronto after visiting the Herrick mine.

B. Neilly, Secretary of the Ontario Mining Association, is now permanently located in his new office, 55 Trusts and Guarantee Building, Bay St., Toronto.

H. J. McCann is appointed Assistant General Manager of the Dominion Coal Company. Mr. McCann has been in the Coal Company's service approaching twenty years, having successively been Chief Clerk of Company, Assistant Sales Agent and Superintendent of Retail Stores. In 1910 he was transferred to the Sydney offices of the Dominion Steel Corporation and appointed Purchasing Agent of the Steel Company, Recently he was appointed Assistant to the President, which position he held until his present promotion. Mr. McCann's long service with the Coal Company has included experience in every branch of executive direction.

Peter Christianson is transferred from the management of the Jubilee Colliery of the Nova Scotia Steel and Coal Company to the Engineering Department of the Company, and is succeeded at the Jubilee by John Murphy, whose official experience was chiefly gained in the collieries of the Dominion Company.

NEW GEOLOGICAL SURVEY MAPS.

The following new maps are issued by the Geological Survey.

Map 185A Sandon, Slocan and Ainsworth Mining Divisions, Kootenay District, British Columbia. A topographical map on scale of 4,000 ft. to the inch. Includes district between Slocan Lake and Kootenay Lake, and towns of New Denver, Silverton, Sandon and Kaslo. Publication No. 1641.

New Glasgow, Pictou County, Nova Scotia. A topographical map on a scale of 2,000 ft. to an inch. Shows valley of the East River, and towns of Westville, Stellarton, New Glasgow and Thorburn. Publication No. 1707.

Matachewan District, in Temiskaming area of Northern Ontario. To accompany Memoir by H. C. Cooke. Scale of one mile to the inch. Publication No. 1793. Coloured geologically.

METAL QUOTATIONS.

Fair prices for Ingot Metals, Montreal, 10th June, 1920.

| | Cents per lb. |
|---------------------------|---------------|
| Copper, Electro | 24 |
| Copper Castings | 23½ |
| Zinc | 10½ |
| Lead | 10¼ |
| Aluminum | 38 |
| Antimony | 12½ |
| Tin | 61 |

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BENEFICIATION OF LOW-GRADE ORES ON THE MINNESOTA RANGES SUGGESTS SIMILAR UTILISATION OF ONTARIO ORES.

(By J. J. O'CONNOR.)

The prophetic vision of iron-ore operators of the Minnesota ranges, in meeting and mastering the problems of beneficiating the immense quantities of low-grade ores, will enable these ranges to hold out a supply of iron ore, far into the future, after the present known high-grade ores are exhausted.

All over the central portion of the Mesabi, are almost unlimited quantities of low-grade ore, a few points in iron below what the furnaces today can handle at a profit.

The washable ores are in great quantity, and are already being washed up to commercial grades by millions of tons per year.

The eastern end of the Mesabi has great low grade deposits of magnetic ore, for the handling of which, a process has been worked out, at a cost of half a million dollars actually expended.

The Vermillion range has large deposits of banded jasper, streaks of ore, separated by bands of jasper and silica.

Minnesota's high-grade ores have enabled her to gain a commanding position in the iron-producing world. Her iron-ore operators are far sighted enough to prepare for the successful holding of the lead she now enjoys, as the greatest iron producer in the world, by lending their money and talent in devising ways for the beneficiating of her low-grade ores.

When Judge Gary of the United States Steel Corporation was in Duluth, Minn. in January 1918, he said: "Within this state are billions of tons of iron ore not now considered of any market value whatever, which some day will be valuable and which may be used practically and profitably for conversion into iron and steel. And it will be hundreds of years before this ore is exhausted."

The conditions obtaining on the Minnesota ranges, are almost exactly duplicated on the northern Ontario ranges. Judge Gary's terms may be easily applied, and with equal truthfulness, to the Ontario ranges, where the quantity, grade and variety of ores are repeated on range after range to an almost unlimited extent, all susceptible of some form of treatment to bring them to merchantable grades.

No one process or scheme can be devised to beneficiate all kinds coming under the head of lean ores. Each variety requires separate treatment, at varying costs.

The work done by the Hayden-Stone interests (Mesabi Iron Company) upon ore already magnetic by nature, makes the problem of handling non-magnetic ores very much easier. A non-magnetic ore can be converted into a magnetic ore by giving it a magnetic roast. That is to say, if a small percentage of coal or coke, or even peat, be mixed with a non-magnetic iron ore, and the mixture then heated in a suitable furnace, to a suitable temperature, under suitable conditions, the ore become magnetic.

The muskeg and peat beds of northern Ontario, together with the enormous hydro development possible in the territory, would solve the fuel and power problem of any such undertaking on Ontario ranges. The preparation and production of peat for this purpose, has as great possibilities in it, as has any scheme for briquetting it, and selling it in competition with coal.

The day is not far distant when Canada must look to its own sources for a supply, of at least a very large

percentage, of its iron ore requirements, if not for the whole tonnage charged to Ontario furnaces. Everything points to an increasing demand for iron ore throughout the continent. This demand will be lasting, and so increase the consumption of United States Lake Superior ores, that, in justice to themselves, they will be obliged to curtail the export of their high-grade ores.

It would, therefore, seem to be a fitting time for the Government to give the necessary encouragement to capital to invest in the development of our enormous deposits of iron ore and be ready for the day that they must be used, and may be our only dependence.

Everything that is being done on the Minnesota ranges in the way of beneficiating lean ores, can be repeated here in Ontario. All it needs is Government encouragement, to induce capital to invest in this greatest of all industrial enterprises. There never has been a time in the history of Canada, when the conversion of this great natural resource into an active element of progress, as the present. There never has been a time when so much interest has been shown by her public men, or such keen sympathy felt for a step of this kind. All agree, that anything that will bring about the rational development of our natural resources, must be in the general interest of Canada, and of the whole people.

It must not be forgotten, that the only chance the Government would be taking, would be the cost of the legislation. If the passing of this legislation did not bring about the industrial development of our iron ores, it would not be called upon for any outlay by way of aid. With the development it would be certain to cause, the advantage to Canada would be Canada would be immeasurable.

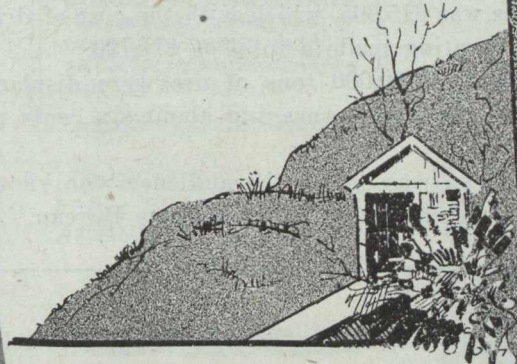
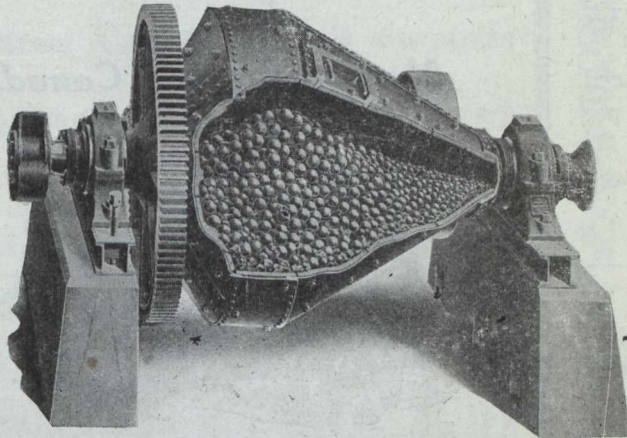
TWO CAN PLAY IT.

The report of the Foreign Relations Committee of the United States Senate in favor of a resolution authorizing the appointment of a commission to deal with the Canadian Government regarding newsprint and pulp imports from Canada contains suggestions of retaliatory measures if the Dominion does not abandon her policy of imposing embargoes upon the export of articles of this character in order to protect her domestic consumers. It hints at similar embargoes by Washington upon the export to Canada of coal, sulphur and dyes.

The Foreign Relations Committee appears to have overlooked a few possibilities in its contemplation of retaliatory measures. For example, Canada need only put an embargo on nickel, of which she controls four-fifths of the world's supply, to cripple the steel industry of the United States. We are heavy exporters of other important materials urgently required for industrial purposes south of the international boundary line, an embargo upon which would be very embarrassing.

On the other hand, an embargo on American coal exports would have a serious effect upon central Canada until Canadian coal producers could meet the new demand. Retaliation would be bad business for both sides, so bad, in fact, that we are fairly certain it will not be started. In other words, the Senate Committee is bluffing—a rather stale and futile proceeding to adopt towards a neighbor as familiar with that game as Canada is, particularly one who is as capable of "calling" that kind of bluff as she is.—"Victoria Times."

THE PRINCIPLE THAT APPEALED TO ENGINEERS



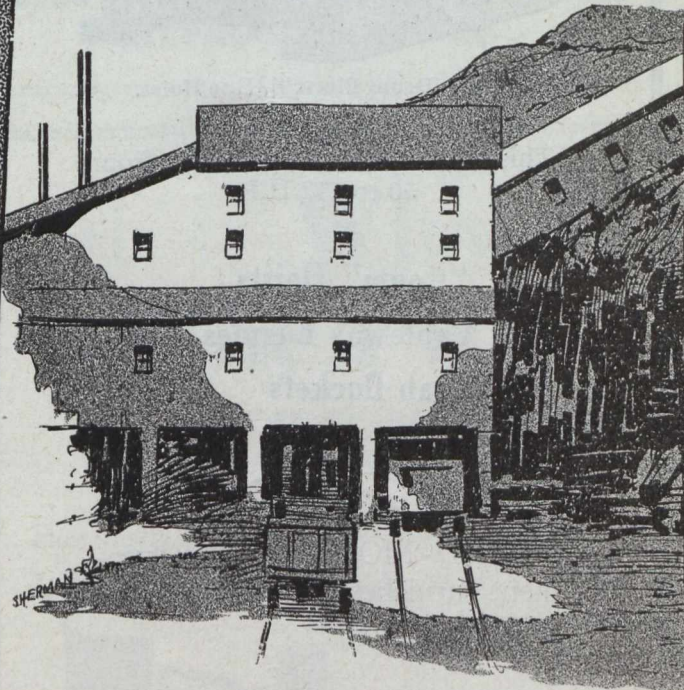
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A BIG SHOT.

Boston—A recent mining operation by the New Cornelia Copper Co. in Arizona serves to show the extent to which modern mining companies of the porphyry type must go to keep costs at a minimum.

The company late last year completed the layout of powder chambers and connecting tunnels in its hill No. 3, the length of underground excavations being 661 feet. It set for explosion 80,000 pounds of Trojan nitro-starch powder and used an electric current of 110 volts to ignite it. Cost of the blast for labor and supplies was \$15,305, which with the cost of drifting and excavating made a total of \$17,720.

Approximately 300,000 tons of ore were displaced by the blast, the cost averaging about six cents per ton.

John D. Ryan was one of the audience who viewed this mammoth eruption.—“Boston News Bureau.”

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The drills were purchased from the New York Engineering Company, 2 Rector Street, New York City, and among their circulars there are testimonial letters from Mr. F. S. Clarke, British Columbia Drill and Dredging Company, Vancouver, and Mr. G. H. Knowlton, Vancouver.

Full Particulars and Prices on application to the Geological Survey, Department of Mines, at address given above, or to the Secretary, War Purchasing Commission, Ottawa, Ont.

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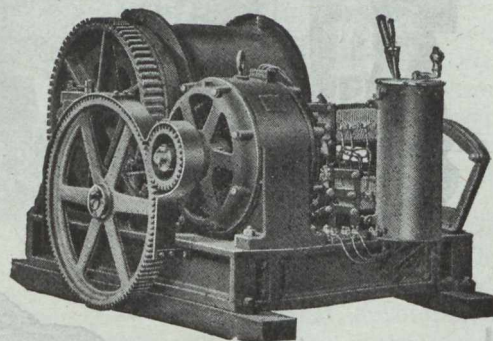
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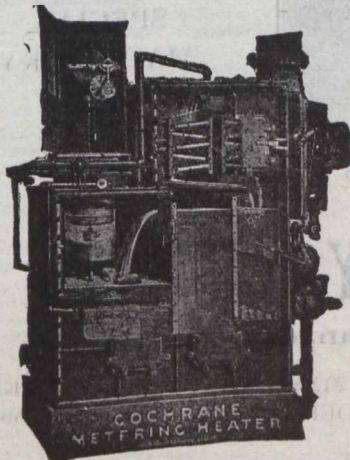
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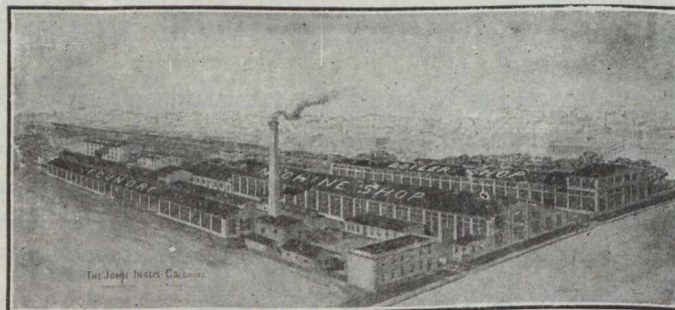
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MINERS' CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is \$10.00, and it is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is **Fifty Cents an acre per year**, and a fee of \$10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of \$5 an acre for SUPERIOR METALS, and \$3 an acre for INFERIOR MINERALS

The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, MONTREAL, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The Bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

HONOURABLE J. E. PERRAULT,
MINISTER OF COLONIZATION, MINES AND FISHERIES, QUEBEC.

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, \$75,436,103; Lode Gold, \$97,121,786; Silver, \$46,839,631; Lead, \$42,294,251; Copper, \$145,741,069; Other Metals (Zinc, Iron, etc.), \$13,278,058; Coal and Coke, \$187,147,652; Building Stone, Brick, Cement, etc., \$28,843,272; Miscellaneous Minerals, \$651,759; making its mineral production to the end of 1918 show an

Aggregate Value of \$637,353,581

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1895, inclusive, \$94,547,241; for five years, 1896-1900, \$57,605,967; for five years, 1901-1905, \$96,509,968; for five years, 1906-1910, \$125,534,474; for five years, 1911-1915, \$142,072,603; for the year 1916, \$42,290,462; for the year 1917, \$37,010,392; for the year 1918, \$41,782,474.

Production During last ten years, \$313,976,022

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with Mining Reports and Maps, may be obtained gratis by addressing

THE HON. THE MINISTER OF MINES
VICTORIA, British Columbia

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:**
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.
Link-Belt Co.
Greening, B., Wire Co., Ltd.
- Chain Drives:**
Jones & Glassco
- Chain Drives—Silent and Steel Roller:**
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:**
Hans Renold of Canada, Limited, Montreal, Que.
- 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
- 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.
Link-Belt Co.
- Coal Pockets:**
Canadian Mead-Morrison Co., Limited.
- Coal Pick Machines:**
Sullivan Machinery Co.
- Coal Screening Plants:**
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:**
The Mine & Smelter Supply Co.
- Conveyor Flights:**
Hendrick Mfg. Co., Ltd.
- Conveyor—Trough—Belt:**
Canadian Fairbanks-Morse Co., Ltd.
Link-Belt Co.
Hendrick Mfg. Co.
Mussens, Limited
Jones & Glassco (Roller, Belt and Chain)
Hendrick Mfg. Co.
The Wabi Iron Works
- Conical Mills:**
Hardinge Conical Mill Co.
- Copper:**
The Canada Metal Co., Ltd.
Consolidated Mining & Smelting Co.
- Couplings:**
Hans Renold of Canada, Limited, Montreal, Que.
- Cranes:**
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co., Limited.
Canadian Link-Belt Company
R. T. Gilman & Co.
Smart-Turner Machine Co.
- Crane Ropes:**
Allan Whyte & Co.
Greening, B., Wire Co., Ltd.
- Crucibles:**
Canadian Fairbanks-Morse Co., Ltd.
The Mine & Smelter Supply Co.
- Crusher Balls:**
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries, Limited, Hull, Que.
Osborn, Sam'l (Canada) Limited.
- Crude Oil Engines:**
Swedish Steel & Importing Co., Ltd.
- Crushers:**
Canadian Fairbanks-Morse Co., Ltd.
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries, Ltd.
Hardinge Conical Mill Co.
Osborn, Sam'l (Canada) Limited.
The Electric Steel & Metals Co., Ltd.
R. T. Gilman & Co.
Lymans, Ltd.
Mussens, Limited
The Mine & Smelter Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works

C. X. L.

Service Department

To assist and advise in blasting operations we maintain a staff of technical experts.

These men are at your service—at any time—and without cost to you.

They will help you to solve your blasting problems.

They will confer with you, or if you desire will go to the job and direct operations till all trouble is removed.

Make use of this department. We maintain it for your special benefit.

Phone or write—

Technical Department,

Canadian Explosives Limited

Head Office, Montreal

Main Western, Office Vancouver



District Offices :

| | |
|----------|---------------|
| Halifax | Montreal |
| Toronto | Timmins |
| Ottawa | Edmonton |
| Victoria | Prince Rupert |
| Cobalt | Sudbury |
| Winnipeg | Vancouver |
| | Nelson |

Factories at :

Beloeil, Que.
 Vaudrueuil, Que.
 Windsor Mills, Que.
 Waverly, N. S.
 Nanaimo, B. C.
 Northfield, B. C.
 Bowen Island, B. C.
 Parry Sound, Ont.

Canadian Miners' Buying Directory.—(Continued)

- 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., Rockawaw.
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.
Sullivan Machinery Co.
Northern Canada Supply Co.
Hadfields, Limited
Fraser & Chalmers of Canada, Ltd.
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.
- Gears (Cast):**
Hull Iron & Steel Foundries, Ltd.
The Link-Belt Co.
- 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, N.J.**High Speed Steel Twist Drills:**Canadian Fairbanks-Morse Co., Ltd.
H. A. Drury Co., Ltd.
Northern Canada Supply Co.
Osborn, Sam'l (Canada) Limited.**Hoists—Air, Electric and Steam:**Canadian Ingersoll-Rand Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Jones & Glassco
Canadian Mead-Morrison Co., Limited.
Marsh Engineering Works
Northern Canada Supply Co.
Mine & Smelter Supply Co.
Fraser & Chalmers of Canada, Ltd.
The Electric Steel & Metals Co.
The Wabi Iron Works
R. T. Gilman & Co.
Mussens, Limited
Link-Belt Co.**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.**Hydraulic Machinery:**Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited
MacGovern & Co., Inc.
Fraser & Chalmers of Canada, Ltd.
The Wabi Iron Works**Industrial Chemists:**

Hersey, M. & Co., Ltd.

Ingot Copper:Canada Metal Co., Ltd.
Hoyt Metal Co.**Insulating Compounds:**

Standard Underground Cable Co. of Canada, Ltd.

Inspection and Testing:

Dominion Engineering & Inspection Co.

Inspectors:

Hersey, M. & Co., Ltd.

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

Canadian Foundries and Forgings, Ltd.

Laboratory Machinery:

Mine & Smelter Supply Co.

Lamps—Acetylene:

Dewar Manufacturing Co., Inc.

Lamps—Carbide:

Dewar Manufacturing Co., Inc.

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

Dewar Manufacturing Co., Inc.

Lanterns—Electric:

Spielman Agencies, Regd.

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

C. L. Berger & Sons

Locomotives (Steam, Compressed Air and Storage Steam):Canadian Fairbanks-Morse Co., Ltd.
H. K. Porter Company
R. T. Gilman & Co.
Fraser & Chalmers of Canada, Ltd.
Mussens, Limited**Link Belt**Canadian Fairbanks-Morse Co. Ltd.
Northern Canada Supply Co.
Jones & Glassco**Machinists:**

Burnett & Crampton

Machinery—Repair Shop:

Canadian Fairbanks-Morse Co., Ltd.

Machine Shop Supplies:

Canadian Fairbanks-Morse Co., Ltd.

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

Canadian Fairbanks-Morse Co., Ltd.

Metal Merchants:Henry Bath & Son
Geo. G. Blackwell, Sons & Co.
Coniagas Reduction Co.
Consolidated Mining & Smelting Co. of Canada
Canada Metal Co.
C. L. Constant Co.
Everitt & Co.**Metallurgical Engineers:**General Engineering Co., New York
The Durr 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.J.

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

Dominion Wire Rope Co., Ltd.

Mine Surveying Instruments:

C. L. Berger & Sons

Molybdenite:

Everitt & Co.

Monel Metal (Wire, Rod, Sheet and Foundry Metal):

International Nickel Co.

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

Canadian Miners' Buying Directory.—(Continued)

- Motor Generator Sets—A.C. and D.C.**
MacGovern & Co.
- Nails:**
Canada Metal Co.
- Nickel:**
International Nickel Co.
Coniagas Reduction Co.
The Mond Nickel Co., Ltd.
- Nickel Anodes:**
The Mond Nickel Co., Ltd.
- Nickel Salts:**
The Mond Nickel Co., Ltd.
- Nickel Sheets:**
The International Nickel Co. of Canada
The Mond Nickel Co., Ltd.
- Nickel Wire:**
The Mond Nickel Co., Ltd.
The International Nickel Co. of Canada
- Oil Analysts:**
Constant, C. L. Co.
- Ore Handling Equipment:**
Canadian Mead-Morrison Co., Limited.
- Ore Sacks:**
Northern Canada Supply Co.
- Ore Testing Works:**
Ledoux & Co.
Can. Laboratories
Milton Hersey Co.
Campbell & Deyell
General Engineering Co., New York
Hoyt Metal Co.
- Ores and Metals—Buyers and Sellers of:**
C. L. Constant Co.
Geo. G. Blackwell
Consolidated Mining and Smelting Co. of Canada
Oxford Copper Co.
Canada Metal Co.
Hoyt Metal Co.
Everitt & Co.
Pennsylvania Smelting Co.
- Packing:**
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber, Ltd.
- Paints—Special:**
Spielman Agencies, Regd.
- Perforated Metals:**
Northern Canada Supply Co.
Hendrick Mfg. Co.
Canada Wire and Iron Goods Company.
Greening, B., Wire Co.
- Permissible Explosives:**
Giant Powder Company of Canada, Ltd.
- Pig Tin:**
Canada Metal Co., Ltd.
Hoyt Metal Co.
- Pig Lead:**
Canada Metal Co., Ltd.
Hoyt Metal Co.
Pennsylvania Manufacturing Co.
- Pillow Blocks:**
Canadian Link-Belt Company
- Pipes:**
Canadian Fairbanks-Morse Co., Ltd.
Canada Metal Co., Ltd.
Consolidated M. & S. Co.
Northern Canada Supply Co.
R. T. Gilman & Co.
- Pipe Fittings:**
Canadian Fairbanks-Morse Co., Ltd.
- Pipe—Wood Stave:**
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.
- Piston Rock Drills:**
Mussens, Limited
Mine & Smelter Supply Co.
- Plate Works:**
John Inglis Co., Ltd.
Hendrick Mfg. Co.
The Wabi Iron Works
MacKinnon Steel Co., Ltd.
- Platinum Refiners:**
Goldsmith Bros.
- Pneumatic Tools:**
Canadian Ingersoll-Rand Co., Ltd.
Jones & Glassco
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.
- 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.
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.
Link-Belt Co.

Screens—Cross Patent Flanged Lip:

Hendrick Mfg. Co.

Screens—Perforated Metal:

Hendrick Mfg. Co.

Screens—Shaking:

Hendrick Mfg. Co.

Screens—Revolving:

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:

Hans Renold of Canada, Limited, Montreal, Que.

Siline:

Coniagas Reduction Co.

Saline Refiners:

Goldsmith Bros.

Smelters:

Goldsmith Bros.

Sledges:

Canada Foundries & Forgings, Ltd.

Smoke Stacks:

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

Special Machinery:

John Inglis Co., Ltd.

Spelter:

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

Sprockets:

Hans Renold of Canada, Limited, Montreal, Que.
Link-Belt Co.

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 Apparances:**
Jones & Glassco
- Transmission Machinery:**
Hans Renold of Canada, Limited, Montreal, Que.
- 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 Rope:**
R. T. Gilman & Co.
Canada Wire and Iron Goods Company.
Dominion Wire Rope Co., Ltd.
- Wire Rope Fittings:**
Canada Wire and Iron Goods Company.
- 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.
- Zincium:**
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- Zinc Spelter:**
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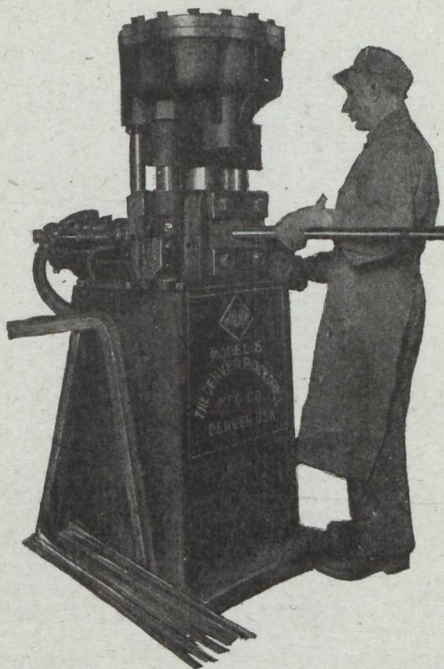
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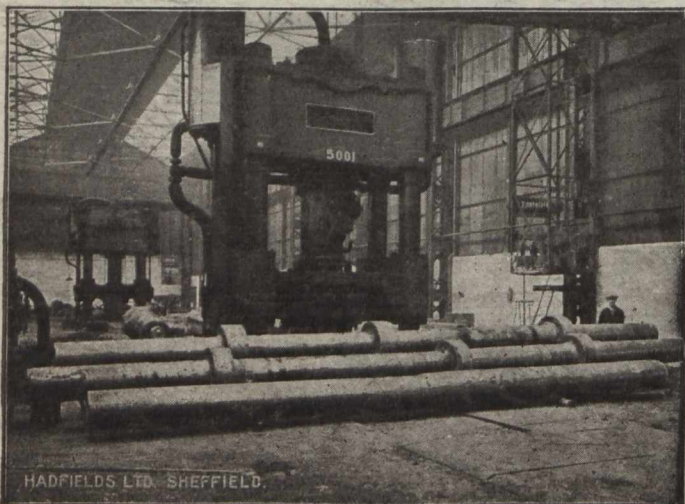


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