

# CANADIAN MINING JOURNAL

Vol. XLI.

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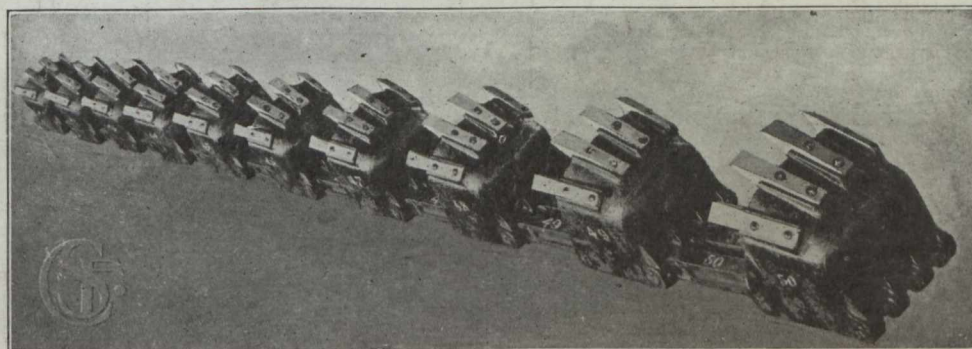
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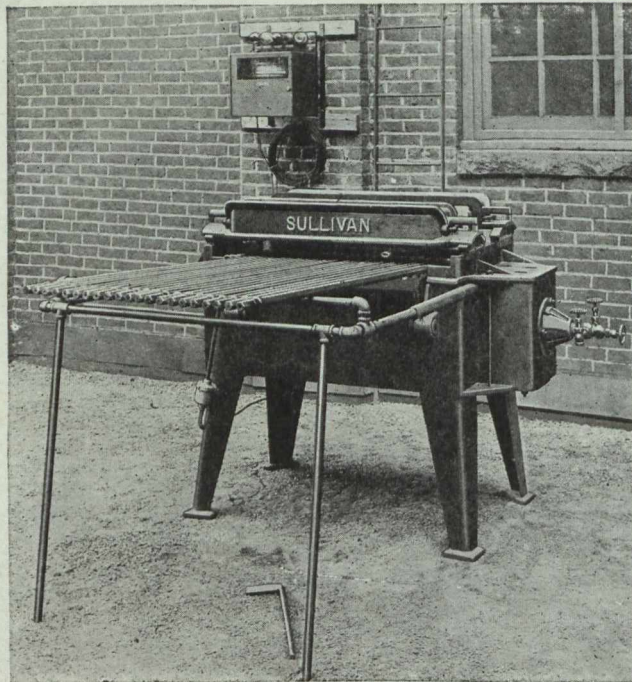
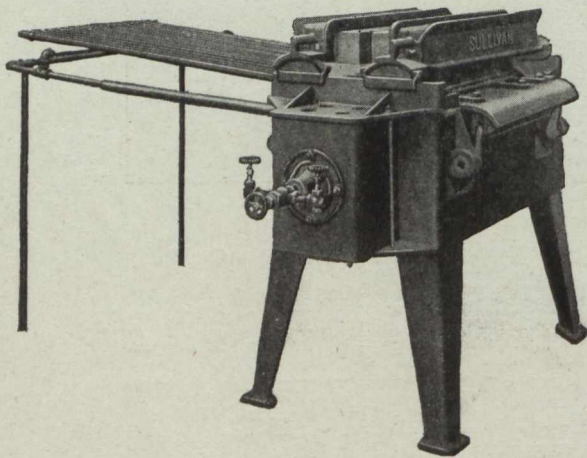
The Sullivan forge burns fuel oil or gas, the blast being furnished by air at low pressure.

*It possesses these advantages:*

1. Uniform temperatures secured; no danger of burning steel.
2. Great capacity; each side of the furnace will hold 16 to 25 steels.
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6. Economy of fuel and compressed air. A signalling pyrometer is recommended, to keep an exact check on the heat maintained.

*The Sullivan furnace occupies a space of 4 ft. 9 in by 2 ft. 9 in., and weighs 2500 lbs.*

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## DEPARTMENT OF MINES

HON. ARTHUR MEIGHEN, *Minister*

CHARLES CAMSELL, *Deputy Minister*

### MINES BRANCH

#### Recent Publications

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

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

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

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

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

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

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

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

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

Summary Report of the Mines Branch, 1918.

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

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

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

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

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

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

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

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

### GEOLOGICAL SURVEY

#### Recent Publications

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Map 1584. Blairmore, Alberta. Geology.

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

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

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

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

Map 1724. Sheep River, Alberta. Geology.

Map 1726. Athapapuskow Lake region. Geology.

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

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

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

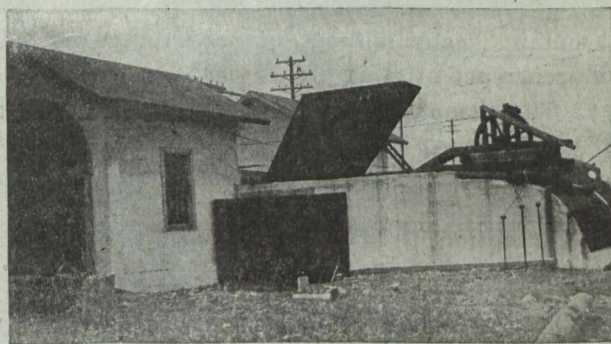
Applicants for publications not listed above should mention the precise area concerning which information is desired.

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

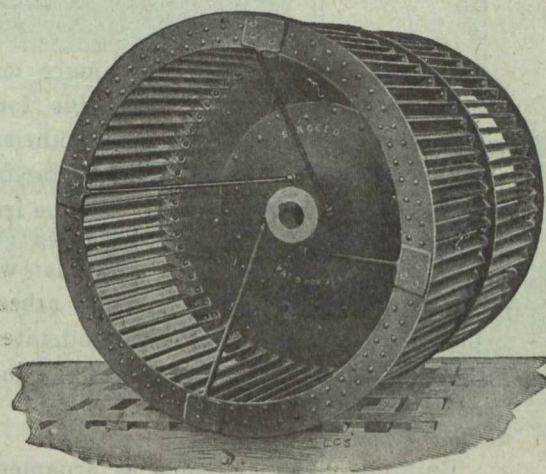
Communications should be addressed to The Director, Geological Survey, Ottawa.

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HON. H. MILLS, Minister of Mines.

# Ontario's Mining Lands

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

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

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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.

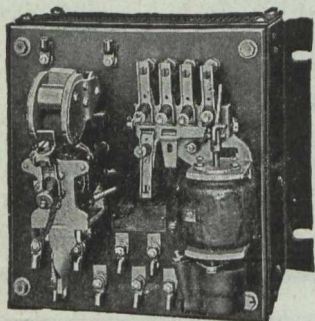
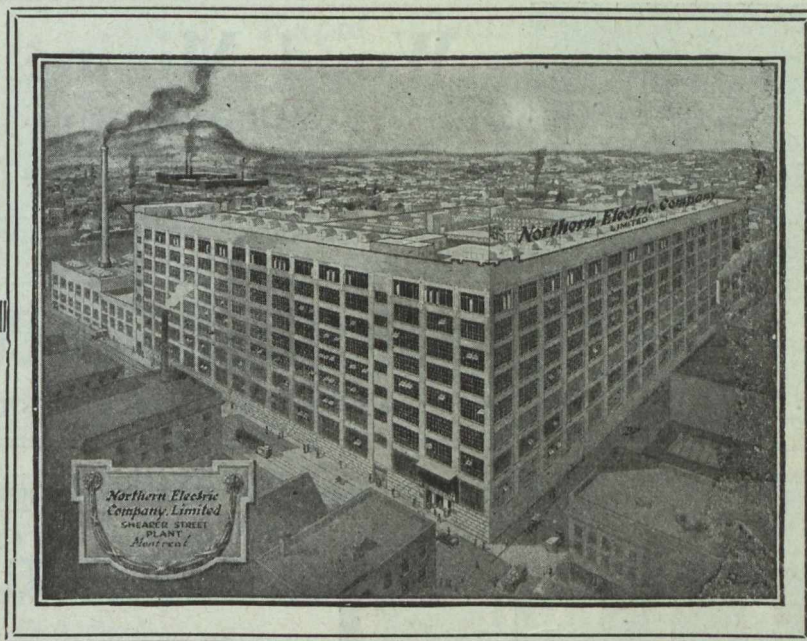
The prospector can go almost anywhere in the mineral regions in his canoe; the climate is invigorating and healthy, and there is plenty of wood and good water. Hydro-electric power is available in many parts of the Province, and many undeveloped water-powers remain to be harnessed. A miner's license 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

**Thos. W. Gibson,**

Deputy Minister of Mines,

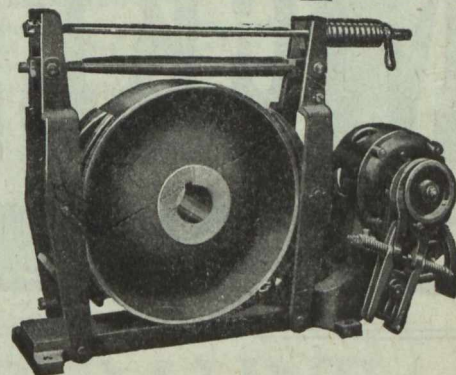
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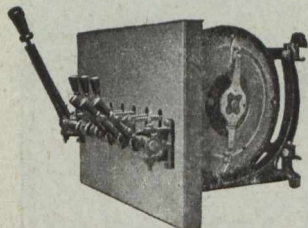
Motor Operated Brake.



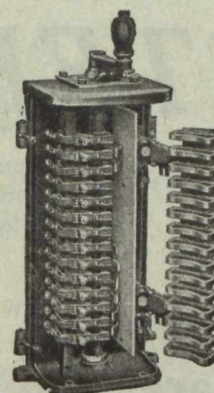
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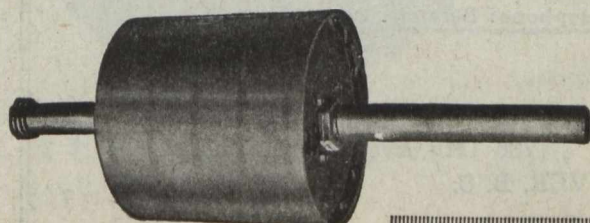
Theatre Dimmer.



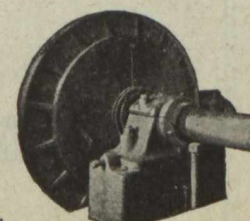
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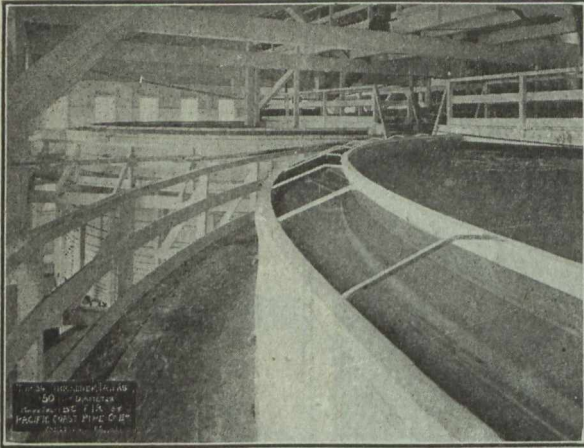
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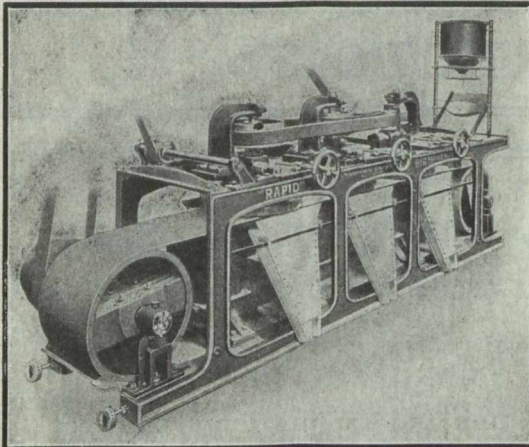
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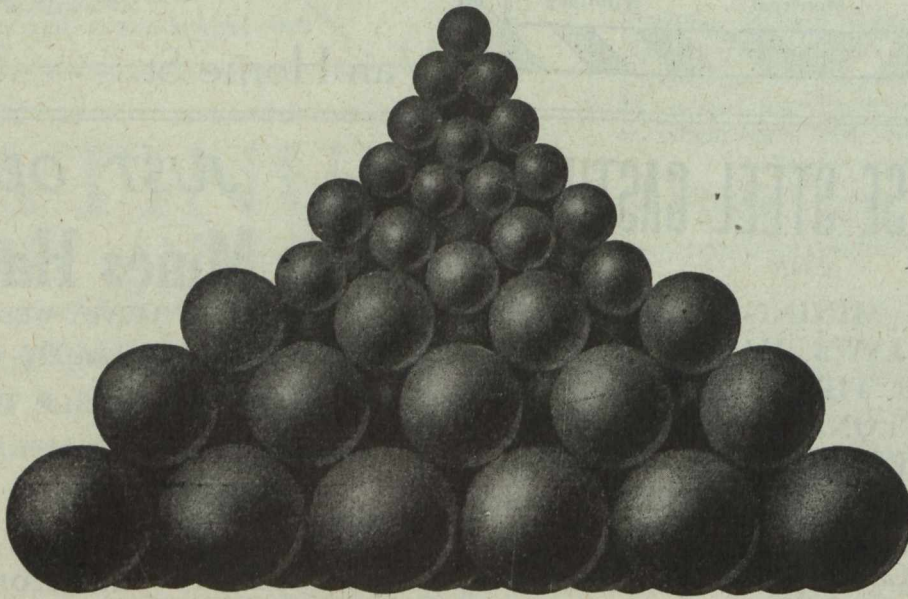
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VOL. XLI.

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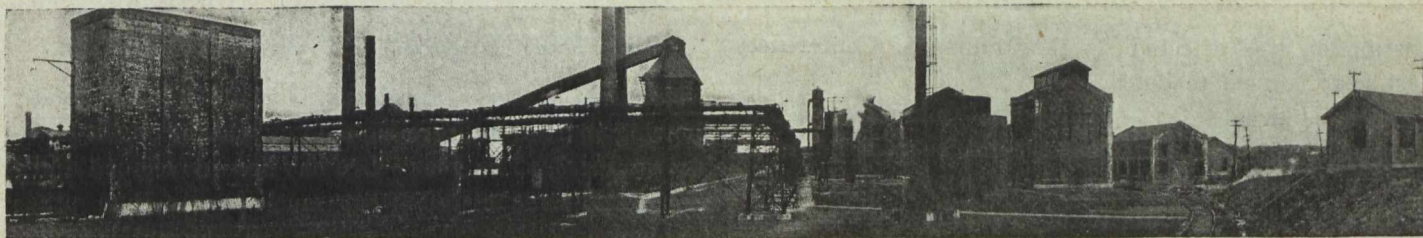
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## EDITORIAL

### A Second Industrial Conference

Announcement is made that a second Industrial Conference is called by the Minister of Labor at Ottawa in the ensuing Autumn, provision for the expenditure which will be entailed having been provided in the parliamentary estimates. Complete unanimity of opinion regarding the necessity or the useful purpose to be served by a repetition of last year's conference is unlikely. The encroachment of the decisions of such a gathering upon provincial rights, and the tendency it fosters to the over-riding of local and provincial considerations by federal measures is something that politicians doubtless do not overlook.

The composition and form of procedure of the Industrial Conference of last Autumn were such as to place the representatives of employers at a disadvantage, and the spokesmen of organized labor were advantaged thereby. Employers in Canada are unorganized and lacking in cohesion, whereas the labor organizations are a unit.

The Canadian Manufacturers' Association is a powerful and necessary organization, but its usefulness lies altogether in caring for the commercial side of industry, which includes a careful watching of tariff and fiscal policies, imports and exports and judicious publicity. The Association is treading on dangerous ground when it becomes the representative of the employer in matters pertaining to labor and wages legislation, nor can it hope to adequately represent the individual employer so long as the laws of Canada permit—and encourage—the complete organization of trade unionists, and forbid similar organization of employers.

The union leader achieves his leadership through possession of oratorical and analytic gifts. His mind is saturated with facts, and apt phrases, regarding questions of which he has made a concentrated life study. As a platform speaker he is at his best, having arrived at leadership through a process of natural selection from amongst his fellows by virtue of ability to impress his sentiments upon others.

The employer represents the evolution of very different experience. Taciturnity has been praised as a business asset since the days of Solomon, and many successful executives suspect the man who can talk well, or is given to putting his thoughts on paper. Facts and figures are doubtless impressive, but they

lose their influence in the presence of a smiling union leader particularly when he jocularly impugns their accuracy.

If the Industrial Conference is to be repeated, and the employers wish to appear at less disadvantage, it is suggested that the employers should be represented by those managing and operating executives that have to deal day by day with their men, and that less reliance should be placed upon ponderous briefs dealing exhaustively, but unconvincingly, with academic phases of employment.

At the Conference last Autumn, the employers fought, on questions of academic principle, the introduction of changes that were accomplished facts of long standing in many industrial establishments in Canada, and in some instances were already incorporated in provincial statutes. In too many instances it was apparent that the employers were unacquainted with contemporary developments in labor matters, whereas the representatives of the men were posted up to the minute.

It should also be mentioned that there is today in the possession of the Department of Labour a mass of statistical information, representing the essence of a voluminous literature upon labour questions, most of which has been compiled and conceived from the natural standpoint of a department, instituted to care for the interests of Labour, as its name sufficiently indicates. The ammunition provided by the publications of the Department of Labour was skilfully used at the last Conference, to the discomfiture of speakers on the employers' side.

The useful work that was accomplished by the Conference of last Autumn could equally well, and with more expedition, have been achieved by a smaller gathering, and, as a matter of fact, any definite results obtained were got in committee. The desired end, namely, the mixing of employer and workman on a mutual footing of equality and tolerance, was not markedly achieved, and the rigid division of the two parties to the Conference, both in regard to seating and ideas was obvious, and had some element of humor, seeing that there were many on one side, who, but for the wheels of circumstance, might have well been upon the other side. The caste distinction between master and man in Canada is new, and fortunately not yet rigid, but that any amelioration of the

distinction was effected by the Industrial Conference last year is open to doubt.

If it is decided to assemble the Conference again this year, the public sessions should be reduced to a minimum length, and should be confined to little more than the appointment of committees. The average executive can ill spare the time necessary to travel to Ottawa and attend a lengthy and exhausting series of conferences necessarily wordy and argumentative, and dealing more with ethics and principles than with economic working conditions.

#### ONE PITFALL AVOIDED.

The Toronto "World," commenting on the Nova Scotia election shortly to take place, states that the "Liberal administration has been cautious and economical rather than progressive; all the mineral wealth of the Province, including the vast deposits of coal, are vested in the Crown, but no effort has ever been made to operate any coal mine by the Government. The result has been high-priced coal to consumers in Nova Scotia, and an absence in the mines of up-to-date machinery."

The Conservative newspapers in Nova Scotia say nasty things about the Liberal Government there, as is the wont of opposing political parties, but no one ever accused the Murray Government of sufficient lack of sense to undertake the operation of a coal-mine. If the opposition could by any means have inveigled the Nova Scotian administration into such an adventure it would have provided them with much campaign literature, and, if it should be regarded as a mark of progress for a local government to undertake coal mines operation, then Nova Scotia has much to be thankful for that the Murray Government has not progressed in this direction, but has preferred to be "cautious and economical rather than progressive." Governments have their uses, but coal-mining is not one of them. The foresight and fostering of coal mining is another story.

#### GOLD PRODUCTION IN CANADA.

In 1919, Canada was one of the few countries, if not the only country, in the world to increase its gold output, and, so far, the returns for 1920 indicate that the figures of last year may be exceeded. By far the greater part of the gold comes from Northern Ontario, and a very small part of that district. At a time when economic causes are causing shrinkage of gold output in other countries, it is significant that in Canada—where these same economic deterrents are not less active—an increase in production of gold should be found possible. This fortunate condition suggests that physical conditions under which gold is mined in Northern Ontario are conspicuously favorable to production at a profit.

#### MORE MEN NEEDED AT ONTARIO MINES.

Northern Ontario metal mines made a very good showing in 1919 and are capable of making much larger production this year. Ore has been developed and mining plant is installed for much larger than present output. This year's results will depend largely on the number of workers available and their willingness to work steadily. Wages are high, but the mines are not sufficiently supplied with labor to permit full utilization of the plant.

It is in the interests of the workers as well as of the shareholders that mines should be operated efficiently. Plants operated at full capacity make much larger profits than when producing smaller quantities. As wages paid to miners cannot be allowed to consume all the profits, the shortage of labor at our gold mines is a matter of concern to all interested in the industry.

#### ONE MAN TO CUT COAL, BUT TWO MEN TO HANDLE IT.

In our British Columbia letter some statements are quoted from Mr. G. W. Bowen, Managing Director of the Western Fuel Co. of Nanaimo, Vancouver Island. Mr. Bowen says with regard to the collieries in the Nanaimo district that "not more than 25 per cent of those employed were actually engaged in the production of coal," and states further, "The profits of the mines are not now so great as they were some years ago, when coal was cheaper on the market." Mr. Bowen's remarks are really a statement of cause and effect, and might with equal accuracy be applied to most coal-producing districts in Canada. The number of men engaged in cutting coal is too small in proportion to the number of men engaged in handling that coal. This unbalancing of the underground organization is the cause of that decrease in production which has as its effect the increasing of the unit cost of mining.

Commenting on the decision of Australia to use nickel for the penny and halfpenny coins issued in future, the "Engineering & Mining Journal" says that incidentally this will increase the demands on New Caledonia and "British America nickel mines." Does the term "British America" mean Canada? If so, there are many reasons to prefer the use of a correct territorial designation. "British America" is correctly used to cover Canada, the British West Indies, British Guiana and Honduras, from a geographical point of view, but applied to Canada today the term is archaic, if innocently used; and, if deliberately chosen, it is not well chosen.

CORRESPONDENCE.

Toonto, July 8, 1920.

Dear Mr. Editor:

I have read with great interest your article on page 538 of the issue of July 2nd on "The Unionization of Technical Men." I am in general sympathy with the ideas expressed in that article as far as I was able to understand them, but a passage that stuck me was as follows:

"We believe the safeguard against such dangers lies in the emancipation of class legislation and a too processes, and would therefore endorse the recommendation already referred to that technical men should join their own organizations and assist in guiding along proper lines," etc.

Yours very truly,

WAKEFUL READER.

Note:—The passage to which "Wakeful Reader" properly calls attention should have read:

"We believe the safeguard against such dangers lies in the emancipation of the scientific worker's mental processes, and would therefore endorse the recommendation already referred to that technical men should join their own organizations and assist in guiding along proper lines a movement that is already important, and bids fair to become much more influential and widespread."

The error arose through editorial correction of a line which contained a mis-spelling, but the printer inserted the corrected line in the wrong place, throwing out the wrong line and retaining the original error (see fifth line from top). As printed, the sentence is, of course, meaningless. We apologize for the mystification of readers of the "Journal," whose annoyance is not unshared.—Ed.

**BRIQUETTE PRODUCTION EXPECTED AT BIENFAIT, SASK. BY SEPTEMBER—WILL NOT ASSIST FUEL SUPPLY GREATLY THIS YEAR.**

Output of briquette fuel from the Lignite Utilization Board plant at Bienfait, Sask., will have little effect this year on the coal market. The plant, which will be completed by the end of August, will have an output of 100 tons per day. Production will be continued for 90 and possibly 100 days during the present year, according to J. M. Leamy, power commissioner and a member of the board. Next year the production of fuel from lignite will be a real factor in the coal market, he stated. The briquettes will be sold at from \$12 to \$13 a ton, he said, and the price will at all times be as low as production costs permit.

Fuel sold this year, will be, as far as possible, distributed among representative dealers and a careful check will be kept to determine the actual value as fuel when put up to a variety of uses, according to Mr. Leamy.

**THIRD INTERNATIONAL MINING CONVENTION AT NELSON, B.C.**

From July 20th to 24th this now well established annual gathering of miners from British Columbia and the North Western States will hold meetings at Nelson. The Minister of Mines will open the Convention and in addition to addresses and papers, excursions through the neighboring mining centres will be arranged.

**THE WORLD'S PRODUCTION OF GOLD.**

Estimate for 1919 and 1920

The United States Geological Survey, Department of the Interior, has given out some preliminary figures showing the production of gold throughout the world in 1919. The production in the United States was \$58,285,196; Canada is reported to have produced \$14,687,000; India \$10,028,000; Australia (not including New Zealand or the Islands), \$29,268,000; the Transvaal, \$171,640,123; Rhodesia and West Africa, \$18,631,070. There was a probably large decrease in the production of gold in Russia and Siberia in 1919. Some increase was probably made in the output of Central America and South America, which, however, was doubtless offset by decreases in the output of other countries. The incomplete returns now available indicate that the world's production of gold in 1919 was between \$345,000,000 and \$350,000,000. The world's production in 1918 amounted to \$380,924,500.

The Geological Survey further states that information received during the first six months of 1920 indicates a still further decrease in the production of gold in the United States and that the output for the year will probably be less than \$50,000,000. The production in Aalaska, Colorado, California, Oregon, and Montana will be much less in 1920 than it was in 1919, because water is very short for placer mining and many stamp mills are closed. Canada as a whole may increase its output, although the production of the Yukon districts will be smaller than last year. The output of Russia cannot be estimated. That of Australia will show a decrease. That of South Africa and South America will probably show no radical decrease. According to the Geological survey the indications are that the decrease in the world's production of gold in 1920 will not be so great as it was in 1919.

**ARTIFICIAL GRAPHITE**

Graphite is manufactured by the Acheson Graphite Co. at Niagara Falls, N.Y. This company utilizes the electric power generated at the Falls to manufacture graphite from anthracite coal or from petroleum coke. This product is used mainly in lubricants, but it is also used in paints, foundry facing, preventives of boiler scale, and fillers for batteries.

Artificial graphite may be used for any purpose for which natural graphite is employed according to the United States Geological Survey except in the manufacture of large crucibles. Patents have been issued recently, however, for methods of manufacturing crucibles in which artificial graphite may be used. Artificial graphite is peculiarly adapted to the manufacture of certain graphite products, among them graphite electrodes, which are not made from natural graphite and for which the demand has greatly increased in recent years. The table below, published by permission of the Acheson Graphite Co., represents only the manufactured graphite that comes into competition with natural graphite.

Graphite manufactured by the Acheson Graphite Co.,

1915-1919.

|                | Pounds     |
|----------------|------------|
| 1915 . . . . . | 5,084,000  |
| 1916 . . . . . | 8,397,281  |
| 1917 . . . . . | 10,474,649 |
| 1918 . . . . . | 9,182,272  |
| 1919 . . . . . | 8,163,177  |

### ELMER A. HOLBROOK APPOINTED ASSISTANT DIRECTOR OF UNITED STATES BUREAU OF MINES.

Nova Scotia readers and members of the Canadian Mining Institute will be interested in the appointment of Elmer A. Holbrook as Assistant Director of the Bureau of Mines, succeeding Dr. F. G. Cottrell. Mr. Holbrook has spent much time in Canada, and has been a frequent visitor to the meetings of the Canadian Mining Institute.

The following account of Mr. Holbrook's professional career is taken from "Coal Age".

Mr. Holbrook was born at Pittsfield, Mass., forty years ago. His early education was obtained at the public schools of that place. His higher education was secured at the Massachusetts Institute of Technology, from which institution he was graduated in 1904, after having completed his course in mining engineering. Prior to his graduation from the Institute he worked in mines in Montana and was a member of one of the locals of the Western Federation of Miners.

Mr. Holbrook's first position after leaving college was with the Standard Ore Co. in Montana, where he

In 1911 he established headquarters at Halifax, Nova Scotia, where he designed and erected the mining laboratory for the Department of Technical Education of the Province of Nova Scotia. During the three years he was at Halifax he did a general engineering practice, most of which was in coal mines. For a time he was in charge of the mining department of the Nova Scotia Technical College.

In 1913 Mr. Holbrook joined the staff of the University of Illinois as associate professor in the mining department. Two years later he was raised to the rank of professor in the same department. During the several years he was associated with the University of Illinois he carried out important engineering and investigational work in the coal mines of the Middle West. In 1917 he was made supervising mining engineer of the Bureau of Mines and was placed in charge of the Middle West coal field station at Urbana, Ill.

The United States Bureau of Mines has at all times co-operated heartily with mining organizations in Canada and with our own Mines Branch. The co-operative mining investigations which have been undertaken at the Urbana Station of the Bureau and the University of Illinois at Urbana have made valuable contributions to coal-mining technical literature, to which Canadian readers have always been made welcome. Mr. Holbrook's acquaintance with diversified mining operations in several provinces of Canada, and his close connection with the co-operative technical investigations referred to will ensure a continuance of the helpful and friendly relationship between the Bureau and mining men in Canada, particularly as the new Director, Dr. Cottrell is no stranger in the Dominion, either in person, or through his technical attainments.

We wish both the Director and his Assistant all success in their positions.

### GOVERNMENT NAMES COMMISSION TO INVESTIGATE LABOR AND WAGES CONDITIONS AT NOVA SCOTIA COAL MINES.

The Minister of Labor has appointed M. E. Quirk of Montreal, Sir William Stavert of Montreal and W. P. Hutchinson of Moncton, N. B. as a Commission to enquire into the questions attending the demand of the United Mine Workers of Nova Scotia for an increase of 25 per cent. in wages from May 1st 1920. Mr. Quirk is chairman. He was formerly Fair Wage Officer for Ontario, and has been entrusted on previous occasions by the Department of Labor with investigations in connection with coal mining disputes in Nova Scotia. Sir William Stavert is a well-known banker, with Maritime Provinces affiliations. W. P. Hutchinson is a train despatcher at Moncton, and has for many years been General Chairman of the Order of Railway and Telegraphers in connection with the Canadian National Railways.

The sittings of the Commission will commence at the earliest date that can be arranged.

A preliminary map of the International Boundary Region between Portland Canal and Stikine River, Alaska-British Columbia, has been issued by the International Boundary Commission of the United States and Canada. During the present summer there is to be a slight change in the line near Gracey Creek, south of the Unuk River and on the other portions additional monuments will be erected.



Entrance of the New Building of the U. S. Bureau of Mines

served as a sampler and underground surveyor. His next position was as superintendent of Ruby Gulch Mining Co. at Zortman, Mont. Later he served in the same capacity for the Gould Mines Co. at Gould, Mont. In 1907 he was made general superintendent of the Daly Reduction Co. at Hedley, British Columbia. At that time the Daly Co. was the largest producer of gold in the Dominion of Canada. After three years with this company Mr. Holbrook began a general practice as an examining engineer. He reported on properties in Nevada, South Dakota, Georgia, Ontario and Quebec, and was engaged for a time at Guanajuato, Mexico.

# Centrifugal Pumps and their Use

By F. A. McLEAN, Sherbrooke, Que.

(Concluded from page 563 of last issue).

## Some applications and Uses of Centrifugal Pumps.

Centrifugal pumps may be driven by means of belts or gears from steam engines, steam turbines, or electric motors, water wheels or any other sources of power available, most convenient or best suited to the location in which the pump is to be used. When operated by electric motors they readily lend themselves to the installation of automatic starting and stopping systems of the float-switch type. Driven by steam turbines they are more economical than steam pumps, operating on less steam and requiring less lubrication. The compactness of such units and their freedom from valves, more or less complicated motions, and sliding surfaces reduce the attendance costs to no small degree

### On Water Works Service.

During the last few years motor driven centrifugal pumps have been widely adopted for waterworks service in small cities, towns and villages. Where they are used to pump water to a standpipe or elevated tank they are often arranged to be started and stopped automatically by either a pressure regulator or float switch. When used with a system of the direct pressure type, they may be run continuously, maintaining the pressure and delivering only such water as may be drawn from the mains. In some locations where a part of the system is at a higher level or at some distance from the station, it is necessary to maintain sufficient domestic pressure at the pumping station to supply the greatest demand and to install a centrifugal pump to act as a booster in the line which requires the higher pressure. A booster pump may

be operated continuously and allowed to "float" on the line thus adding a fairly constant net pressure irrespective of the amount of water which may be taken from that line. A common practice is to use moderate pressure lines for domestic service and increase this largely in case of emergencies such as fire service, etc. Motor driven centrifugal pumps usually being fitted with constant speed motors are not adaptable for more than one pressure, and it is often necessary to install two or more duplicate sets designed for ordinary service which may be operated in series to obtain a larger pressure for fire service.

It is often desirable when installing centrifugal pumps for fire or other service where great reliability and freedom from interruption is essential, to either duplicate the equipment or to provide the pumps with more than one form of driving power.

An interesting instance of this kind is the installation at the Public Markets, St. Boniface, Manitoba, which comprises a No. 5 Cameron Class DV horizontal, double suction volute pump with a capacity of 500 U. S. gallons per minute, operating against a total head of 130 feet, at a speed of 1755 R.P.M. This pump is direct connected at one end to a 30 H.P. Westinghouse, 550 volt, 60 cycle, 3 phase induction motor, and at the other end to a 35 H.P. General Electric Steam Turbine, in such a way that either the motor of turbine may be used as desired thus making the equipment entirely independent of power failure. This arrangement is very compact and has proved very efficient and economical in operation.

Crank and flywheel pumps have been displaced in many localities by turbine driven turbine pumps connected to condensers which have proved much more reliable and economical than the best triple expansion crank and flywheel pumps. Their low installation and yearly operating costs together with their compactness—permitting their use in small buildings and doing away with the necessity of special foundations—

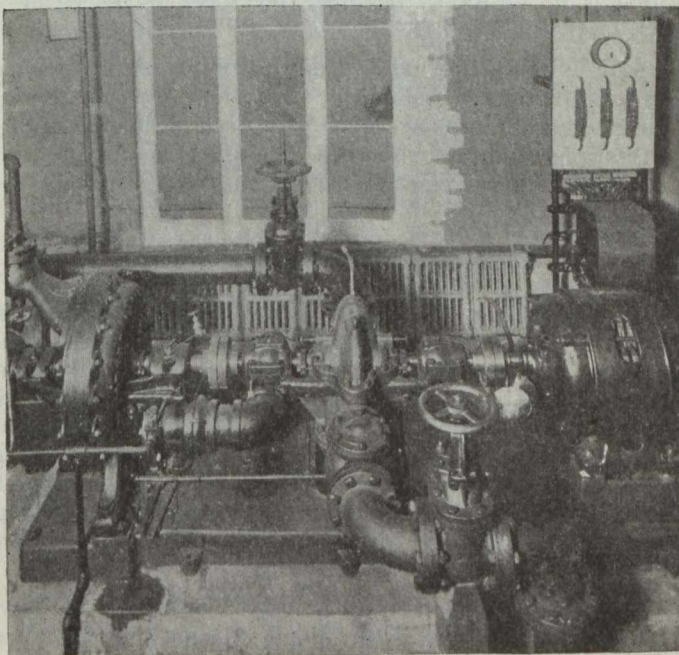


Fig. 6—Cameron Double Suction Volute Pump, Arranged for Steam, Turbine or Electric Motor Drive. Installed at the Public Markets, St. Boniface, Manitoba

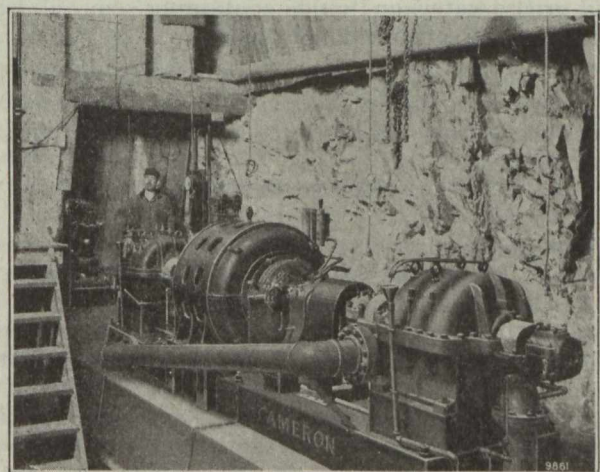


Fig. 7—Three-stage, Motor-driven Centrifugal Pumps in Series in a Mine Pumping Station

are some of the reasons why they are displacing other types for fire protection and water-supply services

#### Mine and Industrial Service.

In the last few years steam pumps have largely been displaced in station pumping service for the unwatering of deep mines where the installation is to be of a permanent nature. For temporary use the steam pump is well suited to this class of service, but where the equipment is to be operated continuously the same features of low maintenance and economy of operation which have led to the use of centrifugal pumps in other fields has caused them to be very widely adopted by many mining companies. Reliability is an essential feature of mine pumping equipment, and the ability of centrifugal pumps to operate continuously 24 hours a day with a minimum amount of care and attention, has resulted in their installation in many places in the mine where steam pumps were formerly used.

Where electric power is available, the motor-driven centrifugal pump can be obtained in portable units, of large capacity, which are very suitable for emergency requirements, such as inrush of water from drowned workings, or inundations from surface waters.

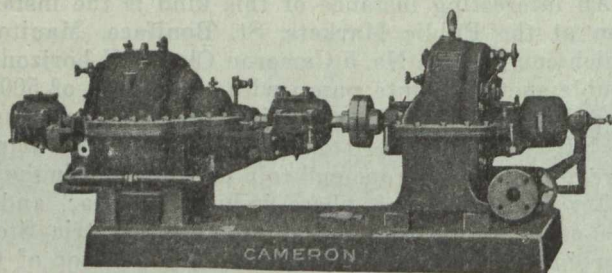


Fig. 8—Three-stage Turbine Pump, Driven by Steam Turbine

Emergency pumps of this type are very desirable at any mine exposed to danger of inundations, and, in many instances, the initial expenditure has been well repaid by the availability of portable pumping equipment when it was badly needed.

For handling slimes, tailings, acids and corrosive solutions in mine concentrating and reduction plants, the centrifugal pump has many advantages over other classes of pumping equipment. For this class of service it is possible to secure units designed to pump dirty and gritty water, or liquids containing semi-solids, and for handling chemical solutions.

The centrifugal pump is specially adapted to the use of corrosion-resisting materials in the construction of those parts that come into contact with the liquid being pumped.

#### Marine Service.

The steam pump has long been standard for use on dredges, barges, naval vessels and merchantmen, and still retains some supremacy in this field which, however, has recently been invaded by steam turbine, engine, or electric driven centrifugal pumps with so much success that it seems to be only a question of time until they will entirely replace reciprocating pumps of all classes of service on the larger vessels.

It is not hard to understand the preference for the centrifugal pump which occupies considerably less space than the best type of reciprocating pump; and space is always at a premium in ships. The centri-

fugal pump is higher in economy, simpler in construction, and delivers the water in a steady stream, resulting in quiet operation, and permitting the use of smaller piping.

#### For Boiler Feeding and General Mill Service.

Centrifugal pumps are ideal for boiler-feeding purposes and are usually either motor or steam-turbine driven. Motor-driven feeding pumps are generally allowed to operate continuously at full speed, maintaining a practically constant pressure in the feed line for a large range of capacity. The amount of water which is fed to the boiler can be controlled by a valve in the feed line without danger of creating a dangerous pressure in the boiler as centrifugal pumps will not build up a pressure greater than 5 or 20 per cent above normal even when the discharge valve is closed.

Steam turbine driven boiler feed pumps may be operated in the same manner, but are often equipped with pressure regulators similar to those used on ordinary steam pumps to maintain a fairly constant differential between the steam and feed line pressures, practically where the variation in steam pressure is considerable. The amount of water fed to the

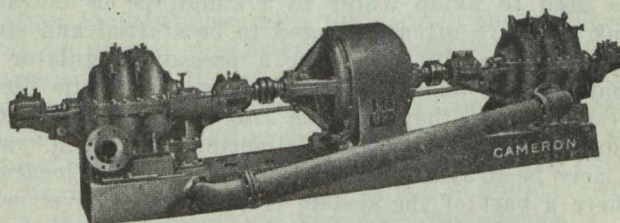


Fig. 9—Motor-driven, Three-stage Turbine Pumps in Series

boiler by either steam or electric-driven centrifugal pumps can be regulated without touching the pump, and there are no valves, rods or large packings to be looked after. In case of loss of suction there is no danger of breakage by water hammer as is the case with the ordinary reciprocating pump.

For circulating and other low-pressure service, steam-turbine, steam-engine or electric-motor driven single-stage pumps are generally used while for higher pressures such as required in boiler feeding, etc., steam-turbine or electric-driven multi-stage pumps are more suitable.

#### Efficiency of Centrifugal Pumps.

The efficiency of a centrifugal pump is highest at only one combination of head and capacity for each change of the speed at which it is driven, and therefore if it is operated at a speed other than that for which it was designed, the capacity in gallons per minute and amount of driving power required can only be approximately determined. When run at other speeds the efficiency is likely to be low, making the equipment unsatisfactory for the purpose for which it was installed as well as expensive to operate.

Even though the increased power necessary to drive an inefficient pump is but small, it must be remembered that the excess power is continuously consumed while the pump is in use and will total up to a considerable sum in a year's time, often representing in money more than the difference in first cost between

an inferior and a properly designed pump. Sometimes this amount will equal the interest and depreciation on the entire installation for a similar period of time.

The saving made by the good pump when compared with an inferior type will pay back its cost in a very short time.

#### Correct Design of Wearing Parts.

There are a few parts of the enclosed-impeller type of pump that are subject to wear, such as the sections of the shaft which are carried in the stuffing boxes and bearings, as well as the portion of the casing which makes a running joint with the impeller. These wearing surfaces should be provided with renewable parts, easily replaced at small cost, and the main or more costly parts being thus well protected will last a great deal longer, ensuring a low depreciation. The casing should be protected from wear in the casing, and a similar pair of rings mounted around the impeller inlet by working rings secured on the impeller used to protect it from wear also. Bronze sleeves fastened to the shaft and passing out through the stuffing boxes will ensure the shaft against scoring and rusting. Centrifugal pumps of the highest grade are usually provided with self-oiling, babbitted shell-type bearings made in two pieces, spherically seated and so arranged that they may be removed when worn and either re-babbitted or replaced with a new set, so that the alignment of the impeller will not be disturbed and the close fit between it and the casing, which is so necessary to prevent leakage internally, will be preserved.

#### Operating Conditions.

In designing a pump for a particular installation, it is necessary that the conditions of head, capacity and speed be correctly determined and furnished to the builder together with information regarding any special requirements which may be involved if the highest efficiency is desired. It should be understood that the centrifugal pump is not an extremely sensitive affair that will be efficient at only one particular combination of head and capacity, and uneconomical when it is not possible to obtain these ideal conditions. The efficiency remains constant for a small variation on either side of the normal capacity, varying inversely as the head, and consequently it is usually better to figure the head a trifle higher than normal and design the pump accordingly, and then if the head should be a little bit less, a slight increase in capacity will be the result, which in most cases will not be objectionable. Sometimes it is possible to obtain two or more conditions of head and capacity from a pump of special design running at a constant speed with satisfactory results, and when some provision is made for speed variation the possibility of designing an efficient pump for variable service is greatly increased.

#### Explanation of Total Head.

The make up of the total head on which a pump has to operate is as follows: the vertical static suction lift from the level of the liquid to be pumped to the center of the pump; the static discharge head which is measured from the centre of the pump to the point at which the liquid is discharged, and the friction in the piping, elbows, valves, etc., in both the suction and discharge lines, as well as the velocity head and entrance head. Another point to be considered, which concerns only the manufacturer of the pump is the

loss of head within the pump itself. The efficiency of the pump is the ratio of the power theoretically required to raise a given quantity of water against the total head to the sum of this power, plus the friction in the bearing and stuffing boxes and the hydraulic losses in the pump due to leakage, etc. These latter figures when worked out for any given pump represent its pump horse-power, or in other words, the total driving power required.

#### The Effects of Variations in Speed.

Both the capacity and the total head of a centrifugal pump are affected by speed variation, and consequently considerable care must be taken to determine the speed at which a pump is to be operated so that its design may be governed accordingly. This is very essential in the case of pumps which are directly connected to constant-speed alternating-current motors which operate at slower speeds under no load than when fully loaded and cannot be conveniently regulated.

#### Starting the Pump.

The impeller of a centrifugal pump possesses no positive displacement of itself and when running in air cannot create sufficient suction to be self priming, and, therefore, both the pump and suction pipe must be filled before starting. This may be accomplished by placing a foot valve on the lower end of the suction line and filling the pump and suction piping from the discharge line allowing the air to escape through an air cock on the top of the pump casing. Another method is to close the discharge gate-valve and exhaust the air in the pump case by means of an injector allowing the foot valve to be dispensed with, provided the pump is started while it is primed. When the pump has been primed it is ready to be started and should be brought up to its proper speed and the discharge valve opened. After the pump has been started, it will require but little attention; an occasional inspection of the bearings, from which the oil should be removed and new oil substituted from time to time is all that will be required. The so-called dynamo oil is well adapted for use in the bearings of centrifugal pumping machinery. Pumps intended for use with corrosive liquids are made of special metal, but the case should be opened occasionally and all internal portions thoroughly inspected. The presence of air or gases in the suction pipe will considerably reduce the capacity and pressure of the pump and care should be taken to avoid this trouble by properly baffling the suction pipe.

#### The Suction Lift.

When a centrifugal pump is once under way it will handle water or other liquids of the same specific gravity at ordinary temperature on as high a suction lift as the best reciprocating pumps, or about 26 feet at sea level, provided the pump and suction piping are free from air and air leaks. It is usually difficult to maintain air-tight suction-glands and piping, and the maximum commercial suction lift is therefore considered to be about 18 feet, although some manufacturers advocate not more than 12 feet whenever possible. The limit of suction lift is decreased by a rise in temperature of the liquid being pumped, and when the temperature of the liquid to be pumped is over 150 Fahr. it is better to have the pump so arranged that the water will enter it by gravity. In boiler feeding and similar service where water near the boiling point is to be handled, the best results

will be obtained by making the suction piping as direct as possible, and allowing the water to flow to the pump under a head of from 6 to 10 feet, to eliminate the formation of vapour.

As previously mentioned, the efficiency of a centrifugal pump is lowered by the presence of vapour, air or gas in the suction line. These collect in the suction opening of the impeller, being the point of least pressure, and interfere with the passage of the liquid, thus seriously reducing the capacity of the pump or even causing it to lose its suction altogether.

#### Size and Arrangement of Piping.

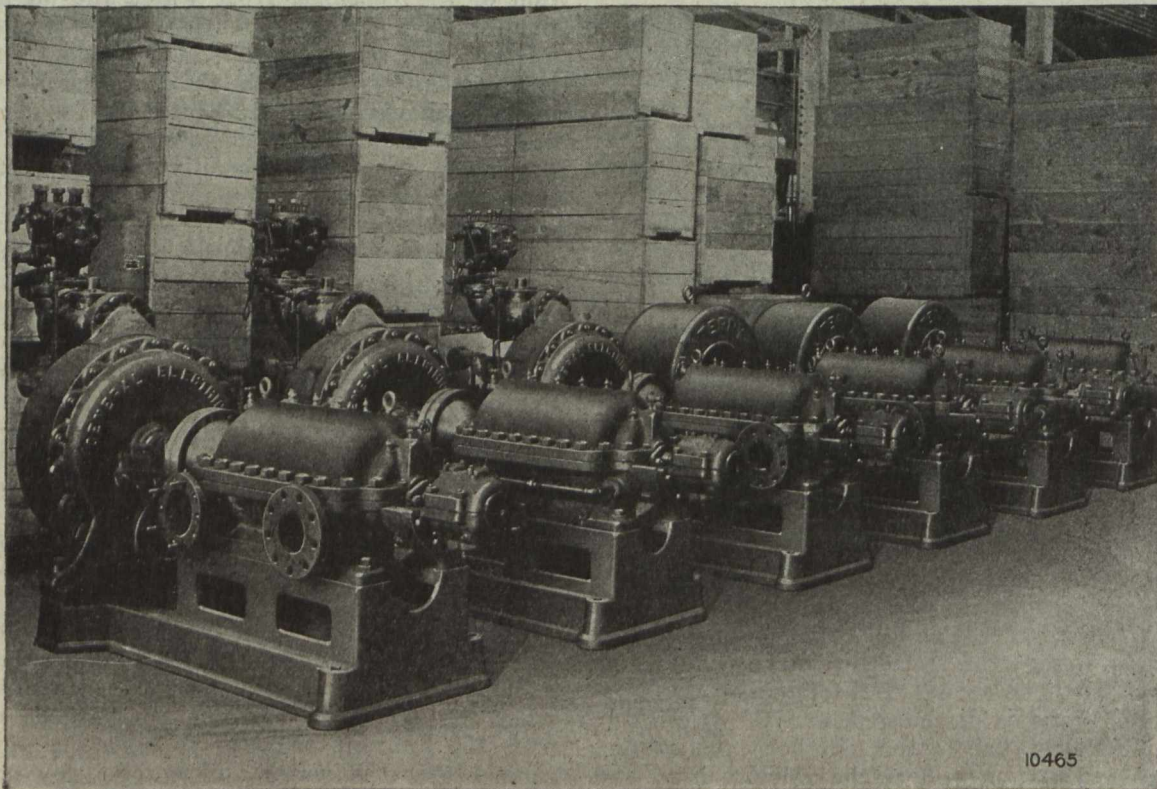
All connecting discharge piping should be arranged to place no strain on the pump and it is usually advisable to make this from one to two sizes larger than the nozzle on the pump, using reducers at these points to make the connections. This will cut down the friction losses and makes the installation more economical to operate. In consideration of the marked advantage of small suction lift the intake pipe should be of as large a diameter and as short and direct as possible. The piping should be so arranged that there are no pockets for the accumulation of air and where these are unavoidable, some means of exhausting them must be arranged. The principles on which the action of the centrifugal pump is based require the liquid to be handled at high velocity. The intake and discharge opening are much smaller than those of a reciprocating pump of the same capacity, and in determining the sizes of pipe to be used, it is well to refer to a standard friction table such as is generally published by the various pump manufacturers in their catalogues. In placing discharge piping it should be kept free of high spots and loops as any air bubbles which may be formed will interfere with the passage of the liquid being pumped.

A gate valve is usually fitted in the discharge line of centrifugal pumps so that the pump may be shut

off the line when not in use or when open for repairs or inspection. A centrifugal pump will revolve in either direction and there is nothing to prevent the liquid in the discharge line flowing back through it when not in operation. Consequently should the power be suddenly cut off, the impeller acting as a water turbine might be driven backward at a speed dangerous to both itself and its prime mover. A foot valve placed on the intake pipe or a check valve on the discharge line may be employed to eliminate this danger. Pumps operating at high pressure on which a foot valve is used, should be provided with a check valve on the discharge line to reduce the shock on the pump when the foot valve seats. It is a good plan to put a by-pass around the check valve so that the pump may be primed should the foot-valve start leaking.

Centrifugal pumps are usually fitted with heavy bed-plates so as to allow the use of a small foundation, which must, however, be of ample strength to bear the weight and support the pump firmly. The pump must set level on its foundation and be carefully aligned before being put into service. The pump, motive power, and bed-plate of direct-connected units which are purchased complete are generally accurately aligned by the manufacturer before shipment, but this alignment is very likely to be disturbed in shipment or by carelessly tightening up the foundation bolts before assurance is had that the alignment is correct.

Some manufacturers ship their pumps with the coupling bolts packed separately, so that alignment may be accurately made by placing a straightedge across the rims of the coupling and measuring the distance between the faces of the coupling. The couplings should not be connected until one is sure that the prime mover is moving in the direction that the pump is intended to rotate which is usually indicated by an arrow cast or painted on the pump casing.



10465

A Battery of Turbine-driven, Multi-stage Marine Pumps awaiting Shipment to U. S. Navy Yards.



## Our Northern Ontario Letter

### THE SILVER MINES

In the report this week that India is to go on a straight silver basis almost immediately, producers of the metal believe they see reason for anticipating a substantial increase in quotations. The price, having sagged to under 90 cents an ounce, rose to 94½ on the strength of the report.

The scope of mining activity in the silver-bearing areas of Northern Ontario is gradually broadening, as shown in the amount of work being done outside of Cobalt, including Gowganda and South Lorrain. It is obvious that high prices for silver will lead to still further activity, and excellent prospects of new producing mines being developed.

Very considerable importance may be attached to an official statement from Major J. McIntosh Bell to the Northern Ontario Correspondent of the "Journal" in regard to the result of work on the Keeley Silver Mines in South Lorrain, in which it is shown that a considerable tonnage of ore assaying from 40 to 90 ounces to the ton has been opened up. An important feature of the statement is that the vein measures about three feet in width, that it has been opened up quite extensively at a depth of 230 feet, with mineralization found to continue to a depth of 300 feet as shown in a winze driven to the last named depth. Major Bell also states that the mill being constructed is nearing completion and will be ready to treat about 80 tons of ore daily by early fall. In the meantime, during the course of developing a large tonnage of milling ore, occasional patches of high-grade ore are being taken out, all of which is being assembled ready for shipment just as soon as a car is filled.

In regard to the ownership of the Keeley Mine, some confusion exists. It is generally believed that it is now owned by the Associated Gold Mines of Western Ontario. As to this the following is an explanation:—The Keeley Silver Mines, Limited, (with an authorized capital of \$150,000) in Feb. of this year took over the Keeley Mine, as well as the adjoining Beaver Lake property, and is now in complete control of both properties. The only shareholders of the Keeley Silver Mines are the Associated Gold Mines of Western Australia, holders of 80,000 shares, and the Erdlich proprietary and the Siberian Proprietary holders of the balance of 40,000 shares.

A rich ore shoot is reported to have been encountered on the recently opened Colonial Mine, which property lies adjacent to the O'Brien. The Colonial has been idle for a number of years, although generally regarded as a profitable producer when worked. The geological conditions are somewhat similar to that occurring on the rich O'Brien Mine, and it is believed the Colonial will in a short time take its place among the regular shippers.

The Kerr Lake Mining Company has made final arrangements to have the Dominion Reduction Company treat between 75,000 and 100,000 tons of low grade ore, contained largely in surface dumps. The contract has been let and work is to commence just as soon as the Reduction Company can provide facilities. Meanwhile, production from the Kerr Lake continues at the rate of approximately \$1,500 daily, the revenue to be derived from the treatment of the low grade material to be in addition to this amount.

Additional high grade ore is being developed at the

Beaver Consolidated, the latest shoot opened up about three inches in width and containing patches of exceptionally rich ore.

At the Oxford-Cobalt property, the shaft has reached a depth of 150 feet. Cross cutting to the vein was commenced this week, the distance being estimated about 22 feet. After reaching the vein, considerable drifting will be done, after which the shaft will be continued to deeper levels.

Opinion in Cobalt is that from now on the Nipissing will not only disburse regular dividends of 5 per cent quarterly, but may also make an annual capital reduction of \$1 per share. The 5 per cent dividend would require \$1,200,000, while the capital reduction would require an equal amount, making a total return of \$2,400,000 an amount equal to \$2 on each of the 1,200,000 issued shares. Current net profits exceed that amount annually, in addition to which there are quick liquid assets of over five million dollars.

A shipment of between 10 and 11 tons of high grade ore has just been made from the Castle property at Gowganda. The ore contains an average of over 1,500 ounces of silver to the ton. A considerable part of it was taken from an open cut on the recently discovered vein on R. C. 101. Further rich shipments are expected to be made at seasonably short intervals.

The reported silver find which last week caused a rush of prospectors from Haileybury has turned out to have been another rainbow. A vein containing considerable bismuth was quietly being worked by lumbermen who believed the substance was silver. It was located in the township of Rattray, east from Boston Creek, and adjacent to the Ontario-Quebec boundary.

According to official information the Reeves-Dobie is operating its mill about 20 hours daily. The plant has a capacity for treating between 25 and 30 tons of ore daily. It is announced that arrangements are being made to have the mill enlarged so as to treat about 50 tons daily. The ore is said to contain close to 30 ounces of silver to the ton. Work on the property has been confined largely to between surface and the 100 foot level.

Owing to a shortage of ore, the Peterson Lake mill has been closed down. The usual amount of development work is proceeding, however, and it is planned to reopen the mill just as soon as sufficient ore is broken.

According to advice just to hand from managing-director H. A. Frank, the directors of the Walsh Mines, Ltd., at Miller Lake, in the Gowganda district, have decided to close down operations temporarily in order to remove their plant from the present location to an island near the north of the property where it is proposed to sink a new shaft and explore the area underlying beneath the lake.

During the month of June, according to the regular monthly statement just issued by Hugh Park, Manager, to the President and directors, the Nipissing yinen Mine produced \$200,449. This is a falling off as compared with the \$335,597 produced during the previous month, but in averaging up the first six months of the year shows a total of \$2,037,567. This being at the rate of over four million annually far exceeds the total for 1919 when a total net value of \$3,553,958 was produced. From these figures it is significant to note that on the operations for the whole of 1919 the net profit amounted to \$2,717,312 which profit was

the highest for any one year in the company's history, and that during 1920 with production at the rate of about half a million higher than in 1919 the net profit may reasonably exceed even that set last year.

Following is the June statement:—

“During the month of June the company mined ore of an estimated value of \$200,449 and shipped residues from Nipissing and custom ores of an estimated value of \$109,746. No bullion was shipped.

“There was no unusual development underground. All stopes continued to produce in a satisfactory manner. Development on several veins were generally encouraging. The usual amount of exploration was carried on.

The low grade mill treated 7,160 tons. The high grade plant treated 183 tons. Following is an estimate of production for the month of June:—

|                          |           |
|--------------------------|-----------|
| Low grade mill . . . . . | \$120,967 |
| Washing plant . . . . .  | 79,482    |

Total . . . . . \$200,449 . . . . .

**Ore and Bullion Shipments**

During the week ended July 9th, three Cobalt companies shipped a total of eight cars containing approximately 583,206 pounds of ore. The Nipissing, with five cars headed the list, as shown in the following summary:—

| Shippers                     | Cars | Pounds  |
|------------------------------|------|---------|
| Nipissing . . . . .          | 5    | 390,147 |
| Mining Corporation . . . . . | 2    | 128,679 |
| O'Brien . . . . .            | 1    | 64,380  |
| <hr/>                        |      |         |
| Totals . . . . .             | 8    | 583,206 |

During the corresponding period, the Mining Corporation and Nipissing both shipped bullion, sending out a total of 155 bars containing 175,943 fine ounces, made up as follows:—

| Shippers                     | Bars | Ounces  |
|------------------------------|------|---------|
| Mining Corporation . . . . . | 99   | 100,564 |
| Nipissing . . . . .          | 56   | 75,379  |
| <hr/>                        |      |         |
| Totals . . . . .             | 155  | 175,943 |

**THE GOLD MINES.**

Interest swings again to the question of a bonus on gold, an explanation of the proposal having been made by Louis T. McFadden of Pennsylvania who introduced the Bill in the United States Congress. “It seems to meet conditions from all corners, is simple and not costly,” says Mr. McFadden, “and provides for the immediate imposing of an excise of 50c. per penny-weight (\$10 an ounce) to be collected on the sale of all articles containing gold or gold used for other than monetary purposes, thereby creating a fund from which the gold producer is to receive \$10 for each ounce of gold produced.” Opinion differs as to the possibility of the Bill becoming law.

At the Hollinger mine, an average of about 1,700 tons of ore is being treated daily and the indications appear to be that the final result for 1920 will approximate that of the preceding year. It is learned that among the necessities recently undergoing a change in price is high grade cyanide which advanced 2 cents a pound this month.

On July 13th the directors of the Porcupine V.N.T. Mines are holding a meeting. On the following day, a special general meeting will be held. The question of obtaining finances for the treasury is to be dealt with. Three proposals are to be considered, one of

which is an offer from the Associated Gold Mines of Western Australia to loan the V.N.T. some \$50,000, taking a first mortgage as security. This proposal is being opposed in the North. Another suggestion has been made that the company consider merging with the North Crown Mines, the company which recently took over the Porcupine Crown and the Thompson-Krist. This suggestion does not appear to be favored by the officials of the V.N.T. The third plan seems to find more general favor, and is the suggestion that in view of the company having 657,000 shares remaining unissued in its treasury, that these should be sold for the purpose of financing the treasury. It is pointed out that on the strength of the assurance that work is to resume, very little difficulty would be experienced in selling a block of perhaps 200,000 shares at around 25 cents a share. Later on, on the strength of the work going on it is felt that quotations would advance and enable the company to sell an additional block of 200,000 shares at a considerable higher price. This, it is thought would put the company in shape to produce in a pretty big way. Officials who have just concluded a visit to the mine, after making an examination of the plant, have announced to the “Journal” correspondent that by spending \$50,000 on the mill it could be so re-modelled and enlarged as to treat between 150 and 160 tons daily. Also, with about \$100,000 the main workings could be extended from the present depth of 600 feet to a depth of 900 feet, with main levels at 600, 750 and 900 feet, thus mining the ore in stages of 150 feet.

According to official advice, the Teck-Hughes in recent months has been able to increase its ore reserves about 30 per cent. This was accomplished at a time when operations were at about two-thirds capacity, by confining effort to that part of the mine lying between the 400-ft. level and surface. Just now the mill is treating an average of 2,400 tons per month. It is found that greater efficiency can be established by operating at a uniform rate of two-thirds capacity than endeavoring to work at full capacity when in doing so the unsatisfactory supply of men would cause more or less erratic results. About 70 men are now on the payroll. In regard to the financial standing of the Teck-Hughes Company, while the mine itself is now producing a profit, yet the \$500,000 bonded indebtedness is a source of worry, some \$70,000 in interest falling due in October. Just what will be done to tide this over has not yet been determined, but the proposal has been made to increase the capitalization of the company.

Final arrangements are being made for the Kirkland Lake Proprietary, 1919, to take over all responsibility for the operation of the Tough-Oakes Mine, paying the Canadian Tough-Oakes Company a nominal rental for the plant so as to relieve this company from responsibility. The shares of the Tough-Oakes Mine are to be exchangeable for Kirkland Lake Proprietary on the basis of two of the former for one of the latter. It is intimated that the Proprietary has \$90,000 immediately available with which to re-open the mine, and to be exchangeable for Kirkland Lake Proprietary on with more in sight provided such is necessary.

From the rate of progress being made in the big construction programme at the Wright-Hargreaves Mine, the mill will be in readiness for operations some time during the closing quarter of the current year. The foundations are all completed, and the structure

itself is now going up. The crushers, ball mill and one of the tube mills are already in place, and work is soon to commence on the construction of the tanks. All buildings including, power house, heating plant, dry, etc., are being brick-veneered inside and the estimated cost of heating the plant is perhaps the lowest in the North. The saving realized in heating is believed as likely to more than repay the cost of the heavier initial expenditure. Underground work is proceeding, the object being to connect shafts Nos. 1, 2 and 3 at the 400-ft. level. More than a dozen faces are in ore, and it is planned to operate the mill on ore coming from development work during the course of cutting the necessary stopes.

At the Bidgood property at Mud Lake in Lebel township, the vein has been cut and measures approximately 15 feet in width. This compares with a width of 12 feet at the 100-ft. level. As yet, average assays have not been announced from the 200-ft. level. The shaft is to be continued at once to a depth of 300 feet at which point the main development program is to be carried out.

Cross-cutting on the 500-ft. level of the Miller Independence mine at Boston Creek is nearing the point where it is expected to encounter the downward continuation of the "Adams" vein in which gold tellurides were found in spectacular quantities near surface. A number of highly mineralized stringers have been cut, and work during the balance of July is regarded as likely to be attended with important results. Work is also being carried on at the "D" or incline shaft.

#### PERSONALS.

O. G. Donaldson, shareholder of the Wright-Hargreaves and the Lake Shore Mines, has concluded a visit to the Kirkland Lake district and returned to his home in Buffalo, N.Y.

Major J. McIntosh Bell paid a visit to the Porcupine V.N.T. mine during the past week-end and returned to the Keeley Mine in South Lorrain early this week.

Wm. Gowans, assistant superintendent of the Castle property in the Gowganda district paid a brief visit to his home in Haileybury returning to Gowganda on Monday.

#### AMBER REPORTED FOUND BY MR. J. C. MURRAY IN NORTHERN MANITOBA.

A newspaper despatch from The Pas, Manitoba, states that Mr. J. C. Murray, formerly Editor of the "Journal" has arrived at The Pas, returning from Cedar Lake, with a gunny sack of amber of good quality. Mr. Murray reports a plentiful supply of amber scattered about the sand and the muck on the borders of the lake. He states that a canoe could be filled with it in less than an hour. The presence of amber at that place has been known for several years, but until Mr. Murray examined it for New York and Toronto interests, its value was unknown. Col. J. B. Miller, of the Parry Sound Lumber Company, and Major Craig, of Toronto, left here for the amber fields today.

The Poulin Asbestos property recently acquired by Mr. Samuel W. Cohen and associates has been organized under the name of the General Asbestos Company, Limited, with head office, Montreal.

## British Columbia Letter

### THE METAL MINES

#### Victoria, B.C.

The amendments to the Placer Mining Act of British Columbia, passed at the last session of the Provincial Legislature, came into effect on the 1st of July. Holders of placer leases, however, have until the 1st of January, 1921, to make such arrangements as are necessary to hold their property. They may do one of two things, viz., pay up arrears on their leases and continue annual payments as laid down by the old Act or consolidate the arrears and pay a proportion of the whole amount together with the current annual fees. Those failing to do either one or the other will be dispossessed of their holdings, the Act as amended providing for automatic forfeiture under such circumstances.

#### Stewart, B.C.

Arrivals from Stewart, B.C. declare that there is no mining boom in the Portland Canal District, but that there is much solid development. Nine diamond drills now are in operation, two on the Premier, two on the Northern Light Group, one each on the 49 Group, the Big Missouri, the Mother Lode, one on Goose Creek and one on the B. C. Exploration Company's property, Marmot River. It is stated that the snow is rapidly disappearing from the higher reaches and that there still is employment for good miners.

Activity is apparent through the country contiguous to the Bear River Valley. Men are engaged in putting the line of the Canadian Northeastern Ry., owned by Sir Donald Mann, in shape for operation, and a gas locomotive has been bought, together with some rolling stock, in order that the transport of supplies to the various camps may be undertaken as soon as the repairs to the road render it feasible.

Some of the mining operations in this section that may be instanced are the development of the Q & L Group held under bond by J. Tretheway, of Cobalt, consisting of surface stripping which has resulted in the exposure of a vein carrying good values and the driving of a tunnel on the vein the ore of which on assay gives return in galena, zinc-blende, and silver; the opening of the Red Top Group by G. Seivert; further work on the Tower Mountain Group by K. P. Matheson, who found promising leads of silver-lead galena last year; the exploration of the Goose Group by the Algonian Development Co., who have it bonded; the development of the L. L. & H. on Bitter Creek; and the vigorous development of the Lakeview Group, Glacier Creek, by P. Welch, of Spokane, and H. J. Fletcher, of Seattle, Wn.

#### Alice Arm, B.C.

The population of the town of Alice Arm is growing to such an extent that increased accommodation has to be provided with the result that there is much building in progress. A three storey hotel is under construction; also many homes in the nature of log cabins. The community radiates prosperity. Everyone is busy and the Dolly Varden Mine Railway is operating regularly, if not in the transport of ore from the mine in carrying supplies from tidewater to the camp. Reports continue to be received regarding the richness of the new ore being found on the development of the Dolly Varden Mine property. It is stated also that the Royal Group nearby is showing up well and that other

properties under development give encouraging indications of merit. Prospectors are going into the hills both up the Kitsault and the Illiance Rivers and much is looked for favorable to the district from the season's work.

#### Usk, B.C.

High grade copper ore is reported to have been discovered on the Nicholson Creek, near Usk, northern B.C., by Albert Baxendale a prospector. As a result the Crescent Group of Mineral Claims has been staked. Stripping is said to disclose a fissure vein, one foot to six feet wide, for a distance of 700 feet carrying bornite and chalcopyrite, much of which is of sufficiently high grade to ship.

#### Slocan, B.C.

That the Utiza Mine will be re-opened at once and by C. F. Caldwell, vice-president and managing director of the Utica Mines Ltd. The old Sunset property, situated near the Utica, also is to be developed. The latter has not been worked for fifteen years. During its operation over \$500,000 worth of ore was shipped, some 2,000 tons averaging over \$250 a ton at the former price of silver. It is proposed to continue the existing crosscut to strike the vein at new depth. The mine, it is hoped, will be shipping by fall.

Work on the Evening Star Mine, Dayton Creek, is proceeding with satisfactory results. The crosscut being driven for depth has reached an advanced stage, its face now being somewhere near the line of the shaft and below it. The workings will be unwatered before an attempt is made to connect the two. As the workings radiating from the shaft are quite extensive the latter work will take some time. Hugh Sutherland, of Winnipeg, Man., formerly executive agent for the Canadian Northern Ry., is the owner of the Evening Star and also of the Silver Nugget, in the same vicinity, which is to be developed.

#### Nelson, B.C.

The Florence Silver Mine, near Nelson, B.C., is in operation and the installation of another unit for the power plant is underway. The mine is working on a two shifts and the concentrator on a one shift basis. There is said to be an abundance of ore in sight, both the Fisher and Replacement veins looking splendid. About 150 tons of millfeed is coming down daily and it is expected that the mill will be able to ship 300 tons of concentrates a month.

Another deal is reported in connection with the Granite-Poorman Mine, Eagle Creek, it being stated that a syndicate has been formed to take over the property from the Vincent Development Co., As a result the Granite-Poorman property will resume operation immediately, a crew of men already having been put to work.

#### The Coal Mines

G. W. Bowen, vice-president and managing director of the Canadian Western Fuel Company, predicts that there will be a scarcity of coal all over the American continent during the winter of 1920-21 and attributes present conditions in the United States in this respect to the transportation problem. The increased demand for coal locally he explains by the shortage of oil and the greater population. The cost of production would govern prices, oil shortage and other contingencies

having nothing to do with the matter. Discussing the latter question he pointed to the fact that the Company was engaged in prospecting for coal, that what appear to be good body at the outset possibly would peter out in development, that in the Nanaimo Mines not more than 25 per cent of those employed actually were engaged in the production of coal, so that the average output of coal per day per person would not run more than a ton and a half. The profits of the mines were not as great now as they were some years ago when coal was cheaper on the market. Little coal was being shipped from Nanaimo to the United States whereas a few years ago the bulk of the output went to San Francisco, Cal. Now practically the only coal going south of the line was that required to fill small contracts with Seattle, Wn., dealers.

In an endeavor to produce satisfactory coking material the Granby Consolidated Mining & Smelting Co., is bringing coal from Brule Lake, Alberta, for mixture with the product of the Cassidy Collieries, Vancouver Island. As a result a considerable proportion of the output of the Cassidy Mine likely will find its way to the domestic markets of Vancouver, Victoria and other British Columbia centres.

T. A. Spruston, superintendent of the Extension Division of the Canadian Collieries (D) Ltd., pointed out to the miners recently the importance of their working more steadily than in the past. In the month of May out of 296 contracts miners employed only 85 worked full time. He figured that 906 shifts were lost which was the equivalent of working the mines one day a week with no miners. Reference was made to the high cost of producing coal at Extension under ordinary conditions. As matters stood there not only was the handicap of time voluntarily lost by employes but of actual lack of labor, there being places in the mines for 100 additional hands if they could be secured. Owing to the habit the contract miners had fallen into the earners of day wages were finding it difficult to get along as the Company had been compelled to close down each Saturday. There was a danger too, that, if production remained low, contracts entered into for the supply of Extension coal would have to be allowed to lapse, in which event, of course, the Company's customers would go elsewhere. Mr. Spruston emphasised the position by pointing out that loss of four days a month meant the loss to the community in wages of \$15,000 a month and resultant depression of trade and general business. He urged the men to work the full six days a week, thus increasing the productivity of the mines 3,171 tons a month. After discussion the miners passed a unanimous resolution urging the men to fill a full six days a week on the morning shift and five days a week on the afternoon shift.

The Chua Chua coal-bearing lands on the North Thompson River, near Kamloops, B.C., have been bonded to the Queen Bess Mining Corporation of Seattle, Wn., approximately \$500,000 being involved in the transaction. Glenville A. Collins, who was chairman of the recent International Mining Convention at Seattle, Wi., was instrumental in putting the deal through. Drilling is to commence forthwith and it is expected that the first shipments will be made next September.

### THE USE OF GYPSUM IN A NON-CONDUCTING ROOFING SLAB.

A paper read before the Technical Section of the Canadian Pulp and Paper Association at Sault Ste. Marie on June 23rd by Mr. H. S. Taylor, described the use of a non-conducting roofing with gypsum as its chief constituent, to overcome the decay and other troubles associated with roofing in paper mills caused by condensation of moisture on the underside of the roof. A moist atmosphere is inseparable from paper-making processes, which consist largely of the evaporation of moisture from a mixture of ground wood and water by passage over heated rollers.

After explaining the required characteristics of a roofing material as durability, non-conductivity and resistance to corrosion, and giving some instances of rapid decay in mill roofs attributable to interior condensation, with particular reference to the mill of the Spanish River Pulp and Paper Co., on Lake Superior, Mr. Taylor (who represents the Management Engineering and Development Co.) was asked to report on a suitable roofing to overcome the difficulties indicated. An abstract from the paper follows:

The result of a thorough investigation was the selection of gypsum for roof slab material combined with wood shavings.

This monolithic gypsum composition slab has long been used for fireproof floors and roof construction in the eastern United States and Canada under the trade name "Metropolitan." Some of the oldest of the large buildings of downtown New York city are of this construction 60 Wall Street, 42 Broadway, Beaver Bldg., Singer Bldg., etc., as well as hundreds of heavy manufacturing and loft buildings, apartments, hotels, residences and the like throughout the metropolitan district and in other communities. The first installation was made in 1892, and came into extended use in 1894. During this year a gypsum roof was placed on the St. Nicholas Skating Rink. I have for your examination a piece of gypsum knocked from the underside of the floor slab of this building just about the refrigerating machinery. The steel stable enforcement was found to be in excellent condition when exposed after 22 years. I also have for your inspection a piece of cable 32 years old, taken from the Horticultural Hall, Philadelphia.

This Metropolitan type of construction was placed on the Woronoco Mill of the Strathmore Paper Company in 1912; the Wayagamack Pulp and Paper Company at Three Rivers made an installation in 1915; Price Brothers have this type of construction over one of their machine rooms, the roof having been laid in 1915, and the Great Northern Paper Company, of Millinocket, Me., have a gypsum slab roof which was placed in 1913. For mills of the Escanaba Paper Company at Escanaba, Michigan, designed by the Management Engineering and Development Company, gypsum roofs are on machine room, boiler house and grinder rooms and the owners are well satisfied.

The slab is designed on the cantenary principle; cold drawn, twisted steel wire cables being figured to carry all the loads in suspension between beam supports. These cables are anchored to the end beams and brought into uniform deflection and tension by steel rods midway of each span.

Gypsum, more commonly called plaster of Paris, is mined as a moderately soft mineral, composed, in varying degree of purity, of hydrated calcium sul-

phate,  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ . When gypsum is calcined at a temperature of  $100^\circ$  to  $120^\circ$  c.,  $\frac{3}{4}$  of the water of crystallization is driven off and the product obtained is the ordinary plaster of Paris. If calcined at temperatures between  $250^\circ$  and  $500^\circ$  C. but not sufficiently long to remove all of the water, a nearly anhydrous product is obtained which also forms a cement.

The product formed, as the result of the setting in either of the above cases, is practically identical with the original gypsum. This material is appreciably soluble in water. One part of the hydrated calcium sulphate at  $0^\circ$  C. dissolves in 488 parts of water; at  $35^\circ$  in 393 parts of water; at  $100^\circ$  in 460 parts of water. Its maximum solubility occurs at  $35^\circ$  C.

The gypsum composition, consisting of about 85 per cent. pure calcined gypsum, mixed with wood fibre to act as a binder and to toughen the finished slab, is mixed with water to a medium working consistency and poured into the forms. The set takes place within ten or fifteen minutes, and the forms are removed the same day if desired leaving a full live load capacity slab. The duty of the gypsum is to fireproof the steel, form a flat slab, and transfer the load from the surface to the cables in direct compression. Its work is analogous to that of the stiffening truss of a suspension bridge floor, for which duty it has proved itself amply strong in various authoritative tests as well as in actual service.

The chief advantages of the construction are:—

1. **Light Weight:** Composition weights 48 lb. cu. ft., or 16 lb. sq. ft. for a 4-inch slab, this weight being one-third that of concrete—less than the dead load of any other permanent, fire-proof construction, and no more than the ordinary wood sheathing. This light weight means a ten to twenty per cent. saving in steel framing supports, as well as reducing loads on foundations.

2. **Quick Setting of Slab:** As gypsum will set ten minutes after pouring, whereas four to ten days are necessary, depending on weather conditions, for concrete, this means a saving in interest and overhead charges by earlier completion. A full live load can be placed on the roof slab two hours after pouring, and forms are generally removed in from four to six hours. Of great interest and value in Canada, this quality permits progress in cold weather, as the slab may be placed without injury in zero temperature and below, the quick set taking place before the water can freeze.

3. **Heat Insulation:** Among the literature furnished you, are copies of the report of Prof. C. L. Norton of Massachusetts Institute of Technology. This report gives the B.T.U. transmission through various constructions used for roofs, together with a chart showing the possibilities of condensation under varying conditions. You will note that with the highly insulating gypsum roof, slab condensation will not occur under a very wide difference and indoor and outdoor temperatures, where the humidity is kept below 80 per cent. by means of ventilation. The dollar value of an insulating roof slab like gypsum as compared with wood of two or three times the conductivity, and concrete of five times the conductivity, may be readily determined from Prof. Norton's report. One heating engineer has established a  $7\frac{1}{2}$  to 10 per cent. reduction in heating equipment, and a 25 per cent. annual fuel saving as compared with concrete. (These tables showed mostly relative conductivities.)

4. **Resistance to Corrosion:** Gypsum is calcium sulphate and, being a salt of sulphuric acid, is not affected by any acids of this group. Beaker tests show corrosion by nitric and hydrochloric acids, but concentrations of these acids in a building are very rarely sufficient to affect a roof slab of gypsum. The same may be said of the strong alkalies, soda ash and caustic soda. In floors twenty years old, the steel has been found perfectly preserved by the embedding gypsum.

5. The fire resistive qualities of gypsum have been proved by many authoritative tests and fire experiences. In 1911 a fire occurred in the Knickerbocker Storage Warehouse, Newark, N. J.—an eight-story building with monolithic gypsum floors and roofs erected about 1900. The five floors were packed to the ceilings with furniture, and the fire raged over a period of eleven hours. The records of insurance and other inspections show the building was repaired and the floors restored, with the exception of two panels, by being plastered underneath with gypsum, the building then being used as a storage warehouse. The low cost of salvage is very apparent.

Gypsum slab was placed over the Lake Superior Paper Company's Sault Ste. Marie mill in the summer of 1919. Since then a new machine room at Espanola and a machine roof at Sturgeon Falls have been covered. A second machine room at Sturgeon Falls is now being constructed and will be covered with gypsum roofing. The roof has a pleasing appearance and is guaranteed for a period of ten years. This guarantee appears to be perfectly safe when considering the time this type of roof has remained in perfect condition on buildings constructed many years ago.

Other types of gypsum roofs will be found on many paper mill structures, the gypsum channel type and also pre-cast type. The channel type is made up in 8 ft. lengths, laid on steel supporting members and joints cemented. It has a pleasing appearance, but as reinforcement is not continuous there is a tendency to deflect under extreme heat. No doubt this deflection is aided by moisture. The pre-cast type we have not had experience with. The Thorold Mill of the Ontario Pulp & Paper Company is covered with this type of construction, but for mills that we have been interested in, the cost of pre-cast was greater than the monolithic slab, due to handling charges. I believe this Metropolitan type of roof construction ideal for machine rooms, grinder rooms, recovery plants, sulphite mills or for almost any paper mill building, as at the present time it is very little more expensive than wood, and from all indications will outlast wood many times over.

For a new mill the labor of placing a gypsum roof is very little more than that of placing a standard wooden roof, but for mills in operation a replacement entails great precaution. If properly planned and carried out, however, operation may be carried on without interruption. As an example of this statement we can take the Lake Superior Paper Company's machine room, a building 180 ft. x 270 ft. where the removal of their wooden roof and the placing of the new gypsum slab was carried on without an hour's shutdown of four paper machines running beneath.

For roofs over machine rooms, grinder rooms or other buildings, wherein moisture is excessive, all steel members directly embedded in the roof slab should be insulated by gypsum covering throughout their entire

surface, as, due to their high conductivity, low temperatures will be conducted to sections on the under side of the roof and on these sections condensation will form, with the resultant drip.

#### METAL QUOTATIONS.

Fair prices for ingot metals at Montreal, 15th July 1920:—

|                           |                    |
|---------------------------|--------------------|
| Copper, electro . . . . . | 23 $\frac{3}{4}$ c |
| Copper castings . . . . . | 23 $\frac{1}{2}$ c |
| Lead . . . . .            | 10 $\frac{1}{2}$ c |
| Zinc . . . . .            | 10 $\frac{3}{4}$ c |
| Tin . . . . .             | 57c                |
| Aluminum . . . . .        | 37c                |
| Antimony . . . . .        | 10c                |

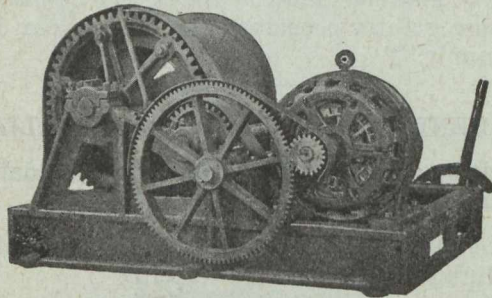
Mr. Charles Camsell, the new Deputy Minister of Mines will make a flying visit to Vancouver the first part of August, when his friends will have a chance to see him for a short time before he takes up his home in Ottawa.

#### SQUARE CORNERED MOLECULES.

One of the strangest true stories that we have heard in some time was told at the summer meeting of the Technical Section. It seems that an oil salesman visited a pulp mill and in praising the quality of his oil to the superintendent remarked that the oils which were being used were decidedly inferior because in one of them the molecules were of cubical shape (and he drew a picture to show the form), while the other was not quite so bad as the molecules were pyramids, (and he drew another sketch), but that the oils which he was selling was far superior to any other on the market because the molecules were round. In fact the salesman, by misrepresenting something with which the superintendent was not at all familiar, convinced him that he was selling a ball bearing oil and consequently the best possible kind of lubricant. The curious part of this story is that we repeated it last week at the smoker of the American Society of Chemical Engineers and one of the gentlemen present was the chief chemist at the mill where the incident occurred and had overheard the conversation between the oil salesman and the superintendent. Another chemist from the same mill was also present and vouched for the truth of the story, else we would be strongly inclined to doubt it.

The superintendent in this case was not acquainted with even the rudiments of every day science and the salesman knew it. If the chemist had not been present, the wonderful new conception of the molecular state of lubricants would have been lost to the world, and this particular mill might have been induced to purchase a really inferior grade of oil, because a concern that permits its salesmen so grossly to misrepresent either his own product or that of others is not likely to be depended upon for a first class article. It is not necessary for a man to have a college education or to be an expert chemist or engineer to have a clear conception of such elementary science as would enable him to detect such misrepresentation and to perceive the principal qualifications of the materials required in his department. The man on the job must be depended upon for considerable advice in the purchase of materials unless the concern has a large technical staff which can carry out performance tests for the benefit of the purchasing and cost departments. From "Pulp and Paper Magazine."

# SAFETY FIRST HOISTS and CAGES



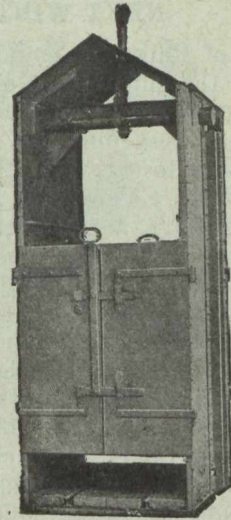
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## PORT ARTHUR NOTES.

(By J. J. CONNOR).

The Swedish-Canadian Mines, Ltd., operating the "Foley" mine, at Mine Centre, has been reorganized, under the following gentlemen: Senator George W. Fowler, Ottawa, President, H. R. Drummond Hay, Barrister, Winnipeg, Vice-President, J. P. Hanson, Chicago, Ill. Secretary-Treasurer, N. T. McMillan, Winnipeg, W. D. McKay, Toronto, and C. R. Fitch, Fort Frances. Directors, F. A. S. Carnegie, M.I.M.E. Engineer at the Mine, J. A. Johnson, Superintendent and Manager.

The work of sampling, and making mill runs is now in progress, with a view of determining the most efficient processes of recovering the maximum of values in the ore, before installing their permanent plant for treatment.

30 men are employed at present. This number will be increased to a full complement to operate the whole mine at an early date. The Company are not giving out the results of their operations, but are apparently well satisfied with the outturn, and are looking forward to active and continued mining and milling of ore.

The Silver Inlet Syndicate are meeting with continued success in uncovering fresh bodies of high grade macfarlanite ore in the roof of the East Stope. In this stope, the roof is of enormous extent. Vast cavities were mined out in the former operations that are without floors, and the operatives move about on rafts, in prosecuting the sampling. The walls and roof are so discolored with graphite, that it is impossible

to determine what is under it, without putting in shots. This is being systematically done, and expectations are being fully realized as the work proceeds.

## VANCOUVER NOTES.

A new cabinet of the minerals of Canada has just arrived at the Vancouver office of the Geological Survey in the Pacific Buildings, Hastings Street W. The minerals were assembled by the Dominion Department of Mines and are neatly arranged, numbered, and listed so that the name and origin of each mineral is easily located.

Prospectors and the public in general should make good use of this exhibit, which has taken much time and trouble to arrange.

The Publicity Committee of the B.C. Chamber of Mines is planning a Chamber of Mines exhibit, to be held in connection with the Vancouver Exhibition in September. All prospectors, associations and individual companies are invited to send exhibits of ores, photographs and interesting data to Chamber of Mines, freight and express prepaid, and such exhibits will be taken care of and placed in prominent positions. The exhibition directors have agreed to give every assistance toward making this the best mineral exhibit ever held in connection with the exhibition.

This is for all British Columbia and everyone is invited to help and make it a success.

### THE THREATENED BITUMINOUS COAL SHORT-AGE IN CENTRAL CANADA DURING NEXT WINTER.

The Board of Railway Commissioners, which is now charged with the supervision of coal imports and exports that were formerly vested in the person of the Dominion Fuel Controller, is completing the organization necessary to carry out this addition to the regular duties of the Commission.

On the 12th July, a Committee from the Canadian Manufacturers' Association was received by Dr. S. J. McLean, the Assistant Chief Commissioner and the possibility of averting the threatened increase in the existing stringency of bituminous coal supply in the provinces of Ontario and Quebec was discussed.

The Committee comprised the Fuel Controllers of Ontario and Quebec, representatives of the eastern and western coalfields, and members of the Special Fuel Committee of the Canadian Manufacturers' Association which has been collecting information on coal supply for the past two years.

In regard to the possibility of bringing coal from the Alberta collieries it was pointed out that the question was largely one of transportation and freight rates, as at the present time the capacity of the Alberta collieries was equal to the supply of any quantity of coal within the possibility of rail transportation, but the amount of coal that the railways could handle and the freight rate that could be arranged would have to be definitely ascertained by Alberta operators before extensive arrangements to meet future orders from Ontario could be made. The time between this date and the commencement of grain shipments eastward—the only period during which it will be possible to handle coal shipments of any volume—is limited, and the attention of the Commission was drawn to this point.

The probability of a coal shortage was admitted, and there was no discussion or questioning regarding a condition that now amounts to a certainty.

With regard to Nova Scotia coal, an actual shortage in production exists, practically identical in extent with the customary annual seasonal shipments to St. Lawrence ports before the decline in outputs which was a result of enlistments among the miners. No possibility of any appreciable assistance from Nova Scotia coal is likely unless additional miners can be obtained, and the advisability of assisting in every possible way the emigration of miners from European fields to Nova Scotia was suggested. The tonnage of coal exports from Nova Scotia to European points was stated to be almost negligible in comparison with the actual drop in production. The necessity to provide ships at reasonable freights was a first consideration in sending Nova Scotia coal to Montreal and St. Lawrence points.

It was further suggested that assistance would be obtained in connection with the coal supply of 1921, if the Nova Scotia collieries were enabled to work steadily and bank out coal during the Winter of 1920-1921. This is possible if an outlet for the coal is guaranteed by making railway contracts this year for next year's delivery, and if the coal companies are assisted by full release of their shipping from government control.

The Fuel Controller of Ontario is vested with the necessary powers to carry out his office, but in Quebec there are no existing regulations empowering the

office of fuel controller to take any effective action. It is expected that the necessary powers will also be revived in Quebec to meet the present emergency.

The Fuel Committee of the Canadian Manufacturers' Association is studying the fuel problem from the standpoint of a permanent solution by the enlargement of coal-mining in Canada, but this is of course a duty in regard to which there is no visible present likelihood of a discharge. The action of the Association at this time was taken because of the recognition of an existing emergency which requires immediate remedial measures. Such action does not, however, imply that present and emergent measures will be also those that promise greater permanent security in our domestic coal supply.

### THE BENDIGO GOLDFIELD, AUSTRALIA.

#### Rehabilitation of an old Goldfield by Consolidation of Properties and Profit-Sharing with Miners.

(Abstracted from an article in the "Industrial Australian Mining Standard" by "F.M.L.")

The following extract, taken from the above-mentioned source, is not without interest to Canadian readers, and has certain analogies in conditions existing in Canada—but not in gold-mining districts.—Ed.

Since 1851 the Bendigo field has produced over twenty million ounces of gold, valued at nearly eighty millions sterling. Of late years the annual yield has steadily declined, but it must not be imagined that the mining industry is by any means played out; it is still the largest industry by far in the district. It is true mine after mine has closed down on account of increased working costs, and the probability is that many mines now being worked would have been added to the list had it not been for the business-like methods and foresight of a few public-spirited business men, who brought about an amalgamation of a large number of companies, with the idea of running the mines on business lines.

#### Mining on Commercial Lines.

These men had seen the disadvantages that accrued from the gambling methods generally associated with mining throughout the State. Dividends were paid with money that should have gone to build up reserves, development work was neglected, and the heart taken out of a mine, with the result that it became a common thing for a mine to be making calls on its shareholders within a few months of paying its regular dividends.

The first step of the promoters of the new amalgamation was to remove, as far as possible, the gambling element, and place the stock on an investment basis; the next, to build up substantial reserves. Thus speculation was discouraged and steady investment encouraged. When it is remembered that a great deal of capital invested in Bendigo mines comes from outside the district, it can be seen that this policy must lead to increased security and confidence.

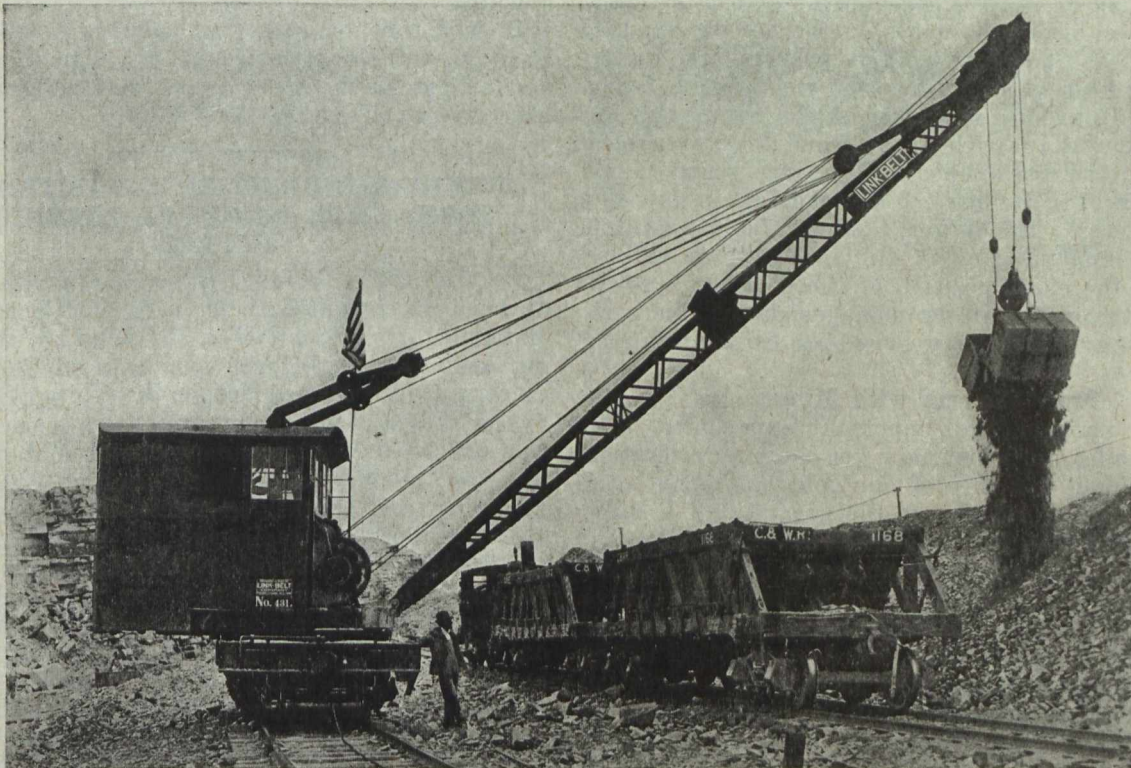
#### The Bendigo Amalgamated Goldfields Co.

The company was formed by the issue of 200,000 shares of 7s. 6d.; nominal capital £750,000, of which £479,848 is paid up. The amalgamation acquired a number of mines, and of these twenty are in full working, the number of men employed being about 800.

By the adoption of business methods, scrapping and disposing of old and worn-out machinery, installing new boilers in place of old and weak ones, thus saving



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wages and firewood, taking advantage of the huge prices ruling for timber, secondhand machinery, and old metal, the cost of new plant was considerably reduced.

A number of the mines are at present being worked at a loss, but in these cases the prospects are such that development work is considered worth proceeding with; as a set-off to the mines on the non-paying list, there are those that pay working expenses, and others, notably the Constellation, in which rich stone is being obtained. This claim was amongst the non-payers for a long time, but the rich yields from it have enabled the directors to build up a fairly large reserve, and the question of a dividend to shareholders is now under discussion. The larger holders favor waiting until the annual meeting in July, when stock will be taken, and the exact position of the company known.

It is to the credit of the management of this company that it has never approached the Government for a grant.

#### Profit-Sharing with Miners.

Another unusual and important experiment that has been made, and which may yet cause an alteration in the working, not only of our gold but of our coal and other mines, and that is the granting of a share of the profits to the miners themselves. A co-operation, of association, of the miners employed by the B. A. G. Co. has been formed, and is known as the "Co-operative Alliance"; 250,000 shares, representing one-seventh of the company's present issue, has been allotted to the to the miners as profit-sharing shares. This gives the men employed an interest in the fortunes of the company, and their work; shares are paid up, and there is no liability. The shares, though profit-sharing, do not, of course, carry any interest in the assets of the company. At the present market value, these shares are worth about £25,000. Having a share in the profits of the mines, the men come to regard the company as one in which they have a vital and personal interest; for instance, a dividend of sixpence a share, declared by the company, absorbing £44,266, means that the Co-operative Alliance benefits to the extent of £6250. The miner receives a wage of £3 12s. a week of 44 hours, and, in addition, one-seventh of the profits earned.

This is a sound business-like arrangement. There is an inducement to work, as the men participate in the fortunes of the company. The stealing of gold will be less rife, as the men guilty are taking a percentage of what belongs to their fellow-workers. They are aware they are receiving a fair deal, and a go-slow policy would be almost an act of suicide. There is considerable allotment coming to the men, and a wise proposal has been made, and that is, that they should form a Co-operative Society along the lines of the one at Port Pirie, which has proved so successful. The miners alone would be shareholders, and with competent management, it should be a means of considerably reducing the cost of living for the miner and his family. The miners are also encouraged and assisted to buy their own homes. It is certain that the methods such as those described been introduced years ago, throughout the State, many a goldfield that lies deserted would be alive to-day.

The gold yield for the year is about 60,000 oz., which is much below the average, but there is no reason why, under the new conditions, it should not be maintained, and even increased.

The Bendigo A1 Co. acquired the northern area from

the B. A. G. Co., and are actively carrying on development work, from which they expect good results at any moment. The New Argus and New Moon are in the same category.

The Lansell interest is small compared with what it once was, but they have a number of mines still working.

It will thus be seen that mining is still alive in Bendigo, and that the district offers in some respects a safe field for investment, now that the gambling element has been largely eliminated.

#### CHEMICAL INDUSTRIES EXHIBITION NEW YORK: WIDE RANGE OF TECHNICAL PAPERS.

For the sixth National Exposition of Chemical Industries which will be held in Grand Central Palace, September 20 to September 25, inclusive, there is being arranged the biggest Symposia on Chemical Engineering ever carried out in the United States. Up to the present four symposiums have been scheduled. One will be on Fuel Economy, one on Materials Handling, one under the general head of Chemical Engineering, and another on Industrial Management.

Many important topics will be treated upon when the Fuel Economy division holds its session. Among the papers to be read will be one on "Fluid Heat Transmission," by A. B. McKechnie, Parks-Cramer Co.; one on "Refractory Cement; Life Insurance for a Furnace," F. W. Reisman, Quigley Furnace Specialties Co.; another on Producer Gas and the Modern Mechanical Producer," by W. B. Chapman, Chapman Engineering Co.; and one on "Preventing Conduction and Radiation Heat Waste," by S. L. Barnes, Armstrong Cork Co. W. O. Rankin, of Quigley Furnace Specialties Co., will talk on "Powdered Coal" and there will also be an address by Conrad Dressler, of the American Dressler Tunnel Kilns.

The Speakers at the Industrial Management Symposium will include Harrington Emerson, on "Ultra Analysis of Costs; H. E. Howe, of National Research Council of Washington, on Research in Industrial Conservation,"; H. A. Ernst of Barret Co., Grinnell Jones, of Harvard University and others who have yet to select their topics.

The Chemical Engineering program consists of A. Hough and Wallace Savage on "Construction of Horizontal Stills; Thomas W. Pritchard, on "New Method of Destructive Distillation; W. D. Richardson, on "Corrosion and Galvanic Action in the Industries," and others to be selected.

The speakers for the Materials Handling program have not yet been announced, but F. G. Anderson, Chain Belt Transmission, will be among those who will occupy the rostrum for a time. Moving pictures have played a big part in previous chemical expositions but this year there will be a series of films which will far surpass anything before attempted. The majority of these are absolutely new, in fact some are still in the process of making.

In the U. S. Chemical Industries Series are included "The Story of Sulphuric Acid," General Chemical Co.; "A New Chemical Industry-Leather from the Sea-Fish Leather," Ocean Leather Co.; (Ford Educational Film Co.); "Perfumes for the World," Antoine Chiris Co.; "Modern Coke and Gas Manufacture," The Koppers Co.; "The Story of Petroleum Oil," Standard Oil, Co., N.J.; "The Asphalt Paving Industry," Bar-

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In the Plant Operations Series there are two films already scheduled and others will also be shown. The ones listed are: "Continuous Motion, Conveying, Stacking, Elevating, Etc.," Brown Portable Conveying Machinery Co., and "Foamite Firefoam Extinguishing Apparatus at work," Foamite Firefoam Co.

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Canadian Fairbanks-Morse.  
Prest-O-Lite Co. of Canada, Ltd.
- A.C. Units:**  
MacGovern & Co.
- Agitators:**  
The Dorr Co.
- Air Hoists:**  
Canadian Ingersoll-Rand Co., Ltd.  
Mussens, Limited.
- Alloy and Carbon Tool Steel:**  
H. A. Drury Co., Ltd.  
International High Speed Steel Co., Rockaway, N.J.
- Alternators:**  
MacGovern & Co.  
Spielman Agencies, Regd.
- Aluminium:**
- Amalgamators:**  
Northern Canada Supply Co.  
Mine and Smelter Supply Co.  
Wabi Iron Works.
- Antimony:**  
Canada Metal Co.
- Antimonial Lead:**  
Pennsylvania Smelting Co.
- Arrester, Locomotive Spark:**  
Hendrick Manufacturing Co.
- Arsenic White Lead:**  
Coniagas Reduction Co.
- Assayers' and Chemists' Supplies:**  
Dominion Engineering & Inspection Co  
Lyman's, Limited  
Mine & Smelter Supply Co.  
Pennsylvania Smelting Co.  
Stanley, W. F. & Co., Ltd.
- Ash Conveyors:**  
Canadian Link-Belt Company
- Ashes Handling Machinery:**  
Canadian Mead-Morrison Co., Limited  
Canadian Link-Belt Co., Ltd.
- Assayers and Chemists:**  
Milton L. Hersey Co., Ltd.  
Campbell & Deyell  
Ledoux & Co.  
Thos. Heys & Son  
C. L. Constant Co.
- Asbestos:**  
Everitt & Co.
- Balls:**  
Canadian Foundries and Forgings, Ltd  
Canadian Steel Foundries, Ltd.  
Hull Iron & Steel Foundries, Ltd.  
Fraser & Chalmers of Canada, Ltd.  
The Electric Steel & Metals Co.  
The Wabi Iron Works.  
The Hardinge Conical Mill Co.
- Ball Mills:**  
Hardinge Conical Mill Co.  
Hull Iron & Steel Foundries, Ltd.  
Mine and Smelter Supply Co.  
Fraser & Chalmers of Canada, Ltd.  
The Electric Steel & Metals Co.  
The Wabi Iron Works.
- Balances—Heusser:**  
Canadian Fairbanks-Morse Co., Ltd.  
Mine and Smelter Supply Co.
- Babbit Metals:**  
Canada Metal Co.  
Canadian Fairbanks-Morse Co., Ltd.  
Hoyt Metal Co.
- Ball Mill Feeders:**  
Fraser & Chalmers of Canada, Ltd.  
Hardinge Conical Mill Co.  
Hull Iron & Steel Foundries, Ltd.
- Ball Mill Linings:**  
Hardinge Conical Mill Co.  
Hull Iron & Steel Foundries, Ltd.
- Belting—Leather, Rubber and Cotton:**  
Canadian Fairbanks-Morse Co., Ltd.  
Canadian Link-Belt Co., Ltd.  
The Mine & Smelter Supply Co.  
Northern Canada Supply Co.  
Jones & Glasco.
- Belting:**  
R. T. Gilman & Co.  
Gutta Percha & Rubber, Ltd.
- Belting—Silent Chain:**  
Canadian Link-Belt Co., Ltd.  
Hans Renold of Canada, Limited, Montreal, Que.  
Jones & Glasco (Regd.)
- Belting (Transmission):**  
Goodyear Tire & Rubber Co.
- Belting (Elevator):**  
Goodyear Tire & Rubber Co.
- Belting (Conveyor):**  
Goodyear Tire & Rubber Co.  
Gutta Percha & Rubber, Ltd.
- Blasting Batteries and Supplies:**  
Canadian Ingersoll-Rand Co., Ltd.  
Mussens, Ltd.  
Northern Canada Supply Co.  
Canadian Explosives, Ltd.  
Giant Powder Co. of Canada, Ltd.
- Bluestone:**  
The Consolidated Mining & Smelting Co
- Blowers:**  
Canadian Fairbanks-Morse Co., Ltd.  
MacGovern & Co., Inc.  
Northern Canada Supply Co.  
Fraser & Chalmers of Canada, Ltd.
- Boilers:**  
Northern Canada Supply Co.  
Canadian Ingersoll-Rand Co., Ltd.  
Marsh Engineering Works  
MacGovern & Co., Inc.  
R. T. Gilman & Co.  
Fraser & Chalmers of Canada, Ltd.  
The John Inglis Company  
Wabi Iron Works.
- Blue Vitriol (Coniagas Red):**  
Canadian Fairbanks-Morse Co., Ltd.
- Bortz and Carbons:**  
Diamond Drill Carbon Co.
- Boxes, Cable Junction:**  
Standard Underground Cable Co. of Canada, Ltd.  
Northern Electric Co., Ltd.
- Brazilian Rough Diamonds:**  
Diamond Drill Carbon Co.
- Brazilian Mica:**  
Diamond Drill Carbon Co.
- Buggies, Mine Car (Steel)**  
Hendrick Manufacturing Co
- Brazilian Ballas:**  
Diamond Drill Carbon Co.
- Brazilian Rock Crystal:**  
Diamond Drill Carbon Co.
- Brazilian Tourmalines:**  
Diamond Drill Carbon Co.
- Brazilian Aquamarines:**  
Diamond Drill Carbon Co.
- Bridges—Man Trolley and Rope Operated—Material Handling:**  
Canadian Mead-Morrison Co., Limited.
- Bronze, Manganese, Perforated and Plain:**  
Hendrick Manufacturing Co.
- Buckets:**  
Canadian Ingersoll-Rand Co., Ltd.  
Canadian Mead-Morrison Co., Limited  
The Electric Steel & Metals Co.  
R. T. Gilman & Co.  
Hendrick Manufacturing Co.  
Canadian Link-Belt Co., Ltd.  
Marsh Engineering Works  
Mussens, Ltd.  
MacKinnon Steel Co., Ltd.  
Northern Canada Supply Co.  
Fraser & Chalmers of Canada, Ltd.  
The Wabi Iron Works
- Buckets, Elevator:**  
Canadian Link-Belt Co., Ltd.  
Hendrick Mfg. Co.
- Cable—Aerial and Underground:**  
Northern Canada Supply Co.  
Standard Underground Cable Co. of Canada, Ltd.
- Cableways:**  
Canadian Mead-Morrison Co., Limited  
Fraser & Chalmers of Canada, Ltd.  
Mussens, Ltd.  
The Wabi Iron Works  
R. T. Gilman & Co.
- Cages:**  
Canadian Ingersoll-Rand Co., Ltd., Montreal, Que.  
Northern Canada Supply Co.  
Fraser & Chalmers of Canada, Ltd.  
The Electric Steel & Metals Co.  
The Mine & Smelter Supply Co.  
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The Wabi Iron Works

# MINING OPPORTUNITIES IN MANITOBA

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## Mineral Areas

Approximately three-fifths of the total area of Manitoba is Pre-Cambrian. In the Pre-Cambrian of Ontario, the well-known camps of Sudbury, Cobalt and Porcupine have been developed. In Manitoba, there was but little prospecting before 1912, when the Rice Lake Camp was opened up, and the Hudson Bay Railway gave access to the mineral areas in Northern Manitoba. Attention is being directed particularly to the Pas Mineral Belt and the Rice Lake Area, but prospecting is being carried on in the Cross and Pipestone Lake Area, the Oxford Lake, Knee Lake, God's Lake and Island Lake Area, and the West Hawk Lake, Falcon Lake, Star Lake Area.

## Development

Since 1915, development has been rapid in the Pas Mineral Belt. Twenty million tons of low-grade copper ore have been explored by diamond drilling at Flin Flon Lake and are now being actively developed under option. High grade copper is exported from Schist Lake to the smelter at Trail, B.C.; over seven million pounds of copper have already been realized. Other copper prospects are under development and the building of a smelter at the Flin Flon property will lead to the establishing of a large copper industry. Gold is now produced at Wekusko (Herb) Lake, and active underground development work is being carried on at Wekusko Lake, Copper Lake and in the Rice Lake District east of Lake Winnipeg.

## Transportation

Transportation is available to the Rice Lake Area by steamboat from Winnipeg to the Hole River, and thence by launch and Provincial wagon road. The Copper Belt is reached from The Pas by the Ross Navigation Co's. steamboats to Sturgeon Landing, thence by wagon road and canoe. Herb Lake is reached from Mile 82 on the Hudson Bay Railway (less than one day from The Pas.)

## Mining Regulations

The mineral resources are under Federal control and the Federal mining regulations apply to Manitoba. No mining license is required. Work to the value of \$100.00 a year must be performed for a period of five years on claims filed under the quartz mining regulations. The office of the Mining Recorder for the Rice Lake district is in Winnipeg, and for The Pas Mineral Belt at the Pas.

## Opportunities

The districts are comparatively new, and on the eve of substantial development. There are good opportunities at the present time for prospectors, mining companies, and particularly for development companies.

For maps, reports and general information, apply to—

**THE COMMISSIONER OF NORTHERN MANITOBA**  
THE PAS, MANITOBA.

## 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.  
Canadian Link-Belt Co., Ltd.  
Greening, B., Wire Co., Ltd.
- Chain Drives:**  
Jones & Glassco (Regd.)
- Chain Drives—Silent and Steel Roller:**  
Canadian Link-Belt Co., Ltd.  
Hans Renold of Canada, Limited, Montreal, Que.
- Chemical Apparatus:**  
Mine and Smelter Supply Co
- Chemists:**  
Canadian Laboratories  
Campbell & Deyell  
Thos. Heyes & Sons  
Milton Hersey Co.  
Ledoux & Co.  
Constant, C. L. Company
- Chrome Ore:**  
The Electric Steel & Metals Co.  
Everett & Co.
- Classifiers:**  
Mine and Smelter Supply Co.  
Mussens, Limited  
Fraser & Chalmers of Canada, Ltd.  
The Wabi Iron Works  
R. T. Gilman & Co.  
The Dorr Company
- Clutches:**  
Canadian Link-Belt Co., Ltd.  
Hans Renold of Canada, Limited, Montreal, Que
- Coal:**  
Dominion Coal Co.  
Nova Scotia Steel & Coal Co.
- Coal Cutters:**  
Osborn, Sam'l (Canada) Limited.  
Sullivan Machinery Co.  
Canadian Ingersoll-Rand Co., Ltd.
- Coal Crushers:**  
Canadian Mead-Morrison Co., Limited  
Canadian Link-Belt Co., Ltd.
- Coal Mining Explosives:**  
Canadian Explosives, Ltd.  
Giant Powder Company of Canada, Ltd.
- Coal Mining Machinery:**  
Canadian Rock Drill Co.  
Denver Rock Drill Mfg. Co., Ltd.  
Osborn, Sam'l (Canada) Limited.  
Canadian Ingersoll-Rand Co., Ltd.  
Sullivan Machinery Co.  
Marsh Engineering Works  
Hadfields, Ltd.  
Hendrick Mfg. Co.  
Fraser & Chalmers of Canada, Limited  
Mussens, Limited  
R. T. Gilman & Co.
- Coal and Coke Handling Machinery**  
Canadian Mead-Morrison Co., Limited.  
Canadian Link-Belt Co., Ltd.
- Coal Pockets:**  
Canadian Mead-Morrison Co., Limited.
- Coal Pick Machines:**  
Sullivan Machinery Co.
- Coal Screening Plants:**  
Canadian Link-Belt Co., Ltd.  
Canadian Mead-Morrison Co., Limited.
- Cobalt Oxide:**  
Coniagas Reduction Co.  
Everitt & Co.
- Compressors—Air:**  
Canadian Fairbanks-Morse Co., Ltd.  
Smart-Turner Machine Co.  
Canadian Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
MacGovern & Co., Inc.  
R. T. Gilman & Co.  
Fraser & Chalmers of Canada, Ltd.  
Mussens, Limited  
The Mine & Smelter Supply Co.
- Concrete Mixers:**  
Canadian Fairbanks-Morse Co., Ltd.  
Northern Canada Supply Co.  
Gould, Shapley & Muir Co., Ltd.  
MacGovern & Co., Inc.  
Mussens, Limited  
R. T. Gilman & Co.
- Condensers:**  
Canadian Fairbanks-Morse Co., Ltd.  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
MacGovern & Co., Inc.
- Concentrating Tables:**  
The Mine & Smelter Supply Co.  
Deister Concentrator Co.  
The Wabi Iron Works
- Converters:**  
Northern Canada Supply Co.  
MacGovern & Co., Inc.
- Conveyors—McCaslin Gravity Bucket:**  
Canadian Mead-Morrison Co., Limited.
- Contractors' Supplies:**  
Canadian Fairbanks-Morse Co., Ltd.
- Consulters and Engineers:**  
Hersey Milton Co., Ltd.
- Conveyors:**  
Canadian Link-Belt Co., Ltd.  
The Mine & Smelter Supply Co.  
Jones & Glassco (Regd.)
- Conveyor Belts:**  
Gutta Percha & Rubber, Ltd.
- Conveyor Flights:**  
Canadian Link-Belt Co., Ltd.  
Hendrick Mfg. Co., Ltd.
- Conveyor—Trough—Belt:**  
Canadian Fairbanks-Morse Co., Ltd.  
Canadian Link-Belt Co., Ltd.  
Hendrick Mfg. Co.  
Mussens, Limited  
Jones & Glassco (Roller, Belt and Chain)  
Hendrick Mfg. Co.  
The Wabi Iron Works
- Conical Mills:**  
Hardinge Conical Mill Co.
- Copper:**  
The Canada Metal Co., Ltd.  
Consolidated Mining & Smelting Co.
- Couplings:**  
Hans Renold of Canada, Limited, Montreal, 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.  
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Mussens, Limited

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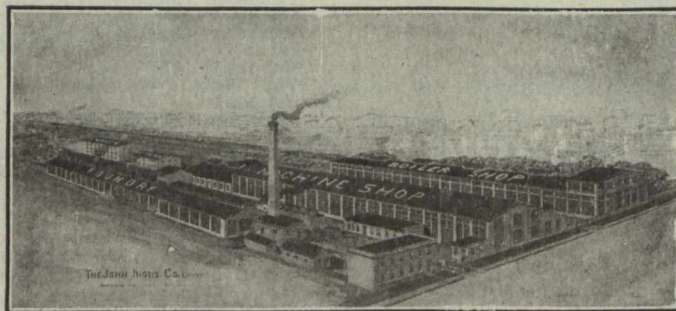
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## Canadian Miners' Buying Directory.—(Continued)

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Hadfields, Limited  
Fraser & Chalmers of Canada, Ltd.  
The Wabi Iron Works
- Cut Gears:**  
Hans Renold of Canada, Limited, Montreal, Que.
- Cyanide:**  
American Cyanamid Company.
- Cyanide Plant Equipment:**  
The Dorr Co.  
The Mine & Smelter Supply Co.
- D. C. Units:**  
MacGovern Co.
- Derricks:**  
Smart-Turner Machine Co.  
Canadian Mead-Morrison Co., Limited.  
Marsh Engineering Works  
R. T. Gilman & Co.  
Canadian Fairbanks-Morse Co., Ltd.  
Mussens, Limited
- Diamond Drill Contractors:**  
Diamond Drill Contracting Co.  
E. J. Longyear Company  
Smith & Travers  
Sullivan Machinery Co.
- Diamond Tools:**  
Diamond Drill Carbon Co.
- Diamond Importers:**  
Diamond Drill Carbon Co.
- Digesters:**  
Canadian Chicago Bridge and Iron Works
- Dies:**  
Canada Foundries & Forgings, Ltd.  
Hull Iron & Steel Foundries, Ltd.
- Dredger Pins:**  
Canadian Steel Foundries, Ltd.  
Hull Iron & Steel Foundries, Ltd.  
The Electric Steel & Metals Co.  
Hadfields, Limited
- Dredging Machinery:**  
Canadian Steel Foundries, Ltd.  
Canadian Mead-Morrison Co., Limited.  
Hadfields, Limited  
Hull Iron & Steel Foundries, Ltd.  
R. T. Gilman & Co.
- Dredging Ropes:**  
Allan, Whyte & Co.  
Greening, B., Wire Co., Ltd.  
R. T. Gilman & Co.
- Drills, Air and Hammer:**  
Canadian Ingersoll-Rand Co., Ltd.  
Canadian Rock Drill Co.  
Denver Rock Drill Mfg. Co., Ltd.  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Osborn, Sam'l (Canada) Limited.  
The Mine & Smelter Supply Co.  
Mussens, Limited
- Drills—Core:**  
Canadian Ingersoll-Rand Co., Ltd.  
E. J. Longyear Company  
Standard Diamond Drill Co.  
Sullivan Machinery Co.
- Drills—Diamond:**  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
E. J. Longyear Company
- Drill Steel—Mining:**  
H. A. Drury Co., Ltd.  
Hadfields, Limited  
International High Speed Steel Co., Rockaway  
Osborn, Sam'l (Canada) Limited.  
Mussens, Limited  
Swedish Steel & Importing Co., Ltd.
- Drill Steel Sharpeners:**  
Canadian Ingersoll-Rand Co., Ltd.  
Canadian Rock Drill Co.  
Denver Rock Drill Mfg. Co., Ltd.  
Northern Canada Supply Co.  
Sullivan Machinery Co.  
Osborn, Sam'l (Canada) Limited.  
The Wabi Iron Works
- Drills—Electric:**  
Canadian Fairbanks-Morse Co., Ltd.  
Sullivan Machinery Co.  
Northern Electric Co., Ltd.
- Drills—High Speed and Carbon:**  
Canadian Fairbanks-Morse Co., Ltd.  
Osborn, Sam'l (Canada) Limited.  
H. A. Drury Co., Ltd.  
Hadfields, Limited
- Dynamite:**  
Canadian Explosives  
Giant Powder Company of Canada, Ltd.  
Northern Canada Supply Co.
- Dynamos:**  
Canadian Fairbanks-Morse Co., Ltd.  
MacGovern & Company
- Ejectors:**  
Canadian Fairbanks-Morse Co., Ltd.  
Canadian Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.
- Elevators:**  
Canadian Mead-Morrison Co., Limited.  
Canadian Link-Belt Co., Ltd.  
Sullivan Machinery Co.  
Northern Canada Supply Co.  
Hadfields, Limited  
Fraser & Chalmers of Canada, Ltd.  
Jones & Glassco (Regd.)  
Mussens, Limited  
The Wabi Iron Works
- Engineering Instruments:**  
C. L. Berger & Sons
- Engines—Automatic:**  
Canadian Fairbanks-Morse Co., Ltd.  
Canadian Mead-Morrison Co., Limited.  
Fraser & Chalmers of Canada, Ltd.
- Engines—Gas and Gasoline:**  
Canadian Fairbanks-Morse Co., Ltd.  
Alex. Fleck  
Fraser & Chalmers of Canada, Ltd.  
Osborn, Sam'l (Canada) Limited.  
Sullivan Machinery Co.  
Gould, Shapley & Muir Co., Ltd.  
MacGovern & Co., Inc.  
The Mine & Smelter Supply Co.
- Engines—Haulage:**  
Canadian Ingersoll-Rand Co., Ltd., Montreal, Que.  
Canadian Mead-Morrison Co., Limited.  
Marsh Engineering Works  
Fraser & Chalmers of Canada, Ltd.
- Engines—Marine:**  
Canadian Fairbanks-Morse Co., Ltd.  
MacGovern & Co., Inc.  
Swedish Steel & Importing Co., Ltd.
- Engines—Steam:**  
Canadian Fairbanks-Morse Co., Ltd.  
Canadian Mead-Morrison Co., Limited.  
R. T. Gilman & Co.  
MacGovern & Co., Inc.  
Fraser & Chalmers of Canada, Ltd.
- Engines—Stationery:**  
Swedish Steel & Importing Co., Ltd.
- Engineers:**  
General Engineering Co., New York  
The Dorr Co.
- Ferro-Alloys (all Classes):**  
Everitt & Co.
- Feed Water Heaters:**  
MacGovern & Co.
- Fire Fighting Supplies:**  
Gutta Percha & Rubber, Ltd.
- Flashlights—Electric:**  
Spielman Agencies, Regd.
- Flood Lamps:**  
Northern Electric Co., Ltd.
- Flourspar:**  
The Consolidated Mining & Smelting Co.  
Everitt & Co.
- Forges:**  
Canadian Fairbanks-Morse Co., Ltd.  
Northern Canada Supply Co.
- Forging:**  
Canadian Mead-Morrison Co., Limited.  
Canadian Foundries and Forgings, Ltd.  
Hull Iron & Steel Foundries, Ltd.  
Smart-Turner Machine Co.  
Hadfields, Limited  
Fraser & Chalmers of Canada, Ltd.
- Frogs:**  
Canadian Steel Foundries, Ltd.  
Hull Iron & Steel Foundries, Ltd.  
John J. Gartshore
- Frequency Changers:**  
MacGovern & Co., Inc.
- Furnaces—Assay:**  
Canadian Fairbanks-Morse Co., Ltd.  
Lymans, Limited  
Mine & Smelter Supply Co.
- Fuse:**  
Canadian Explosives  
Giant Powder Company of Canada, Ltd.  
Northern Canada Supply Co.
- Gaskets:**  
Gutta Percha & Rubber, Ltd.
- Gears:**  
Hans Renold of Canada, Limited, Montreal, Que.  
Jones & Glassco (Regd.)
- Gears (Cast):**  
Hull Iron & Steel Foundries, Ltd.  
Canadian Link-Belt Co., Ltd.
- Gears, Machine Cut:**  
Canadian Fairbanks-Morse Co., Ltd.  
Canadian Steel Foundries, Ltd.  
The Electric Steel & Metals Co.  
The Hamilton Gear & Machine Co.  
Fraser & Chalmers of Canada, Ltd.  
The Wabi Iron Works
- Granulators:**  
Hardinge Conical Mill Co.
- Grinding Wheels:**  
Canadian Fairbanks-Morse Co., Ltd.
- Gold Refiners**  
Goldsmith Bros

## Canadian Miners' Buying Directory.—(Continued)

- Gold Trays:**  
Canada Chicago Bridge & Iron Works
- Hose (Air Drill):**  
Goodyear Tire & Rubber Co.  
Gutta Percha & Rubber, Ltd.
- Hose (Fire):**  
Goodyear Tire & Rubber Co.  
Gutta Percha & Rubber, Ltd.
- Hose (Packings)**  
Goodyear Tire & Rubber Co.  
Gutta Percha & Rubber, Ltd.
- Hose (Suction):**  
Goodyear Tire & Rubber Co.  
Gutta Percha & Rubber, Ltd.
- Hose (Steam):**  
Goodyear Tire & Rubber Co.  
Gutta Percha & Rubber, Ltd.
- Hose (Water):**  
Goodyear Tire & Rubber Co.  
Gutta Percha & Rubber, Ltd.
- Hammer Rock Drills:**  
Canadian Rock Drill Co.  
Denver Rock Drill Mfg. Co., Ltd.  
Osborn, Sam'l (Canada) Limited.  
Mussens, Limited  
The Mine & Smelter Supply Co.
- Hangers and Cable:**  
Standard Underground Cable Co. of Canada, Ltd.
- High Speed Steel:**  
Canadian Fairbanks-Morse Co. Ltd.  
H. A. Drury Co., Ltd.  
Osborn, Sam'l (Canada) Limited.  
Hadfields, Limited  
International High Speed Steel Co., Rockaway.
- High Speed Steel Twist Drills:**  
Canadian Fairbanks-Morse Co., Ltd.  
H. A. Drury Co., Ltd.  
Northern Canada Supply Co.  
Osborn, Sam'l (Canada) Limited.
- Hoists—Air, Electric and Steam:**  
Canadian Ingersoll-Rand Co., Ltd.  
Canadian Fairbanks-Morse Co., Ltd.  
Canadian Rock Drill Co.  
Denver Rock Drill Mfg. Co., Ltd.  
Jones & Glassco  
Canadian Mead-Morrison Co., Limited.  
Marsh Engineering Works  
Northern Canada Supply Co.  
Mine & Smelter Supply Co.  
Fraser & Chalmers of Canada, Ltd.  
The Electric Steel & Metals Co.  
The Wabi Iron Works  
R. T. Gilman & Co.  
Mussens, Limited  
Canadian Link-Belt Co., Ltd.
- Hoisting Engines:**  
Canadian Fairbanks-Morse Co., Ltd.  
Canadian Rock Drill Co.  
Denver Rock Drill Mfg. Co., Ltd.  
The Electric Steel & Metals Co.  
Mussens, Limited  
Sullivan Machinery Co.  
Canadian Ingersoll-Rand Co., Ltd.  
Canadian Mead-Morrison Co., Limited.  
Marsh Engineering Works  
Fraser & Chalmers of Canada, Ltd.  
The Mine & Smelter Supply Co.
- Hoisting Towers:**  
Canadian Mead-Morrison Co., Limited.
- Hose:**  
Canadian Fairbanks-Morse Co., Ltd.  
Gutta Percha & Rubber, Ltd.  
Northern Canada Supply Co
- Hose (Steam, Air, Water):**  
Gutta Percha & Rubber, Ltd.
- Hydraulic Machinery:**  
Canadian Fairbanks-Morse Co., Ltd.  
Hadfields, Limited  
MacGovern & Co., Inc.  
Fraser & Chalmers of Canada, Ltd.  
The Wabi Iron Works
- Industrial Chemists:**  
Hersey, M. & Co., Ltd.
- Ingot Copper:**  
Canada Metal Co., Ltd.  
Hoyt Metal Co.
- Insulating Compounds:**  
Standard Underground Cable Co. of Canada, Ltd.
- Inspection and Testing:**  
Dominion Engineering & Inspection Co.
- Inspectors:**  
Hersey, M. & Co., Ltd.
- Jacks:**  
Canadian Fairbanks-Morse Co., Ltd.  
Can. Brakeshoe Co., Ltd.  
Northern Canada Supply Co.  
R. T. Gilman & Co.  
Mussens, Limited
- Jack Screws:**  
Canadian Foundries and Forgings, Ltd.
- Laboratory Machinery:**  
Mine & Smelter Supply Co.
- Lamps—Acetylene:**  
Dewar Manufacturing Co., Inc.
- Lamps—Carbide:**  
Dewar Manufacturing Co., Inc.
- Lamps—Miners:**  
Canada Carbide Company, Limited  
Canadian Fairbanks-Morse Co., Ltd.  
Dewar Manufacturing Co., Inc.  
Northern Electric Co., Ltd.  
Mussens, Limited
- Lamps:**  
Dewar Manufacturing Co., Inc.
- Lanterns—Electric:**  
Spielman Agencies, Regd.
- Lead (Pig):**  
The Canada Metal Co., Ltd.  
Consolidated Mining & Smelting Co.
- Levels:**  
C. L. Berger & Sons
- Locomotives (Steam, Compressed Air and Storage Steam):**  
Canadian Fairbanks-Morse Co., Ltd.  
H. K. Porter Company  
R. T. Gilman & Co.  
Fraser & Chalmers of Canada, Ltd.  
Mussens, Limited
- Link Belt**  
Canadian Fairbanks-Morse Co. Ltd.  
Northern Canada Supply Co.  
Jones & Glassco
- Machinists:**  
Burnett & Crampton
- Machinery—Repair Shop:**  
Canadian Fairbanks-Morse Co., Ltd.
- Machine Shop Supplies:**  
Canadian Fairbanks-Morse Co., Ltd.
- Magnesium Metal:**  
Everitt & Co.  
Hull Iron & Steel Foundries, Ltd.
- Manganese Steel:**  
Canadian Steel Foundries, Ltd.  
The Electric Steel & Metals Co.  
Hadfields, Limited  
Osborn, Sam'l (Canada) Limited.  
Hull Iron & Steel Foundries, Ltd.  
Fraser & Chalmers of Canada, Ltd.  
The Wabi Iron Works
- Metal Marking Machinery:**  
Canadian Fairbanks-Morse Co., Ltd.
- Metal Merchants:**  
Henry Bath & Son  
Geo. G. Blackwell, Sons & Co.  
Coniagas Reduction Co.  
Consolidated Mining & Smelting Co. of Canada  
Canada Metal Co.  
C. L. Constant Co.  
Everitt & Co
- Metallurgical Engineers:**  
General Engineering Co., New York  
The Dorr Co.
- Metallurgical Machinery:**  
General Engineering Co., New York  
The Dorr Co.  
The Mine & Smelter Supply Co.
- Metal Work, Heavy Plates:**  
Canada Chicago Bridge & Iron Works
- Mica:**  
Everitt & Co.  
Diamond Drill Carbon Co
- Mining Engineers:**  
Hersey, M. Co., Ltd.
- Mining Drill Steel:**  
H. A. Drury Co., Ltd.  
Osborn, Sam'l (Canada) Limited.  
International High Speed Steel Co., Rockaway, N
- Mining Requisites:**  
Canadian Steel Foundries, Ltd.  
Dominion Wire Rope Co., Ltd.  
Hadfields, Limited  
Osborn, Sam'l (Canada) Limited.  
Hull Iron & Steel Foundries, Ltd.  
Fraser & Chalmers of Canada, Ltd.  
The Electric Steel & Metals Co.  
The Wabi Iron Works
- Mining Ropes:**  
Dominion Wire Rope Co., Ltd
- Mine Surveying Instruments:**  
C. L. Berger & Sons
- Molybdenite:**  
Everitt & Co.
- Monel Metal (Wire, Rod, Sheet and Foundry Metal):**  
International Nickel Co.
- Motors:**  
Canadian Fairbanks-Morse Co., Ltd.  
R. T. Gilman & Co.  
MacGovern & Co.  
The Mine & Smelter Supply Co.  
The Wabi Iron Works

## Canadian Miners' Buying Directory.—(Continued)

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

**Nails:**  
Canada Metal Co.

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

**Nickel Anodes:**  
The Mond Nickel Co., Ltd.

**Nickel Salts:**  
The Mond Nickel Co., Ltd.

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

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

**Oil Analysts:**  
Constant, C. L. Co.

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

**Ore Sacks:**  
Northern Canada Supply Co.

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

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

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

**Paints—Special:**  
Spielman Agencies, Regd.

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

**Permissible Explosives:**  
Giant Powder Company of Canada, Ltd.

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

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

**Pillow Blocks:**  
Canadian Link-Belt Company

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

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

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

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

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

**Platinum Refiners:**  
Goldsmith Bros.

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

**Powder:**  
Giant Powder Company of Canada, Ltd.

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

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

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

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

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

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

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

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

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

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

**Pumps—Diaphragm**  
The Dorr Company

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

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

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

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

**Railway Supplies:**  
Canadian Fairbanks-Morse Co., Ltd.

**Refiners:**  
Goldsmith Bros.

**Riddles:**  
Hendrick Mfg. Co.

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

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

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

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

## Canadian Miners' Buying Directory.—(Continued)

**Rope—Wire:**

Allan, Whyte & Co.  
 Dominion Wire Rope Co., Ltd.  
 Greening, B. Wire Co.  
 Northern Canada Supply Co.  
 Mussels, 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.  
 Mussels, 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.  
 Mussels, Limited

**Scales—(all kinds):**

Canadian Fairbanks-Morse Co., Ltd.

**Screens:**

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

**Screens—Cross Patent Flanged Lip:**

Hendrick Mfg. Co.

**Screens—Perforated Metal:**

Hendrick Mfg. Co.

**Screens—Shaking:**

Canadian Link-Belt Co., Ltd.  
 Hendrick Mfg. Co.

**Screens—Revolving:**

Canadian Link-Belt Co., Ltd.  
 Hendrick Mfg. Co.

**Scheelite:**

Everitt & Co.

**Separators:**

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

**Shaft Contractors:**

Hendrick Mfg. Co.

**Sheet Metal Work:**

Hendrick Mfg. Co.

**Sheets—Genuine Manganese Bronze:**

Hendrick Mfg. Co.

**Shoes and Dies:**

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

**Shovels—Steam:**

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

**Ship Bunkering Equipment:**

Canadian Mead-Morrison Co., Limited.

**Silent Chain:**

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

**Silent and Steel Roller:**

Canadian Link-Belt Co., Ltd.  
 Jones & Glassco (Regd.)

**Siline:**

Coniagas Reduction Co

**Saline Refiners:**

Goldsmith Bros.

**Smelters:**

Goldsmith Bros

**Sledges:**

Canada Foundries & Forgings, Ltd

**Smoke Stacks:**

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

**Special Machinery:**

John Inglis Co., Ltd

**Spelter:**

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

**Sprockets:**

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

**Spring Coil and Clips 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.  
 Mussels, 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.  
 Mussels, 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.  
 Mussels, 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.

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

**Transits:**  
 C. L. Berger & Sons

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

**Transmission Apparatus:**  
 Jones & Glassco (Regd.)

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

**Troughs (Conveyor):**  
 Hendrick Manufacturing Co.

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

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

**TTrucks:**  
 Canadian Fairbanks-Morse Co., Ltd.

**Tubs:**  
 Hadfields, Limited

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

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

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

**Turbines—Water Wheel:**  
 MacGovern & Co.

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

**Twincones:**  
 Canada Foundries & Forgings, Ltd.

**Uranium:**  
 Everitt & Co.

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

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

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

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

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

**Winding Engines—Steam and Electric:**  
 Canadian Fairbanks-Morse Co., Ltd.  
 Canadian Ingersoll-Rand Co., Ltd.  
 Marsh Engineering Works  
 Fraser & Chalmers of Canada, Ltd.  
 The Electric Steel & Metals Co.  
 Mussels, 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.

**Zirconium:**  
 Everitt & Co.

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

**Zinc Spelter:**  
 Canada Metal Co., Ltd.  
 Hoyt Metal Co., Ltd.

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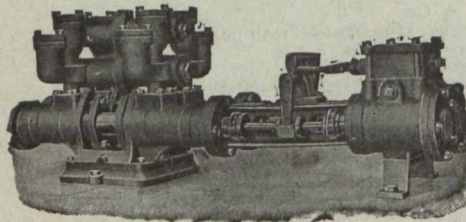
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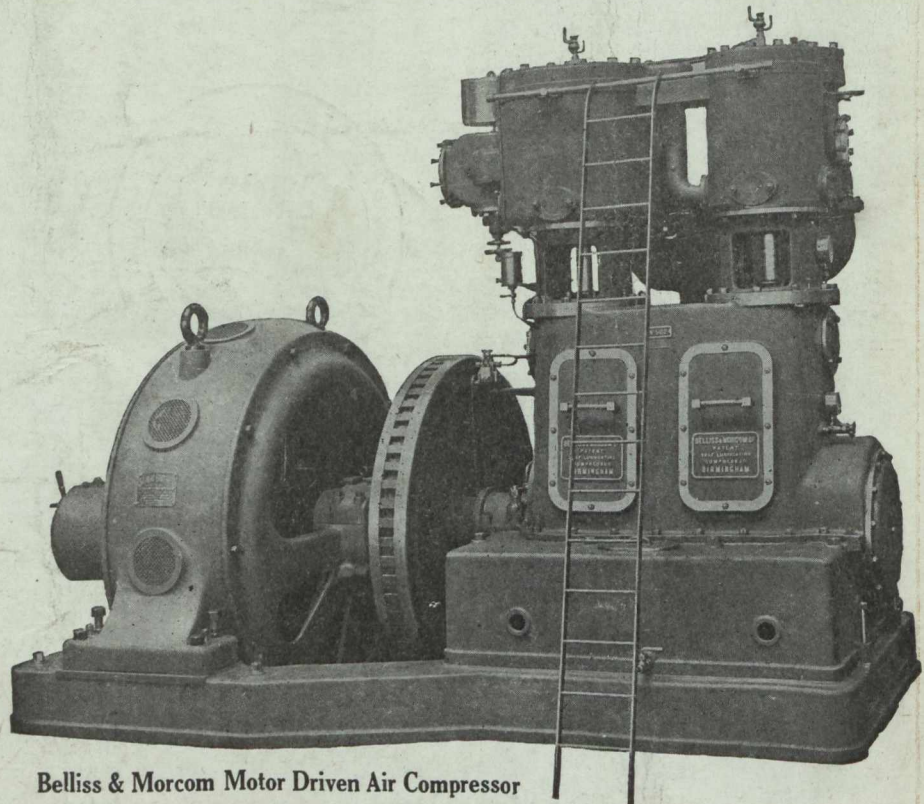
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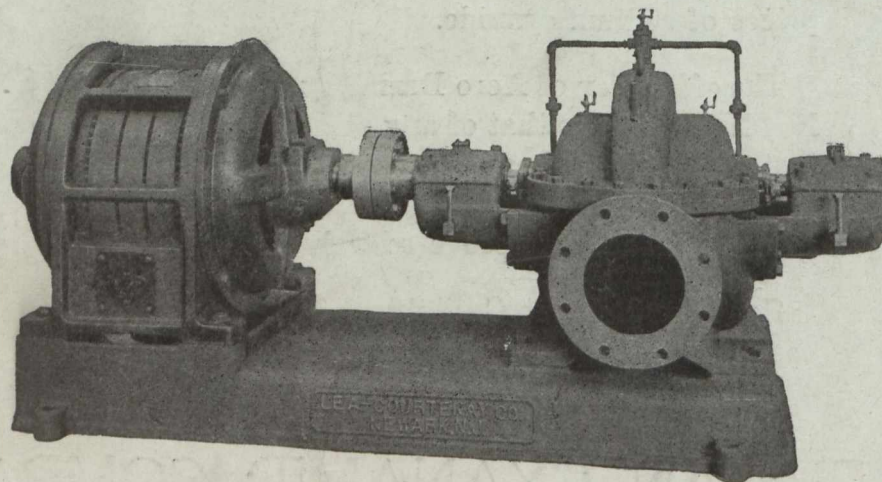
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