

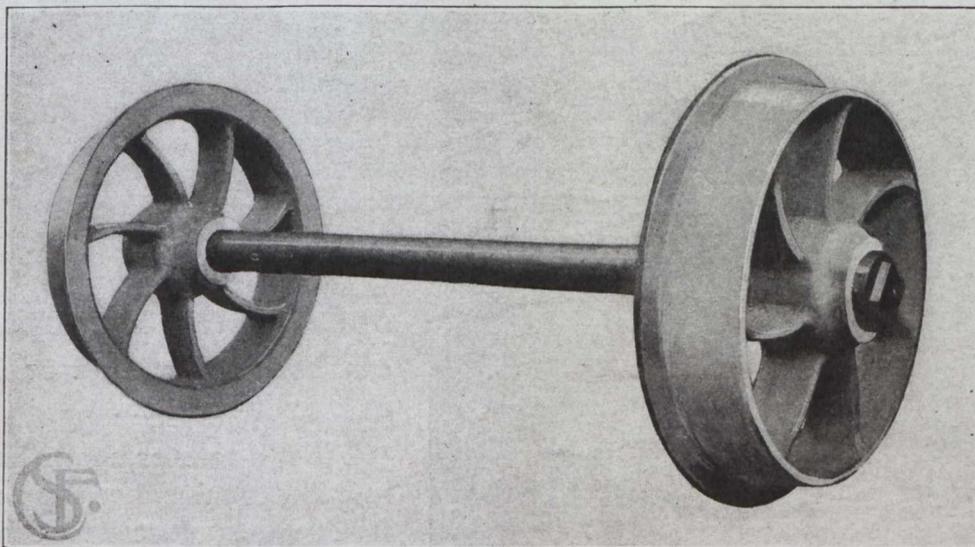
# CANADIAN MINING JOURNAL

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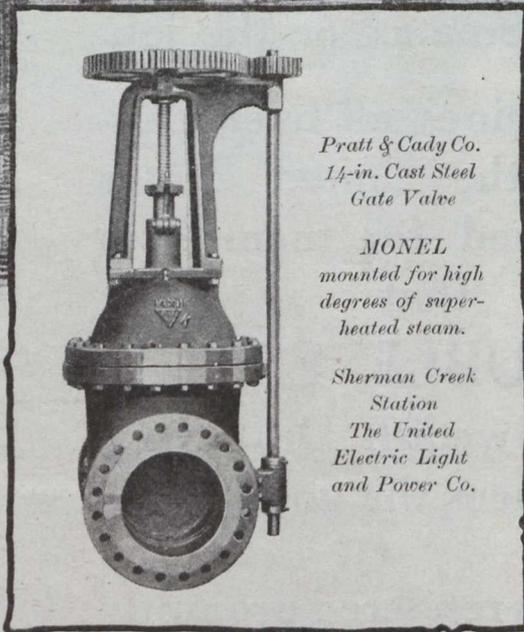
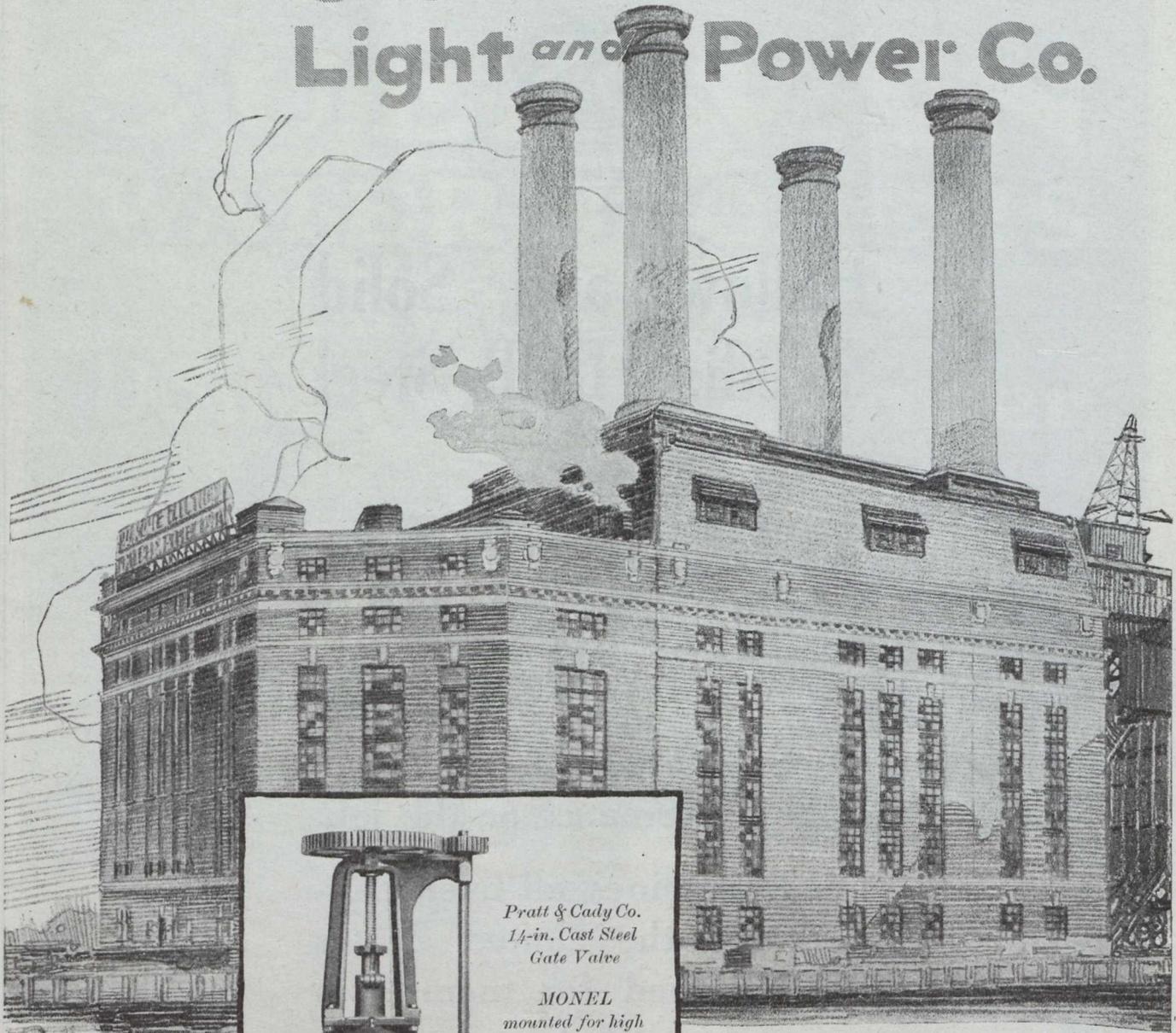
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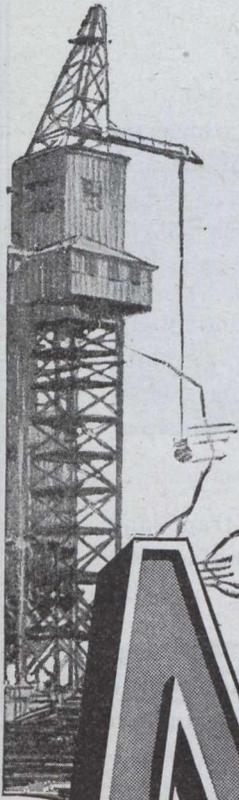
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# Ontario's Mining Lands

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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.

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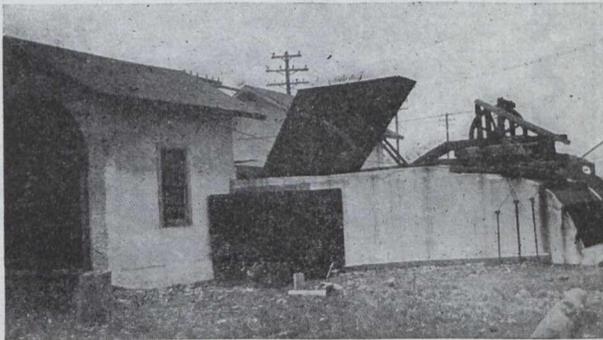
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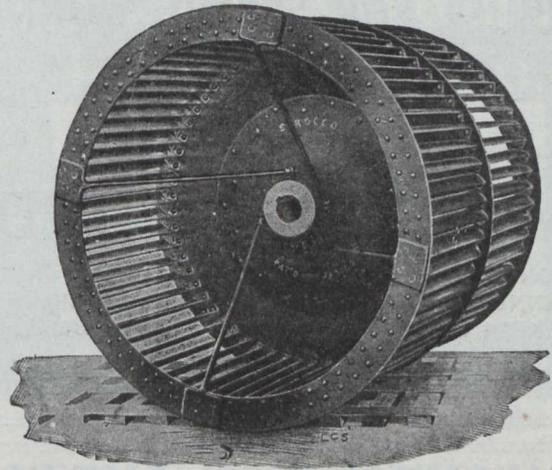
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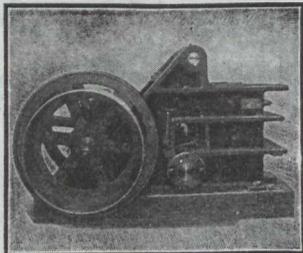
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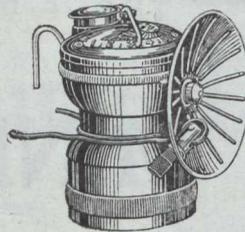
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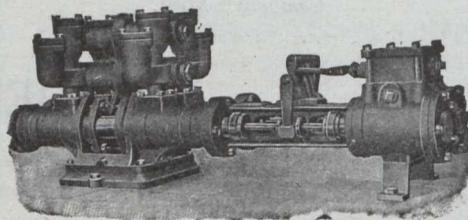
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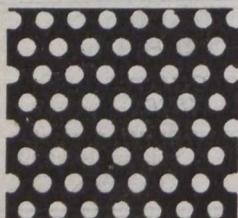
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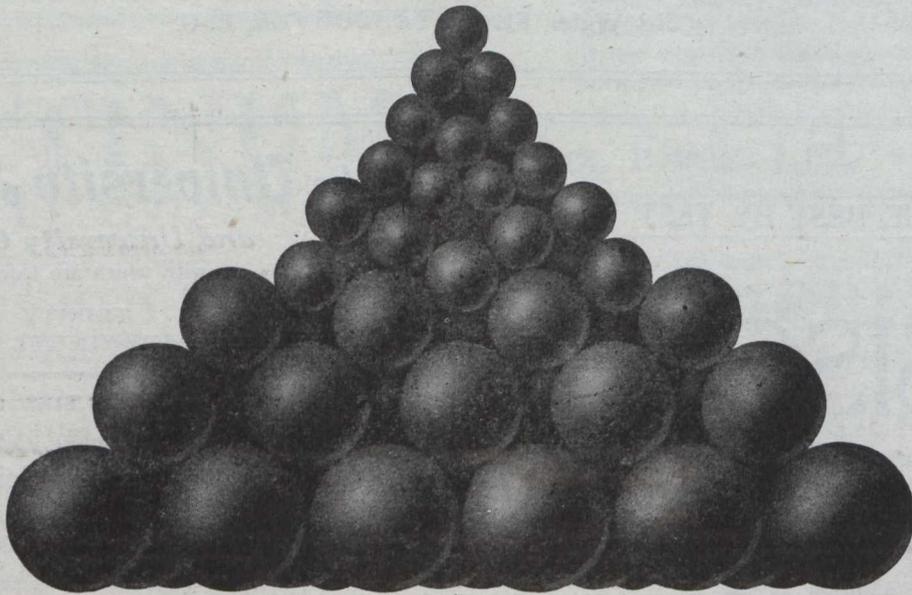
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VOL. XLI.

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No. 16

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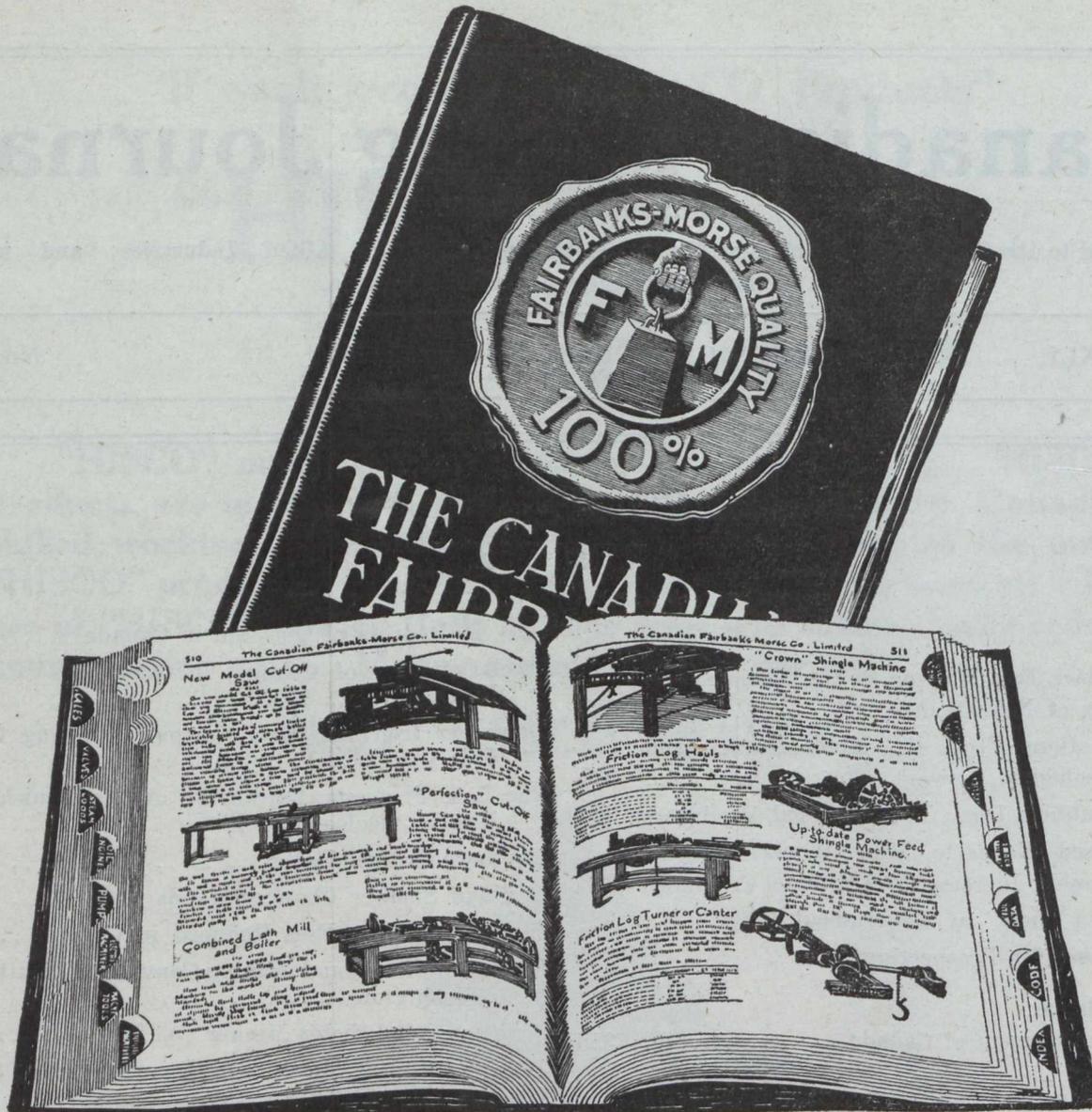
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## EDITORIAL

### The Glace Bay Meeting of the Mining Society of Nova Scotia

The Annual Meeting of the Mining Society of Nova Scotia promises to be unusually interesting this year. It is to be held at Glace Bay, the local capital of a district that has been producing coal for a century and has seen the mining and shipping of more coal than any other producing point in Canada. Among other claims for distinction possessed by Glace Bay is that it was the site of the first wireless call across the Atlantic, it being from Glace Bay that Marconi first talked with Poldhu Station.

A later, and more notable honor that attaches to Glace Bay and its immediate environs, is the large voluntary enlistment that took place during the war. While comparisons of enlistments and casualties are open to misconstruction unless very carefully worded, we believe that Glace Bay's record in this regard is an exceptionally proud one, and its results in the reduction of coal production have been and will continue to be very far-reaching.

Glace Bay is a name that will in years to come be very prominent in the transactions of mining societies, as in its immediate vicinity the future will see the most important developments of undersea mining in the world, so far as present knowledge of undersea coal deposits indicates. The long-distance underground transmission of electric current, the conveyance of

ventilating currents for distances and against resistances not now contemplated, the speeding up of the underground transportation of coal and materials; the carriage of workmen to and from the producing coal faces, and new problems in mine illumination and signalling, will all see great advances at Glace Bay. The distances from shore at which coal can be mined will, in the first instance be limited by economic factors, the chief of which will be the commercial value of coal. That this is a steadily rising value can be taken for granted. Nevertheless, it is probable that the cost of coal extraction from under the sea will set bounds to production before physical difficulties set the absolute limit. Sufficient is known today, however, to indicate that the old assumed limit of three miles from shore can be exceeded, and very possibly this limit can be doubled so far as physical considerations are concerned. In this connection, much interest will attach to the paper which is to be read by Mr. Walter Herd, the Mining Engineer of the Dominion Coal Company, on the application of hydraulic stowing to undersea coal workings, with especial reference to the Sydney coalfield. Probably no development of mining practice of recent years has such a bearing on the possible extent of undersea coal-mining as the feasibility, or otherwise, of hydraulic stowing.

### Resignations from the Mines Branch and Geological Survey

In this column last week, the frequency and number of recent resignations from the Mines Branch at Ottawa was commented upon, and it was mentioned that the work of certain divisions had been greatly reduced and in some cases may be expected to cease entirely because of the depletion of the staffs.

Mr. P. G. McConnell, the Deputy Minister, has recently stated before the Committee that is examining into expenditures on scientific work under government direction that in a few months half of the staff of the Mines Branch will have left that Department's service for private employment, because they feel "that scientific men are placed at a disadvantage in the government service, and are taking the only course open, namely, getting out to private work."

Mr. McConnell's summing up of the situation is exact. The question that interests the public is whether

Canada can afford to be deprived of the services of these trained scientists, who, in most instances, are leaving the service of the Government not because they are attracted by higher salaries, but because they cannot live, as professional men should live, on the salaries allotted to them.

A recent debate in the Senate on the scale of salaries that should be paid to scientific workers in government service was illuminating, inasmuch as it disclosed on the part of men who should know better, fundamental misconceptions on several matters that have from time to time been emphasized in this "Journal," namely, the importance of the work carried on by the technical departments of the Civil Service, the scale of remuneration that trained scientists are entitled to, and the possibility of filling the vacant places caused by resignations. The average salary paid to

servants of the Mines Branch and the Geological Survey is respectively \$1,904 and \$1,884 per annum. In the upper divisions of the two branches, which includes the technical employees, the annual salary averages in the case of the Mines Branch \$2,158, and in the case of the Geological Survey, \$2,156. The maximum salary in the Geological Survey is \$3,700, and in the Mines Branch, \$3,500.

When it is possible for men who have achieved sufficient distinction in public life to be made senators to maintain that such salaries as these are adequate, that the country cannot afford to pay more, and that the places of men who refuse to give their services any longer for such indecently inadequate payment can without difficulty be filled, it must seem that further resignations cannot be avoided. It also follows that

if the country places such a low estimate on the work of the technical department of the Civil Service it will reap correspondingly poor results. Parsimony at the source of national wealth and progress is wrongly applied. The encouragement of mediocrity, timidity, lack of faith in one's country, ingratitude and miserliness proceeding from ignorance, have not hitherto been characteristics of the Canadian people. We believe they are alien to the Canadian spirit, and constitute the negation of progress. In the public interest, Mr. McConnell's frank statement is to be welcomed. If the Canadian public understood how vitally the future of the country was imperilled by the justifiable dissatisfaction of technical civil servants at this time there would be a speedy readjustment of official attitude at Ottawa.

## The Public's Duty Towards Coal Producers

"Coal Age" of New York, in a recent issue, summarises the majority report of the Commission that has recently considered the problem of coal production, distribution and sales in the United States, and points out some conclusions of this Commission which parallel strikingly the reasons given by the Editor of the "Journal" for the comparative failure of the coal trade in Canada, in a paper recently read at the Canadian Mining Institute meeting in Toronto.

Our contemporary writes: "The consumer of coal is told bluntly that most of his coal troubles are his own fault, springing from the fact that he has been heedless of his duty to the men who dig and ship his coal." The Commission points out the evils of high demand in Winter and no demand in the Summer, and says unhesitatingly "that the railroads, the iron and steel producers, the public utilities and other big consumers of coal must shoulder the responsibility for these conditions. It condemns frankly "the traditional coal purchasing methods of the railroads," and "Coal Age" remarks that "this way of telling the public of its own shortcomings and advising it to remedy its own faults instead of choosing fantastic theories of economic betterment seems strangely new and refreshing."

The high prices of coal today is a consequence, in large part, of the hostile attitude of the people and large purchasing interests towards coal operators in the past. The United States Commission finds that all the bituminous coal producers in the United States in 1918 made only 9.72 per cent on their investment, while "the companies reporting very high rates of return upon investment are all small concerns with investments of only a few thousand dollars, whose net income represents to a large extent the earnings of the owners for their own labour and management." The same might be said of Canadian coal producers,

except that it would be difficult to find in Canada, even in 1918, a coal company that made ten per cent on its investment.

For example, the price of coal to the consumer in the Sydney, Nova Scotia, district is today seven dollars per ton. During at least fifteen years, from 1900 to 1915, the price of coal in this locality remained stationary at three dollars per ton. At that figure the operators did not realize a return on their investment which would permit of the accumulation of proper financial reserves, nor is it probable that in this fifteen year period the business of mining coal in Nova Scotia yielded an average of five per cent to the operator. The attitude of the public was so hostile, and that of the railways so short-sighted, that the operators did not dare to face the full truth of their own cost-sheets, and they for years sold coal at a price which recouped them for the immediate expenditure of wages and purchases of material, but did not include the provisions for amortization, depreciation, depletion of areas and rising costs of production that were just as properly a part of the costs of mining coal as were labour and material charges. Today, the consumer must pay for undercharges of the past, and he must also, unless worse things are to follow, pay a proper actuarial proportion of the costs of the future. It is all very well to load posterity with debt, but the public today happens to be the posterity of an indifferent, non-understanding and hostile past.

To those who have had the direction of coal mining operations know what labour and thought are needed to take a half-cent per ton off the producing cost. They have had the pleasure of learning in recent years, through the investigations of fuel administrations, that the profit of the coal producer is as nothing compared with the "spread" of the coal merchant and the distributing agencies. They have seen the local coal-

hauler add more to his charges in a day than the coal operator added in years, and the conviction is spreading among coal operators, that, as was pointed out in the "Journal" some years ago, the coal operator must, in self-defence and for the protection of the public, himself control the sale and distribution of coal from the pit-mouth until it is landed in the cellar of the ultimate consumer. As an example of waste of effort and generally misdirected energy, take the case of most Canadian towns, where coal is hauled in half-ton carts to consumers' cellars through snow and mud, when, if ordinary common-sense were applied to the question, it could be transported at a moiety of the cost, in large motor-truck consignments, under Sum-

mer conditions. Ten cents a ton off the cost of production would send a mine manager crazy with joy, but a good many times ten cents is thrown away by antiquated methods of delivery little in advance of the bullock cart. Why should all the efforts of the mining engineer, mine accountants, machinery experts, and the provision of devices for utilising refuse coal and saving all the possible by-products of the industry be nullified as soon as the colliery confines are passed by a system of coal distribution whose chief characteristics are waste, duplication of effort, misdirected energy and general confusion, interspersed by excellent opportunities for discerning persons to make a few dollars in the confusion.

### Increased Wages to Mine Workers Cause Double Increase to the Ultimate Consumer

One of the least understandable contentions put before the public in connection with the selling price of coal is that it is possible for substantial wage increases to be given to the mineworkers without necessitating any increase in the price to the consumer. It has been suggested that an increase in wages at the source of coal supply can be minimised by larger production and economics until a vanishing point is reached with the arrival of the coal in the bins or cellar of the ultimate consumer. Nothing could be more misleading. The effect of a wage increase upon the selling price of coal must always be "crescendo" and never "diminuendo." One of the most unjust statements we have recently seen is a warning put out by a government official in the United States against profiteering in coal which intimates that the increased cost of coal to the consumer will be limited to the increased amount of wages given to the mine workers.

The mine-workers in the United States have been given an increase of 27 per cent in wages. To illustrate how this will work out, take as a concrete example a colliery raising 2,000 tons of coal per day, with a labour cost before the increase of one dollar per ton.

2,000 tons at one dollar . . . . . \$2,000  
 Increase in wages of 27 per cent . . . . . 540

As a result of the increased wages paid to the mine-workers there will be an immediate rise in the cost of materials secured locally, such as horse-feed, pit-timber, and in all incidental costs of hauling, machine-shop work. This increase can be conservatively placed at five cents a ton. There will be a much greater ultimate increase, as eventually all the increased cost of wages will come back upon the purchase price of metal supplies, wire ropes, mine cars, oils, etc., but this rise will be gradual, and cannot be figured accurately as to immediate effect.

Added to the previously mentioned costs, we now obtain . . . . . \$2,640.00  
 Divided by 2,000 tons, or, per ton . . . . . 1.32

A colliery of this size will use for its own consumption, at boilers, for heating and yard transportation, say 200 tons daily. The extra cost of coal to fires will be therefore \$64.00, being 2,000 tons at 32c per ton.

The price of coal to employees will remain constant, so that the increased cost must be recouped from an addition to the cost of production. Assuming the number of householders to be 125, which would be about right for a colliery of this extent, and consumption of coal at two tons monthly per household, there will be about ten tons daily, or say three dollars to be added to mine cost. The sum of these additions is \$2,707.00, equal to a cost per ton of \$1.35.

It is assumed that the production under increased wages will remain unimpaired, but it is well known that contract workers usually have before them a certain daily earning, which consciously, or unconsciously, they do not exceed. The history of wage increases has been that a decrease in the output of the contract worker follows. Should this be the case, the cost per ton will be increased by much more than the amount instanced.

The coal operators must charge the railways more for coal under these circumstances, which we will estimate will increase the cost of coal transportation to market by five cents per ton. As the wholesaler does business on a percentage basis, his spread on the handling of coal to the retailer will be necessarily increased by at least two cents per ton. The retailer, who must take a larger percentage, will probably have to add another five cents, and the teamster who deposits the coal in the cellar will be moderate if he does not add more than three cents per ton. Addition of these cumulative increases, all small, but we believe all unavoidable, will bring the original 27 cents per

ton up to 50 cents, without any additional revenue to the coal operator.

Nothing is said of the case of the railways, who will shortly after the increase to the miners becomes effective, have to face a demand for increased wages from the railway employees, on the plea of dearer coal, and will also, as mentioned, have to pay more for locomotive coal.

The foregoing considerations have been confined to labour costs, but there are many other costs on the colliery sheet which will be affected by the wage increase, such as rates and taxes, insurance costs, compensation costs, and other fixed charges, and eventually every item of material, everything that depends on freight rates, administrative and executive charges, will be increased, too probably accompanied by a decreased production.

The foregoing is not intended as an example of the vicious circle, about which we have heard ad nauseum, but as concrete example of how a 27 per cent increase to the miner will, before it reaches the consumer, become a 50 per cent increase, despite all the pious hopes of the profiteer hunters, without benefiting anyone permanently, the miner himself not excluded.

There is no help for this condition of affairs apparently, but the officials of the United States Government should not add insult to injury by suggesting through the press that it is possible for coal operators to absorb the cost of wage increases out of their profits, or to confine the increase to the consumer to the actual amount of increase obtained by the miner. It cannot be done.—From "Iron and Steel of Canada".

#### "CLOSED SHOP" BY GOVERNMENT EDICT.

The "Edmonton Bulletin" has the following:—

"Our so-called Minister of Labor has started to enforce his edict that no one may work in a mine in Alberta unless he belongs to the United Mine Workers. The first fruit of his enterprise in that direction is that four mining camps in the province are shut down, with more results of the same kind likely to follow the further extension of his mischievous interference. Autocratic measures can be carried a good way in Canada. But when it is attempted to compel men to join a labor union the point is reached where such measures ought to fail, and are likely to fail. Any man who can dig coal, and who is willing to do so, and to behave himself, ought to be allowed to work in a mine—so far as the law is concerned—without asking the consent of the United Mine Workers and Senator Robertson. And the people of Alberta are entitled to have coal to burn whether or not the men who dig it have the approval of this alien labor organization and the irresponsible head of the labor department. If the Minister of Labor cannot do anything to get men to labor he at least might stop preventing men from

laboring at a time when increased production is so desperately needed."

In our January issue we expressed the belief that the enforcement of the "closed shop" by Government edict was new, and also very dangerous, because based on a fundamentally erroneous principle. The problem of the O.B.U. in the West was, and is, no doubt a very anxious one, but not even the most pressing problems can condone expediency, nor can it ever come about that the violation of a first principle of citizenship can ever bring in its train anything but harmful results. The Minister of Labour, or any other person in office, has no right to enforce membership in an organization upon any man. He might just as properly dictate the cut of his clothes.—From "Iron and Steel of Canada".

#### AIRPLANES FOR PROSPECTING.

In a recent number of the "Engineering and Mining Journal" attention is called to the great undeveloped northern areas of Canada which may reasonably be expected to prove productive of minerals, and it is suggested that airplanes might be advantageously used in exploration. Many who have slowly traversed the northern wilderness have longed for the power to fly like the birds, and the great impetus given by the war to aviation has made it seem likely that the explorer's dream may soon come true. We are particularly favored in Northern Canada owing to the presence of numberless small quiet lakes that would make splendid stopping places for airplanes of the "boat" type.

Those who have made enquiries concerning the cost of operating airplanes, are not inclined to believe that there will be much flying over our northern woods for some years yet. There are, however, special occasions when the advantages gained might compensate for the cost and we may expect to hear soon of exploring parties starting off in the early Summer by airplane for districts that are otherwise very difficult of access. It is to be expected, however, that the spirit of adventure and the pleasure of exploring new fields will for some time be more effective in luring the aviators than will comparisons of transportation costs and the saving of time on the journey.—R.EH.

Mr. Balmer Neilly, Secretary of the Ontario Mining Associations, has left Cobalt, where he has been a resident for many years, for Toronto, and he will immediately open the permanent office of the newly formed Association.

Mr. Neilly was manager of the Penn-Canadian Mines and is a past-President of the Timiskaming Mine Managers' Association. He is also a vice-President of the Canadian Mining Institute.

Mr. J. B. Tyrrell, of Toronto, Canada, has been engaged by the National Mining Corporation of London, England, as one of its Consulting Engineers.

## Correspondence

### THE GOVERNMENT OF CANADA

The Editor of the  
"Engineering and Mining Journal"  
New York.

In the March 6 issue of Engineering and Mining Journal, page 595, under the title "Canada's Alleged Autonomy," I note with interest the statements made regarding Canada's status as a nation, and as many of the statements are incorrect, I take the liberty of writing you on the subject.

There is still considerable misconception in republican countries on the Canadian system of government, and, among uninformed sections of the people, a fairly general opinion still exists that the Dominion, forming part of the British Empire, with a monarch at its head, is necessarily subject to autocratic rule, or at least, very much at the dictates of the Colonial Office in London. Nothing is farther from the truth, as residents of the Dominion who have come from all quarters of the globe could testify, and though maintaining her place as an integral part of the Empire, Canada is absolutely self-governing, and its government second to none in its democratic traits. Canada is a nation, and her status, as such, was plainly asserted and recognized at the Peace Conference, and she is accorded a voice among the nations of the earth. Though spontaneously her loyalty to the Empire took her into the war immediately upon England's declaration, she entered as an independent nation, and was under no compulsion to enlist her forces or resources.

Canada is a self-governing British Dominion, with a responsible government, which means that the will of the people is absolute in the matters of government, and that the Governor General, the King's representative in the country, must form his executive council or cabinet from the members of Parliament who can command the support of the majority of members of the House of Commons, the house, which in practice, has sole control of the powers of taxation and appropriation. It means that the political executive of the day resigns its executive functions whenever it ceases to possess the confidence of the people.

The Dominion of Canada is under responsible government in the fullest meaning of the term, and in the internal affairs of the country there can be no uninvited interference by Great Britain, whether by Parliament at Westminster, the Colonial Office, or the Governor General. Recognition of this fact is the fundamental principles of the relations between Great Britain and the overseas Dominions. The Imperial Parliament has far less to do with the internal affairs of Canada than, for instance, Congress has to do with the internal concerns of the several states of the Union. Relations between Great Britain and Canada are not those of domination on the one hand, of subserviency on the other, but as between nations equally free to do as they will.

Before the confederation of the Dominion in 1867, there was a Governor-General, established at the capital of the United Provinces, and a Governor in each of the then other provinces of British Columbia, Nova Scotia, and Prince Edward Island. They were all appointed by the crown at the recommendation of the

Colonial Office. By the British North America Act, however, though the office of Governor-General was continued, governors of the separate provinces ceased to exist, and for them were substituted lieutenant governors—invariably Canadians—appointed by the Governor-General in council.

The Governor-General and the lieutenant-Governors of the provinces are the sole representatives of the King in Canada, and the appointment of the former, which is always done with the approval of the Dominion Government, is the only civil designation made by the crown. These men have absolutely no influence on the Government and its policies, and, directly or indirectly, do not affect the every-day life of the Dominion, its policies, standard, or ideals, as much as, for instance, any Canadian newspaper editor. The Governor-General is the material link with the Imperial Government, and is only interested in the smooth and continuous running of the Government. The only voice of the country is that of public opinion as expressed at the polls at the periodical elections.

The people of Canada elect their own governments, make their own laws, and control all their own political affairs. All matters of taxation are entirely in their own hands, and Great Britain has no more control over them in this regard than it has in the imposition of a tax on the people in the United States. Canada, though a loyal dominion of the British Empire, as the recent war most clearly evidenced, maintains her place among the nations as responsible and self-governing; and pursues the way of democracy untrammelled by autocratic bonds or extraneous hindrances to her people government.

In this question it is interesting to read the Prince of Wales' remarks at a recent banquet tendered him in Ottawa. Speaking on his relations to Canada, he says: "Canada, like the other British dominions, played such a big part in the war that she has in consequence entered the partnership of nations and has affixed her signature to the peace treaties. This means that the old idea of an empire, consisting of a mother country, surrounded by daughter states, is entirely obsolete and has long been left behind by the British Empire. Our empire has now taken a new and far grander form. It is now a single state, composed of sister nations of different origins and different languages. The British nation is the largest of these nations, but the younger nations have grown up to its equals, and Great Britain, like the dominions, is only one part of the whole.

In view of the facts, as set out in the foregoing, I trust, in fairness to this country, you will be disposed to publish this letter, as you have published statements of Mr. Thompson, in the article referred to.

NORMAN S. RANKIN,

Montreal, Canada, March 27, 1920.

The "Journal" welcomes Mr. Rankin's satisfying reply to Mr. Phillip Thompson's letter in the "Engineering and Mining Journal" of New York, which found fault with our statement that Canada was a self-supporting, sovereign, autonomous nation. If there are persons who doubt that this is Canada's status, it is, as previously remarked, only possible to express surprise. An established fact does not permit of argument.—Ed.

# The Importance of Cool Dry Compressed Air in Mining

A Discussion of Some of the Troubles Caused by Moisture in Compressed Air and how They may be Overcome.

By F. A. McLEAN.

## The Evils of "Wet" Air.

Moisture in compressed air should always be avoided, especially where it is to be used to operate reciprocating or rotating mechanisms, on which it has a pernicious effect when carried into the working parts, tending to wash away the lubricant; thereby increasing the wear and shortening the life of the moving parts through leaving highly finished and closely fitted surfaces bare, and in sliding or rolling contact with each other. While this is true of practically all air compressed machines, it is particularly so in the case of those operating at high speeds, such as hammer drills, pneumatic tools, motor-driven air-hoists, sand rammers and the like, in which the surfaces exposed to wear are of necessity limited in size as well as machined to very close limits, and wear is particularly objectionable on the ground of lowered economy through increased air consumption and loss of power.

While moisture in wet air is bad enough in interior piping, its effects are likely to be far worse out of doors in open-cut mining, quarrying, contracting, switch and signal work, etc., where it is likely to collect at low points in the system, causing water hammer, with consequent racking effect on the joints, and loss of power through reduction of the air passages, as well as increasing the danger of freezing and bursting of the pipes during cold weather. The low temperature caused by the rapid expansion of the air from the exhaust of rock drills, pneumatic hammers and other air-operated devices will often freeze the moisture, clogging the exhaust openings, and preventing their efficient operation.

Time is generally an important factor in mining operations and losses in this respect are usually of more importance than in other directions. It is, therefore, essential that the proper precautions be taken to ensure freedom from interruptions which are too often caused by freezing of the pipe lines or drills. In a case of this kind which came to the writer's attention late last fall, operations at a large eastern mine were held up and the miners forced to sit around and "swap" stories for two hours while waiting for the pipes to be thawed out and this did not happen on a cold day either, although it was damp and muggy.

## The Importance of Cool Compressed Air.

Air discharged from the cylinder of a compressor is hot in comparison with the atmosphere and on entering the supply pipe-lines heats them to some extent. This heating effect, travelling further along the pipe lines with the continued operation of the compressor, causes them to expand gradually, with the result that when the compressor is shut down for the night, in the cooler atmosphere they are subjected to an equivalent but more violent contraction. Although this effect may not be readily noticeable, it is likely to result in strained and loosened joints, with consequent loss of efficiency through leakage.

## Aftercoolers—The Remedy.

It is a well known fact that atmospheric or free air always carries moisture (the amount varying with meteorological conditions in different localities) and

also has the capacity to absorb more up to the time that its saturation point is reached.

The moisture carrying capacity of air increases rapidly with rises in its temperature, and decrease, but not quite so rapidly, with increases in pressure. As the pressure will always be at the highest point just as the air is leaving the compressor, if we can reduce its temperature to the lowest point, the air will be in a position to give up so much of its moisture that there will be little or none left to cause trouble when lower pressure and mayhap higher temperatures are reached further along the line. It is thus evident that the remedy for these conditions lies in reducing the temperature of the air after it leaves the compressor and often before it enters the pipes, to as low a point as possible, which will not only prevent all of these troubles, but will ensure better all-round distribution efficiency as a whole. Some cooling takes place in the intercooler of a compound or stage compressor, and with the larger and better designed inter-coolers used on modern compressors, more of the moisture is removed by this means than was possible with the older types. The air receiver also cools the air to some extent, and serves as a receptacle for the collection of moisture from the air which passes through it, and for this reason is fitted with cocks by which the moisture can be drawn off at intervals.

In the simplest form of compressed air power plant, the receiver is the only means of removing moisture from the air that is employed. Too much reliance should not be placed on the receiver for this purpose, however, as when located close to the compressor, as it should be; and the consumption of air is heavy, the temperature of the receiver shell will usually be such that little or no condensation can occur. In some cases, the temperature of the receiver becomes so high that oil carried from the compressor cylinder becomes ignited, causing serious fires or explosions. It is, therefore, better to depend on some means of cooling and drying the air after it has left the compressor, and before it enters the receiver and supply lines, and this is where the after-cooler "fits in".

## What The Aftercooler Will Do.

Aftercoolers cool and dry the air more thoroughly than is possible with the best type of receiver, and so reduce to a minimum the troubles which follow the use of wet air, and in addition remove some of the oil which might be carried into the receiver and perhaps to the pipe lines, to the detriment of the air-supply hose. While clean air is of considerable importance in open-cut mining, quarrying and contracting, it is especially so in tunnels and shafts where oil in the exhaust of rock drills or coal cutters tends to vitiate the air.

One of the principal functions of an air receiver is to compensate for the pulsating effect of each stroke of the compressor piston and prevent rapid fluctuations in the air pressure. For this reason the receiver should have sufficient capacity to prevent any material rise in the receiver pressure by the volume of air forced into it at each stroke of the compressor piston.

If the air is allowed to pass directly into the supply pipes there will not be sufficient space for its immediate accommodation and the pressure will momentarily run up far in excess of the average pressure in use accompanied by a periodic acceleration of flow. This results in an increase in the frictional resistance of the pipes and at the end of each stroke the compressor piston is required to force the air out of the cylinder against a pressure temporarily greatly in excess of normal, increasing the power consumption and putting an unnecessary strain on the compressor. In a single cylinder compressor the discharge pulsations are more violent than in stage compressors, as the total discharge must take place from a cylinder of larger diameter in a smaller portion of the stroke than is the case with the high-pressure cylinder of a multi-stage compressor where the discharge valves open earlier in the stroke and the diameter of the air pipe is about one-half of that of the cylinder. In this respect the installation of the aftercooler, since it increases the available receiver capacity, will be of considerable benefit, especially in intermittent work, such as running rock-drills, pneumatic tools, hoists, etc., and will assist the governor or regulator of the compressor in maintaining a steadier pressure.

**Construction of the Aftercooler.**

Aftercoolers usually consist of a cylindrical steel shell with cast-iron heads supported on cast foot-pieces and surrounding a nest of iron or brass tubes, the ends of which are either expanded or fitted with copper ferrules and caulked into steel tube plates at each end of the casing, provision is made for expansion and contraction. Water enters the lower set of tubes, traverses each row and leaves at the top of the shell, while the air enters and leaves at the top surrounding the tubes in transit, and travelling in a direction opposite to the water. Baffle plates are arranged so as to cause the air to cross and recross the tubes several times. An open funnel is generally placed in the water discharge to show the amount of water flowing and facilitate its adjustment. The moisture collected from the air is prevented from escaping with it by a plate in front of the air-discharge opening.

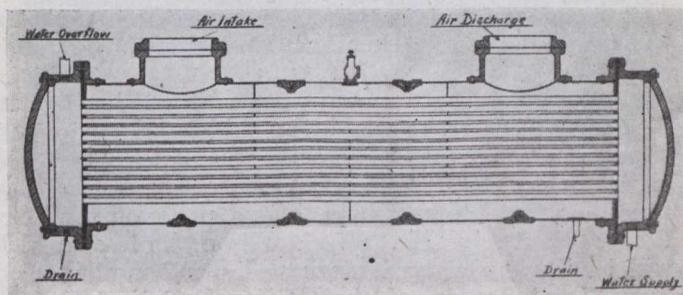


Fig. 1.

There is some difference of opinion as to the respective merits of iron and brass tubes for this class of service. Brass is a better conductor of heat than iron, but on the other hand, galvanized iron tubes are usually rougher and present more surface to the air so that there is probably little or no difference between them in cooling effect. Vertical aftercoolers are sometimes preferred on account of the smaller floor space which they occupy, but aside from this, there is no reason for using one style in preference to the other. While aftercoolers of different makes vary in minor details the essential principles of all are the same and

their construction will be more readily understood by referring to Fig. 1.

**Sizes and Capacities.**

Aftercoolers are usually equipped with pressure gauge, safety valve, flanged pipe connections, water fittings and drain cocks. When properly designed and supplied with the requisite amount of water they will readily reduce the temperature of the air passing through them to within 15 or 20 degrees of the entering cooling-water. The temperature and quantity of the latter required depends on the cooling effect desired. The following figures, which are based on good cooling results with air at 80 to 100 pounds gauge pressure when compressed by a two stage machine, will be found accurate for use with aftercoolers of the type described:

Temperature of Cooling water	Gallons per hour per 100 cu. ft. of Actual free air per min.
50 degrees Fahr.	120
60 " "	150
70 " "	180
80 " "	210
90 " "	240

Aftercoolers are made in a number of different sizes, the capacity of which varies with the temperature of the cooling water and whether the air to be cooled is obtained by single or multistage compression. This point will be seen more clearly by examining the table in Fig. 2, giving the sizes and capacities of Ingersoll-Rand Aftercoolers.

An aftercooler may be suspended from the ceiling or mounted on, or under, the floor, as may be most convenient from the standpoint of economy of floor space or ease in making the necessary connections. It should be placed between the receiver and the compressor and as close to the latter as possible. Pipe of amply large size should be used in making the necessary connections and care should be taken to provide piping by which the moisture may be drained off at intervals. It is good practice to make connections from the compressor to the aftercooler and from the aftercooler to the receiver one or two sizes larger than that leaving the receiver, using reducers to make the actual connections if necessary. Elbows should be avoided, any bends that are necessary being made by giving the pipes a wide sweep.

In some localities water is scarce and where this condition exists, it is often possible to use the cooling water from the aftercooler for hot boiler-feeding, increasing the efficiency of the plant and adding to its economical operation to some extent through the recovery of waste heat.

While an aftercooler will not eliminate all of the moisture from compressed air, —(the best results in this respect, especially in the case of large installations, being obtained by the use of an aftercooler in conjunction with a number of small secondary receivers or moisture traps placed at intervals along the supply lines)—it will be found that in the majority of cases the aftercooler alone will dry the air to such an extent that the troubles due to wet air and the consequent inconvenience and low efficiency which follows are entirely done away with.

In addition to this, the installation of the aftercooler often results in increased economy in power consumption with no outlay other than the cost of the aftercooler, the necessary connections and a moderate sup-

ply of cool running water. It is thus evident that the inclusion of an aftercooler when securing estimates on a new compressed-air plant, or the addition of one

to a plant already in existence, is a subject well worth the attention of anyone desirous of obtaining the highest efficiency from their compressed-air equipment.

AIR AFTERCOOLERS																
80 TO 100 POUNDS AIR PRESSURE																
Number	Size of Aftercooler		Actual Square Feet of Cooling Surface	Pipe Connections			Maximum Capacity of Aftercoolers in Cu. Ft. of Free Air per Minute with Cooling Water at								Shipping Weight lbs.	
	Diameter Shell Inches	Height or Length Feet and Inches		Air		Water Inlet and Outlet	60° F.		70° F.		80° F.		90° F.		Domestic	Export
				Inlet, Inches	Outlet, Inches		Single Stage Compression	Two Stage Compression	Single Stage Compression	Two Stage Compression	Single Stage Compression	Two Stage Compression	Single Stage Compression	Two Stage Compression		
<b>HORIZONTAL TYPE "HK"</b>																
1	14	10'-0"	55	5	4	1	253	360	230	330	207	297	186	268	1800	2160
3	20 <sup>3</sup> / <sub>4</sub>	10'-6"	152	8	6	1 <sup>1</sup> / <sub>2</sub>	705	1170	640	1054	575	957	518	860	3000	3600
5	22 <sup>1</sup> / <sub>2</sub>	14'-6"	305	10	8	2 <sup>1</sup> / <sub>2</sub>	1410	2360	1280	2135	1150	1920	1035	1725	4200	5000
7	30	17'-8"	757	14	10	3	3500	5840	3180	5299	2880	4750	2590	4270	8500	10200
9	39	19'-0"	1497	18	14	5	6900	11500	6280	10479	5650	9400	5100	8450	16100	19300
10	45 <sup>1</sup> / <sub>4</sub>	19'-0"	2012	18	14	6	9300	15500	8450	14084	7600	12650	6850	11350	19700	23700

Fig. 2.

## Annual Meeting of the Mining Society of Nova Scotia

May 4th & 5th Glace Bay, Nova Scotia.

The 28th Annual Meeting of the Mining Society of Nova Scotia will open in the Club Rooms of the Dominion Coal Company in the morning of May 4th. Business will include consideration of motions to alter the date of the Annual Meeting of the Society and to change its name.

In the afternoon, the President, Mr. A. J. Tonge, General Superintendent of the Dominion Coal Company, will deliver the presidential address. The following papers are expected to be read:

"The Application of Hydraulic Stowing to Undersea Coal Workings with special reference to the Sydney Coalfield" by Walter Herd, Mining Engineer of the Dominion Coal Company.

"Generating Steam by use of Open-Hearth Furnace Waste Gases" by E. G. Mackay, Superintendent of Blast Furnace Department, Nova Scotia Steel and Coal Company. "Conservation in Drawing Mine Timbers" by P. G. Prendergast, Manager of Dominion No. 3 Colliery. "The Plate Mill of the Dominion Iron and Steel Company" by W. H. Graham, Superintendent of Construction, Dominion Steel Company.

A Smoker will be held on Tuesday evening in the Club Rooms.

On Wednesday morning, Mr. H. Y. Russel of the Canadian Explosives Company is expected to give a talk on the manufacture of explosives. Mr. Angus W. Macdonald, Employment Agent and Superintendent of Welfare Work of the Dominion Steel Corporation, will give a paper on "Labor Turnover in Industrial Plants, and what can be done to minimize it. A paper on "Longwall Mining and Conservation" will be presented by Mr. J. H. Cunningham, Papers are expected to be given by Mr. John Preston of the Nova Scotia

Steel and Coal Company, and by Mr. F. E. Notebaert, Mining Engineer of the Acadia Coal Company. The papers read at the Toronto Meeting of the Canadian Mining Institute on "Transportation of Coal" by Mr. M. A. McInnes, President of the Lackawanna & McCrory Coal Company, and formerly a District Superintendent of the Dominion Coal Company, and by Mr. F. W. Gray, on "Canada's Coal Supply," will be open for discussion.

At noon on Wednesday, the Members and visitors will be guests of the Dominion Coal Company at luncheon.

On Wednesday afternoon a meeting will be held in the Savoy Theatre, to which the public will be invited when a paper on "Coke and By-Products" will be given by Mr. F. E. Lucas, Economy Engineer of the Dominion Steel Corporation, and a paper on Colliery Power Plants, by Mr. W. S. Wilson, both of which will be illustrated by lantern slides and moving pictures. Prof. Sexton, of the Halifax Technical College will speak at this meeting on the Vocational re-training of Workers in Industry.

No specific arrangements have been made for visits to plants or mines, but arrangements will be made by the Secretary for any persons who wish to visit any of the neighboring collieries or steel plants.

### ANGLO-PERSIAN COMPANY'S OPERATIONS IN NEW BRUNSWICK.

It is reported from Moncton, N. B. that that the Anglo-Persian Oil Company has struck a moderate flow of gas in a bore near Coal Branch, Kent County. Boring for oil has for some time been proceeding in this locality by the Anglo-Persian Co.

**NOVA SCOTIA ACCIDENT PREVENTION ASSOCIATION**

The Workmen's Compensation Act of Nova Scotia provides that an association of employers for the prevention of accidents may be formed under the auspices of the Compensation Board, and that such rules as may be decided upon by the Association for the purpose of preventing accidents, shall, if approved by the Board, become compulsory upon employers in the Province.

An organizing meeting was held last year, and recently the first annual meeting of the Association was held in Halifax.

The newly elected officers of the Association are as follows:—

President: George D. Macdougall, General Superintendent, Nova Scotia Steel & Coal Co., New Glasgow.



**GEORGE D. MACDOUGALL.**

President of the N. S. Accident Prevention Association, and Vice-President, Mining Society of Nova Scotia.

1st Vice-President: F. E. Lucas, Economy Engineer, Dominion Steel Corporation, Sydney.

2nd Vice-President: J. E. Lucas, the Halifax Shipyards, Ltd., Halifax.

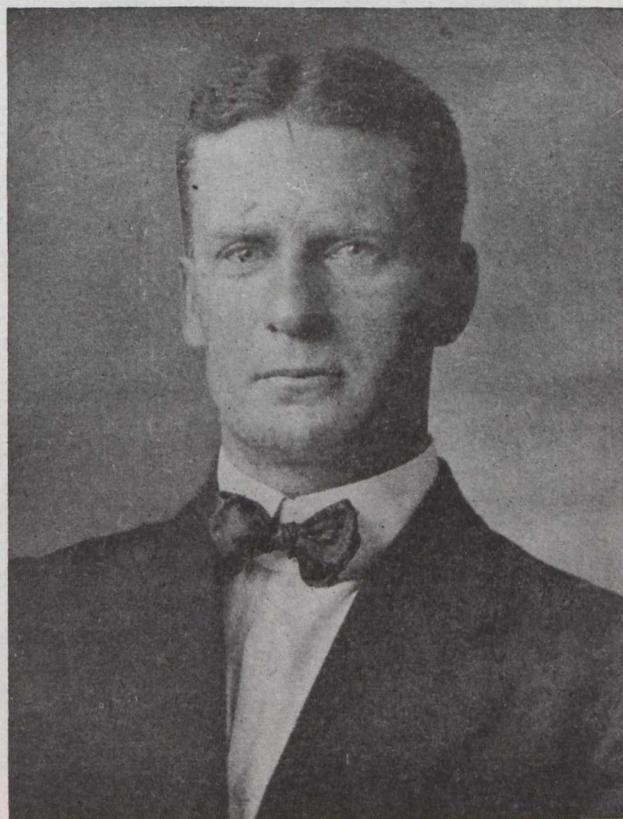
Secretary-Treasurer: H. B. Thompson.

An Executive Committee is composed of the Chairmen of the respective trade sections, these being as follows:—

Mining, A. J. Tonge, General Supt., Dominion Coal Co.; Lumbering and Woodworking, R. E. Dickie;

Metal Trades, R. B. Stewart, Maritime Bridge Co., New Glasgow; Building Construction, A. S. Curry, Rhodes Curry, Ltd., Amherst; Public Utilities, J. H. Winfield, President, Maritime Telephone Co.; Transportation and Navigation, G. W. C. Hensley, Pickford and Black, Halifax; Miscellaneous, C. V. Managhan, Moirs Ltd., Halifax.

The meeting was addressed by the past-President, Mr. C. D. Dennis, Rhodes Curry Ltd., who described the organizing meeting held last April and outlined some of the difficulties which it had been necessary to overcome in commencing the work of the Association. Mr. A. F. Lucas then addressed the meeting, and was followed by Mr. F. W. Armstrong, Vice-Chairman of the Compensation Board, and Mr. John Mackeigan, auditor, who explained the financial position of the Board, and outlined the manner in which it was hoped the Association would be able to assist the Board in controlling and reducing accidents and the assessments.



**F. E. LUCAS.**

Vice-President N. S. Accident Prevention Association.

As all the officers of the Association are men who hold responsible positions of superintendence in the main divisions of industry comprised within the scope of the Compensation Act in Nova Scotia, it may be anticipated that such regulations as may commend themselves to the Association will be enforced. The Association will also form a nucleus and a directing force for first-aid work, "safety-first" meetings, and similar activities that have had such excellent results in the reduction of the accident rate in other industrial communities. Nova Scotia is to be congratulated on the formation of this Accident Prevention Association, and on the personnel of the officers.

# Canadian Oil Exploitation and Prospects

The world's supplies of petroleum are to-day everywhere attracting the attention and serious consideration of Governments and industry. The continued source of supply and control of that supply, the vastly increasing demand for liquid fuel as the motive power for transportation of all kinds by land or water, from the humble car now owned by the average citizen to the latest type of battleship of the British Navy bunkering over 1,300,000 gallons, for power and lubrication in the world's factories, for lighting purposes and for surfacing the enormous road mileage which must be maintained to meet conditions of modern mechanical transport, are questions of vital interest throughout the world, and here in Canada point the way to a field of opportunity and effort whose importance to the country as a whole can hardly be exaggerated.

With two of the large oil producing fields, Mexico

maximum this year and to decline steadily thereafter," and in another issue of that journal the same authority states, "Canada is the only country in which the petroleum industry may be said to be controlled by foreign (United States) interests."

Beyond calling attention to this latter statement this article is not concerned with the question of political control, but is an attempt very generally to summarize those conditions which tend to a conservative optimism as to the vast oil possibilities to-day hidden in the unexploited sedimentary strata of Canada.

## Area of Possible Oil Fields.

If we take the map of Canada and very roughly draw a line from east of Great Slave Lake passing through Lake Athabasca down to the north end of Lake Winnipeg, along the east shore of that Lake to its southerly end, thence to and along the North



KNOWN AND POSSIBLE OIL RESOURCES OF THE WORLD  
A diagrammatic index showing distribution and relative size of oil supplies for the future, as estimated according to present information  
From the U. S. Geological Survey

and Russia (sources of 20 per cent of the world's supply), temporarily handicapped by unsettled conditions, with the probable early decline of the United States fields (the source of 60 per cent of the world's supply), reports which come to hand of prospecting and drilling activities of the approaching season in the vast potential oil fields of Western Canada are of greater national importance than almost any other proposed line of development.

## Canada's Annual Production.

According to Government statistics, Canada's annual oil production up to date stops short of 310,000 barrels (90 per cent from the Ontario fields) in comparison with over 330,000,000 barrels produced by the United States. A leading United States Geologist (J. D. Northrop) writing in a recent issue of the Engineering and Mining Journal, states, "petroleum production in the United States is expected to reach its

shore of Lake Superior to the Soo, and thence along the northerly shore of the Georgian Bay to Parry Sound, thence due east to the St. Lawrence River, and along the northerly bank of that river to its mouth, we shall have divided the Dominion into two vast areas, that lying to the northward of our line being regarded as generally hopeless for oil prospecting, that lying westward and southward being from its geological formation rich in promise for the finding of productive oil fields within the economical range of practical drilling.

If we further examine the Geological map of this latter area, we find that the great oil-bearing strata of the North American Continent, which in the United States have been productive of the richest and most prolific oil reservoirs of the world, contributing in fact over 60 per cent of the world's total oil supply, constitute the principal geological formations and outcrops of this vast Canadian territory.

All of these Geological formations contribute in the various oil fields in the United States to the vast total production of that country.

It requires, therefore, no more than an average share of optimism to predict that Canada's future as a world oil producer is certain, and only awaits the assured result of time and capital expended on the scientific location of favorable structures of these formations and their subsequent exploration by the drill.

#### The Western Provinces.

In the Western Provinces attention in the past has chiefly been divided between the possibility of commercial development of the bituminous sands exposed on the Athabasca River, commonly called the "Tar Sands," and the search for petroleum in the vast regions of the Mackenzie River Basin, north and south of Edmonton, in Northern, Central and Southern Alberta, in the Peace River and Great Slave Lake Districts, whilst recently reports are to hand of organization for prospecting and drilling in the districts of Kootenay and Vancouver, B. C.

tain reservoirs holding large pools of pay-oil, since the entire absence of folding in the strata is unfavorable to the large accumulation of such reservoirs and moreover, denudation by ancient glacial action has exposed the oil sands to the atmosphere, so that in the course of ages, evaporation of the lighter oils has taken place, leaving only the heavy tarry residue, now in evidence, dispersed throughout these vast deposits.

#### Commercial Value of Tar Sands.

Hence it is likely that for years to come, the commercial value of these tar sands will be limited to their development as bituminous road making material for which purpose their suitability has already been demonstrated in the city streets of Edmonton, and the economics of the question are being fully investigated by the Department of Mines of the Dominion Government. Improved methods of distillation may make the recovery of the oil content of these deposits a commercial proposition as also may the future exhaustion of producing oil wells, but this latter is too far ahead to be of interest to the present generation.



#### The Athabasca Tar Sands.

The outcrop area of the "Tar Sands" of the Athabasca River has been estimated to extend from 750 to 1,000 square miles, and the deposits probably extend considerably further to the southward under heavy cover. Various estimates have been made of the probable oil content of these sands which have been reported to range in thickness from 140 to 225 feet, and to contain 25 per cent of oil, but in fact the numerous shallow wells drilled have only obtained small amounts of black viscous oil showing on analysis a high percentage of light oils. The more volatile and valuable constituents of this petroleum have long since disappeared and, as the flow has ceased, the rocks from which it issued are probably exhausted, in short these tar deposits are all that remain of a vast oil reservoir now spoilt and wasted. Further, the horizontal stratification of these deposits is entirely against the probability that they will in themselves be found to con-

In the Athabasca District, at Pelican Rapids, the Canadian Geological Survey sank a shallow well in 1798 and tapped a heavy flow of gas, and later, at the same place, the Pelican Oil and Gas Company met a heavy gas flow in a shallow drill hole. In 1917-18, the Imperial Oil Company sank two wells along the Alberta and Great Waterworks Railways and the Tapley Syndicate put down a third in the same territory. These tests were made by practical men but success was not attained, a small show of tarry oil being obtained at depths of about 1,000 feet. These results however do not in any way disprove the presence of pay oil in the vast fields to the south of this area which are so far from the outcrops that even the most expert explorer has little data to guide him, and drilling "in the dark" is the only test that can be resorted to.

#### Scientific Study of Structures.

The first essential therefore for the successful dis-

covery of liquid oil accumulations is the location of suitable structures of the oil bearing sands, and their exploration by drills, those beds distant from the area of outcrop of the Athabasca sands offering better prospects than those in the immediate vicinity, as also do the regions Northwest of Edmonton and Athabasca Landing where favorable structures which are independent of these tar sand leakages are known to exist. Whilst numerous widely separated wells have been sunk there has in the past been a tendency to locate them without particular regard to testing the main structural features or the promising horizons, but recently considerable work has been done in the direction of scientific geological study of these structures. The Geological Survey of the Department of Mines, as well as such large commercial organizations as the Imperial Oil Company, The Standard, The Shell, and the Anglo-Canadian Oil Companies, are accomplishing good pioneer work in locating the regions which show the folded geological structures of the petroliferous sands most favorable to success in oil drilling, and particular attention has been paid to the Peace River district of Northern B. C. and to the Great Slave Lake district.

#### The Peace River District.

The upper cretaceous formations of the Peace River District are reported as consisting of a gentle homocline not favorable to formation of oil reservoirs, but further West the survey parties report more promising conditions of sharp folding and domes.

The above does not in any way disprove the existence of Peace River oil reservoirs in the underlying Devonian sands, these being non-conformable to the upper cretaceous deposits which alone have been explored by the drill to date. Indeed, the very fact that these Devonian beds are deformational to the upper beds may be an encouragement to further prospecting of this district, since, if the formation bed has a gradient it may go far to neutralize possibly unfavorable conditions created by the homocline structure of the overlying beds. Moreover, this homocline structure is not necessarily unpromising for oil reservoirs provided that the gradient is sufficient to allow of gravitational segregation of the water, oil and gas; elsewhere conditions of sand porosity and cementation have resulted in the isolation and accumulation of large oil reservoirs in such homocline structures, and indeed some portion of every anticline, the formation usually reported on as most favorable for oil, is in itself a homocline.

The Peace River Oil Company, the Tar Island Oil and Gas Company, the Consolidated Oil Fields Ltd., the Victory Oil Co., and the Northern Pacific Oil Company have all had drills in this region penetrating to depths of from about 1,000 feet to 1,300 feet. Their general experience has been the finding of small quantities of heavy tarry oil, and, in an effort to reach the lower Devonian formations, encountering heavy flow of gas or water which must be shut off before further exploration can proceed. This difficulty is however purely physical, and the Three Creeks Oil Company are reported to be now installing large pumping units to deal with this obstacle.

#### Southern Alberta.

In the district around Calgary considerable drilling has been done, and in some cases small flows of from 15 to 30 barrels a day, ranging from very light to

heavy oil, have been obtained. Geological opinion is that in this territory the rapid descent of the oil-bearing strata from the faulted and folded areas created by the mountain uplift has placed these strata at so great a depth in this district as to make drilling a doubtful commercial undertaking. Some experts also hold the opinion that the very light finds of oil in the Calgary field are indications that the original source of the oil, the parent reservoir, was at a great distance, and that the oil in its lateral movement has been subjected to so great filtration as to have rendered it an unpromising prospect. New methods of distillation of these light oils may however give them an added value and revolutionize opinion in this respect, converting the class of oil into a valuable source of supply of motor fuel spirit.

The principal companies which have undertaken Alberta Oil Company. The Prudential Oil Company, and the Calgary Petroleum Products Company, most of the wells being in the Sheep River area.

#### South and Southeast of Edmonton.

Examination of the vast districts southeast of Edmonton lying between the North Saskatchewan and the Belly Rivers have determined that the reported anticlinal folds of the upper cretaceous structure do not exist in Central Alberta. The homocline structure of this area may be responsible for the difficulty hitherto experienced in locating any large accumulation of petroleum oil, but the area is vast and the absence of anticlines does not disprove the existence of such reservoirs.

It is said that the Imperial Oil Company, The Shell Oil Company, and some other interests will spend large sums in drilling in this field during 1920, and the activities of such experienced oil men show how great is their confidence in the promise of this region.

#### Kootenay and Vancouver Districts.

The Amalgamated Oil Co., Ltd., and the Crow's Nest Oil Company are reported to have acquired extensive rights in the Kootenay District, and to be either actively engaged in drilling or preparing to do so in 1920, and on the International Boundary near Vancouver, a Company known as the Boundary Bay Oil Company is reported to have drilled to a depth of over 700 feet, and to have produced a small flow of oil, whilst in the same district the Pitt Meadow Oil Wells Company and the Empire Oil and Natural Gas Company have sunk wells, and the Spartan Oil Company has drilled a test hole near Burnaby Lake to a depth of about 2,000 feet, at a point where one of the most important oil seepages occurs.

It is difficult to analyze the geological promise of the Kootenay District in regard to large oil reservoirs, owing to the faulted and fracture-displayed nature of its structures. The reports of the Dominion Government Geological Society show large outcrops of Carbonaceous limestones (elsewhere a prolific source of oil) and of post-Cambrian rocks, and petroleum has actually been found in these regions, and verified by Dr. Selwyn as far back as 1891. Geologists have reported that in this region, the ancient limestones have been thrust forward over cretaceous beds in which the petroleum may have originated, and which may yet be the source of unknown quantities of oil. In this connection the following quotation from the Dominion Government Geological Survey Annual Report of 1898 is illuminating having regard to present day activities above noted.

"The indications certainly seem to be sufficiently promising to warrant some outlay in the work of sinking test wells, notwithstanding the generally disturbed and broken character of the formations of the region," and it may here be noted that the most productive of the United States oil fields, that of California, is of diversified geological structure complicated by faults, outcrops, and igneous intrusions.

In the Vancouver district, oil and gas seepages have been known for some years past though their origin has not been demonstrated, but it has been thought that they may indicate oil pools in the sedimentary rocks underlying the Fraser River. Few natural outcrops of these rocks exists, but it is thought that they are folded in a series of anticlinal and synclinal folds favorable to accumulation of oil pools, and it is reasonable to suppose that they are an extension of the structures of the same deposit known to exist further south of the International Boundary, and a striking general resemblance may be noted between the geological structures of this district and those of the great producing oil fields of California, which have been estimated to contain seventeen billion barrels of fuel and asphaltic oils.

#### The Fields of Eastern Canada.

This review would be incomplete without reference to the oil fields of Eastern Canada, in fact the Devonian formations of Ontario are at present producing the greater part of the output of the Dominion and have been producing since 1857. In this province the Mosa oil field in Middlesex County is the largest producer and contributed 108,988 barrels in 1918 to the provincial total of 288,760. This production is reported by Government Geologists to be from the crest of a dome of the Delaware limestone (corniferous) at depths of about 300 feet. This productive field developed from an abandoned prospect as a result of careful study of structural formations followed by practical drilling, it is quoted as proof that the possibilities of the Ontario oil fields are far from exhausted.

There are eleven other oil fields in the province, all producing from shallow wells in the Devonian formations. In the opinion of some experts, deeper lying formations in Ontario, which have not yet been explored by the drill, may prove to be extensions of the Lower Devonian and Silurian formations which constitute the great oil fields of Pennsylvania and Central Ohio.

#### The Maritime Provinces.

In New Brunswick and Nova Scotia oil possibilities have attracted attention since 1859, but competition with the enormous output of the adjacent United States oil fields has done much to discourage production. The New Brunswick Petroleum Co., in about 1900, drilled over 70 wells in the South Eastern district of the Province and obtained a small flow of pay-oil from the Carboniferous and Devonian formations. More important are the oil shale deposits in Albert County, which comprise the residuum of a petroleum field exhausted through seepage.

These petroliferous shales may yet have high commercial value when modern methods of distillation shall render the recovery of their by-products commercially possible such a development may be indicated in the near future in the recovery of motor fuel spirit through new process. In 1908 these oil shales were tested for yield

of crude oil and Sulphate of Ammonia in the retorts of the Pumpherston Oil Co., Scotland—the average yield being 40.09 gallons of crude oil and 76.94 lbs. of Sulphite of Ammonia per ton of shale—the result comparing favorably with Scotch shales, which have been successfully worked for many years. In Nova Scotia efforts to find oil were made as early as 1864, but without commercial results. Various seepages occur and favorable geological Devonian and Corniferous formations are noted in certain districts, but the structures are not considered promising, having been badly broken up and contorted. Oil shales have been known in this province for over 60 years; their analysis yields somewhat similar results to those of New Brunswick, but lower in Ammonium Sulphate, they are at least as good as the successfully operated Scotch deposits. The remarks as to their probable development which have been made above in connection with the Albert County deposits of New Brunswick, apply equally here.

#### WILL DEVELOP ATHABASCA OIL FIELDS IN ALBERTA.

Anglo-Dominion Petroleum Company will spend much money in exploring the 340 square miles of oil lands under lease.

(From Our Toronto Correspondent.)

Exploration and development of the Athabasca River oil region in Northern Alberta on a big scale is foreshadowed by A. F. A. Coyne of the Anglo-Dominion Petroleum Company of London, England, who has arrived in Toronto from England. Mr. Coyne has come over from the company in charge of seven geologists, one of whom is W. P. D. Stebbing, F.G.S., and the part is enroute to the West, where they will immediately start geological investigation of the 340 square miles which the Anglo-Dominion Company have under lease. Equipment is about ready for the operation of thirty oil rigs.

Mr. Coyne states his company has appropriated two and a half million dollars for the first twelve months of exploration and operation and further large sums will be spent as occasion demands. The British Government is vastly interested in the exploitation of Canadian oil fields and is lending every support to any enterprise that promises to free the British Dominions from dependence on the United States for oil. The London market realizes that Canada is a country of great mineral wealth and both the Government and financial groups, representing various mining industries, are ready and willing to back any legitimate scheme that promises a fair return on the money invested. The Anglo-Dominion Petroleum Company has already acquired the Athabasca gas franchise and is applying for the Edmonton franchise.

Connected with the Anglo-Dominion Petroleum Company are Alexander Duckhan, chairman of the Board of Directors of the Trinidad Central Oil Fields; Ballie Underdown, director of Trinidad Central, director of the U.S. Cable Co. and President of the British Motor Manufacturers' Association; Henry Antrobus, Wallis Wood and other well-known British financiers. W. R. Martin, of Medicine Hat, holds the position of field superintendent and Martin & Phillips of Medicine Hat holds the position of field superintendent and Martin & Phillips of Medicine Hat have entered into a five year contract with the company for the drilling of the wells.

### COAL AN IMPRESSIVE QUESTION IN CANADA.

Reference was recently made in these columns to plans being discussed in Canada for shipping Nova Scotia coal up the St. Lawrence River and Lake Ontario for distribution to points in the Province of Ontario now dependent on the United States for coal.

Whether this plan is feasible or not, it would seem that the high price of anthracite will tend to restrict its use in some parts of the Dominion. In fact, some of the Canadian papers are expressing fears that the growth of the country may be interfered with by the price of fuel in the more remote sections, where a high freight rate enhances the cost to the consumer. It is even suggested that part of the population may be forced to emigrate.

Under the stimulation of railroad building and industrial activities, the settlements in Canada have been pushed far back into the interior. Only a minor portion of the requirements can be met by water-borne deliveries, and in exact ratio as the settlements extend up towards the north the need for fuel increases. So we may readily believe that the fuel bill is becoming a very important matter, the more so as Canada has generally been on a lower price and wage basis than the United States in all particulars, especially in the smaller communities.

Psychologically a coal bill at the rate of \$18.00 a ton at some small town in northern Ontario creates about the same impression as a bill at the rate of \$25.00 a ton in New York.—“Saward’s Journal,” New York.

### STEEL COMPANY OF CANADA INCREASES ITS COAL HOLDINGS.

A significant item in the Annual Report of the Steel Company of Canada is the President’s statement that the Company has consolidated its holdings with two companies in the United States, and now owns a third interest in a single block of coal lands comprising 4,438 acres. Mining is to be carried on through a centrally located shaft, which will effect a saving over present methods.

### NEW MINING COMPANIES

The International Prospecting and Developing Company has been granted a provincial charter for the purpose of engaging in a general mining business with head office at Ottawa. The company is capitalized at \$1,000,000 and the provisional directors are R. F. Kelly, M. J. O’Connor, A. G. Midford, U. Chatelain, and C. G. Cummings.

Another company to be granted an Ontario charter is Algomont Mines, Limited, with head office at Toronto. The capital is fixed at \$4,000,000. Toronto people are named as the provisional directors.

### DOMINION STEEL COMPANY DRILLING FOR IRON ORE

The Dominion Steel Company is drilling for iron-ore near Loch Lomond Cape Breton, about 30 miles from Sydney. Outcroppings of high-grade hematite are present, and diamond drilling is being undertaken to prove the extent of the deposit

### THE LATE PROFESSOR LAPWORTH.

#### A Distinguished English Geologist.

Prof. Charles Lapworth, LL.D., F.G.S., F.R.S., died on Sat. at his residence, 38 Calthorpe-road, Edgbaston, in his 78th year. Prof. Lapworth was for more than 30 years one of the most accomplished members of the professional staff of Mason College and the University of Birmingham, and had a wide reputation as a geologist. Born at Faringdon, Berkshire, in 1842, Prof. Lapworth was educated at the Training College of Culham, near Oxford. Then he became a school-master at Galashiels. It was while he was at Galashiels that he began to study geology, and in 1870 he read his first scientific paper before the Geological Society of Edinburgh. This led to his acceptance of an appointment at St. Andrew’s University, and he stayed there from 1875 until 1881, when he went to Birmingham as Professor of Geology in Mason College. It was not until 1913 that he decided to retire from the active work of his profession, and the council of the university, in accepting his resignation, passed a resolution in which they thanked him for his long and assiduous services, and recorded the fact that the geological surveys of the Empire owed some of their methods to the genius of Prof. Lapworth, whose name was of more than European reputation. Then followed the conferment upon him of the honor of Emeritus Professor. In 1883 he was accorded the distinction of LL.D. of Aberdeen University, and in 1912 of Glasgow also, while some time prior to that he became M.Sc. of the University of Birmingham. In 1887 he was awarded the Bigsley gold medal of the Geological Society, and in the following year was elected a Fellow of the Royal Society, while the Council further recognised his work in 1891 by conferring upon him their Royal gold medal. In 1889 he received the Wollaston medal of the Geological Society, while in 1905 he was the Wilde medallist of the Manchester Philosophical Society. As far back as 1892 he was the president of the Geological Section at the annual meeting of the British Association; from 1902 to 1904 he was the president of the Geological Society; in 1895-96 he was a member of the council of the Royal Society; and when the Royal Commission was formed in 1902 to enquire into the coal resources of this country he was appointed a member of that body, while in addition for a very long period he was the consulting geologist on matters of mining and civil engineering—particularly with reference to the water Bills of Birmingham, Gloucester, Harrogate, Leicester, etc. Prof. Lapworth’s contributions to scientific literature were voluminous. He published altogether 40 or 50 original papers in the annals of various societies, giving accounts of his discoveries and conclusions. The important group of fossils known as the graptolites, which lie at the foundation of the study of the older fossiliferous rocks of geology, were first reduced to order by him and his classifications. In the West of England he similarly worked out the true arrangement of the rocks and fossils and the type districts of Shropshire and elsewhere, and in the Midlands geologists are familiar with his discovery of Cambrian rocks and fossils in the Nuneaton and Lickey district. Prof. Lapworth leaves a widow, two sons, and a daughter.

—“Colliery Guardian.”

## Northern Ontario Letter

### THE SILVER MINES

Under pressure of what is reported to be an attempt on the part of some of the European countries to bring about a decline in the price of silver, the quotations for the metal have again become unsteady. Mindful, however, of the outstanding fact that consumption is greater than production and that the visible supply is daily becoming less, the silver producers still cling confidently to the belief that the law of supply and demand must inevitably run its course and that in such a case the quotations could scarcely be expected to decline to any very great extent, while there is great promise of another upward swing following the expected failure of Europe to break the market.

Now that the annual statements of all the leading mines in Cobalt have been issued for the year 1919, it is impossible to review with a full measure of accuracy the extent of the prosperity enjoyed during that interesting period when silver prices averaged away above any previous record in the history of Cobalt. It is interesting to note that in the majority of cases the value of the output compared favorably with that of the preceding year, despite the fact that the mines lost an average of at least seven weeks due to last Summer's labor strike.

Having maintained its output in 1919 almost on a par with 1918, and having actually increased its ore reserves during the period, the McKinley-Darragh is now on a fair way to round off another prosperous year in 1920. About the end of April or the first week in May, the big oil flotation plant will be set in operation, and should result in further materially increasing the revenue.

The annual statement of the Nipissing Mining Company for 1919 is one of the factors that holds out considerable assurance of improved economic conditions. The report shows that in spite of the added expense due to curtailing operations on account of the strike, the company succeeded in reducing the cost of production by upwards of  $3\frac{1}{2}$  cents on each ounce of silver produced. Total production for the year amounted to 2,905,475 ounces, so that the saving due to the decline in costs amounted to \$101,691. The value of the year's output was \$3,553,958, and the net operating profit amounted to \$2,717,312 which was the highest in the history of the Nipissing Mining Company. Following is the official summary of the company's operations at Cobalt during the year:—

"The year 1919 was a remarkable one in the silver industry. The official price of \$1.01½ per ounce, set by the United States Government, remained in force for the first four months of the war. Early in May, however, both the United States and British Governments removed all restrictions on the price and on the exportation of silver. Due mainly to the strong demand from China, the price thereafter gradually rose to the maximum of \$1.37½ quoted in New York on Nov. 25th

"The New York official average for the year was \$1.112 per ounce. Nipissing received \$1.1371 United States currency, f.o.b. Cobalt for 1919 shipments.

"The miners of Cobalt went out on strike July 23rd, and returned to work September 8th, but the mill could not be started until September 24th. This two month's shut down was mainly responsible for the drop in the year's production to 2,905,475 ounces, which is the lowest production (in point of ounces) since 1908.

"The net operating profit, however, was the largest in the history of the company amounting to \$2,717,312. The cost

of production was 35.6 cents per ounce, compared with 39.02 cents in 1918. The company received for the silver produced during the year, including the inventory sold since January 1, 1920, an average of \$1.2077 per ounce.

"The low grade ore assayed 27.09 ounces per ton; the average in 1918 was 23.81 ounces. The profit was 72.42 per cent of the gross values of the production.

"Exploration met with better results than usual, so that the ore reserves are up 350,000 ounces from a year ago.

"Wages have been increased 82½ per cent since 1915, but Cobalt did not escape the epidemic of strikes which passed over the country. Since then, mine committees elected by the employees treat with their respective managements regarding local questions, and in addition a central council composed of mine managers and one employee from each mine, discuss questions affecting the camp as a whole. It is hoped that the new arrangement will work out more satisfactorily for all concerned."

Surplus of the Nipissing Mining Company was \$4,372,952 at December 31st, 1919.

The Beaver Consolidated Mines has declared a dividend of 3 p.c., payable May 31st, after a lapse of two or three years as a non-dividend payer. The statement has been made that the Kirkland Lake Mine is now on a profitable producing basis, and this is believed to be the reason for the resumption of dividends on the Beaver. The latter company, purchasing the Kirkland Lake Mine, and financing its development found its resources taxed to the limit during that period, and, now with the Kirkland Lake Mine on a paying basis, the Beaver is free to give returns to its shareholders. From this date forward, the Beaver will only receive the benefits of the profits made from the operation of the Beaver mine, but will also stand to receive the return of the \$404,000 which the Beaver advanced to the Kirkland Lake, plus seven-eighths of the total profits from the operation of the Kirkland Lake Mine. As yet, of course, net profits on the Kirkland Lake enterprise are not large, but promise to increase considerably, selling that the President of the Company states that the broken ore underground will average around \$12 to the ton. It is stated that the mill on the Kirkland Lake operated 21 days during March and recovered \$16,145.

While it is stated that the Kirkland Lake Mine is on a paying basis, yet the margin is obviously narrow, for these reasons: In February the mill treated 2,439 tons of ore, or an average of about 84 ton a day, according to official figures. It is understood that production amounted to about \$19,000, which would indicate an average recovery of around \$7.80 a ton. Mr. Culver estimates costs at \$7.50 per ton.

The Keeley Mine, in South Lorrain is making good headway. The milling equipment purchased a few weeks ago from the Coniagas Company was transported to the Keeley before the winter roads broke up, and has left the Keeley free to carry out the work of installing the mill with the least possible delay.

Late advice from the Triangle property in Auld township in the Elk Lake district tends to show that continued encouragement is being met with at depth where heavy leaf silver is being encountered in a one-inch vein, and with good values extending well back into the wall rock.

It is believed that the recent shipment of twenty tons of ore from the Castle property of the Trethewey Company, in Gowganda, will yield between \$40,000 and \$50,000. The enterprise appears to be already on a self-supporting basis.

The Coniagas Mines will disburse a 2½ p.c. dividend plus a bonus of equal amount on May 1st. The disbursement will amount to \$200,000 and makes a total of \$9,840,000 paid to date by this company. The Coniagas has produced to date about 27,500,000 ounces of silver, and has ore reserves good for three years in advance of current production.

It is estimated that arrangements will be made to commence operations at an early date on the Bailey-Cobalt mine, the litigation in connection with which was recently concluded.

Negotiations which may be of far-reaching importance are being carried on between the Temiskaming Mine Managers' Association and a workmans' committee with the object in view of inaugurating a system of sick benefit insurance.

### ORE AND BULLION SHIPMENTS

During the week ended April 16th, three Cobalt companies shipped an aggregate of approximately 385,455 pounds of ore. The Mining Corporation with four cars was the heaviest shipper, this company having decided to ship an average of about one car daily for some little time. Following is a summary:—

Shipper	Cars	Pounds
Mining Corporation . . . . .	4	260,860
O'Brien . . . . .	1	64,595
La Rose . . . . .	1	60,000
Totals . . . . .	6	385,455

During the corresponding period, the leading producing companies continued to withhold their bullion from the market, no shipments of refined silver being made apparently on the strength of the belief that the present recession in quotations for the metal is but temporary.

Following is a statement of ore shipments over the T. and N. Railway for the month ending March 31st. (In tons of 2,000 lbs.) :—

Cobalt Proper	Tons
Coniagas . . . . .	141.23
Dominion Reduction . . . . .	31.00
Hudson Bay . . . . .	30.46
La Rose . . . . .	43.93
McKinley-Darragh . . . . .	103.05
Northern Customs . . . . .	43.14
O'Brien . . . . .	32.13
Temiskaming . . . . .	36.00
	460.94

The above shipments were made to the following Companies:—

CANADA	
Deloro Smelting & Refining Co., Marmoro . . . . .	248.12
Coniagas Reduction Co., Thorold . . . . .	141.23
UNITED STATES	
American Smelting & Refining Co., Perth	
Amboy . . . . .	30.46
Pennsylvania Smelting Co., Carnegie . . . . .	41.13
	460.94

### PRICE OF SILVER

March 2nd. Highest . . . . .	132.000
March 12th. Lowest . . . . .	117.000
Average . . . . .	125.551

### THE GOLD MINES

On account of the enforced curtailment of lumbering operation caused by the spring break-up, a large number of men are seeking employment in other industries. The situation promises to benefit the gold mines in that the high wages being paid by the producing gold mines offers big attractions as compared with other work in the most northerly districts. It is thought possible that the aggregate tonnage treated by the leading mines will increase during the next month or two.

In June of 1919 the Hollinger reached the peak in point of number of men available. The same causes are again at work, and the same effect is anticipated. At that time the management was able to accumulate a big reserve tonnage of broken ore from which to draw for milling requirements toward the end of the year when a decline in the number of available men declined.

It is intimated unofficially that the Dome management has undergone a change, and that Mr. Depensier is now general manager, with Mr. Dowsitt as assistant manager. Mr. J. Jorden is mill superintendent, with F. Horne as assistant. It is also stated that the Dome will employ mucking machines underground and that hopes are entertained of being able to bring the mill up to close to 1,400 tons daily.

At the McIntyre, the tonnage being treated and the high average mill heads points to the probability of the output for the fiscal year to end June 30th to exceed two million dollars for the first time in the company's history. It has been officially stated that net profit for the period may be expected to exceed one million dollars. In addition to this, the development of the downward continuation of the main ore body at a depth of over one-quarter of a mile is serving to maintain high ore reserves in spite of the large production. A continuation of the present results is expected to result in the interim dividend disbursements to be made at increasingly frequent intervals.

With the mill on the Porcupine Crown operating at full capacity, and with half a year's mill requirements in broken ore lying on the stulls, the company is on a fair way to pile up a substantial surplus in a remarkably short time. This view is strengthened by the fact that average mill heads are in the vicinity of \$11 to the ton.

At the Wright-Hargeraves mine at Kirkland Lake a number of men have been taken on preparatory to the commencement of the big construction program. The work at hand will consist of de-watering the mine and preparing the various working faces for production pending the completion of the mill.

The question of re-opening the Tough-Oakes mine is still more or less unsettled, with the indications pointing toward a beginning early in May, although this has not yet been definitely decided.

A new head-frame is being erected on the Kennedy-Boston property. A small steam driven mining plant is also being installed. This work is preparatory to continuing the shaft from its present depth of 100 feet, to a depth of 150 feet at which point considerable drifting will be done. About 5,000 logs have been cut and will be turned into lumber right away in the Company's small sawmill. This lumber will be used in connection with the construction of necessary camp-buildings.

In the Fort Matachewan district, the Matachewan Gold Mines, Limited, is being explored by use of three diamond drilling machines, one of which is owned by the company, and two of which are working under contract. It is planned to do about 6,000 feet of drilling and to complete this program by about August. The results achieved will have a vital bearing on the future course of the company.

#### WELLAND SMELTER CHANGES HANDS.

The Cobalt Smelter at Welland that has been operated since 1912 by Metals Chemical Company has been purchased by The Ontario Smelters and Refiners, Limited. The plant is being altered to suit the requirements of the new owner's process and they expect to begin smelting operations early in May.

The Ontario Smelters and Refiners, Limited, will continue treating all grades of Cobalt silver ores that carry cobalt in commercial quantities. Their process of extraction has the advantage over some other processes in that it gives almost a complete recovery, not only of this silver and cobalt contents, but also the nickel, arsenic, antimony and copper.

The daily capacity of the Welland Smelter is fifteen tons. It is well equipped with cupola, mechanical furnace, crushers rolls, ball mills and chemical department.

#### CLAIM RECORDING FEES REDUCED IN ONTARIO

By the new mining act introduced by Hon Harry Mills, Minister of Mines in the Ontario Legislature, there is a reduction of from \$10 to \$5 in the fee charged for recording a claim by a miner for himself. The fee for recording a claim staked out by someone else has been increased from \$10 to \$15. Another amendment is that no licensee can stake out more than three mining claims for himself or more than six for any one else in any one mining division a year. Every licensee who stakes out a claim by sending a sample to the provincial assayer at Toronto with one departmental coupon in the case of gold, silver, copper, lead or metallic iron and by sending two coupons he can get one assay made without cost for the tin or tungsten.

#### SECOND INTERNATIONAL MINING CONVENTION SEATTLE, WASH.

The Second International Mining Convention on the Pacific Coast was held at Seattle, April 7th to 10th. The outstanding feature of this Convention was the attention paid to the problem of gold mining occasioned by rising prices of labour and commodities and the fixed price of the metal. Governor Emmet D. Boyle of Nevada spoke on the question from the miner's standpoint and Mr. Frank A. Vanderlip of New York presented the banker's viewpoint.

The attendance and mineral exhibit from British Columbia were fully representative. The West Kootenay Prospectors' Association was represented by its President, Mr. John Mullholland, and the East Kootenay Association by the Secretary, Mr. J. H. Huchcroft. The concentration of the exhibits and meetings under one roof made for the greater success of the meeting.

The next and third convention is to be held in 1921 in Portland.

#### ASSOCIATED GOLDFIELDS MINING CO., LTD.

The Annual Meeting of this Company was held in Toronto on April 16th., several hundred shareholders being in attendance.

Dr. G. A. Mackay, President of the Company, in his address to the shareholders said that a dividend might be expected next year. Liquid assets at the end of 1919 were reported as being \$1,048,862, with total liabilities of \$11,164. During the year \$169,258 was expended in mining. A large part of this expenditure is being credited to assets as capital expenditure on development. The President said the ground for the first milling unit of 1,000 tons daily capacity had been broken at Block "D" and actual construction begins at once. The building of an additional unit will be deferred until more is known about the labor situation and transportation facilities. The President announced the Company's intention to proceed with the development of further sources of hydro-electric power, and mention was made of the sinking of a new 500-ft. shaft on Block "C."

The shareholders expressed confidence in the management of the properties, re-electing all the old Board of Directors. It was decided to extend the present stock pool until January first next, or until thirty days after the commencement of operations at the new mill.

The most important statement made was that in addition to the low-grade ore bodies on which the Company's milling equipment plans were based, two lenses of ore averaging \$11.15 a ton had been discovered. These lenses were ascertained to be 2,000 feet long, from 50 to 150 ft. wide, and had been proved to a depth of 500 ft. without indications of cutting out.

It was announced that Dr. H. C. Cooke, formerly of the Geological Survey, had been retained as the Company's geologist.

Housing for 200 men has been erected during the past year, and sufficient accommodation for a force of 500 men was contemplated before the end of the Summer. A private hospital, under the direction of the Company's physician, and a number of cottages for married employees were proposed.

#### BOOK REVIEW.

MICROSCOPIC EXAMINATION OF THE ORE MINERALS. W. Myron Davy and C. Marson Farnham. First Edition. Mc. Graw-Hill Book Co., New York. 154 pages with Indices. 6 ins. by 9 1/4 ins. Cloth Boards.

This work deals with the technique of polishing and examining the specimen, and with the photomicrography of polished sections. The main feature of the volume is a series of determinative tables, to which a thumb index is given. The index is arranged as to order of reagents used in identification. A number of supplementary tests are detailed. The examination of polished specimens of ores is in the work referred to as "mineragraphy" following the analogy of the better known term of metallography. The work is intended for advanced students and for professional reference in the laboratory. The printing, indexing, and general arrangement of the work leaves nothing to be desired.

**BRITISH COLUMBIA LETTER.****Stewart, B. C.**

It is announced that certificates of incorporation have been issued to two companies for the operation of an express service by hydroplane between Stewart, B. C. and Long Lake, the latter being situated close to the Premier Mine and other prospects of the Salmon River section, Portland Canal District. Roy C. Price is mentioned as the organizer and the manager of the enterprise and it is said that finances are being advanced by business men of northern British Columbia and that terminal facilities have been arranged for.

Dale L. Pitt, manager of the Premier Mine, has returned to the property accompanied by two engineers, Messrs Hansen and Trojanowski, of the American Smelting and Refining Co. Mr. Pitt states that it is the intention to continue diamond drill development. The two engineers named are to supervise plans for the construction of a new mill. The company proposes to continue the shipment of high grade ore and to mill the low grade, transportation in the summer being by wagon road.

The Pacific Coast Development Co. is carrying on development of the Big Missouri and is taking in supplies over the snow so that the possibility of transportation difficulties in the summer will be obviated. The Alguncian Development Co. also is shipping in equipment both for mining and for the maintenance of camps while on the Forty Mine recent showings have been developed of a very promising character.

P. W. Racey has been appointed engineer in charge of the properties of the Silver Creek Mines, Ltd., Salmon River.

**White Horse, Y. T.**

A body of high grade copper ore has been disclosed at the Copper King Mine near White Horse and a considerable quantity has been sacked ready for shipment with the improvement of weather conditions.

**Alice Arm, B. C.**

A. J. T. Taylor, managing director of the Taylor Mining Co., having returned from Alice Arm states that it is expected that the railway will be cleared of snow and the shipment of ore by rail rendered possible sometime early in the month of May.

**Hazelton, B. C.**

The opening up of a new vein of two feet of good milling ore is reported by the operators of the Silver Standard Mine. Development is continuing. Necessary alterations and repairs have been made to the Mill and a short time ago operations were commenced, some silver-lead and silver-zinc concentrates already being ready for shipment. Because of this early start the milling season will be six weeks longer in duration this year.

**Princeton, B. C.**

The Canada Copper Corporation plans to commence milling at its new plant, Allenby, B. C., by next August. It is estimated that over 600 men will be employed this summer at the Copper Mountain Mine and at the Mill.

**Kamloops, B. C.**

A car of high grade ore from the Joshua Mine of the Donohue Mines Corporation awaits shipment to the Trail Smelter. Additional concentrating machinery is to be installed to bring the capacity of the plant up to 25 tons a day.

**Sheep Creek, B. C.**

The Motherlode Mill, of the Nuggett Gold Mines, Limited, which combines the ball, stamp and tube principles, is being overhauled and will be ready for work in May. The ore body under development continues to show up well and the Company is looking forward to a successful season.

**Ymir, B. C.**

The Mining Corporation of Canada has taken up its bond on the Yankee Girl Gold Mining Property, Ymir, B. C., and development, it is stated, is to be proceeded with on a considerable scale. Last December this company took a conditional bond on the Yankee Girl and subsequently A. W. Newberry, a New York Mining Engineer, made an examination. It is understood that there will be a new incorporation known as the Texas Yankee Girl Mining Company, under which the mine and adjoining mineral property will be developed and operated.

**Grand Forks, B. C.**

The Provincial Government has decided to undertake some diamond drilling on properties of the Franklin Camp, situated close to Grand Forks. The Mitchell Diamond Drill Contracting Company is preparing to start work under the direction of P. B. Freeland, District Mining Engineer, as soon as weather conditions permit.

**Trail, B. C.**

Employees of the Consolidated Mining and Smelting Company of Canada at Trail, B. C. have been experiencing difficulty in securing housing accommodation. So marked has the problem become that not a few have had to make homes for themselves at Rossland and Nelson, communities some distance away from the scene of their daily labors. Recently the Company recognized their employees troubles by announcing a decision to help those who wished to build homes in Trail by making loans for the specific purpose of meeting the cost of construction. The chief points of the Company's plan are that advances will be made to married employees up to \$2,500, the total allowed in no case to be over 80 per cent of the estimated value of the lot and the building, that the sum granted shall be repayable both as to principal and interest in monthly instalments extending over four, six, or eight years; and that the loan shall be secured by a first mortgage on the property. While the Company expresses the wish that those building adopt of the one standards plans which are being provided this is not being made a necessary part of the agreement.

Ore receipts in gross tons at the Consolidated Mining and Smelting Company's Trail Smelter for the week extending from the 22nd to the 31st of March last were 7,271 tons, making the total for the year 73,246 tons.

**Victoria, B. C.**

An amendment has been passed to the Iron Ore Bounties Act of British Columbia extending the period of its operation to 1925. This legislation empowers the Provincial Government to pay a bounty of \$3 a ton on pig iron manufactured in British Columbia from local ore and \$1.50 a ton on pig iron produced from ore produced outside the Province.

The British Columbia Government proposes a radical innovation this year for the stimulation of interest in the mining industry and for the assistance of returned soldiers. Last year \$2,000,000 was voted to provide funds for the bonusing of local industry. Not all of

this was loaned and the Provincial Legislature is being asked to supplement the appropriation by some \$500,000, of which \$50,000 is to be set aside for the financing of returned soldiers desirous of going into the hills in search of minerals. The details have not yet been worked out but Hon. Wm. Sloan, Minister of Mines, is understood to contemplate the sending out of about thirty parties this summer, each party to be composed of two of whom one shall be an experienced prospector and the other a man who, by reason of his overseas service, is entitled to special consideration. In the case of each party the government will take the place of the provider of the time-honoured grubstake. Discoveries will be recorded as provided under the Mineral or Placer Acts and the government, no doubt, will expect to be reimbursed where the prospectors meet with success. More particulars will be available later but meanwhile it may be stated that the authorities feel that, although this is an advanced policy, attractive theoretically but somewhat doubtful as to the results to be expected on practical application, it may serve the twofold purpose of inspiring the prospectors with renewed energy and enthusiasm and giving a hand to those veterans who feel that they wish to change from former sedentary occupations to a life in the open.

The "Allied Forces Exemption Act" of British Columbia has been amended at the present session of the Provincial Legislature in order that its provisions may continue in force until 1921. It also is made to apply to placer claims whether held by record or lease under the Placer Mining Act. This simply means that returned soldiers who held mineral or placer properties in this Province at the time of their enlistment are given a further period to get on their feet before the obligations set out in the Mineral and the Placer Acts are applied to them.

The construction of a concentrator at the Sunlock Group of Mineral Claims, Jordan River, Vancouver Island, will not be proceeded with immediately, such a decision having been reached at the recent annual meeting of the shareholders of the Coast Copper Co., Limited. The recommendation of the board of directors to make a bond issue of \$500,000 was endorsed. This fund is to be used on further development and when the ore reserves assure a daily output of 500 tons, and construction conditions are satisfactory, a concentrator will be installed. The President's report stated that the work of the year had practically doubled the ore reserves and that new locations now give the property a total of twenty-three claims and several fractions with a total area of about 968 acres. Test shipment sent to the Trail Smelter during the year proved the Sunlock ores to be readily amenable to the flotation process of concentration. Development, it was decided, will be continued; ore blocked out; and, such as may have to be mined, stored, so that when the time comes to provide a concentrator there will be available and in sight a sufficient supply to maintain operations indefinitely. T. W. Bingay, is the president and A. N. Skill the secretary while the old board of directors was re-elected as follows: W. R. Winter, W. O. Miller, P. W. Racey, Stuart Campbell, and W. M. Archibald.

#### Texada Island.

The Calumet and Arizona Mining Company is reported to have purchased the Cornell, a copper property belonging to the Van Anda Group, which was lo-

cated some 20 years ago and worked for a period. The property was bonded to the present purchasers two or three years ago. It is the intention to instal the plant necessary to clear the main shaft of water and then to prospect by drilling about 2,000 feet of diamond-drill borings. This work will be undertaken this summer.

#### MANITOBA LETTER.

By C. A. MILLICAN, Winnipeg.

The Gold King Mines, Ltd. has acquired a half interest in two claims lying south of, and between the company's holdings and Hole River Lake. These will give the company frontage rights in the Lake about half a mile long, and have been secured chiefly with that object in view.

Mr. Victor Mattson, who owns these claims, and who is in charge of operations in the Gold King properties has so much faith in the district that he declined an offer for the full rights. Up to date there has not been much prospecting done on them, but Mr. Mattson evidently expects to find some rich veins, hence his reason for obtaining a half-interest.

It is the intention of Marigold Mine to discontinue sinking in the near future and devote available funds for surface stripping. An assay of ore from the bottom of the 30 feet shaft shows value of slightly over \$10 per ton on a 6 ft. vein.

Mr. Beckman, Managing Director of the Gold Pan Extension Mine, has returned from a trip to the property. Mr. Beckman states that the buildings are all completed, and active mining operations are being carried on.

The four drill compressor is not yet working, but sinking is being carried on by hand drilling for the present. Very shortly the compressor will be in commission when sinking will proceed at the rate of 100 feet per month.

The vein in the shaft is 5 feet wide, composed of quartz and schist, between well defined walls. A crew of fifteen men are at present working, sinking being carried on by double shifts.

Work is progressing steadily at the Gold Pan Mine. The drift to the south at the 200-foot level is now about 115 feet from the shaft.

A movement is on foot to organize a Trading and Transportation Co. to handle the business of the Rice Lake District. Undoubtedly there will be a heavy movement, both in people and supplies, in that section of the country this season.

#### OTTAWA WILL NOT DISALLOW BRITISH COLUMBIA LEGISLATION REGARDING DOLLY VARDEN MINE.

The Minister of Justice has refused the application for disallowance of the legislation of the Province of British Columbia regarding the Dolly Varden Mine. Solicitors for the Dolly Varden Mines Co., Ltd., the original owners, will now seek to establish through the Courts that the Act passed by the B. C. Legislature was ultra vires, and that the persons presently in charge of the mine are liable for damages for trespass and to account for all monies realised from the working of the mine.

# Associated Goldfields Mining Company, Limited

HEAD OFFICE: TORONTO - MINES: LARDER LAKE, ONT.

CAPITAL - \$5,000,000

ANNUAL MEETING, APRIL 16, 1920

## PRESIDENT'S ADDRESS TO THE SHAREHOLDERS:

To the Shareholders:

Your Directors have much pleasure in submitting their report of the operation of the Associated Goldfields Mining Company, Limited, for the year ending December 31, 1919. Accompanying the report are statements as to the physical condition of our mining properties at the time of this annual meeting, and reference to the company's development and construction policies.

It is with considerable pride that your Directors call attention to the enviable financial position of the company. At December 31, 1919, the company's liquid assets were:

Cash on hand and in the banks . . . . .	504,778.44
Victory Bonds . . . . .	93,883.96
Notes receivable . . . . .	450,000.00
Total . . . . .	\$1,048,662.40

Total liabilities were:	
Trade accounts payable . . . . .	\$6,897.32
Wages accrued . . . . .	4,266.75

Total . . . . . \$1,164.07

Of the authorized capital of 5,000,000 shares of a par value of \$1, there remained in the treasury at the end of 1919, 1,073,588 shares.

To bring these figures closer to the date of this meeting, we have certificates from the banks, showing cash on hand at March 31, 1920, \$737,580.55; Victory bonds, \$87,821.84, and notes receivable, \$275,000. Therefore, after large expenditures for labor, supplies, materials and equipment during the past three months, we had at March 31 approximately \$1,100,000 in liquid assets.

### Mining Expenditures.

During the year 1919 more money was spent on developing the properties than in all previous years combined. The sum of \$169,258.62 was expended, the chief expenses being wages, supplies, diamond drilling and freight. A large portion of this sum has been considered a capital expenditure and has been transferred to assets as capital development.

### Mining Results Obtained.

Splendid results were obtained during the year, and the physical condition of our three main mining properties was greatly improved.

At Block "B" mining work has been carried on vigorously, and highly satisfactory results are being secured on the three hundred, four hundred and five hundred foot levels. It is felt that development and exploratory operations should be carried on further before engineers draw conclusions as to the character and extent of the ore bodies and the type of mining and milling operations most suitable for their treatment.

### High-Grade Ore Bodies.

On Block "C" and "D" our endeavors to develop a large body of ore, approximating \$5 a ton in value, have been very successful, and these endeavors have been unexpectedly satisfactory in that we have located and partially bounded two wide lenses of considerably higher grade ore.

Underground workings and diamond drilling have shown these high-grade lenses to have a known length of 2,000 feet each, and each averages from 50 feet to 150 feet in width. Diamond drilling shows these bodies to exist at least 500 feet below surface. The average value of these high-grade lenses, over the areas covered by these dimensions, is \$11.15 a ton.

As development and exploration of these two high-grade lenses is still proceeding, and the boundaries have yet to be exactly fixed, it is not deemed advisable to present at this date

an estimate of the total tonnage of high-grade ore here existing, but there is unquestionably sufficient high-grade ore to supply for years a mill of 2,000 tons daily capacity.

### Low-grade Ore Bodies.

These high-grade lenses are enclosed in an exceptionally extensive body of low-grade ore, with a width of from 400 to 500 feet. The removal by selective mining of the high-grade material will not interfere with the later mining and milling of the low-grade material on the large scale originally planned.

The company now finds itself in the enviable possession of high-grade ore sufficiently proven and developed as to fully warrant the immediate commencement of a mill of at least 1,000 tons daily capacity. We possess enough ore of high value to assure profits from milling operations of this size, comparing well with the probable profits from the treatment of a much larger tonnage of lower grade material. Therefore returns will result earlier than anticipated.

### First 1,000 Tons Milling Unit.

The ground for the first milling unit of 1,000 tons daily capacity has been broken at Block "D," and actual construction begins at once.

A decision as to the building of an additional and adjoining unit of 1,000 tons depends on a study now being made as to probable labor conditions of the near future, and as to how far delivery of mine and mill equipment will be affected by the transportation facilities existing. Your directors desire to emphasize that the construction of first units is in the nature of steps toward the ultimate aim of gold mining plants of an aggregate daily capacity of 10,000 tons.

### Railway Facilities.

The company's consulting engineer, in advising the construction immediately of the first milling plant, also advises that the most complete development of the properties and the largest production of gold, of which our mines are capable, depends on the building of a branch line from the T. & N. O. Railway to Larder Lake, a distance of twelve to sixteen miles, according to which route is chosen. This question of railway facilities is under the consideration of your Directors.

### To Develop Additional Power.

To provide sufficient energy for enlarged mining and milling requirements, as well as other demands, the Directors have decided to proceed immediately with the development of further hydro-electric power.

### New 500-foot Shaft.

Work at Block "C" on the sinking of a three-compartment shaft has been commenced. The first objective is 500 feet. Stations, stopping-levels, electric tramping levels, ore pockets, etc., will be established at intervals. From this shaft will be developed and drawn a large part of the high-grade ore referred to above. As these bodies to a considerable extent have been opened and prepared for stoping in our existing underground workings, there seems every reason to expect that with the workings from the new shaft producing ore, a large tonnage will be accumulated when milling operations commence, and that a constant supply of ore will be maintained.

When weather permits, the diamond drills will be brought from underground, and further exploration of ore bodies will be resumed from surface, the immediate object being to learn the total length of the high-grade lenses.

### Accommodation for 500 Men.

During the past year the company constructed accommodation for 200 men, and these living quarters and dining-halls will compare favorably

with the best in the mining districts of northern Ontario. As the scope of our operations is increasing rapidly, the company is proceeding with the construction of further quarters, so that, by summer, 500 men may be accommodated. Among the new buildings will be a private hospital, under the company's resident physician, and a number of cottages for the married men of the staff.

### Appreciation of Staff.

The Directors desire to express their appreciation of the loyal and able services of all members of Associated Goldfields forces. The company is very fortunate in its possession of the services of Mr. A. J. Moore, the consulting engineer. He brought to his work with us the benefits of a long and thorough technical education and the experience gained in thirty years of managing some of the largest mining and metallurgical operations on this continent.

### Dr. H. C. Cooke Engaged.

To its staff of mining engineers the company, your Directors are pleased to announce, has been able to add Dr. H. C. Cooke, who for many years was with the Geological Survey Dominion of Canada. Dr. Cook is now engaged in his duties as the company's geologist. Two other graduate mining engineers are also on our technical staff.

In conclusion, your Directors wish to assert that since our last meeting they have accomplished all that they set out to do, and much more than they anticipated doing. At the properties the discovery and development of gold-bearing bodies has exceeded their most optimistic expectations. In the important matter of financing the company to the stage where its mines are adding to the country's production of gold the Directors desire to say that their work is already completed. No further stock need be offered for subscription. On November 11th, 1918, the day of the armistice, the company had \$5,000 on hand above the liabilities. At the time of our last annual meeting, on April 10th, 1919, the company had on hand \$160,000. Since this last date approximately \$260,000 has been expended at the properties, and to-day the company possesses cash, bonds and similar resources of \$1,100,000.

With gold-bearing bodies of large dimensions, and profitable values proven, there remains the task of bringing the company's mines to the broadest stages of production and fullest return on investment. Now that ample financial resources have been secured, we have complete confidence that our mine management and forces will successfully accomplish this task.

For the Directors:

G. A. MacKAY,  
President.

The Board of Directors was re-elected.

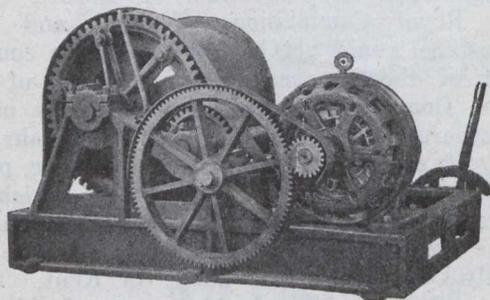
Geo. A. MacKay, President; A. A. McFall, Vice-President; A. Singer, J. Dinwoody, D. H. McCartney.

The following were elected members of the Advisory Board: James Langskill, Geo. H. Smith, A. N. Burns, Senator V. Ratz, G. M. Hendry, Capt. J. J. Walters, Jas. Dobson, Samuel Harrop, F. W. Fisher, Robert Smith, W. T. Taylor, Chas. D. McGregor, Walter Page, Orrin Kolb, Simon Sinclair, W. T. McClain, Alfred Singer, John H. Taylor, Dr. R. K. Anderson, M.P., Scott L. Cowley, B. Stone, W. H. Smith, W. H. Despard, J. Robinson, A. B. Rose, Henry Goldwater, J. A. Wilson, M.D., W. A. Johnson, William Schneider, C. W. Schiedel, F. Powell, A. J. Gough, Jos. Bamford, S. B. Gundy, F. Jacobi, A. Butler, S. W. Jenckes, H. H. Stevenson.

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### THE CANADIAN INSTITUTE OF CHEMISTRY

The Canadian Institute of Chemistry came into being in May, 1919, by vote of chemists of Canada assembled in convention, and shortly after, the first meeting of the original members was called when the following officers and Council were elected:—

President: J. Watson Bain, University of Toronto.

Vice-Presidents: George Baril, M.D., Laval University; Dr. A. McGill, Chief Chemist Dept. Trade and Commerce, Ottawa; R. D. Mc. Laurin, University of Saskatchewan.

Councillors: G. R. Ardagh, University of Toronto; Dr. J. S. Bates, Price Bros., Ltd., Kenogami; Dr. Harold E. Biglow, Mt. Allison University; S. J. Cook, Dept Trade and Commerce, Ottawa; J. A. Mc. D. Dawson, Dept. Trade and Commerce, Vancouver; Dr. L. F. Goodwin, Queen's University; I. Grageroff, Canadian Explosives, Ltd.; A. Lehmann, University of Alberta; Matthew A. Parker, University of Manitoba.

At the present time the Institute numbers 113 Fellows, and three Associates, together with H. R. H. the Prince of Wales, who graciously consented to become an Honorary Fellow.

Mr. Harold J. Roast (393 Guy St., Montreal) is the Secretary-Treasurer.

The Institute represents Canada on the Board of the inter-allied Chemical Union.

The following extracts from the Constitution set forth the objects of the Institute and the qualifications required for membership:

Objects of the Institute:—

"A" To raise the profession of Chemistry to its proper position amongst the other learned profession, so that it may

attract a larger proportion of the best intellects and thereby secure a supply of trained Chemists adequate to the growing industrial needs of the country.

"B" To form an organization immediately available for consultation by the Government.

"C" To protect the public by gathering together a body of men who may be consulted with confidence.

"D" To look after the professional well being of the Chemists by:—

1. Having a registration bureau for Chemists.
2. Having social centres for Chemists and Chemists only.
3. Maintaining an employment bureau for Chemists.
4. Having centres for the interchange of Scientific experience, by both papers and lectures.
5. Maintaining a clearing house of available chemical knowledge, including a library and suitable register that would enable the central bureau to put one Chemist in touch with that other chemist, who might be able to assist him in his particular problems (leaving it to the parties interested to arrange details as to recompense or otherwise).

"E" To secure such Government recognition as may from time to time be deemed advisable.

"F" To maintain a professional association for professional men.

"That the membership consists of two classes: Fellows and Associates, of either sex, the former having the right to use the letters F.C.I.C., and the latter having the right to use the letters A.C.I.C.

"That the following be the requirements for Fellows:—

- (a) One who shall be of the age of twenty-five or over, being a graduate of a recognized University, having a four years course in Chemistry or Science, and who can satisfy the Council that Chemistry, Pure or Applied, has been his major subject, and who has been actively engaged in the pursuit of Chemistry in a **responsible capacity** for two additional years.
- (b) One who shall be of the age of twenty-five or over, being a graduate of a recognized University, giving only a three year course in Chemistry or Science, who can satisfy the Council that Chemistry, Pure or Ap-

plied has been his major subject, and who has taken another year's training in Chemistry, at a University, and has had in addition two years experience in Chemistry in a responsible capacity in a laboratory approved by the Council, or under the direction of a Fellow of the Institute. If the additional year at a University is not taken, then three years training in a responsible capacity in a laboratory by the Council.

(c) Those who do not qualify under (a) or (b) being of the age of twenty-five or over, shall have held a position of responsibility in Pure or Applied Chemistry for not less than five years and shall be examined by a Board appointed by the Council. The Candidates shall be examined on the theory and practice of Chemistry with special reference to the branch of Chemistry in which they have been engaged. This examination may be waived at the discretion of the Council if the Candidate was engaged in Chemistry at the date of the inauguration of the Association and has held a position of professional responsibility for not less than eight years.

"That the following be the requirements for Associates:—

Persons being under twenty-five years of age who would otherwise be eligible for membership as Fellows under provisions a, b, and c, the requirements under a and b regarding the practice of Chemistry in a responsible capacity for two years being waived.

"An Associate upon reaching the age of twenty-five years may become a Fellow providing he is recommended by three Fellows and has been engaged for at least two years in the practice of Chemistry pure or applied, and is otherwise eligible as a Fellow.

"An Associate upon election to a Fellowship shall pay the difference between the initiation fee for Fellows and Associates.

"The Council reserve the right to refuse admission to any applicant, or to remove any member for sufficient cause.

**Fees:**—The entrance fee for Fellows be Ten Dollars and Annual Fee Ten Dollars.

The Entrance for Associates be Five Dollars and the Annual Fee Five Dollars.

**METAL QUOTATIONS.**

Fair value for ingot metals at Montreal, April 30th 1920:

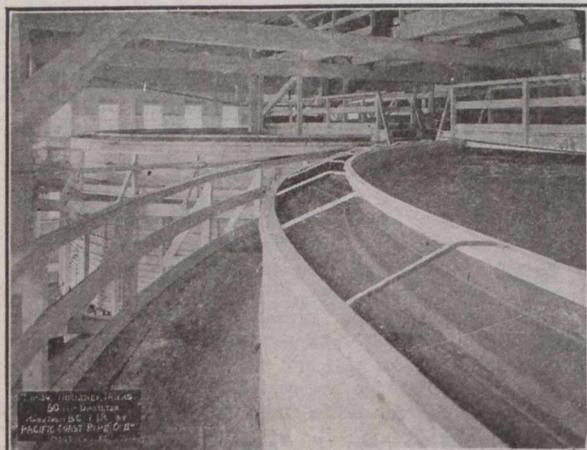
	Cents per lb.
Electro Copper . . . . .	24
Castings Copper . . . . .	23½
Lead . . . . .	11
Zinc . . . . .	10
Tin . . . . .	71
Antimony . . . . .	13
Aluminum . . . . .	40

**UNDERGROUND TEMPERATURES IN THE KENT COALFIELD.**

In the course of an article on the Kent Coal Field in the "Financial News" (February 13), Dr. William Galloway gives some particulars in regard to some of the deeper seams encountered in the course of development. Thick seams have been found at Barfreston (3,318 feet depth, 9ft. 6in. thick); Stonehall (3,332ft., 8ft. 7in.) and Maydensole (3,760ft., 5ft. 8in.). These depths verge upon the maximum of 4,000ft. below which the Royal Commissions of 1871 and 1904 thought that coal could not be worked in this country on account of the increase in temperature of the strata. The Commissioners estimated the rate of increase (geothermic gradient) to be 1 deg. Fahr. for every 60ft. of additional depth below a plane parallel with, and 50ft. below, the surface, at which the temperature of the strata does not fluctuate, and is the same as the mean annual temperature at the surface, namely, about 50 degs. Fahr. in Kent. Some seams will probably be found at a greater depth than 4,000ft. in Kent, more especially south of Stonehall and under the Channel, and for that reason the following observations of the rock temperature in Snowdown and Tilmanstone collieries are of interest. Those made in the Beresford seam at Snowdown and Tilmanstone, and in the Hard seam at Snowdown, were taken with the thermometer, and in the manner specified by the Committee on Underground Temperature of the British Association; that in the seam at 3,011 ft., at Snowdown, with an ordinary thermometer placed in a bore-hole in the coal:—

	Temp. Fahr. Deg.	Av'ge Geothermic depth. Ft.	gradient. Ft.
Beresford at Tilmanstone and Snowdown . . . . .	74	1,500	60
Hard (Snowdown) . . . . .	80	2,240	60
Seam at 3,011ft. . . . .	90	3,011	75

The geothermic gradient from a depth of 50ft. below the surface to the Beresford seam is 1 deg. Fahr. for every additional 60ft.; that from the Beresford to the seam at 3,011ft. is 1 deg. for every additional 94ft. This decrease in the gradient with increasing depth is not unusual. If it holds good in other parts of the field, and at greater depths, the temperature of 113 degs. Fahr. will not be reached in Kent until the depth is rather over 5,000 ft., or 1,000ft. below the limit imposed by the Commission.



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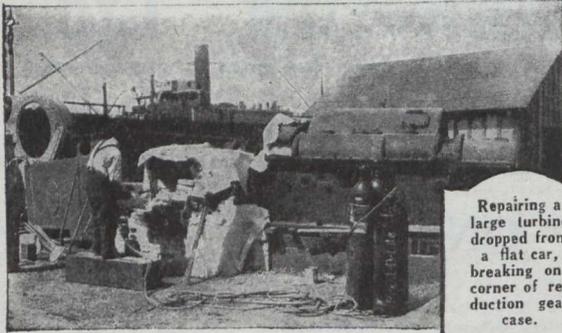
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International High Speed Steel Co., Rockaway, N.J.
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MacGovern & Co.  
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- Aluminium:**
- Amalgamators:**  
Northern Canada Supply Co.  
Mine and 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, 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
- Assayers and Chemists:**  
Milton L. Hersey Co., Ltd.  
Campbell & Deyell  
Ledoux & Co.  
Thos. Heys & Son  
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- 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—Husser:**  
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.  
Link Belt Co.  
The Mine & Smelter Supply Co.  
Northern Canada Supply Co.  
Jones & Glasco.
- Belting:**  
R. T. Gilman & Co.
- Belting (Transmission):**  
Goodyear Tire & Rubber Co.
- Belting (Elevator):**  
Goodyear Tire & Rubber Co.
- Belting (Conveyor):**  
Goodyear Tire & Rubber Co.
- 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.
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- 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.  
Link-Belt Co.  
Marsh Engineering Works  
Mussens, Ltd.  
MacKinnon Steel Co., Ltd.  
Northern Canada Supply Co.  
Fraser & Chalmers of Canada, Ltd.  
The Wabi Iron Works
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Hendrick Mfg. Co.
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Northern Canada Supply Co.  
Standard Underground Cable Co. of Canada, Ltd.
- Cableways:**  
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Fraser & Chalmers of Canada, Ltd.  
Mussens, Ltd.  
The Wabi Iron Works  
R. T. Gilman & Co.
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Canadian Ingersoll-Rand Co., Ltd., Montreal, Que.  
Northern Canada Supply Co.  
Fraser & Chalmers of Canada, Ltd.  
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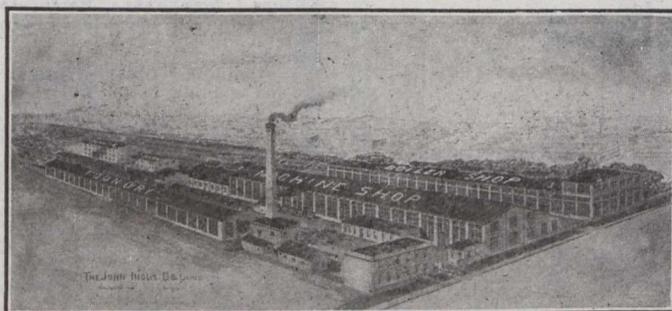
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MacKinnon Steel Co., Ltd.  
The Electric Steel & Metals Co.  
Northern Canada Supply Co.  
Osborn, Sam'l (Canada) Limited.  
Marsh Engineering Works  
Mine and Smelter Supply Co.  
Fraser & Chalmers of Canada, Ltd.  
Mussens, Limited  
R. T. Gilman & Co.  
The Wabi Iron Works
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Burnett & Crampton  
Hull Iron & Steel Foundries, Ltd.  
John J. Gartshore  
Marsh Engineering Works, Ltd.  
Osborn, Sam'l (Canada) Limited.  
The Electric Steel & Metals Co.  
The Wabi Iron Works
- Carriers (Gravity):**  
Jones & Glassco
- Castings—Brass**  
The Canada Metal Co., Ltd.
- Castings (Iron and Steel)**  
Burnett & Crampton  
Canadian Steel Foundries, Ltd.  
Hull Iron & Steel Foundries, Ltd.  
Osborn, Sam'l (Canada) Limited.  
The Electric Steel & Metals Co.  
The Wabi Iron Works
- Cement and Concrete Waterproofing:**  
Spielman Agencies, Regd.
- Cement Machinery:**  
Northern Canada Supply Co.  
Hadfields, Limited  
Hull Iron & Steel Foundries, Ltd.  
Osborn, Sam'l (Canada) Limited.  
Fraser & Chalmers of Canada, Ltd.  
Canadian Fairbanks-Morse Co., Ltd.  
The Electric Steel & Metals Co.  
R. T. Gilman & Co.  
Burnett & Crampton
- Chains:**  
Jones & Glassco  
Northern Canada Supply Co.  
Canadian Fairbanks-Morse Co., Ltd.  
Link-Belt Co.  
Greening, B., Wire Co., Ltd.
- Chain Drives:**  
Jones & Glassco
- 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
- Coal:**  
Dominion Coal Co.  
Nova Scotia Steel & Coal Co.
- Coal Cutters:**  
Osborn, Sam'l (Canada) Limited.  
Sullivan Machinery Co.  
Canadian Ingersoll-Rand Co., Ltd.
- Coal Crushers:**  
Canadian Mead-Morrison Co., Limited
- Coal Mining Explosives:**  
Canadian Explosives, Ltd.  
Giant Powder Company of Canada, Ltd.
- Coal Mining Machinery:**  
Canadian Rock Drill Co.  
Denver Rock Drill Mfg. Co., Ltd.  
Osborn, Sam'l (Canada) Limited.
- Canadian Ingersoll-Rand Co., Ltd.  
Sullivan Machinery Co.  
Marsh Engineering Works  
Hadfields, Ltd.  
Hendrick Mfg. Co.  
Fraser & Chalmers of Canada, Limited  
Mussens, Limited  
R. T. Gilman & Co.
- Coal and Coke Handling Machinery**  
Canadian Mead-Morrison Co., Limited.  
Link-Belt Co.
- Coal Pockets:**  
Canadian Mead-Morrison Co., Limited.
- Coal Pick Machines:**  
Sullivan Machinery Co.
- Coal Screening Plants:**  
Canadian Mead-Morrison Co., Limited.
- Cobalt Oxide:**  
Coniagas Reduction Co.  
Everitt & Co.
- Compressors—Air:**  
Canadian Fairbanks-Morse Co., Ltd.  
Smart-Turner Machine Co.  
Canadian Ingersoll-Rand Co., Ltd.  
Northern Canada Supply Co.  
MacGovern & Co., Inc.  
R. T. Gilman & Co.  
Fraser & Chalmers of Canada, Ltd.  
Mussens, Limited  
The Mine & Smelter Supply Co.
- Concrete Mixers:**  
Canadian Fairbanks-Morse Co., Ltd.  
Northern Canada Supply Co.  
Gould, Shapley & Muir Co., Ltd.  
MacGovern & Co., Inc.  
Mussens, Limited  
R. T. Gilman & Co.
- Condensers:**  
Canadian Fairbanks-Morse Co., Ltd.  
Smart-Turner Machine Co.  
Northern Canada Supply Co.  
MacGovern & Co., Inc.
- Concentrating Tables:**  
The Mine & Smelter Supply Co.  
Deister Concentrator Co.  
The Wabi Iron Works
- Converters:**  
Northern Canada Supply Co.  
MacGovern & Co., Inc.
- Conveyors—McCaslin Gravity Bucket:**  
Canadian Mead-Morrison Co., Limited.
- Contractors' Supplies:**  
Canadian Fairbanks-Morse Co., Ltd.
- Consulters and Engineers:**  
Hersey Milton Co., Ltd.
- Conveyors:**  
The Mine & Smelter Supply Co.
- Conveyor Flights:**  
Hendrick Mfg. Co., Ltd.
- Conveyor—Trough—Belt:**  
Canadian Fairbanks-Morse Co., Ltd.  
Link-Belt Co.  
Hendrick Mfg. Co.  
Mussens, Limited  
Jones & Glassco (Roller, Belt and Chain)  
Hendrick Mfg. Co.  
The Wabi Iron Works
- Conical Mills:**  
Hardinge Conical Mill Co.
- Copper:**  
The Canada Metal Co., Ltd.  
Consolidated Mining & Smelting Co.
- 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.  
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.  
Lyman, Ltd.  
Mussens, Limited  
The Mine & Smelter Supply Co.  
Hadfields, Limited  
Fraser & Chalmers of Canada, Ltd.  
The Wabi Iron Works

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**BUYERS OF CANADIAN MINERALS, METALS, ALLOYS, METALLIC RESIDUES  
COBALT ORE, OXIDE, RESIDUES, NICKEL ORE, OXIDE, ETC.****MOLYBDENITE, WOLFRAM, SCHEELITE, MANGANESE ORE, CHROME ORE, CORUNDUM, GRAPHITE  
METALS & ALLOYS****COBALT, TUNGSTEN, MOLYBDENUM, NICKEL, ALUMINIUM, FERRO - SILICON, FERRO - CHROME, ETC  
ASBESTOS—CRUDE, FIBRES, SHINGLE STOCK.****American Zinc Lead and Smelting Co.**

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LEAD ORES**

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Limited

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Nova Scotia

19 Collieries

Output—5,000,000 tons annually

"Dominion" Coal

Screened, run of mine and slack

"Springhill" Coal

Screened, run of mine and slack

Collieries at Glace Bay, C.B., and Springhill,  
N.S.Shipping Ports—Sydney and Louisburg, C.B.,  
and Parrsboro, N.S.

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112 St. James Street, Montreal

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and to the following Agents:

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Buntain, Bell &amp; Co., Charlottetown, P.E.I.

Hull, Blyth &amp; Co, 1, Lloyds Ave., London, E.C.

Rarvey &amp; Co., St. John's, Nfld.

**NICKEL****THE MOND NICKEL COMPANY, LTD**

39 Victoria Street, London, S.W.

Also Makers of

**Copper Sulphate,****Nickel Sulphate, and****Nickel Ammonium Sulphate**

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

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

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

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

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

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

**Nails:**  
Canada Metal Co.

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

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

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

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

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

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

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

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

**Ore Testing Works:**  
Ledoux & Co.  
Can. Laboratories  
Milton Hersey Co.  
Campbell & Deyell  
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.

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

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

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

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

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

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

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

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

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

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

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

**Platinum Refiners:**  
Goldsmith Bros.

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

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

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

**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 White & Co.

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

- Rope—Wire:**  
Allan, Whyte & Co.  
Dominion Wire Rope Co., Ltd.  
Greening, B. Wire Co.  
Northern Canada Supply Co.  
Mussens, Limited
- Rolls—Crushing**  
Canadian Steel Foundries, Ltd.  
Fraser & Chalmers of Canada, Ltd.  
Hull Iron & Steel Foundries, Ltd.  
Osborn, Sam'l (Canada) Limited.  
Hadfields, Limited  
The Electric Steel & Metals Co.  
Mussens, Limited  
The Wabi Iron Works
- Samplers:**  
Fraser & Chalmers of Canada, Ltd.  
C. L. Constant Co.  
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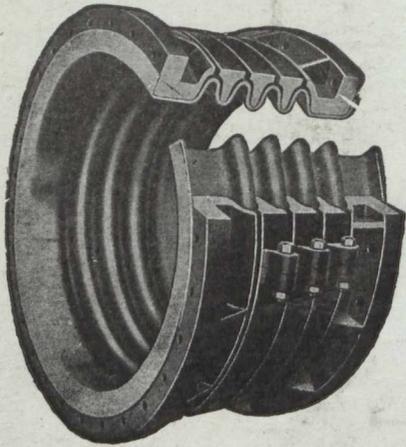
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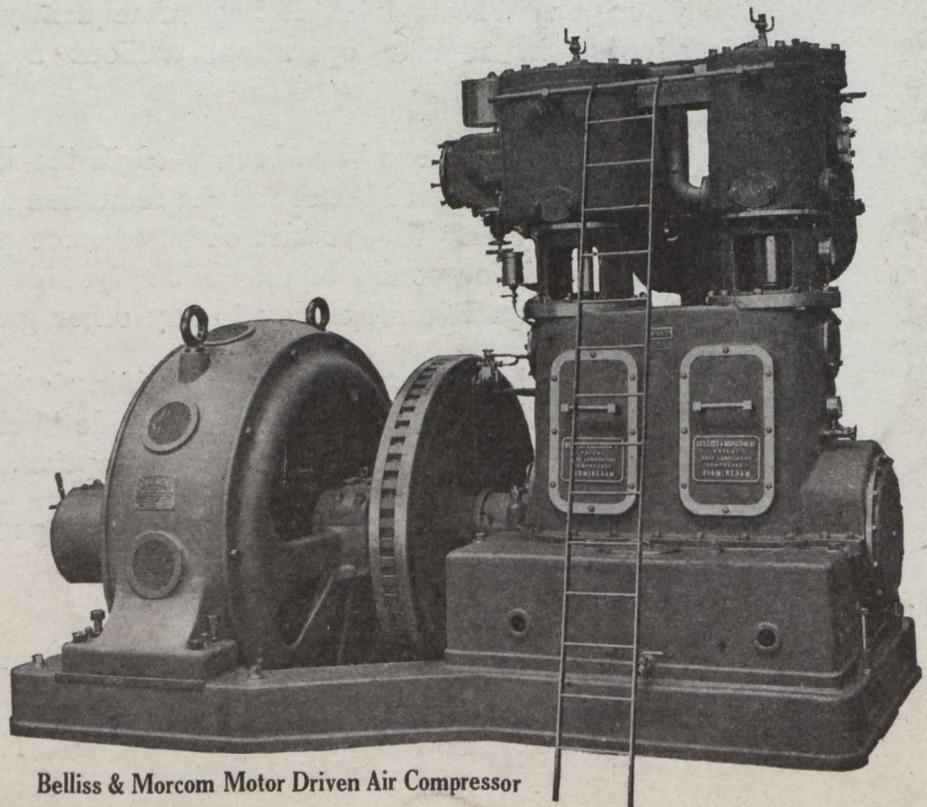
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