

CANADIAN MINING JOURNAL

VOL. XXXVIII

TORONTO

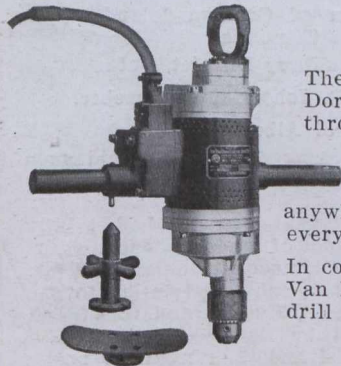
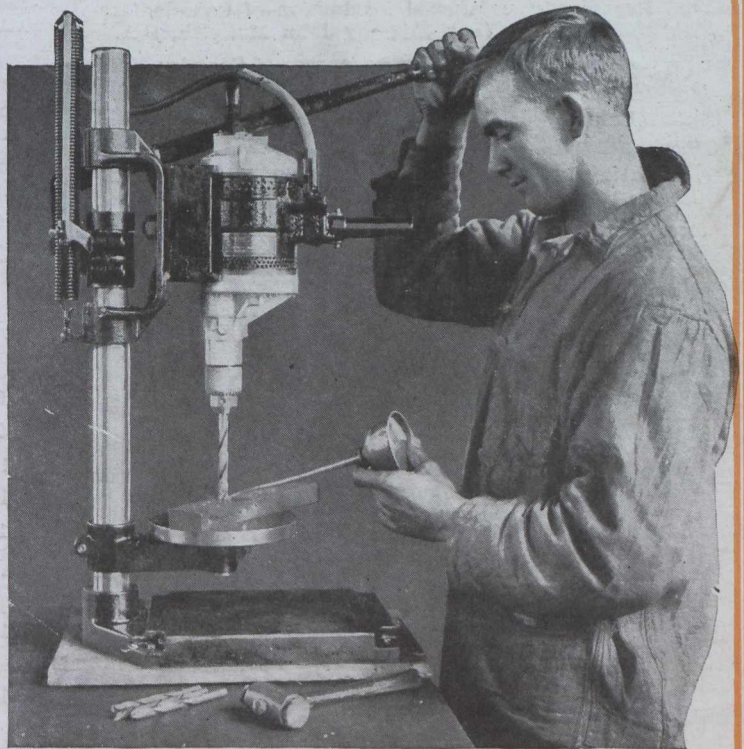
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MINES BRANCH

Recent Publications

- The Nickel Industry: with special reference to the Sudbury region, Ont. Report on, by Professor A. P. Coleman, Ph.D.
- The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.
- Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.
- The Bituminous Sands of Northern Alberta. Report on, by S. C. Ells, M.E.
- Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.
- Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.
- The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.
- The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.
- Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.
- Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.
- Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

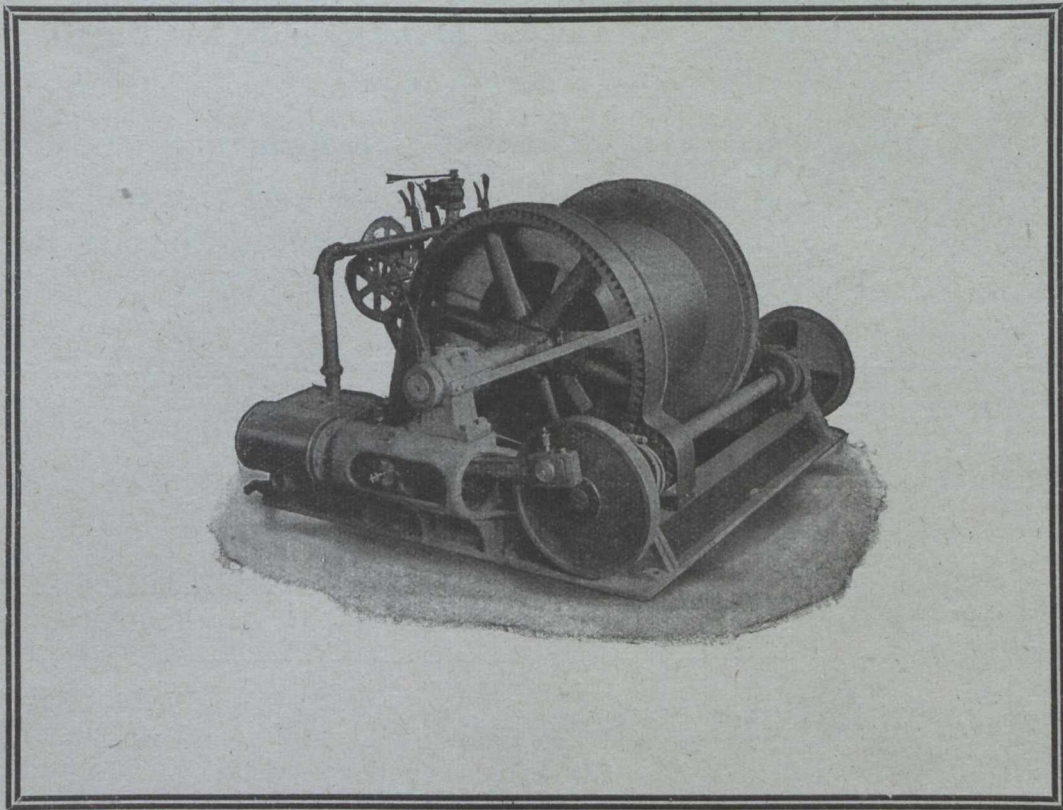
The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

- Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.
- Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.
- Chemical Laboratory.—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.
- Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.
- Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.
- Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

GEOLOGICAL SURVEY

Recent Publications

- Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.
- Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.
- Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.
- Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.
- Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.
- Memoir 85. Road Material Surveys in 1914, by L. Reinecke.
- Memoir 87. Geology of a Portion of the Flathead Coal Area, British Columbia, by J. D. Mackenzie.
- Memoir 88. Geology of Graham Island, British Columbia, by J. D. Mackenzie.
- Memoir 89. Wood Mountain-Willowbunch Coal Area, Saskatchewan, by Bruce Rose.
- Memoir 92. Part of the District of Lake St. John, Quebec, by John A. Dresser.
- Memoir 93. The Southern Plains of Alberta, by D. B. Dowling.
- Memoir 94. Ymir Mining Camp, British Columbia, by Charles Wales Drysdale.
- Memoir 95. Onaping Map-Area, by W. H. Collins.
- Map 59A. Wheaton, Yukon Territory.
- Map 60A. Wheaton, Yukon.
- Map 67A. Kirkfield Sheet, Victoria County, Ontario.
- Map 150A. Ponhook Lake Sheet, Nova Scotia.
- Map 175A. Ymir, Kootenay, British Columbia.
- Map 176A. Graham Island, Queen Charlotte Islands, British Columbia.
- Map 177A. Southern Portion of Graham Island, Queen Charlotte Islands, British Columbia.
- Map 180A. Espanola Area, Sudbury District, Ontario.
- Map 184A. Roberval, Lake St. John County, Quebec.
- Map 187A. Southern Plains of Alberta.
- Applicants for publications not listed above should mention the precise area concerning which information is desired.
- Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.
- The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.
- Communications should be addressed to The Director, Geological Survey, Ottawa.



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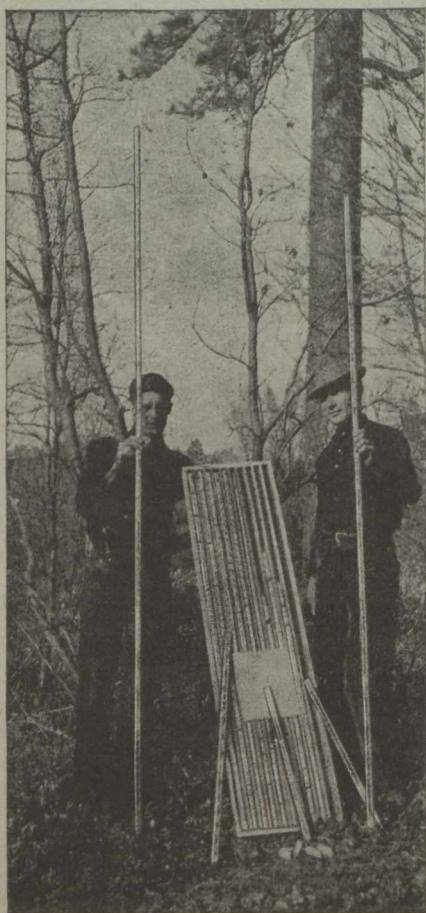
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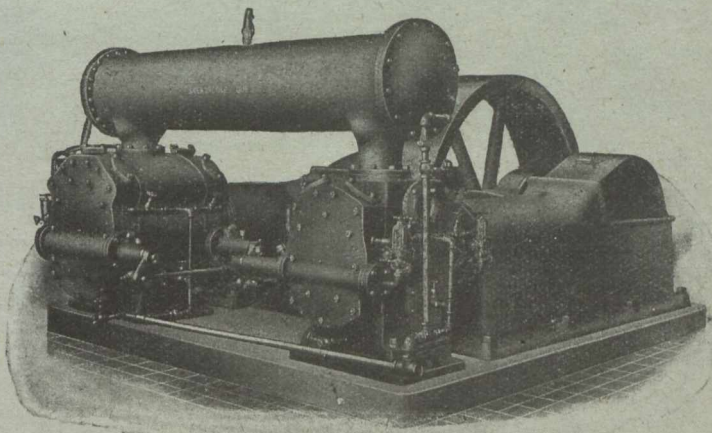
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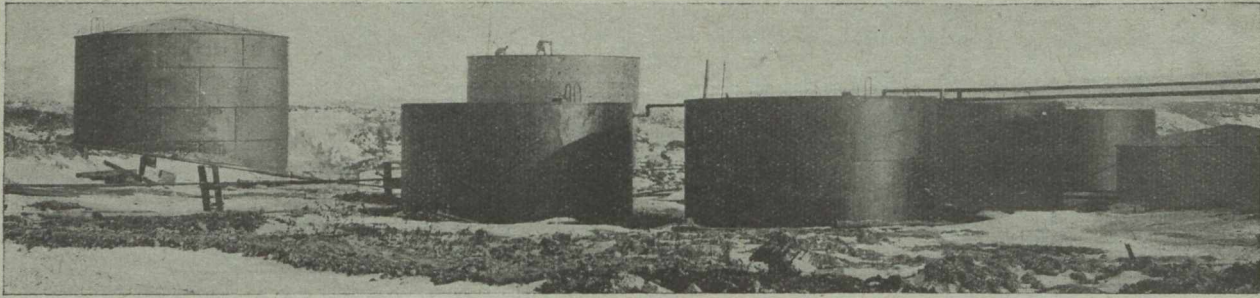
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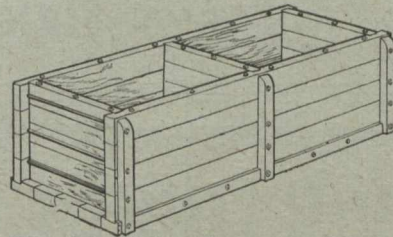
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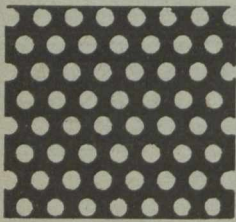
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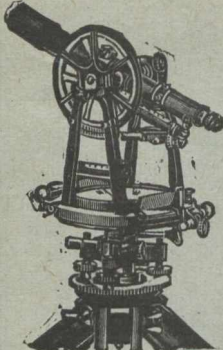
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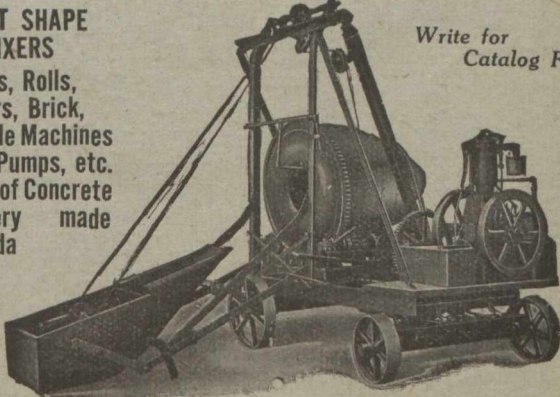
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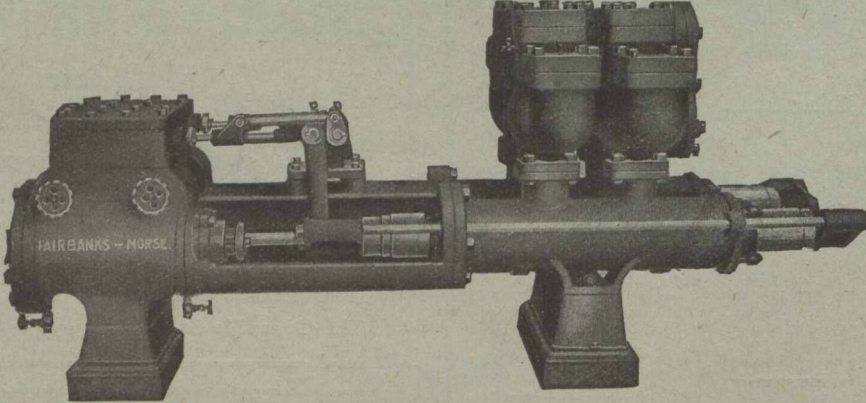
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CONTENTS.

Editorials—	Page
The Minister of Mines	247
Misrepresentation of Labor	248
Militarism vs. Patriotism, by F. W. Gray.....	249
Iron and Steel in Canada, 1917.....	250
Development of Nickel Refining Processes, by V. Hybnette.....	251
Personal and General	261
Special Correspondence	262
Markets.....	266

THE MINISTER OF MINES.

It has been pointed out to us that some of our remarks on the need of a real Minister of Mines appear to be an attack on the Government and the present Minister. As this Journal is not concerned with party politics, however, we trust that our remarks will be properly interpreted as criticism of our method of government. The men who have held the portfolio of Minister of Mines should be given credit for any work they have done, for it is obvious that they were not expected to do very much. Otherwise properly qualified men would have been chosen and a suitable salary provided for.

If we have been correctly informed the recent holders and the present holder of the portfolio of Minister of Mines have really endeavored to do something. They have recognized that they are not qualified for the position; but have accepted the appointment with the intention of at least doing their best. For doing their best they deserve credit. It is perhaps because of recognition that these men have made an honest effort to fill the position that mining men have refrained from saying what they think about the system.

To maintain silence while dissatisfaction exists may be good policy under certain conditions; but we doubt whether the mining industry will receive proper attention if mining men hesitate to criticize the system that they know to be rotten.

At no time have the basic industries of the country been more in need of careful governmental supervision than now. And yet mining, next to agriculture our greatest basic industry, is without a salaried Minister.

THE MISREPRESENTATION OF LABOR.

Commenting on the labor situation in Northern Ontario, Mr. Homer L. Gibson says in Gibson's Fortnightly Mining Review:

"The mine managers have practically unanimously ignored the request of the Miners Union for a conference to discuss the points of difference. This seems, then, to put the issue squarely up to the Union.

"The managers contend that since the miners are already receiving an amount fully equal to their demands, under the bonus system now almost universally in vogue, their claim that such demands are inspired by the high cost of living are inconsistent, and that such demands constitute, in fact, a demand for recognition of the Union. This they seem determined not to grant.

"We understand that individual managers have offered to discuss the matter with a committee of their own employees as such, but have absolutely refused to enter into any negotiations with them as representatives of the Miners Union. If such is the case it would seem regrettable if the miners cannot be prevailed upon to waive, in these times of world strife, the temporarily unimportant point of recognition of the Union, and get together with their employers as man to man. We be-

lieve that such a discussion would lead to better feeling all round and would solve the difficulty.

"It is probable that the members of the Union will be asked to vote on the question of applying to the Minister of Labor for a Royal Commission. If such commission be asked for and granted, it will probably be thirty days before it can commence its sittings, and probably another thirty days before a decision can be expected. No immediate removal of this situation as an uncertainty is therefore in sight."

As Mr. Gibson points out, miners in Northern Ontario who are desirous of conferring with their employers can do so readily enough. The people who find the managers unwilling to confer with them are the officers of the Union which in Northern Ontario as in other parts of North America pretend to represent the miners.

If the miners of Northern Ontario were really anxious to discuss the labor situation with their employers they would not allow the men who direct the affairs of the Western Federation of Miners to intervene. The records of these men are too well known.

Protracted strikes are generally so disastrous to the miners that they react on the instigators. The Federation leaders are therefore not anxious to recommend strikes. They prefer to make threats. By threats the officers of the Federation hope to accomplish their ends without arousing the anger of their dupes. Unfortunately for them the mine managers of Ontario have called their bluff.

Until the miners of Northern Ontario nominate real representatives it cannot be assumed that they are desirous of holding conferences with their employers. A request for a conference from a branch of the Western Federation of Miners is no more a request from the employees of the mining companies, than is the statement of Mr. James Simpson an expression of the sentiments of the workmen of Toronto.

It is said that the marble for the new Houses of Parliament at Ottawa is to be purchased in the United States. The estimates call for marble to the value of \$200,000. As there are in Ontario and Quebec deposits of suitable stone, it is strange that Canadian quarries are not to supply the marble needed for the Canadian public buildings. Does the fault lie with the Government or the owners of the quarries.

ENLARGING ACID PLANT.

Construction has been started on the enlargement of of the sulphuric acid plant of the Consolidated company in Trail, the increase being 50 per cent. or up to a capacity of manufacturing some 20 tons of the acid daily. The addition will be about 100 feet in length, giving a total length of the acid building of 280 feet, with a width of about 55 feet.

This enlargement has been necessitated by the constant demands of the electro-chemical departments of the works in the refining of metals, each of which has been made larger than at first intended, thereby making

an increasing demand for the acid. In addition to this it has been almost impossible to secure hydrofluosilicic acid at any price—which is made from sulphuric acid and other ingredients—and this was a prime necessity in the refining of the metals.—Trail News.

GRANBY CONSOLIDATED.

Through fuel shortage at its Grand Forks plant it has been impossible for Granby Consolidated to operate that unit since early in April, thereby entailing a loss in production of approximately 2,000,000 pounds of copper and a monetary loss of about \$150,000. Labor trouble tied up the Crow's Nest Pass Coal Co., but miners will probably get back to work soon, which will permit of fuel shipments to Grand Forks.

It is now costing about 21 cents a pound to produce copper at Grand Forks, against about 17 cents a year ago. Increased labor and material costs account for this increase. On 28 cent copper, profits per pound would be but seven cents compared with 11 cents a year ago.

Only under highpriced copper can operations be maintained at what was originally the only property of the Granby Co. Twenty-cent copper would necessitate its shutdown, but the investment which the management was wise enough to make several years ago in other mines and a most modern smelting plant will find adequate return in operations centering at Hidden Creek where the Anyox smelter handles ore from its own and surrounding mines.

The Anyox smelter in May handled about 70,000 tons of ore, the same as in April, which, assuming a yield of 40 pounds of copper per ton would result in a production of 2,800,000 pounds. The smelter equipment will be increased through the addition of two new reverberatory furnaces while flotation concentration will also be given a trial in an experimental plant. Eventually Granby may make its own coke at a very material saving from what has to be paid at the present time.

The Midas mine in Alaska, which Granby secured several years ago, will commence shipments shortly to Anyox. This property, which was once examined by Guggenheim engineers gives promise of developing into a large and important mine. Its ores carry precious metals values aggregating \$4 per ton, while its copper averages from 4 per cent to 6 per cent.

Assuming an 11-cent cost at Anyox and a 29-cent copper price. Granby during the past two months has been earning at the rate of about \$27 a share (eliminating Grand Forks, closed down for the period) whereas it has earned on higher-priced copper at the rate of over \$40 a share with both properties running.

It is understood that Granby to-day has cash and copper in excess of all liabilities of approximately \$3,500,000. The company closes its fiscal year on June 30, although it does not make public its annual report until October.—Boston News Bureau.

COPPER AND SILVER IN MICHIGAN IN 1916.

The production of copper in Michigan in 1916, as reported by the United States Geological Survey, Department of the Interior, was 273,692,525 pounds, valued at \$67,328,361, and that of silver was 716,640 fine ounces, valued at \$471,549, a combined value of \$67,799,910. This is an increase of \$21,078,251, or 45 per cent. over the value of the output in 1915.

The average price of copper per pound for 1916 was 24.6 cents, compared with 17.5 cents in 1915.

MILITARISM vs. PATRIOTISM.

By F. W. Gray.

In the issue of this Journal for 1st October 1914, the writer referred, under the above caption, to the action of the Sydney Trades & Labor Council in protesting against the formation of a Home Guard Regiment in Sydney, because of the tendency of such an organization "to foster the abuse of militarism."

A good deal of water has flowed under the mill since October 1914, and the blood of freemen has been spilt in Freedom's cause as never before. In October 1914 there was being enacted that "Calvary of Ypres," in which the regular Army of Great Britain sacrificed itself to the point of practical obliteration. We did not know then, we were to learn later, when the danger was less imminent, how dreadful was that fight, and how nearly our cause was lost.

There was perhaps at that time some excuse for ignorant optimism, as we had not then become acquainted with the truth regarding the German and his aims which we have since seen expressed in such deeds as the sinking of the "Lusitania," the use of poison gas, the Zeppelin raids, the Belgian deportations, the Armenian massacres, the torpedoing of hospital ships, the filthy antics of the Prussian ape in the recent retreat at Noyon, and other infamies as numerous as they are execrable.

Evidently the Sydney Trades & Labor Council has not learnt the obvious lesson of events, because this body has again expressed its views by a resolution opposing compulsory military service on the ground that it "is opposed to democracy, and the cause of freedom as enjoyed by all England's Dominions."

It is the reason adduced for the resolution that calls for particular attention, because it is typical of the thinking of a certain type of trade unionist. There are reasons connected with party politics in Canada that could be urged—by those who still believe in such ancient shibboleths as party politics—but these questions are not in reason here. The same confused thinking is still apparent in the minds of the leaders of the Trades and Labor Council as existed in 1914. At that time the writer stated: "The depreciation of home militias, for reasons that have been sufficiently obvious in Cape Breton, in Vancouver and in Colorado, is a plank in the political platform of the Trades and Labor Congress and its affiliations on the other side of the line, and this attitude has unfortunately clouded the thinking of many well-meaning men, who, probably, if they thoroughly dissected their mental processes would find themselves to be patriots in the truest sense of that much abused word."

Evidently also, the Sydney Trades & Labor Council is but following the lead of the heads of their organization, as witness the recent discordant action of Mr. J. C. Watters in Washington, and the reported utterances of the officers of the Trades and Labor Congress at Ottawa. The most vociferous exponents of this attitude are to be found in Vancouver, and—unfortunately it is impossible to avoid the statement—this deplorable point of view is most apparent just in those centres of Canadian population where international trades unionism, so-called, has been most prominent and active.

The machinations of German propaganda, masquerading under the guise of pacifism, ramified throughout the whole of trades unionism in the United States, and every honor is due to Mr. Samuel Gompers for his refusal to be deceived by the intrigues of German agents.

The attitude of advanced thinkers and leaders of the proletariat in the ranks of the Allies is typified in men like Viviana of France, Henderson of Great Britain, Kerensky of Russia, and Gompers in the United States.

With selective conscription in the United States, with total conscription in Great Britain and France, with conscription in New Zealand, and compulsory military training in Australia, are not the self-styled leaders of labor in Canada a little behind the procession when they refer to the mild form of selective conscription proposed in Canada as "opposed to democracy and the cause of freedom enjoyed by all England's Dominions?" And is Canada a "Dominion of England?" Canada is one of the allied democracies of the British Empire, proud of that connection and fighting for it, and, as Sir Wilfrid Laurier said recently, "We Canadians stand to-day prouder of our British allegiance than we were three years ago."

The unfair part of the propaganda of the Trades & Labor Congress, however, is that it represents the feelings of the men it is supposed to voice. The Sydney Trades & Labor Council has mandate to speak for the workmen of Cape Breton. The workmen of Cape Breton Island have enlisted to the extent of not less than six thousand men, and many more would enlist to-day but for the restriction on recruiting the Government was compelled to enforce to maintain the output of coal and steel.

In the same way the utterances of Mr. Watters and Mr. Simpson most emphatically do not represent the feeling of the workmen of Canada. They voice the sentiments of a few men who have conceived the idea that "militarism" is the first of vices, and who in their confused thinking cannot dissociate the defence of freedom and democracy from the oppressive aims of armed auto-cracy.

The choice of Canada to-day lies between conscription until German auto-cracy is finally and thoroughly defeated, or conscription for all time. There is another alternative, namely absorption in the United States and loss of independence, but that will not help those who object to conscription at this time, because there too, as in all the nations that aspire to national freedom, the choice is the same.

The very fact that the leaders of the Trades and Labor Congress can meet and voice their academic protests in because freemen—Englishmen, Scots, Welshmen, Irishmen, and the long, long list of British peoples in their infinite complexity and their essential onenses, are fighting, not talking. The analogy with Russia in her present chaotic condition is obvious. There, "idealism run mad" is not overwhelmed because the Allies are keeping the Germans busy on other fronts.

Trades unionists object to military measures because they break up and interfere with the ordered progress of democracy. Some Labor leaders have talked of peace and a desire to remain at peace, as though the desire in itself were a virtue sufficiently potent to connote also the ability to remain at peace. An unshackled tiger, a consuming fire, will break up and interfere with the peace of a household, but still the average householder will look for his gun, and will call the fire department, under such circumstances.

Unless the leaders of the Trades and Labor Congress wish to be superseded and dismissed from office by the unionists who will some day return from the front they must wake up. That these men do not voice the opinions of those they are supposed to lead is notoriously well-known.

In 1914, we stated it would be an injustice to suppose that Canadian Trades unionists, despite the opinions of their leaders, would play any other part in the war but that of men who fight for home and country, and quoted Bret Harte's memorable verse, which has since assumed vastly greater significance:

Hark! I hear the tramp of thousands
And of armed men the hum;
Lo! a nation's hosts have gathered
Round the quick alarming drum,—
Saying, "Come,
Freemen, come!
Ere your heritage be wasted," said the quick
Alarming drum.

And the great heart of the nation, throbbing,
answered, "Lord, we come."

Events have proven the correctness of that estimate of Canadian trades unionism. They did come. Thank God they came. The nation that gave birth to Bret Harte came also. Neutrality between right and wrong became impossible so soon as the righteousness of the cause of allied democracy became plain.

The dislike of trades unionists to "militarism" is genuine, and is shared by the average citizen of the British Empire. It is an attempt to create an individual class distinction for trade unionists to arrogate to themselves this universal hatred of military autocracy.

The attitude of most all of us is well described by "Diplomat" in an open letter to Sir Douglas Haig which appeared in a London newspaper. This writer says the British Armies in France commanded by Haig look upon war as "an accursed anachronism, a dirty, unchivalric, tedious, unseemly business, a fool's game as well as a friend's. They are under no illusions. But they will 'stick it' to the death, because they know there is no other way to abolish the reign of the devil upon earth, and win for reasonable men the chance of a sweeter and better life."

The compelling reason for conscription in Canada, as elsewhere in the Empire, is to put the full effort of the country into the prosecution of the war. No other reason would have forced the Government to otherwise attempt such a measure. Under these circumstances, therefore, to characterize the Premier's action "as opposed to democracy and the cause of Freedom," is to utter an absurdity.

To quote Mr. Balfour before the House at Ottawa:

"We have put our last dollar on democracy, and if democracy fails us then we are bankrupt indeed." "But, he added, "I know that democracy will not fail us."

IRON AND STEEL IN CANADA, 1917.

The Mines Branch of the Department of Mines has received from the producers complete returns of the production of pig iron in Canada and with the exception of three small plants, complete return of the production of steel ingots and castings during the first three months of 1917.

The total production of pig iron during the three months was 276,777 short tons, or an average monthly production of 92,259 tons, as against an average monthly production throughout 1916 of 97,438 tons.

Furnaces were in blast at Sydney, and North Sydney, Nova Scotia, Hamilton, Port Colborne, and Sault Ste. Marie, Ontario, and a small electric furnace was operated at Orillia producing pig iron from scrap steel. The blast furnace at Deseronto was idle throughout the period.

The total production of steel ingots and castings during the three months was 403,880 short tons, or an average monthly production of 134,627 tons, as against an average monthly production of 106,268 tons during 1916.

The monthly production, exports and imports, 1916 and 1917, are shown in the accompanying tables:

PIG IRON IN CANADA.

Monthly Production, Exports and Imports.

	Production.		Exports.		Imports.	
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
	1916.	1917.	1916.	1917.	1916.	1917.
January ...	562,097	89,187	1,635	106	4,456	5,473
February ..	or	83,801	1,393	732	4,101	3,502
March	monthly	103,789	2,725	1,394	5,602	7,442
April	average		80		5,963	
May	of		30		6,489	
June	93,683		221		3,190	
July	92,012		394		3,773	
August	87,864		3,902		3,961	
September ..	102,744		1,534		5,001	
October	113,608		4,344		5,933	
November ..	104,436		4,055		3,310	
December ..	106,496		2,991		6,351	
Total ..	1,169,257		23,304		58,130	
Monthly average...	97,438		1,942		4,919	

STEEL IN CANADA.

Monthly Production and Imports.

	Production of steel ingots and direct steel castings.		Imports.*	
	1916.	1917.	1916.	1917.
	Tons.	Tons.	Tons.	Tons.
January	589,553	130,944	4,212	13,322
February	or	120,568	7,288	15,213
March	monthly	152,368	5,206	32,590
April	average		10,877	
May	of		8,542	
June	98,259		11,368	
July	100,817		10,742	
August	107,273		13,412	
September	113,411		10,433	
October	123,469		12,958	
November	124,431		12,723	
December	116,265		10,309	
Monthly Average ...	1,275,219		118,070	
	106,268		9,839	

* The figures given hereunder represent the exports of steel ingots and billets from the United States to Canada and are compiled from the monthly reports of "Foreign Commerce and Navigation of the United States," Washington, D.C.

IRON AND STEEL IN CANADA, 1916.

Revised Statistics and Comparison with 1915.

Division of Mineral Resources and Statistics, Department of Mines, Ottawa.

	1915	1916
	Short Tons.	Short Tons.
Iron Ore—Shipments:		
Hematite	205,989	45,541
Magnetite	59,217	19,113
Roasted siderite and hematite....	132,906	210,522
Total shipments	398,112	275,176
Sold for export	89,730	140,608
Imports (Customs record)	1,504,113	2,339,677
Charged to blast furnaces, Canadian ore	293,305	221,773
Charged to blast furnaces, imported ore	1,463,488	1,964,598
Charged to steel furnaces	74,872	55,059
Shipment from Wabana, Nfld.	868,451	1,012,060
Pig Iron—Production by Provinces:		
Nova Scotia	420,275	470,055
Ontario	493,500	699,202
Production by grades:		
Basic	739,613	953,627
Bessemer	29,052	31,388
Foundry and malleable	145,110	184,242
Total production	913,775	1,169,257
Exports of pig iron	17,307	23,304
Exports of ferro-alloys	9,238	22,802
Imports of pig iron	47,482	58,130
Imports of ferro-alloys	13,758	14,777
Steel:		
Production of ingots and castings.	1,020,896	1,428,249
Production of ingots by classes:		
Open hearth	962,411	1,377,387
Bessemer	19,448	1,416
Electric steel		17,939
Other steels	7,970	961
Direct castings by classes:		
Open hearth	28,384	23,496
Electric		1,700
Other castings	2,683	5,350
Electric steel, total production ...	5,625	19,639
Imports of steel ingots, billets and blooms from United States....	58,486	118,070
Production of steel rails	232,411	90,123
Production of wire rods	124,381	179,226
Imports of wire rods	71,839	66,166
Imports of tin plate	45,165	57,543
Value of total exports of iron and steel goods	\$48,268,148	\$63,837,681
Value of total imports of iron and steel goods	\$74,308,983	\$129,090,168

DEVELOPMENT OF NICKEL REFINING PROCESSES.

By V. N. Hybinette.

Evidence of Mr. V. N. Hybinette, of Kristianssands, Norway, Before Ontario Nickel Commission, London, England, 4th April, 1916.

It may seem to you at the beginning that I am taking you too far back, but to show you just how it all came about, I shall start at my old home town, Falun, in Sweden. There they had what were in olden days the largest copper mines in the world. About 1875 they stopped their old smelting business, and introduced the Henderson process of chloridising roasting and leaching for their copper ores. Only a few miles outside this town of Falun was one of the biggest, perhaps the biggest, nickel mine in Sweden. This nickel mine was at Slattberg and the nickel works were at Sagmyra, near by. Shortly after the Franco-Prussian war these mines were bought by some German interests which probably controlled the nickel refining business of the world at that time. That old mine was in the '70's producing copper-nickel matte by smelting, like all the other Swedish mines in these days; there were four or five of them, all smelting a very low-grade matte and treating that low-grade matte with sulphuric acid so as to obtain sulphate of iron as a by-product. The sulphuretted hydrogen was taken into chambers and made into sulphuric acid. The residue, containing sulphide of copper and nickel, was sent to Germany as such. In the middle of the '80's when I started as apprentice at the copper works in Falun, Mr. Hendrik Munktell, also owner of the world-famous Grycksbo paper mills where the Swedish filtering paper is made, was the general manager of these old copper works which were using the Henderson process for chloridising copper ores. Henderson was manager of the Tharsis works in Glasgow in those days—the '60's and '70's. The Germans had stopped working the nickel ores at Sagmyra when the New Caledonian ores were found, and the plant had been shut down for more than ten years, when it occurred to Mr. Munktell that the Sagmyra ores might be treated by chloridising roasting; and my first employment in the nickel industry was to make a series of experiments beginning on a small laboratory scale but afterwards enlarged, with chloridising roasting of copper-nickel ore, extracting the copper and nickel with water and acid, and afterwards refining that solution in one way or another. It would take me too long to go through all that. In those experiments we met with so much success that Mr. Munktell, who was a rich man, got some other people with him and established works with this process at Hommelvik, in Norway, where they used nickel ores from different mines in Norway, which were considerably richer than the Swedish ores. We started building in 1887, and were able to produce nickel in 1889, 1890 and 1891. I was the superintendent of these works, and the processes had all been worked out by me. But the production at the best amounted only to 50 tons a year. In those days we were being paid 80 cents a pound for the nickel. Practically all the nickel was sold to a gentleman whom you will probably see when you get to Sheffield tomorrow, Mr. Doncaster.

Q. I know him well—Samuel Doncaster? A. Yes, he was part owner in those works, and he visited them and he knows me very well. We were getting through our troubles in that plant and beginning to make some money, although in the meantime nickel had gone down to about 60 cents a pound, when one day in the

autumn of 1891 we read an article in the "Engineering and Mining Journal" to the effect that Col. Thompson, the president of the Orford Company, had made a contract with the United States government to supply them with a million dollars' worth of nickel at the rate of 30 cents a pound, and this was at a time when we were getting from 60 to 80 cents a pound. I advised my friends to shut down their plant, which they did in the spring of 1892, and I went over to America to see what the Orford Copper Company were doing. When I arrived there, I found that they had been experimenting off and on for several years with the nickel contained in the copper matte which they got from the Canadian Copper Company's little smelter at Copper Cliff. The matte was originally treated as a copper matte and no payments were made for nickel, and the Orford Copper Company did not save it. However, in 1890-91, they experimented with a process which seemed to promise to be of some use, and it was on the strength of that process that Col. Thompson made this contract. In this process the Bessemerised matte was treated with sulphuric acid so as to dissolve out the nickel as sulphate.

Q. Was that after roasting? A. No.

Working Up the Orford Refining Process.

Q. The raw matte? A. Yes. The copper sulphide is very hard to dissolve; the nickel sulphide dissolves easily, and by not roasting the matte, it was possible to obtain a nickel sulphate free from copper. The solution so obtained was boiled down to dryness and the crystals roasted, whereby nickel oxide was produced, and this was delivered to the United States government on account of the contract. It was soon found, however, that they were not able to get anything like all the nickel dissolved in that way. The process was very costly, and Col. Thompson found that he had made a bad bargain. If they could not invent a new process in a hurry to make nickel at 30 cents a pound when the market price was 60 cents a pound, they would not be able to fulfil their contract. So they started looking up all the old patents, papers and metallurgical books, and particularly the patent descriptions of the United States Patent Office. They found one, which for some reason or other took their eye, invented by an old brass smelter in Torrington, Connecticut. I do not know whether you are aware of it, but there is some copper-nickel ore there. This process consisted of melting copper-nickel matte with soda salts, whereby copper sulphide and sodium sulphide formed the top, and nickel sulphide formed the bottom. I might state here that this separation of nickel from copper was known in Europe and in use many years before the Orford Copper Co. took it up. The patents granted to Bartlett, John L. Thompson and R. M. Thompson are for production of a commercially pure nickel by repeated smeltings with soda salts, whereas the old processes only used the reaction for removing the bulk of the copper. When I arrived in New York in the spring of 1892 the Orford Copper Co. had just got that process perfected in such a way that they were smelting their matte with nitre cake four or five times and obtaining a nickel sulphide containing over 70 per cent. nickel, 1 per cent. arsenic, some antimony, at least 1 per cent. iron and 1 per cent. copper as the principal impurities.

Q. Was that from the Sudbury ore? A. That was from the Sudbury ore. They had a contract for refining all the material that the Canadian Copper Company could give them. The armor plate makers soon found out that to make a good armor plate they had

to have better nickel, consequently the United States government required the nickel oxide to be free from arsenic, and the copper content was not allowed to be above 0.25 per cent. I was able to show them how to get rid of the arsenic by a small change in their ordinary practice, and as a reward for that I was engaged in the company's employ to build a plant to make metallic nickel. I built that plant in the spring of 1893 at a place entirely separate and about two miles distant from the main works of the Orford Copper Company. In the meantime I had been allowed to study the metallurgical practice of the Orford Copper Company, and on account of the experience I had obtained in Norway, I saw how I could greatly improve upon their metallurgy. However, nothing was done until 1895, when the specifications for nickel became stricter, and it became impossible to sell nickel oxide for armor plate containing more than 0.15 per cent. copper, which quality it was impossible to obtain by the top and bottom smelting, at least in an economical way. They were then repeating their smeltings with nitre cake from 7 to 9 times. In my work with the Henderson process at the plant in Norway, I had found how differently the copper and the nickel behaved when they were being chloridised in a roasting furnace, and it occurred to me that it would be much easier to extract the last trace of the copper by chloridising roasting and leaching instead of by this top and bottom smelting.

As I said, it was in 1895 that I was allowed to demonstrate and introduce this process at the Orford Copper works because they had been unable to find anything else that would save the situation. I could just as well have done it in 1892, but they would not let me, as there was a great deal of jealousy about it. When my scheme proved successful, I was given charge of the nickel department. Later on, in 1897, when I was given complete charge of the whole nickel industry of the Orford Copper Company, I was able to carry out my system in a more finished way, so that it became what it is now, the Orford process, which consists in top and bottom smelting repeated two or three times, leaching with water of the pulverized bottoms, followed by leaching with weak acid to remove sulphide of iron and incidentally also cobalt, and finally two treatments by chloridising roasting and leaching. These two treatments are so carried out that you chloridise the sulphide and leach it, and the resulting nickel oxide is mixed with nitre cake and salt, then roasted and leached, whereby the copper contents of the nickel oxide are reduced to only a few hundredths of 1 per cent.

When I had introduced all these improvements I was promised by Col. Thompson to be taken in as a partner, but unfortunately at the time he was selling out and rearranging his affairs I was taken ill with malarial fever, so that I was practically useless for two or three years. When I came back to health again I found that the International Nickel Company was formed, and that I had been allocated a very insignificant proportion of what I had been promised. This to a great extent was simply due to the fact that I had been ill and that nobody had thought I was going to recover. If I had been strong and healthy, I suppose I would have been able to hold my own—a little better than I did, at least. You can understand how I had had to work during the years I had charge of the Orford works. I was practically the only scientifically educated engineer with the Orford Copper Company and the Canadian Copper Company, and I had had single-handed to change the process and at

the same time increase the production from 200,000 or 300,000 pounds of nickel to 1,000,000 pounds a month. This I did inside of three years, 1897-1900, without at any time stopping the works, by simply adding to and changing them around in the best way I could, and in addition without any particular appropriation of money to do it with.

Q. All the time I suppose you were adapting the old works to your requirements? A. Yes, that was it. Well, when I had the Orford process as well developed as I thought I could get it, in the year 1900 it seemed to me that it was not without its faults; the quality of the nickel was not as good as that of New Caledonia; the number of processes that the material had to go through made it utterly uneconomical, not to say impossible, to work on a small scale. The only reason that the process is economical is that it is carried out on so large a scale by the International Nickel Company. It is, however, a tremendous improvement upon the nickel processes which existed before 1892, and upon all others that had been invented in the meantime.

Invention of Electrolytic Method.

I concluded in about the year 1900, or perhaps 1899, that the only correct way to handle the problem of separating nickel from copper was to make the matte into an anode, electrolyse that anode and obtain the nickel at the cathode directly; and I set out to solve that problem. I did solve it in a laboratory way at the time, and informed Col. Thompson of the fact; but inasmuch as he was not the owner of the mines and smelters, and had simply a short time contract for refining, he did not consider that he could afford to change the whole of his plant. Consequently nothing was done. But in 1904, while I was in the employ of the International Nickel Company as their metallurgical engineer, I informed Mr. Monell of the existence of this process, and he agreed with me to give it a trial and promised that I would get a certain payment in case it was accepted. A plant was built for electrolytic refining in the summer of 1904 at the Orford works, but just as it was about to be started, or just as it was started, and I had shown my ability to produce nickel in that way, I was ordered to patent the process in the name of the Orford Copper Company and hand the patents over to them without any payment. This was entirely contrary to the original agreement, and I had no other course than to leave the company's employ. I was shortly thereafter asked to build a plant for the Lake Superior Corporation which owned some nickel mines in the Sudbury district, but—I do not know what to say—through the peculiar feelings of some of the directors, the board of directors could never be made to agree to build a plant, and after having spent almost a year in negotiations I had to give it up. I then got together some very rich people in New York more or less affiliated with what is known as the "Standard Oil crowd," and took an option on some mines and began to prepare for the building of a plant; but just then some of the directors in the new company found that they had friends who were interested in the nickel business with whom they would not care to compete, and therefore I was told that they would not go into it. This adventure had lost me another year.

Tried at Fredericktown; Installed at Kristianssands.

After that I got an offer to go down to Missouri and build a plant for treating the complex ores of the North America Lead Company at Fredericktown. I never thought that their ore bodies amounted to very

much, neither could I see that their chances of ever becoming a large factor in the nickel business were very good, but I thought that it would be a way of introducing my process for separating copper and nickel on a large scale, and I therefore accepted the proposition. To make it go through I had to put up a great deal of money, much more than I could afford, out of my own pocket. I went down there, and in the years 1906 to 1909 I worked out and started the process which, as far as the metallurgy went, was successful. Not only was I able to separate the copper and nickel, but also to separate out in a novel way the large quantity of cobalt that was present in those ores.

Q. Do you happen to remember the assay of that ore? It is only a matter of general interest, but the relative amount of nickel and copper would be important? A. It was a lead ore in limestone which, together with the galena contained a nickel-cobalt mineral called linnaeite, and also some chalcopyrite. The values in copper, nickel and cobalt varied very much, but in concentrating the material in the ordinary wet lead concentrating-mill a middling was obtained containing, outside of fairly large quantities of lead, about 4 per cent. copper, 2 per cent. nickel, and 1 per cent. cobalt. This was the raw material for my process. The process worked well, and we were making money when I was suddenly notified that the board of directors would not carry on the work any longer, and they shut the place down without any good reason. In the meantime I had been approached by my old friends in Norway who were interested in using my process in that country. They sent their engineers to Fredericktown to inspect the copper-nickel part of the plant, and upon receiving a favorable report from these engineers the Norwegians made a contract with me for building the plant at Kristiansands in Norway. To define the state of perfection of the process at that time, I will say that the original plant at the Orford works had been designed for a material containing two parts of nickel to one part of copper, but it was used for so short a time that I was unable to learn anything from that installation. The new installation in Fredericktown had necessarily to be made in a different way—only the main principle was the same—on account of there being so much more copper and so much less nickel, and particularly on account of the presence of considerable quantities of lead and cobalt. When it again came to handling the material in Norway there were other considerations, such as the high price of coal and cheap electricity, which made it necessary to again change the process. But although the first plant put in in Norway could in consequence be said to be an experiment, it worked very satisfactorily from the beginning. It had only been operated for half a year when it was concluded to double its capacity. It was started in 1910; the capacity was doubled in 1911 and 1912, and again increased in 1914, so that the capacity at the present time is about 1,800 tons of nickel per year.

Q. And copper? A. 1,200 tons.

Q. And precious metals—do you take much notice of those? A. Oh, yes.

Q. Can you tell us anything about them? A. Well, the ores vary very much, just like they do in Canada.

Q. I suppose the palladium would be more than the platinum, as it is in the Canadian ores? A. Yes.

Refining Operations in Norway.

Q. What is the cost of erection of the plant? A.

The actual cost of the plant, as it now stands, with a capacity for 1,800 tons, was about \$250,000.

Q. That 1,800 tons is nickel? A. Yes. We are not using it to that capacity now, on account of our inability to obtain raw material during the war. We are only operating the plant to half its capacity.

Q. Is that entirely on Norwegian ore at the present time? A. Entirely on Norwegian ore.

Q. From the two mines? A. Yes.

Dr. Miller—By raw material you mean the ore? A. Yes.

Chairman—And matte? A. Yes, and scrap. We bought a good deal of German silver, scrap and turnings, and things of that kind. The refining plant, where we used bessemerised matte, is built very cheaply, perhaps a little too cheaply; it is a wooden structure. It is doing the work, however, and the actual cost of refining is in ordinary times, not figuring on war prices, between 100 and 110 per ton of nickel.

Q. Does that include roasting of the matte and the making of anodes and everything? A. Yes.

Dr. Miller—That is the total cost? A. From the Bessemerised matte to nickel cathodes, electrolytic copper ingots and precious metal slimes. There is no cost on the copper, all the cost is figured on the nickel.

Q. What is the ton? A. It is the metric ton.

Mr. Young—2,204 lbs? A. Yes. We have demonstrated these cost figures to the satisfaction of Mr. J. E. McAllister, of Toronto, Mr. W. A. Carlyle, of London, Mr. W. R. Deacon, of New York, and several well known American engineers.

Dr. Miller—If you were working on a larger scale, as you hope to do, in Canada, they would probably be reduced? A. Yes. The material that we are using is 6 to 8 tons of coal per day, a few tons of coke for smelting the anodes, and about 1,800 horse power of electricity for making these 1,800 tons of nickel per year. This power consumption includes blowers, elevators, lighting of plant and so forth.

Chairman—How would your electric power costs compare with those in Ontario at say 15? A. We are paying at present 45 crowns, which is practically \$12—we are practically paying \$12 per horsepower year, for high voltage current delivered at the refinery.

Mr. Gibson—What does your coal cost? A. Our coal in ordinary times costs us between 18 and 20 crowns per ton delivered at the refinery. This is about \$5 a ton.

Q. And your coke? A. Coke costs \$7 a ton.

Q. Are these long tons? A. Yes; and we have about 100 men employed in three 8-hour shifts, paying them an average of 13 cents per hour.

Chairman—Could we say that throughout the information you give us you are always speaking of the metric ton? A. Yes. Of course the coal and coke which comes from England is different.

Q. It really would not make much difference? A. No.

Mr. Young—It is 36 pounds difference per ton, I think.

Chairman—We have descriptions of your process in Dr. Coleman's report. Could you give us one which we could publish as your own description, giving what details you thought best? A. The process is thoroughly described in its main features in the patents which have been granted to me in the United States and Canada in the years about 1905 and 1914-16.

Chairman—There were two taken out very recently, were there not? A. There were four taken out on

the main improvements which we have introduced during our work in Norway.

Method Suitable for Ontario Ores and Conditions.

Dr. Miller—Is there any reason whatever why this process of yours, which is in successful operation in Norway, cannot be put into practical operation in the Province of Ontario? A. There is absolutely no reason. The ores which we are working, Norwegian ores, give us on an average 1.0 per cent. nickel.

Chairman—Does that mean recovery? A. Yes, yield. None of the mines is worked at a greater rate than 100 tons a day. The process consumes absolutely no chemicals whatever.

Q. Of course that would be a great advantage to us? A. I mean, outside of lead for linings of tanks, and firebricks and ordinary repairs of furnaces.

Q. And as regards waste liquors and that sort of thing? A. There is none. The solutions are automatically regenerated, so that the main solution with which we started in Norway five years ago is the same one today. It has never deteriorated at all. Of course we have had to make some more, and we have it in our power automatically in the process to obtain an increased bulk of such solution, so that when we have increased our plant we have automatically increased the bulk of the solution.

Mr. Young—And there is nothing noxious or harmful or offensive in the process? A. No. The same workmen who were with us when we started are still with us, and they are in a good, healthy condition.

Q. And there is nothing to hurt outsiders? There is no discharge? A. No. We are in a fine garden district, and we have had to put up a 150-foot high chimney for the sake of getting rid of the sulphurous acid which results from roasting the matte.

Chairman—When you are preparing your anodes, you roast to a certain point, I suppose? A. Yes.

Q. But there is no trouble with a reasonably high chimney? A. No.

Dr. Miller—Could not the making of the anodes be done at the smelter and the anodes shipped to your works? A. Yes, or the roasting can be done at the smelter, and anode melting done at the refinery.

Q. No sulphur would be given off? A. No, at least only an insignificant amount.

Mr. Gibson—Do you roast your ores in the open air in heaps? A. No, we do not roast them at all. All the sulphur which comes off comes off in the bessemer converters.

Mr. Young—You were saying that you were in a garden district? A. Yes.

Q. A populous district? A. Yes.

Mr. Gibson—Do you have any appreciable losses as between the contents of the ore and the recovery? A. Our slags contain on an average 0.15 per cent. nickel and 0.1 per cent. of copper.

Q. You said you had 1.0 per cent. of nickel recovery, but you did not mention the copper recovery. A. That is about 0.7 per cent.

Q. With the richer ores at Sudbury the percentage loss would be reduced? A. Yes.

Chairman—Your total losses per ton of ore would be practically the same as in Norway, and therefore proportionately less? A. Yes.

Mr. Young—How does the cost of labor compare in the two countries? A. It is cheaper in Norway. We are paying our workmen 13 cents an hour on an average, working 8-hour shifts. You have to pay about double, I suppose?

Q. Easily. A. A plant making two or three times as much as we are making in Norway, would only need 50 per cent. more labor, so that when we are working on a larger scale that will even itself out.

Dr. Miller—Your mining costs would be lower? A. Yes, very considerably lower. Our mining costs are about \$2 a ton of ore, whereas we do not expect it will cost anything like that, not much more than half of it, in Canada. Our smelting costs are about \$2 a ton of ore, and that can also be decreased very considerably when working on a larger scale.

Mr. Gibson—Why do you expect the cost of mining in Canada to be less than in Norway? A. On account of the larger ore bodies.

Q. Notwithstanding the fact that our labor is much dearer? A. Yes.

Dr. Miller—You said you were mining not more than 100 tons a day from the larger mine? A. Yes.

Mr. Young—In taking your costs from the books do you distribute the overhead charges? A. Yes.

Q. Over the whole? A. We have a cost-sheet which will be laid before you, which shows the whole costs divided up into some 20 or 30 heads, beginning with freight to the plant, then the weighing in, the crushing and sampling, the roasting and anode smelting, electrolysis, copper refining, steam generation, precious metals, recovery; and such charges as superintendence, office keeping, taxes, insurance, selling expenses, and so forth, each item by itself figured out per ton of nickel.

Chairman—That answers quite a number of little points I had intended to ask you.

Mr. Young—Does the Government audit check your costs? A. Yes.

Q. As well as your general expenses? A. Yes.

Mr. Gibson—Does your company publish a printed report for the information of shareholders? A. No, we do not. We do not publish anything. We have our annual meeting at which we read a report behind closed doors to stockholders only, with instructions to keep it to themselves; and the printed report which is given out is not supposed to be any better than the one which the International Nickel Company is publishing.

Details of Process.

Chairman—Could you give us any particulars—we have got them from the other companies and it would be convenient if we could get them from all—as to the analysis of the ore, of the matte, and of the metallic nickel and metallic copper—anything that you would probably like to be published? It would make the whole thing on all-fours. A. The ores from the different mines vary very much. Taking the whole smelting mixture, I would say that the ore analyses 1.3 per cent. to 1.4 per cent. of nickel and about 0.9 per cent. of copper; it contains in one smelter 20 per cent. of sulphur, 35 per cent. of iron, and 35 per cent. of silica.

Q. Would that mean real silica—or what we call silicious matter? A. Real silica, and the rest, lime, alumina and magnesia. The blast furnace slag which we throw away contains on an average 0.15 per cent. nickel and 0.10 per cent. copper; and the Bessemer matte which we produce contains about 50 per cent. of nickel and 30 per cent. of copper. The main thing about the bessemerised matte is that we bessemerise it to contain about 0.5 per cent. of iron.

Q. That is almost identical with the Canadian practice, is it not? A. Yes.

Q. And the reason for that, I presume, is to avoid the excessive loss of nickel which occurs if you carry it

beyond that stage. Is that so? A. Well, you cannot carry it beyond that stage.

Q. You cannot get rid of any more sulphur? A. You cannot get rid of any more; that is the utmost limit. It is very hard to get that, because it freezes. The bessemerising cannot be carried any further, and there is no use in carrying it any further. Of course it might be a nice thing if you could get it down to 0.1 per cent. or 0.2 per cent. of iron, but it does not matter.

Q. I was thinking more of getting rid of the sulphur for the manufacture of anodes. A. You do not want that for other reasons. There are ways and means of getting rid of that sulphur easily enough. We really do not want to go any further. We do not want to get rid of that sulphur.

Q. But in making your anodes, could you use those containing as much as 20 per cent. of sulphur? A. Yes, but they would be so brittle that they would not last so long. There is no chemical reason why you could not, but there are practical reasons such as brittleness of the anodes, and bulkiness, and so forth.

Q. Did you give us the assay of the nickel? A. I was going to give you the assay of the nickel.

Q. We have got so far as the matte now? A. Yes, the nickel can be produced without any chemical difficulty up to 99.9 per cent. pure. But for practical and commercial reasons, there is no use in going to such a high grade, and therefore we are only producing a quality that is competing favorably in the market. We have never since we started had any complaint against the quality of the product.

Mr. Young—If the market called for pure nickel, you could meet the demand with your process? A. Yes.

Chairman—Could you guarantee it free from copper? A. We can make it down to 0.01 per cent. or 0.02 per cent. of copper, but we are not making it down to more than about 0.1 per cent. because the market does not call for anything purer. We could make it practically free from iron, but we are leaving about 0.50 per cent. or iron in it.

Q. And cobalt, I presume, goes in and is called nickel? A. Yes, any cobalt that stays in the bessemerised matte goes in with the nickel, but in bessemerising, when you get rid of the iron you lose the bulk of the cobalt also. The nickel which we produce is guaranteed to contain less than 1 per cent. of cobalt, but it very rarely contains more than 0.50 per cent.

Marketing Nickel in Germany.

Mr. Gibson—Where is your market for the nickel? A. We are selling our total output on a long time contract to Germany. It was sold by the German company before the war in England, Italy and Russia, but is now going exclusively to Germany and Austria.

Q. Has nickel materially increased in price since the outbreak of war? A. Yes, but we have not had any very particular benefit from it.

Q. By reason of your long-time contract? A. Yes.

Mr. Young—That is hard luck? A. Yes.

Q. Did I hear some gentleman at one time say that there was an objection to the electrolytic process in operations of any magnitude—that as you get handling enormous quantities of ore the electrolytic process is not so adaptable as with a smaller quantity? A. I can tell you something about that. I heard it today from Mr. Dunn. A short time ago some large

financial interests in New York were asked whether they would help to finance the British America Nickel Corporation, and without any further thinking over if it would be advisable, they went right to the International Nickel Company for information and were told that they knew my process very well, which they do not. They were also told that although they admitted the process was worked on a very small scale in Norway, it was so intricate chemically and had so many operations that it was impossible to work it on a large scale. I would say that it was just the other way round. The Orford process is many times as intricate as the present electrolytic process. Half a dozen world-renowned engineers who have seen the plant at Kristianssands have never for one minute doubted it could be carried out on any scale whatsoever.

Mr. Young—It is only fair to say that those remarks, as I understood them, were not directed to your process, but were made in the course of discussing the electrolytic processes in general. A. Yes.

Mr. Gibson—Do you know of any climatic difficulty in working your process in Ontario? A. No.

Q. Would it be workable in the Sudbury district? A. Yes.

Q. There would not be any difficulty in the way of extremes of cold and so on? A. No. I have installed an equally intricate electrolytic process in the north, where they sometimes have 50 degrees below zero.

Recovery of Copper and Precious Metals.

Chairman—You have not given us the composition of the copper. Do you melt that down, or sell it as precipitate? A. The copper is recovered as cement copper, together with the precious metals, and the cement copper is melted down to anodes which are electrolytically refined.

Q. By you? A. Yes, by us. It is carried out exactly in the same way as the ordinary electrolytic refining of ordinary copper material, whereby we get the electrolytic quality of copper equal to any on the market.

Q. I suppose you sell the anode mud containing the precious metals? A. Yes.

Q. You do not smelt that? A. No.

Q. That is just the same as the ordinary electrolytic blister copper practice? A. Yes.

Q. Do you make any nickel salts or copper salts? A. No.

Q. No oxide—nothing but the metals? A. No. We can if we want to, but so far we have not. But that again would involve consuming sulphuric acid, which we naturally could produce ourselves.

Mr. Gibson—Do you make any use of the sulphur at any stage of the operation? A. We get automatically in our process enough sulphuric acid in the roasted material to supply us with whatever sulphuric acid the process needs.

Q. Is that a considerable quantity? A. No, it is a very small quantity.

Chairman—It comes from the oxidation of the sulphur in the anodes? A. Yes.

Mr. Gibson—That is converted into sulphuric acid? A. It is automatically, without doing anything to it, worked into sulphuric acid in the process.

Chairman—How do you precipitate your copper as precipitate? Is that from the solutions from the electrolytic deposition of the nickel? The mother liquor will contain the copper? A. No. My electrolytic pro-

cess consists mainly in that you have a large quantity of nickel sulphate solution which is all the time circulating in the plant between the nickel depositing department and the copper depositing department. In the nickel depositing department the anodes are dissolved whereby both copper and nickel go into solution. Only nickel is deposited, and the solution carrying the copper is pumped over into the copper department where cementation on slabs of metal identical with the anodes takes place; the copper is deposited as cement copper, and the nickel dissolved from the slabs, whereby the solution is made free from copper and returned to the nickel department to take up more copper.

Q. You are managing director of your Company, are you not? A. No, I am not; I am consulting engineer and one of the directors.

Mr. Gibson—Have we the name of your company? A. Kristianssands Nikkelraffineringsverk.

Chairman—We will send a transcript of the shorthand notes to you. A. It might be recorded that the refining does not include any loss whatsoever of copper, nickel, and precious metals except such incidental losses as may occur through leakages and things of that kind.

Q. In other words, all the losses which we have been discussing are those in the production of the matte? A. Yes; and so far as we can analyse, all the precious metals are recovered.

Mr. Gibson—If we have not time to visit Norway, would it be possible to get a copy of your costs of which you spoke? A. Yes, for private information; certified by the official reviser (chartered accountant).

Q. Could we have the items in English so that we can understand them? A. Yes. We have made them up in that way before.

Dr. Miller—You have had some experience in handling New Caledonian ores, I think? A. Yes.

Mixing Norwegian and New Caledonian Ores.

Q. Could you give us the cost per ton of the New Caledonian ore? A. I can give you some particulars regarding the treatment of New Caledonian ore. The New Caledonian ore is in a metallurgical sense different from the Canadian or Norwegian ore, in that it is practically free from copper. Heretofore the main cost of refining has been in the separating of nickel and copper, and the refiners of New Caledonia ore have therefore taken great pains not to introduce into their furnace charges any material containing copper. The New Caledonian ore is so composed that it requires a great deal of fluxing, and, inasmuch as practically all available iron fluxes contain some copper, the fluxing of the New Caledonian ores has heretofore been done by using limestone, gypsum, fluorspar and the residues from the Leblanc soda process. This, however, has had its effect on the cost of making nickel from New Caledonian ore, inasmuch as it has been impossible to treat the ore unless there were quantities of cheap fluxes to be had. And even at that with the cost of fuel, the large quantities of flux and the nature of the mixture, the fuel consumption in smelting New Caledonian ore has been very large. My electrolytic process for separating nickel from copper is so cheap that the old objection to introducing the copper is no longer good, particularly as the ores generally contain a certain amount of precious metals, which pay part if not all of the refining costs. We have therefore lately started the practice of mixing

our Norwegian ores with New Caledonian ore, and it has been very successful. No barren fluxes whatsoever are necessary. The fuel consumption, on account of the presence of iron and sulphur, is very low. The slag we obtain is of such a composition that the nickel content thereof is surprisingly small. The ore from our mines can be mixed with New Caledonian ore without briquetting, which is usually done in the ordinary practice of smelting New Caledonian ore. So far as we have been able to find out, we are able to treat the New Caledonian ore in this way cheaper than by the ordinary present practice.

Chairman—Could you tell us what the amount of iron is, and the general composition of the New Caledonian matte as sent over—the first stuff is about 45 per cent. of nickel, I believe—and how much iron that contained? A. The New Caledonian matte that now comes on the market is partly produced by electric smelting, whereby the objections which I just mentioned to a great extent fall away. But the trouble is that electric power in New Caledonia can only be had in very limited quantity. There is a ferro-nickel produced called matte; we have had some of it; it varies very much in composition.

Q. Would it contain a great deal of sulphur—say 20 per cent.—or more, or less? A. We have had some that really was a matte, and we have had some that really was a metal. From the little experience we have had from buying material from them, I would say that they have not yet got on to a settled practice of production, but I may be wrong in that.

Dr. Miller—There are one or two questions I should like to ask. I started to ask you what the cost of New Caledonian ore is, laid down in Norway? A. I thought you meant treatment. Well, that varies very much, because the freight charges vary enormously. Under ordinary conditions we can get the 5½ to 6 per cent. ore laid down in Kristianssands for about 11 cents per pound of the nickel contents. That would be about the average price, which I think is about the same price as here in England.

Q. Ordinarily, that ore will run to about how much of nickel? A. 5½ to 6 per cent.—between 5 and 6 per cent.

Q. Have you any idea of the cost of refining it by the methods employed by the French company and its branches? A. No, I do not know, but I can make a good guess. I suppose I should say about 6 cents per pound of nickel.

Q. This would mean the total cost of refined nickel from New Caledonian ore about what? A. Say 17 to 18 cents per pound.

Q. What is the cost of refined nickel by the Mond process? A. It may be as much as 15 cents per pound.

COAL MINERS HOLD OUT.

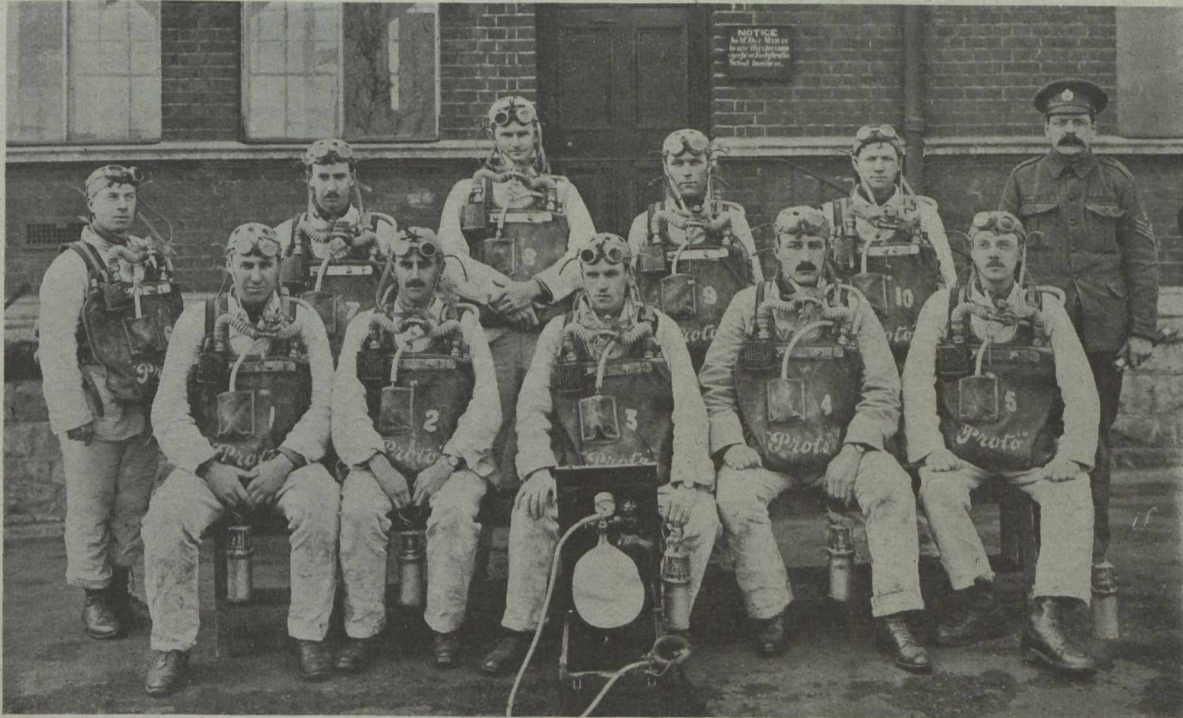
Calgary, June 4.—Despite rumors to the contrary, the miners are determined to back up the action of their Policy Committee in the district fight with the International Executive. Over the week-end a vote was taken, and every camp, including those of Taber and Lethbridge, from which reports of friction between the officials came, voted its approval of the Policy Committee's action in standing out for the 30 per cent. increase. This proves the district officials' judgment that the men would not return to work unless their demands were met.

SOME CANADIANS IN ENGLAND.

The accompanying photograph will interest many of our readers, for the faces are familiar ones. The men standing are: T. M. Montague, W. W. Ritchie, James Bartlett, A. D. Macdonald, Tom Code and the Instructor. Those sitting are: V. M. Meek, M. C. H. Little, J. Stevenson, R. H. Dickson and Clayton R. E.

date the diversion continues, and with the present outlook it is likely to continue until the end of the canning season, or into next September."

In spite of the greatly increased production of tin plate, the demand still far exceeds the supply and those who can get along with substitute containers are being asked to do so. U. S. Secretary of Commerce Redfield says of means of conserving the supply:



Officers Class in Mine Rescue Work, April 6th, 1917, Royal Engineers Barracks, Chatham, Eng.

TIN PLATE.

Commenting on the tin plate situation the "American Metal Market" says:

"The production of tin plate is very heavy. Prior to 1915 it was a good year indeed that approached 1,000,000 gross tons of output. This year's output promises to be in excess of 1,500,000 tons. Exports at present are running lighter than last year, through the patriotic action of the mills. Terne plate production is also light, and taking into account the diversion of shipments towards the perishable food crops as well as the accumulations, it is hardly a wild guess that the supplies of cans for the perishable food crops this season will be something like double the average of the best previous years."

"There is reason to expect a tremendous pack of the perishable food products this summer and fall, judging by the supplies of tin plate that are being furnished for the purpose. The food packers who make their cans and the can makers who sell to the food packers took very heavy shipments between seasons, as there was tin plate due them on 1916 contracts at prices very far below what could be done for the present season, these contracts being at \$3.50 to \$3.60, while prices for the first half of the present year were \$5.75 to \$6.00 and for the second half of this year \$7.50 to \$8.00."

"For nearly two months past the tin plate manufacturers have, upon request of the authorities at Washington, been shipping particularly large quantities of tin plate for the perishable food products, to the curtailment of shipments to other consumers. Even up to this

"The greatest saving in tin plate can be effected by using substitute containers for non-perishable goods, and the U. S. Bureau of Foreign and Domestic Commerce has prepared suggestions along these lines. Many familiar articles which are put up in tin containers can well be put up otherwise. Substitutes are now in use for packing tobacco, coffee, tea, spices, baking powder, soap powder, white lead, powdered paints, syrup, cocoa, cheese, lard, butter and peanut butter."

TANTALUS MINE LEASED.

Whitehorse, Yukon,—J. P. McAbeer of Tacoma, Wash., for the past six years superintendent of Tantalus coal mines, has leased the property and will work from 12 to 15 men there this summer, the amount of output to be regulated by the facilities for transportation, which are limited. With the exception of a small tonnage taken by the W. P. & Y. R. at Whitehorse the entire product of the Tantalus mine is readily sold in Dawson. A great deal more coal could be disposed of in that city if boats or barges were to be had to transport it.

Mr. McAbeer intends to make several important changes in the methods of working the mine and in the handling of the product. Among other things he will put in a washer and screening plant, and Mr. Wright, representing the Jeffrey Manufacturing Co., of Columbus, Ohio, will arrive shortly to take charge of the installation of these and other improvements contemplated in the 3000 feet of underground workings.—Weekly Star.

HEDLEY GOLD MINING CO.

The annual report of Mr. I. L. Merrill, of Los Angeles, president of the Hedley Gold Mining company, is as follows:

During the past year everything at the mine and mill has gone along fairly well. I think we have opened about as much new ore as has been extracted, but am disappointed in the grade of this new ore. The average grade of our reserve is now about \$9 per ton. We plan to do considerable development this year at the mine, and hope to open more higher grade ore. The mill construction is completed. The continuation of the war has kept our operating costs very high, and we will be forced to mine a little higher grade of ore than the mine average until supplies, etc., get back to about normal again.

Mr. Gomer P. Jones, general superintendent, reports: For the year ending December 31, 1916, your mill at Hedley, B. C., has treated 73,491 tons of ore, all mined from the Nickel Plate property, but very little development work other than the opening up of ore bodies within already estimated boundaries has been done. This work was necessary so that a more uniform grade of ore could be maintained. In doing this it was proven that in some sections our estimate of reserve in 1915 report was below the actual tonnage available, while in other sections it was greater, consequently our estimate of tonnage in this report has been revised.

The main reason for the small amount of development shown was the excessive cost of material and labor due to war conditions, and should these conditions continue during 1917, the intention is to open up sections of the property where pay ore is known to exist, and by this means we hope to prove up the Sunnyside Nos. 1, 2 and 4 and the country adjacent to the Nickel Plate without interfering with the surplus, as these properties will produce enough ore to pay the development expense, while there is promise of other orebodies being discovered.

The development for the year has proven payable ore to exist to the extreme limit of the workings, drifts and drill holes, and we see no indications of discontinuance of the main ore shoots.

The mill has changed over, so that cyanide precedes concentration. This has been made necessary, as the freight and treatment costs per ton of ore milled was unusually high, due to the increased quantity of concentrate, high freight rate and loss on gold. By the new system the greater part of the gold will be paid for at \$20.67—a gain of \$1.17 per ounce over the former arrangement. The concentrate shipped will be of less value, consequently will take a lower freight rate.

The mill, as arranged is most modern, and will permit of a surplus being made with a lower grade ore than formerly, and a greater surplus with ore of the same grade as now; with normal conditions prevailing the advantage should be very noticeable.

The mill equipment and both hydro-electric plants, steam auxiliary, tramways and all other machinery and plant are in good working order and should need but little repair for some time to come.

Net profits for the year 1916, \$248,617: dividends for year, \$240,000, or 20 per cent. on issued capital. Undivided profits after all dividends were \$443,687. The sum of \$47,475 was expended in making changes in the mill, and it will take about \$13,000 additional to complete the changes. There were 73,491 tons of ore treated during 1916, of an average value of \$10.65 a ton, giving a recovery at the mill of \$711,997, at an expenditure of \$463,379, and net profits of \$248,617.

HOLLINGER.

In a statement issued June 8, 1917, N. A. Timmins, president of the Hollinger Consolidated Company, stated that it was not the intention of the directors to pay the dividend which ordinarily would be payable on June 18. Mr. Timmins said: "This decision has been reached after full consideration of the present labor situation, and while the board regrets the decision it feels that the shareholders will recognize that it is the only course to adopt."

Labor conditions, said the Hollinger president, instead of showing any improvement, appeared to be gradually drifting into a state of uncertainty which was most embarrassing to the management and seriously interfering with the carrying on of operations.

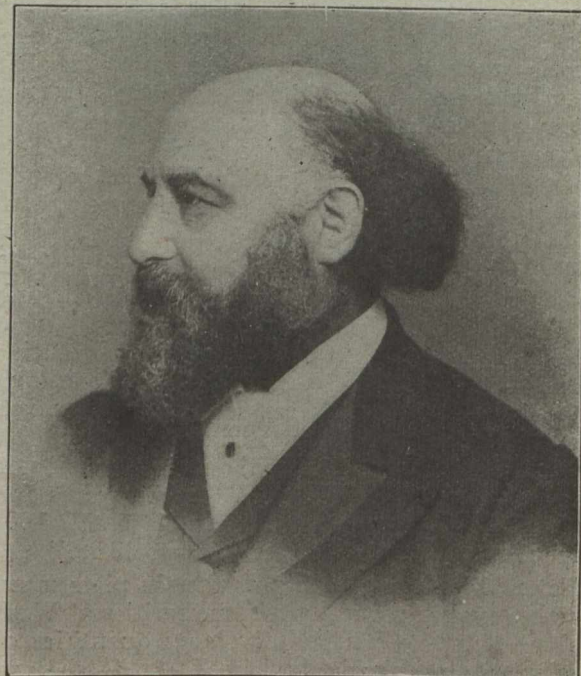
The directors were seriously considering the advisability of directing their efforts almost entirely to development work, and thus put the mine in shape to largely increase the output as soon as an adequate supply of efficient labor should be available.

Mr. Timmins stated that the company was operating under the most up-to-date conditions and was more than satisfying the strict requirements for the protection of the men enacted by the Ontario Mining Act, which was everywhere regarded as a model of its kind. As to wages, the amount paid by the Hollinger company exceeded in the aggregate the demand of those who were responsible for the present agitation.

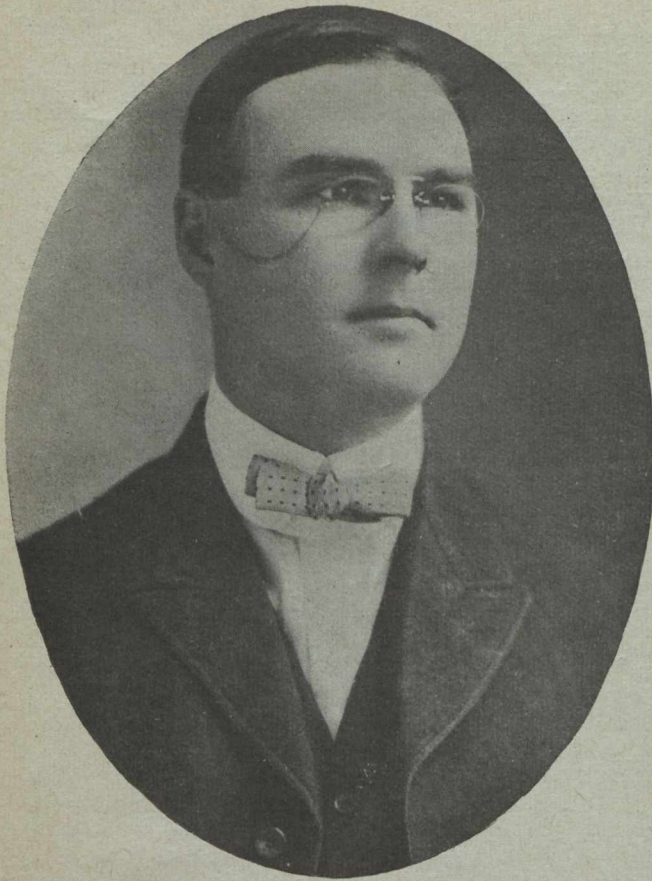
The unrest now so prevalent had been created by a few alien enemies who do not seem to appreciate the liberty they enjoy, assisted by professional labor agitators from the United States, officials of the Western Federation of Miners, who entered Canada notwithstanding the existence of orders against their doing so, and a few Canadians prominent in labor politics.

Mr. Timmins said that there was no intention to close the mine. Operations would be continued as long as a sufficient number of workmen could be secured to carry on, and as long as the company received adequate protection from the authorities.

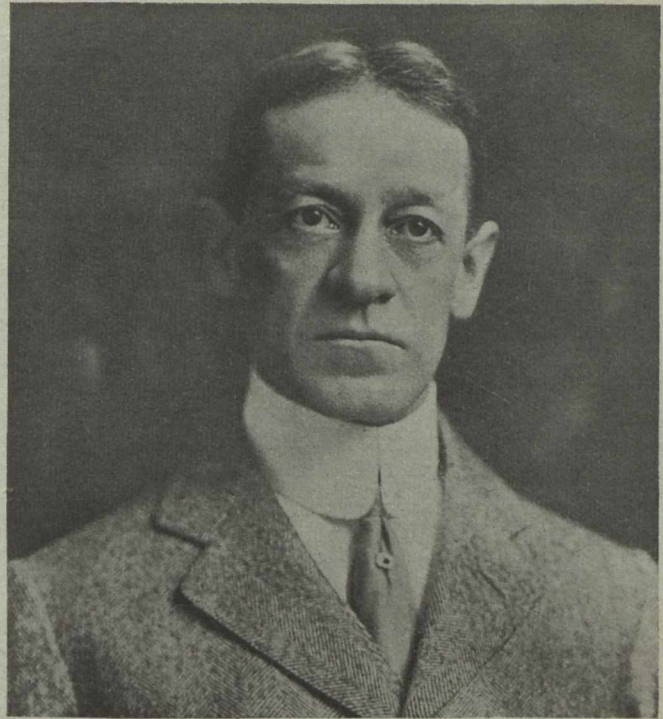
The Hollinger president added that the mine was in excellent condition, and that the ore reserves had been materially added to since the beginning of the year. It would be unwise for shareholders to part with their stock at the present market price.



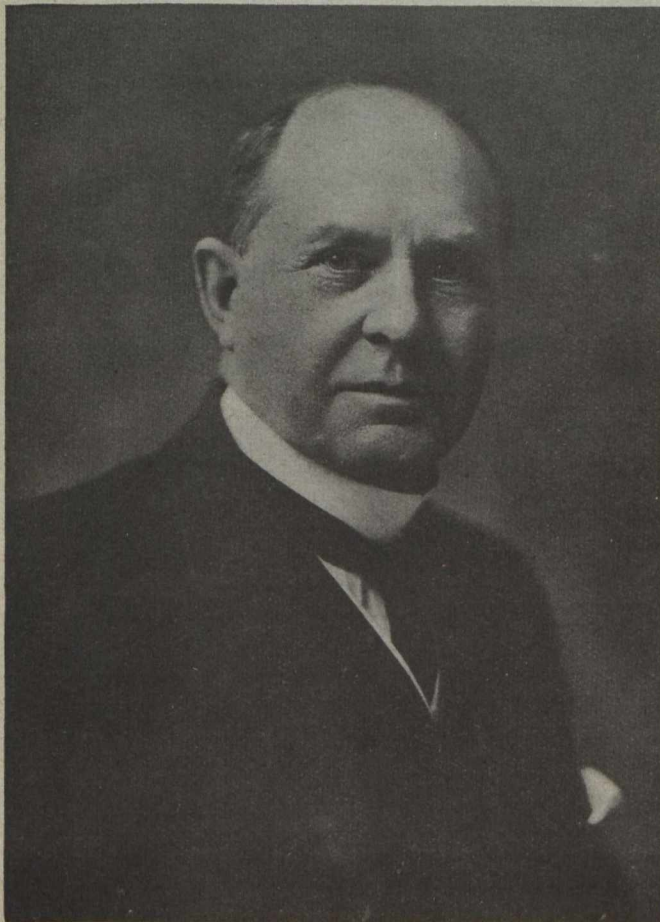
The Late Dr. Ludwig Mond.



C. A. THOMAS,
Resident Manager Yukon Gold Co., Dawson, Yukon.



HENRY S. FLEMING,
Chairman of the Executive Committee, Canadian Colliers Co.,
British Columbia.



COL. THOMAS CANTLEY,
President Nova Scotia Steel & Coal Co.



J. W. BOYLE,
President and General Manager Canadian Klondyke Mining
Company.

LUBRICATION OF ROCK DRILLS.

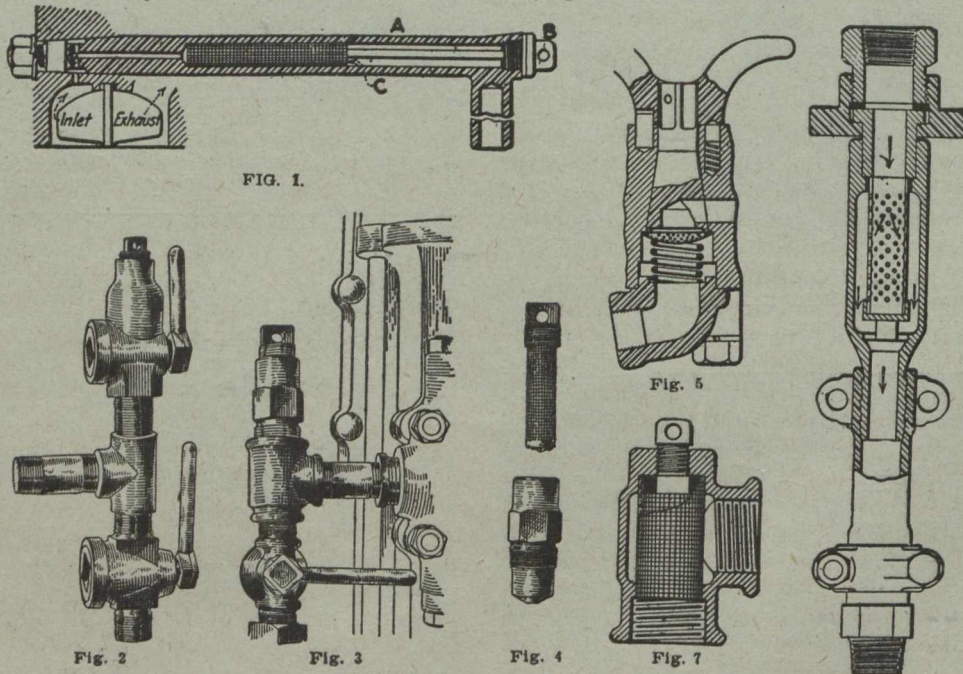
By Charles C. Phelps.

Rock drills are generally regarded as the most "rough and ready" tools in use. They can withstand almost any abuse. As a consequence many drill runners believe that any oil is good enough for lubricating a drill. While it is true that drills will run with almost any kind of oil, it is beyond question that the best results and the least repair costs are obtained only by employing lubricants especially suited to the service. For steam-operated drills a good quality of heavy-body steam cylinder oil is generally found to be most suitable. For air-operated drills, the usual advice is to employ a light or medium-body oil of good quality; however, recent experiments have shown that liquid grease is much better suited for air-operated drills under many conditions of service. This lubricant has been used successfully with both hammer and piston drills, mounted and unmounted types. Liquid grease is particularly valuable for water machines, like the Leyner-Ingersoll, water jackhammer and water stopper, for the reason that it is not washed out by the water as readily as oil is.

plenish the supply until the drill runs dry and, by its poor performance, reminds him that it is time to re-lubricate. One of the best ways to determine whether a hammer drill is getting sufficient lubricant is to notice, when changing steels, whether the shank has oil on it. An operator soon learns to tell when a drill needs lubricant by the dry appearance of the steel shank.

The more modern drills are provided with means for automatic lubrication—features of the greatest practical value. Sometimes the oiling device is an integral part of the drill, and sometimes it is a separate part.

Fig. 1 shows the arrangement for oiling employed with a typical stopper drill. The oil well is in the handle used for rotating the stopper. The hollow handle A fits in a taper hole in the valve chest. In the handle is a porous plug C, beyond which is the oil chamber. Before starting the machine, oil plug B is removed and the chamber in the handle filled with liquid grease. As the machine runs, the pulsations of the air in the supply chamber of the chest draw the oil through the porous plug in the machine. Means are provided to exhaust any pressure in the handle after the air is shut off



Rock Drill Lubricating Appliances.

Liquid grease is a substance that has the appearance of oil and flows similarly, but otherwise has the characteristics and properties of grease. It may be handled in an ordinary oil can and will flow freely through the automatic lubricators on drills. It is made by several of the oil companies. It would be impractical to list here all the various brands which are suitable for air-operated drills, but "I. R. X." Jackhammer and Stopper Grease, (Standard Oil Co.) No. 6 Keystone Liquid Grease, (Keystone Lubricating Co.) "B" Absorbed Oil, (E. F. Houghton & Co.), have been found to give satisfactory results.

The method of feeding is fully as important as the kind of lubricant used. Insufficient lubrication results in slower drilling speed, power wasted in friction, and a more rapid wearing out of parts with consequent higher repair expense. Lubricating too liberally simply increases the oil bill without making any appreciable gain in the operation of the drill. Too often, the matter of lubrication is left to the discretion of the drill runner, who either feeds the oil too liberally or forgets to re-

without drawing the oil out of the chamber. The porous plug serves the double purpose of regulating the flow of oil and straining out any dirt or grit it may contain. A somewhat similar arrangement is used with jackhammers, but in these drills the oil chamber is placed in the side of the cylinder.

If a drill does not embody an oiling device as an integral part of its construction, it can be fitted easily with a special oiler, of which there are several types on the market. In fact, many modern drills are designed to be used with oilers of the external type.

Fig. 2 shows a satisfactory type of external oiler which embodies an oil reservoir of about a half-pint capacity. It is made of malleable iron with a taper plug valve, and is intended for use with either air or steam-operated piston drills. The reservoir is closed with a screw plug. The taper plug has two cups on opposite sides, each holding about a teaspoonful of oil. One cup is always in communication with the reservoir and filled. A half-turn of the handle empties this cup into the supply passage to the drill, and the oil is carried as a spray into

the machine. The other cup is filled ready for another turn of the handle. The reservoir holds enough oil for a half-shift's run, and the handle should be thrown about every 5 to 10 ft. of drilling. The right amount of oil is admitted each time, with no loss of oil or pressure.

Another type of oiler, Fig. 3, is destined to take the responsibility for proper drill lubrication out of the hands of the runner and place it entirely in those of the foreman. It operates by the pulsations of air in the supply pipe near the drill, due to the alternating reversals of the drill piston, and from the nature of its operation has been aptly named the "Heart Beat" oiler. It consists of an oiler body containing a plug carrying a cartridge of wire gauze and an absorbent material (Fig. 4). The body is screwed into a tee, to the branch of which the drill is connected, the oiler coming above the tee and the throttle.

The cartridges are carried in boxes. Three cartridges will suffice for one shift. The drill runner going on shift gets three cartridges from the foreman, and coming off shift, he returns three dry cartridges, which are dropped in a tub of oil and recharged. There is no way of drying the cartridges except by using them in the drill, and the return of dry cartridges is proof the drill has been properly oiled. The oil is not wasted—blown out without doing useful work—but is fed slowly and used to best advantage.

The "Heart Beat" oiler not only enforces proper lubrication of the drill, thus reducing its wear and increasing its capacity, but also economizes lubricant. This type of oiler is intended only for use with air-operated piston drills.

Sometimes drill runners introduce oil through the hose, pouring it in before connecting the drill line to the pressure main, thereby saving themselves the trouble of unscrewing the oil plugs of the drill. This practice cannot be condemned too emphatically, for the oil rapidly destroys the rubber lining used in ordinary hose, and furthermore, it carries into the drill any particles of dirt that may have lodged in the hose.

The remaining important part to be considered in connection with lubrication pertains to grit, dirt and other foreign matter. It is scarcely necessary to mention that the working parts of the drill should be cleaned frequently, preferably with kerosene, and kept well oiled or greased while standing idle.

Dirt must be prevented from entering the drill either with the lubricant or with the compressed air. The former point is taken care of by using a good quality of liquid grease only or oil free from impurities and keeping the supply in a closed vessel. A little grit will do a lot of damage in cutting out cylinders, valves and rotation parts. Small particles of grit and dust pass through the hose, and these must be removed before entering the drill, usually, by an air strainer or filter of some type placed as close to the drill inlet as practicable.

Fig. 5 shows the details of a strainer placed within a stoping drill. This strainer consists of a cup-shaped disk of perforated metal held in position back of the throttle valve by a coiled spring. It has been objected by some that a strainer such as this will result in loss of air pressure. However, tests at various pressures have shown that no reduction in air consumption or loss of power occurs through its use. If the work done by the machine falls off, it is an indication that the strainer is clogged with dirt and needs cleaning. It will be noticed that the air inlet is enlarged at the strainer, permitting an unrestricted flow of air.

Fig. 6 shows another type of strainer, which is principally intended for use on stope drills. The straining medium consists of a piece of perforated metal rolled into the form of a tube. The connection of which this type of strainer is a part should always remain attached to the valve chest when the machine is disconnected from the pressure line to prevent dust from entering the tool while lying idle. Dirt collects on the inside of the straining tube and may be easily removed from time to time by taking the device off the drill and blowing air through it from the end opposite that into which air ordinarily enters. Fig. 7 shows a sectional view of an angle filter, which forms a part of the standard equipment of certain water drills.

The straining medium in the filter, illustrated in Fig. 7 consists of a tube of brass wire cloth through which the air must pass to enter the machine. The area through this tube is greatly in excess of the area of the inlet and outlet passages, which insures a free flow of air.—Eng. and Min. Journal.

PERSONAL AND GENERAL.

Members of the Canadian Mining Institute who attended the International Mining Convention held at Nelson, British Columbia, on May 18 and 19, in connection with which there was held a joint meeting of the Columbia Section of the American Institute of Mining Engineers and the Western Branch of the Canadian Mining Institute, were Mr. Jas. Anderson, Kaslo; Mr. L. K. Armstrong, Spokane, Wash.; Mr. S. G. Blaylock, Trail; Mr. S. S. Fowler, Riondel; Mr. J. Cleveland Haas, Spokane; Mr. E. Jacobs, Victoria; Mr. W. C. E. Koch, Nelson; Mr. Oscar Lachmund, Greenwood; Mr. G. A. Lafferty, Rossland; Mr. A. G. Larson, Spokane; Mr. W. H. Linney, Spokane; Mr. Alfred McMillan, Rossland; Mr. Fred S. Peters, Rossland; Mr. Wm. Thomlinson, New Denver; Mr. John Vallance, New Denver; Mr. H. E. Wade, Trail; Mr. Bruce White, and Mr. Oscar White, Sandon, Slokan.

Mr. M. S. Davys has returned to West Kootenay district of British Columbia from Southern California, much improved in health.

Mr. S. P. Silverman, son of Mr. S. I. Silverman, manager, is superintendent for the Tidewater Copper Co., which is developing the Indian Chief mine, near Sidney Inlet, West Coast of Vancouver Island, B.C.

Mr. James Cronin was down from the Babine region of Omineca mining division of British Columbia last month, to visit his family in Spokane, Wash.

Lieut. C. St. G. Campbell is reported missing since April 6

Mr. Arthur A. Cole, president of the Canadian Mining Institute, is acting as field organizer for the Central Directing Committee of Volunteer Organizations, entrusted with the task of securing industrial returns for the Advisory Council for Industrial and Scientific Research. The performance of this duty will involve something like 10,000 miles of travelling. Mr. Cole left early in May for British Columbia, and will visit in turn the provinces of Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia.

Mr. Samuel Cohen, general manager, Crown Reserve Mining Co., Ltd., Porcupine-Crown Mines Limited, has returned to Montreal after a two-months' trip to California.

Mr. Julius M. Cohen, manager Croesus Gold Mines, Limited, Matheson, Ont., has been appointed a first lieutenant in the United States Reserve Corps.

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA.

At the end of May there was little change in the situation as regards the strike of members of District No. 18, United Mine Workers of America, affecting the operation of coal mines in the Crowsnest district of British Columbia and in Alberta. There has been a deadlock for a while, the miners insisting on a 30 per cent. increase in wages and the operators stating that they will not grant so large an increase, meanwhile maintaining their stand on their stated willingness to grant a 15 per cent. increase.

One press despatch, from Ottawa, is to the effect that the strikers are not inclined to resume work except on their own terms, notwithstanding the efforts of President White of the International organization of the U. M. W. of A. A despatch from Calgary, Alberta, stated that by May 29th another step had been reached in the strike situation, the miners seeming to have gained one point. Following instructions from the International Board that work be resumed on the 15 per cent. increase basis, the various camps in District 18 have notified District President Graham of their intention to insist on their demand for a 30 per cent. increase. The district secretary is quoted as having said: "There is no possibility, as far as we can see at present, of any camp deviating from this line of action, and we are quite satisfied with the conditions. "No communication had by then been received by the representatives of the miners, neither from the operators nor the Dominion Government, and no move was then expected toward a resumption of work in the mines of the central and southern parts of the district.

On the other hand, it is stated that indications of a disposition to meet the demands of the men had come from the Grand Trunk Pacific section, in which are situated the Mountain Park, Pacific, and Yellowhead mines, which are described as large independent collieries. Requests for representatives of the policy committee were made and two representatives had gone to that district, the expectation being that the 30 per cent. increase would be conceded there.

From the Brule Lake region, on the Canadian Northern Railway, where about 800 miners are on strike, no similar intimations had been received up to May 29, and there was uncertainty as to the attitude of the mine operators there. The mines in both the Grand Trunk Pacific and Canadian Northern Railway districts are stated to not be represented in the Western Coal Operators' Association, so they are individually free to make their own settlement with the miners. Vice-President Rees, Canadian representative on the U. M. W. of A. International Council, who had been attending the council meeting in Indianapolis, was expected to arrive in Calgary on May 30, and it was expected he would endeavor to persuade the miners to follow the advice of President White and return to work. The further statement was made that this would be the last effort to reach a settlement of the trouble by agreement, and should it fail the alternative would be for the Government to take charge of the coal mines and operate them under the direction of a Commission.

Meanwhile, there is some improvement in the position in Rossland camp and at Phoenix, for in the former the Consolidated Mining and Smelting Company has employed a number of men to do development work in its mines, and in the White Bear in which it has been doing exploratory work under an option to pur-

chase, while the Granby Consolidated Company has put on forty to fifty men, also to do development work, pending the receipt of coke at the company's smelting works to admit of a return to production and smelting operations.

The effect of the long-continued stoppage of the supply of coke from the Crowsnest region is seen in the considerable decrease that has taken place in the quantity of ore received at the Consolidated Company's smelting works at Trail, West Kootenay. During three weeks ended May 21, the total quantity of ore received was 10,270 tons, as compared with that of the corresponding periods of the four earlier months of the current year, as follows: For three weeks in April, 19,120 tons; in March, 29,342 tons; in February, 30,471 tons, and in January, 23,646 tons. Reduced to daily averages, the average for each day of the three weeks in January was 1,126 tons; in February, 1,451 tons; in March, 1,397 tons; in April, 910 tons, and in May 489 tons. The Granby Company's smelting works at Grand Forks have been inoperative for several weeks, and the Canada Copper Corporation has had to restrict its smelting to using one furnace only, using coke obtained from the United States.

East Kootenay.

Production of lead and zinc ore, probably in the largest part of the latter, is being maintained at the Sullivan mine, in Fort Steele mining division. During rather more than six weeks, ended May 21, the total quantity of ore received at Trail from this mine was 17,473 tons. From other mines in the district, only 202 tons was received, of which 126 tons was from the Consolidated Company's St. Eugene mine, and 76 tons from the Paradise mine in Windermere mining division of East Kootenay.

The Victor-Silver Leaf mine, on Maus creek, about eight miles from Fort Steele, is being worked by Spokane men, who are employing ten men doing development work pending the completion of a temporary wagon road to allow of hauling being done between the Kootenay Central Railway and the mine, after which more men will be put on. The expectation is that a production will be made daily of 20 to 40 tons of silver-lead ore of a grade that will average about 100 a ton gross value. Besides the high-grade ore, there is stated to be a large quantity of milling ore, so that if concentrating facilities be provided, there will be concentrate as well as crude ore to ship to the smelting works.

West Kootenay.

Ainsworth.—The Bluebell, on the east shore of Kootenay Lake, and the Highland, north of the town of Ainsworth, have been the larger shippers to Trail from this division in recent weeks. The most noteworthy feature of late was the starting of the concentrating mill of the Florence Silver Mining Co., after weeks of waiting for sufficient water for power and milling purposes. The installation of concentrating machinery at the Silver Hoard mine, near the town, is reported. Arrangements have been made for resuming work on the Cork-Province property, on the south fork of Kaslo creek. The Utica is stated to be in an improved position financially, with about \$100,000 available for operating purposes.

Slocan.—With the snow melting the water supply has considerably increased, so that concentrating mills are no longer hampered as they had been for several months. The changed conditions are making it easier to operate mines and to run concentrating mills to capacity. The Rambler-Cariboo, Slocan Star, and Sur-

prise are being benefited by the passing of winter, production of concentrate being practicable on a larger scale than during the winter. Favorable developments in the Noonday company's Slocan King mine, in close proximity to the Slocan Star, are reported. The Queen Bess continues to do well, with much good ore available for shipment when hauling to the railway shall again be practicable. Lucky Jim affairs are still in a tangle so far as the affairs of the company are concerned, but the receiver, under whom the mine has been operated for some time past, has been gradually accumulating money with which to pay off the unsecured claims that have long been standing against the company. In Silverton camp, progress is being made at the Standard, most of the men employed being at work in the company's Alpha property; the chief output of late has been of zinc ore from levels 6, 7, and 8; a late report is that some more good silver-lead ore has been found on No. 4 level. The Galena Farm mine and concentrating mill are now running and shipment of ore and concentrate to Trail has been resumed.

Nelson.—Developments in the Granite-Poorman gold mine are favorable. There is an improved outlook for the Eureka copper mine. The finding of a shoot of good silver-copper ore in one of the Silver King mines has been reported. In the Salmo region there is a change for the better; in the Emerald there is much lead ore opened, and shipments will be made as soon as the wagon road will stand the heavy hauling over it. Sulphide zinc ore has been found on the 300-ft. level of the Hudson Bay mine, from which shipment of carbonate ore is again being made.

Revelstoke and Lardeau.—The Lanark, at Illecillewaet, in Revelstoke division, is again on the shipping list, having shipped 41 tons to Trail at the beginning of May. A concentrating plant has been installed on that property. Efforts are being made to revive interest in the lode-mining properties in the Big Bend of the Columbia region. Various properties in Lardeau and Trout Lake divisions are having attention.

Boundary.

Mention has already been made of conditions at the respective smelting works of the Granby and British Columbia Copper (now Canada Copper Corporation) smelting works. Now that spring has set in, preparations are being made to again ship ore from the Union mine, in Franklin camp, some 50 miles north of Grand Forks.

Similkameen and Nicola.

In Nicola valley, concentration of ore has been commenced at Stump Lake by the Donohue Mines, Ltd. Experiments with Nicola coal, for making a good metallurgical coke and recovery of by-products, are reported to have given promising results.

COPPER MINING IN YUKON.

Whitehorse, Yukon.—It is reported a body of high grade ore was struck a few days ago in the War Eagle. Messrs. Wm. Ceinick, John Bonanza and Fred McGlashen, lessees of the Anaconda copper mine, are having hauled into town and will ship some time this week two carloads of ore which has an assay value of 15.40 per cent. copper. Some of the ore will run as high as 40 per cent.

Foreman Nelson of the Valerie copper mine was in

Town Saturday and reported that everything was progressing there in fine shape. The main shaft has been cleared of ice and pumped free of water and all is in readiness for the commencement of the work of taking out ore as soon as some necessary machinery, expected to reach here from the outside almost any day, arrives.

The main shaft of the Copper King mine having reached a depth of 190 feet, Manager J. P. Whitney now finds it necessary to add more machinery to overcome the increased seepage of water. In the past 40 days a 200 foot drift has been run on the Copper King to tap a body of bornite and peacock copper ore located by the diamond drill. The drift has not yet reached this deposit, however, and its extent is therefore still problematical.—Weekly Star.

MR. GALLOWAY FIRST B. C. DISTRICT ENGINEER.

Victoria, B.C., June 1.—The first of the district engineers to be appointed under the provisions of the Mineral Survey Act of the late session has been named by the Government. Mr. John D. Galloway, assistant mineralogist in the Department of Mines here for some years, a competent mining engineer, and a graduate of McGill, has been appointed engineer for the North-eastern Mineral Survey district which comprises the old mining divisions of Omineca, Peace River, Cariboo and Quesnel, with headquarters at Hazelton.

The act divides the Province into six districts, for which appointments will be made, but with the exception of Mr. Galloway there will be no further appointments made for some time, it is stated. A perfect deluge of applications have been sent in by those seeking office.

The position of district engineer will be no sinecure. The act requires him to carry on a continuous mineral survey of his district, keep complete records and plans thereof and submit continuous reports to the department, and generally perform the duties required by the act, assist the prospectors by furnishing them with needed information, examining and testing their samples of ore, report upon the necessity or otherwise and cost of roads, trails, etc., and direct drilling operations under the Government's plan of testing mineral properties, etc.

Hon. Mr. Sloan, Minister of Mines, stated yesterday that he considered the department fortunate in being able to secure the services of a man so eminently qualified to fill the position as Mr. Galloway.—The Colonist.

EXPLOSION AT CUMBERLAND MINE.

Nanaimo, B. C., June 4.—Four men were killed instantly and much damage done to No. 6 mine of the Canadian Collieries, Dunsmuir, Ltd., at Cumberland by a terrific explosion Sunday. The four victims comprised members of a survey party headed by George N. Bertram, Chief Surveyor of the collieries, who, as is the usual custom, mapped out on Sundays, when the full shift was not working, such extensions and new work as were contemplated during the week. The party consisted of George N. Bertram; Lewis Murdock, Assistant Surveyor; Frank Bobbo, fire boss, and A. Brown of Nanaimo, a miner. So far the cause of the explosion remains a mystery. About fourteen years ago there was an explosion in the same mine, when about sixty were killed. Since then, however, the mine has been considered safe by miners. It is located under the very heart of Cumberland, and the town was badly rocked by the force of the explosion.



Underground in a Cobalt Silver Mine.

MARKETS

SILVER PRICES.

	New York. cents.	London. pence.
May 25.....	74 ⁵ / ₈	37 ⁷ / ₈
" 26.....	74 ⁵ / ₈	37 ⁷ / ₈
" 28.....	74 ⁵ / ₈	....
" 29.....	74 ⁵ / ₈	37 ⁷ / ₈
June 1.....	74 ⁷ / ₈	38
" 4.....	75 ¹ / ₄	38 ³ / ₈
" 6.....	75 ¹ / ₈	38 ¹ / ₈

TORONTO MARKETS.

Cobalt oxide, black, \$1.50 per lb.
 Cobalt oxide, grey, \$1.65 per lb.
 Cobalt metal, \$2.25 per lb.
 Nickel metal, 45 to 50 cents per lb.
 White arsenic 15 cents per lb.
 June 8, 1917—(Quotations from Canada Metal Co., Toronto)
 Spelter, 12¹/₂ cents per lb.
 Lead, 14 cents per lb.
 Tin, 67 cents per lb.
 Antimony, 26 cents per lb.
 Copper, casting, 34 cents per lb.
 Electrolytic, 36 cents per lb.
 Ingot brass, yellow, 23 cents; red, 25¹/₂ cents per lb.
 June 8, 1917—(Quotations from Elias Rogers Co., Toronto)
 Coal, anthracite, \$9.50 per ton.
 Coal, bituminous, nominal, \$9.00.

NEW YORK MARKETS.

Connellsville Coke—
 Furnace, spot, \$9.50 to \$9.75.
 Furnace, contract, \$8.50.
 Foundry, spot, \$10.00 to \$11.00.
 Foundry, contract, \$9.50 to \$10.50.
 Straits Tin, spot, f.o.b. nominal, 61.00 cents.
 Copper—
 Prime Lake, nominal, 31.00 to 32.00 cents.
 Electrolytic, nominal, 32.50 to 33.00 cents.
 Casting, nominal, 30.50 to 31.00 cents.
 Lead, Trust price, 10.00 cents.
 Lead, outside, nominal, 11.50 cents.
 Spelter, prompt western shipment, 9.55 to 9.67¹/₂.
 Antimony—
 Chinese and Japanese, nominal, 21.00 to 21.50 cents.
 Aluminum—nominal.
 No. 1 Virgin, 98-99 per cent., 59.00 to 61.00 cents.
 Pure, 98-99 per cent. remelt, 56.00 to 58.00 cents.
 No. 12 alloy remelt, 41.00 to 43.00 cents.
 Powdered aluminum, 85.00 to 90.00 cents.
 Metallic magnesium—99 per cent. plus, \$2.50 to \$3.00.
 Nickel—Shot and ingot, 50.00 cents.
 Electrolytic, 55.00 cents.
 Cadmium, nominal, \$1.45 to \$1.50.
 Quicksilver, \$90.00.
 Platinum—
 Pure, \$105.00.
 10 per cent. iridium, \$110.00.
 Cobalt (metallic), \$1.70.
 Tungsten, per unit—
 Sheelite, \$17.50.
 Wolframite, \$17.00.
 Silver (official), 75¹/₈ cents.

COBALT AND PORCUPINE STOCKS.

	As of June 11th, 1917.	
	Gold.	
	Asked.	Bid.
Apex .....	.04 ¹ / ₂	.04 ¹ / ₈
Boston Creek .....	...	.62
Davidson .....	.75	.60
Dome E xtension .....	.14	.12 ¹ / ₂
Dome Lake .....	.17	...
Dome Mines	10.00	9.75
Eldorado.....	.02	...
Elliott .....	.35	.33
Gold Reef .....	.02	.01
Hollinger Con.	3.55	3.50
Inspiration .....	.06	...
Keora .....	.12 ¹ / ₂	.10
Kirkland Lake .....	...	.36
McIntyre	1.37	1.35
Moneta .....	.11	...
Newray Mines .....	...	.63
Pearl Lake .....	.00 ¹ / ₄	...
Porcupine Bonanza .....	.09	...
Porcupine Crown .....	.54	...
Porcupine Gold .....	.02	...
Porcupine Imperial .....	.02 ¹ / ₄	.02
Porcupine Tisdale .....	.01 ³ / ₄	.01 ¹ / ₂
Porcupine Vipond .....	.34 ¹ / ₂	.33
Preston .....	.04	.03
Schumacher G. M. ....	.48	...
Teck Hughes .....	.56	.50
Thompson Krist .....	.09	.08
T. Burns, com. ....	...	.17 ¹ / ₂
West Dome Con. ....	.18	.17 ³ / ₄
	Silver.	
Ananac .....	.20	...
Bailey .....	.04	.03
Beaver .....	.33	.30 ³ / ₄
Buffalo	1.40	1.00
Chambers-Ferland .....	.11	.10 ¹ / ₂
Coniagas	4.50	3.75
Crown Reserve .....	.28	.25 ¹ / ₂
Gifford .....	.03 ⁵ / ₈	.03 ¹ / ₂
Gould Con. ....	.00 ³ / ₈	...
Great Northern .....	.08 ³ / ₄	.08
Hargraves .....	.11 ³ / ₄	.11 ¹ / ₂
Hudson Bay	40.00	...
Kenabeek .....	.28	.27
Kerr Lake	4.70	4.55
Lorrain .....	.18	...
La Rose .....	.45	.41
McKin. Darragh .....	.52	.51
Nipissing	7.50	7.40
Ophir. ....	.05 ¹ / ₄	.05
Peterson Lake .....	.09 ¹ / ₂	.08 ³ / ₄
Right of Way .....	.06	.05
Shamrock .....	.18	...
Silver Leaf .....	.02	.01 ¹ / ₄
Seneca Superior .....	.02 ¹ / ₂	.02
Temiskaming .....	.37	.36
Trethewey .....	...	.11
White Reserve .....	...	.10
Wettlaufer .....	...	.05
York, Ont. ....	.02	...

SMELTER SMOKE CASES.

Toronto, May 31.—In a written judgment of 180 pages Mr. Justice Middleton gave judgment this afternoon against the Mond Nickel Company in two cases, and against the Canadian Copper Company in four damages for the sulphur fumes from the smelters in Sudbury district.

Other actions had been begun, but remained in abeyance, pending the trial of the six charged decided upon to-day.

An interesting exhibit at the trial was a letter from Lord Kitchener as to the importance of nickel in the war.

To-day's awards were: Andrew Ostrosky and Justine Ostrosky, \$500; and J. H. Clary, \$1,00—against Mond Nickel co.

J. F. Black, \$1,000; Maria Taillefer, \$8000; Joseph Belanger, \$750; and Sudbury & Copper Cliff Dairy Co., \$1,000. against Canadian Copper Co.

A BILLION IN BULLION.

In the House at Ottawa last week Sir Thomas White stated that the amount of gold in coin and bars handled by the Canadian finance department since the war was twice the total amount of gold that there was in England when the war began, and this vast supply had come to Canada from Great Britain, Asia, Russia, Africa and other countries, via Halifax and Vancouver. The bullion shipments had been made in British warships coming to Halifax or Vancouver, where they were met by officials of his department and taken to Ottawa.

Since the beginning of the war, said Sir Thomas, the Canadian finance department had handled for the Imperial government and the Bank of England \$1,000,000,000 in bullion. In addition to this, the Mint had been enlarged to refine gold coming from South Africa and Russia.

LARGE COPPER PRODUCTION.

Boston, June 6.—In the first four months of this year the principal copper mines of North and South America produced a total approximating 715,000,000 pounds. The come-back from the winter curtailment has been quite marked all along the line, and with no interference to the mining operations as a whole the current year should be able to hang out another high record in the matter of production.

Of the 715,000,000 pounds produced to date in 1917 Anaconda was responsible for nearly 114,000,000 pounds, with Phelps-Dodge Corporation properties second with a total of 64,000,000 pounds.

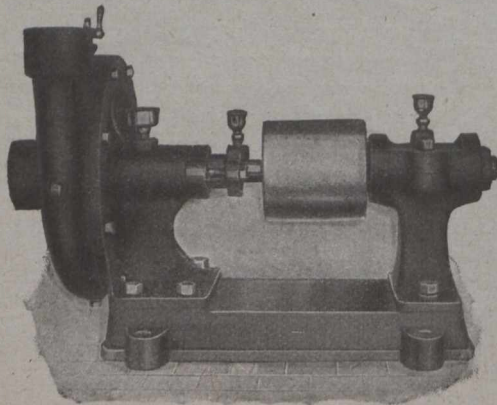
WESTERN BRANCH C. M. I.

A business meeting of members of the western branch of the Canadian Mining Institute was held at Nelson on Friday, May 18th, with Bruce White, chairman of the branch, in the chair.

Scrutineers reported the election of W. M. Brewer of Victoria, mining engineer, as chairman of the branch for the ensuing year and of the following members of council to represent the various parts of the province: Cariboo, John Hopp, Barkerville; Crowsnest, Chas. Grhaam, Michel; East Kootenay, J. H. Cram, Kimberley; Nelson, A. G. Larson; Trail, E. H. Hamilton; Boundary, C. M. Campbell, Phoenix; Similameen, F. S. Norcross, Jr., Copper Mountain; Nicola and Yale, Frederic Keffer, Highland Valley; Kamloops, W. F. Wood; mainland coast, F. M. Sylvester, Vancouver; Omineca, J. H. McMillan, Prince Rupert; Victoria, Wm. Fleet Robertson. Other members of the branch council, ex officio, are Messrs. E. E. Campbell, Anyox; S. S. Fowler, Riondell; Thos. Graham, Cumberland; G. P. Jones, Hedley; M. E. Purcell, Rossland, and Bruce White, Sandon, Slovan.

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PETER DALY and Others—Defendants.

PURSUANT to the Judgment and Final Order for sale made in this cause and bearing date respectively, the 7th day of October, A.D. 1916, and the 21st day of December, A.D. 1916, there will be sold with the approbation of Joseph B. Walkem, Esq., K.C., Master of this court at Kingston, at his office at 93 Clarence Street in the City of Kingston, at the hour of 3 p.m., on the 15th day of June, 1917, the minerals in, under and upon the east half of Lot No. 6 in the 8th Con. of the Township of Bedford, in the County of Frontenac. This lot has many well-defined veins and showings of mica. It has always produced when worked, mica in good paying quantities, of large size and good quality. Very little mining has been done on the property and no shaft has been sunk to a depth of 20 feet. Anyone interested in mining should inspect this property before the day of sale. The property will be offered for sale subject to a reserve bid to be fixed by the Master.

TEN per cent. of the amount of the purchase price is to be paid at the time of sale, the balance within thirty days thereafter.

In all other respects the terms and conditions of sale will be the standing conditions of the Supreme Court of Ontario.

Further particulars can be had from STEWART, HOPE & O'DONNELL, of Perth, Ontario, Solicitors for the Vendor, and J. L. Whiting, Esq., K.C., Kingston.

(Sgd.) J. B. WALKEM,

37—3t.

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The Company continues the notice of the former owners of these patents that it is ready to grant licenses for the use of this process to those who wish to install and use it in Canada, as well as in other parts of North America.

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Can. Ingersoll-Rand Co., Ltd
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Standard Underground Cable Co. of Can., Ltd.
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- Cages—**
Fraser & Chalmers of Canada, Limited.
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Standard Underground Cable Co. of Canada, Ltd.
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Sullivan Machinery Co.
- Cars—**
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W. Fraser.
Jeffrey Mfg. Co.
Northern Canada Supply Co.
MacKinnon, Holmes & Co.
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Northern Canada Supply Co.
Hull Iron & Steel Foundries, Ltd.
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Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Jones & Glasco
Northern Canada Supply Co.
B. Greening Wire Co., Ltd.
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Thos Heys & Sons.
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Ledoux & Co.
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- Coal Mining Machinery—**
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers of Canada, Limited.
Jeffrey Mfg. Co.
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Sullivan Machinery Co.
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Can. Fairbanks-Morse Co.
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Jeffrey Mfg. Co.
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International Nickel Co.
- Nickel—**
International Nickel Co.
- Ore Sacks—**
Northern Canada Supply Co.
- Ore Testing Works**
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Canadian Miners' Buying Directory.—(Continued from page 14.)

Pulleys, Shafting and Hangings— Can. Fairbanks-Morse Co. Fraser & Chalmers of Canada, Limited Jeffrey Mfg. Co. Northern Canada Supply Co.	Darling Bros., Ltd. Smart-Turner Machine Co. Canadian Ingersoll-Rand Co., Ltd. Fraser & Chalmers of Canada, Limited	Scales— Can. Fairbanks-Morse Co.	Steel Drums— Smart-Turner Machine Co.
Pumps—Boiler Feed— Can. Fairbanks-Morse Co. Darling Bros., Ltd. Smart-Turner Machine Co. Northern Canada Supply Co. Canadian Ingersoll-Rand Co., Ltd. Fraser & Chalmers of Canada, Limited Wettlaufer Bros.	Pumps—Vacuum— Can. Fairbanks-Morse Co. Darling Bros., Ltd. Smart-Turner Machine Co.	Screens— B. Greening Wire Co., Ltd. Jeffrey Mfg. Co. Northern Canada Supply Co. Fraser & Chalmers of Canada, Limited Roberts & Schaefer Co.	Steel—Tool— N. S. Steel & Coal Co. Armstrong, Whitworth of Can., Ltd.
Pumps—Centrifugal— Can. Fairbanks-Morse Co. Darling Bros., Ltd. Escher Wyss & Co. Mussens, Limited. Smart-Turner Machine Co. M. Beatty & Sons. Can. Ingersoll-Rand Co., Ltd. Fraser & Chalmers of Canada, Limited	Quarrying Machinery— Sullivan Machinery Co. Can. Ingersoll-Rand Co., Ltd.	Screens—Cross Patent Flanged Lip— Hendrick Mfg Co.	Surveying Instruments— W. F. Stanley. C. L. Berger.
Pumps—Electric— Can. Fairbanks-Morse Co. Darling Bros., Ltd. Smart-Turner Machine Co. Canadian Ingersoll-Rand Co., Ltd. Fraser & Chalmers of Canada, Limited	Rails— W. Fraser.	Separators— Can. Fairbanks-Morse Co. Darling Bros., Ltd. Smart-Turner Machine Co.	Tanks—Cyanide, Etc.— Fraser & Chalmers of Canada, Limited Hendrick Mfg. Co. Pacific Coast Pipe Co., Ltd. MacKinnon, Holmes & Co.
Pumps—Pneumatic— Can. Fairbanks-Morse Co. Darling Bros., Ltd. Smart-Turner Machine Co. Can. Ingersoll-Rand Co., Ltd. Sullivan Machinery Co.	Roasting Plants— Fraser & Chalmers of Canada, Limited	Sheet Lead— Canada Metal Co., Ltd.	Tipples— Roberts & Schaefer Co.
Pumps—Steam— Can. Fairbanks-Morse Co. Can. Ingersoll-Rand Co., Ltd. Darling Bros., Ltd. Mussens, Limited. Northern Canada Supply Co. Smart-Turner Machine Co.	Rolls—Crushing— Fraser & Chalmers of Canada, Limited	Sheets—Genuine Manganese Bronze— Hendrick Mfg. Co.	Transits— C. L. Berger & Sons.
Pumps—Turbine— Can. Fairbanks-Morse Co.	Roofing— Can. Fairbanks-Morse Co. Northern Canada Supply Co.	Shovels—Steam— M. Beatty & Sons. W. Fraser.	Tube Mills— Fraser & Chalmers of Canada, Limited
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	Rope—Wire— B. Greening Wire Co., Ltd. Allan, Whyte & Co. Northern Canada Supply Co. Fraser & Chalmers of Canada, Limited	Stacks—Smoke Stacks— Can. Fairbanks-Morse Co. Hendrick Mfg. Co. MacKinnon, Holmes & Co.	Valves— Can. Fairbanks-Morse Co.
	Samplers— C. L. Constant Co. Ledoux & Co. Milton Hersey Co. Thos. Heys & Son.	Stamp Mills— Fraser & Chalmers of Canada, Limited	Winding Engines— Canadian Ingersoll-Rand Co., Ltd.
		Steel Barrels— Smart-Turner Machine Co.	Wire Cloth— Northern Canada Supply Co. B. Greening Wire Co., Ltd.
		Steel Drills— Sullivan Machinery Co. Northern Canada Supply Co. Can. Ingersoll-Rand Co., Ltd.	Wire (Bare and Insulated)— Standard Underground Cable Co., of Canada, Ltd. Zinc Spelter— Canada Metal Co., Ltd.

ALPHABETICAL INDEX TO ADVERTISERS

A	Dominion Steel Foundry, Ltd. 3	Ledoux & Co. 15
Aikenhead Hardware, Ltd.	Dorr Co. 15	Lindsey, G. G. S. 15
.....Outside Front Cover	Dwight & Lloyd Sintering Co., Inc. 7	Lymans, Ltd. 6
Allan, Whyte & Co.	E	M
American Zinc Lead & Smelting Co. 5	Escher, Wyss & Co.	MacKinnon, Holmes & Co.
Armstrong, Whitworth of Can., Ltd. 3	Eustes Mining Co. 16	Manville Asbestos Co. 16
B	F	Mond Nickel Co. 4
Bath, Henry & Son 17	Foster, W. L. Co. 14	Murphy, Chas. J. 15
Balbach Smelting & Refining Co. 17	Ferrier, W. F. 15	Mussens, Ltd. 10
Beatty, Blackstock, Fasken, Cowan & Chadwick 15	Fleck, Alex. 9	N
Beatty, M. & Sons 12	Flotation Process of Ore Concentration. 13	Northern Canada Supply Co., Ltd. 7
Berger, C. L. & Sons 9	Foundation Co. of Montreal 12	Northern Electric Company
Blackwell, Geo. G., Sons & Co. 17	Fraser & Chalmers of Can., Ltd. 4	Nova Scotia Province 8
British Columbia, Province of .. 7	Fuller, A. S. & Co. 16	Nova Scotia Steel & Coal Co. 4
Buffalo Mines, Ltd. 5	G	Nova Scotia Government. 8
C	General Engineering Co. 16	O
Campbell & Deyell, Ltd. 15	Goldsmith Bros., Smelting & Refining Co., Ltd. 5	Ontario, Province of
Canadian Explosives, Ltd. 18	Goyette, A. E. 5	..... Inside Back Cover
Canadian Fairbanks-Morse Co. 10	Goold, Shaply & Muir Co., Ltd. ... 5	P
Can. Ingersoll-Rand Co., Ltd. 1	H	Pacific Coast Pipe Co. 9
Canadian Inspection & Testing Laboratories	Hassan, A. A. 15	Q
..... 15	Hamilton Gear & Machine Co. 12	Quebec, Province of
Canadian Laboratories Ltd. 15	Hendrick Mfg. Co. 6	Queen's University
Canada Metal Co. 12	Hersey, Milton Co., Ltd. 15	R
Canadian Milk Products, Ltd. 10	Heys, Thomas & Son 15	Rogers, John C. 15
Canadian Steel Foundries 14	Hitchcock, C. H. 15	S
Cohen, S. W. 15	Hull Iron & Steel Foundries, Ltd.	Smart-Turner Mach. Co., Ltd. 266
Consolidated Mining & Smelting Co. 17	..... outside front cover	Smith & Traers Diamond Drill. 16
Coniagas Reduction Co., Ltd. 17	I	Smith & Durkee Diamond Drill Co. 15
Constant, C. L. & Co. 17	Imperial Bank of Canada 6	Smith, Sydney 15
Curtis's & Harvey	International Molybdenum Co. 5	Spearman, Chas. 15
.....Outside Back Cover	International Nickel Co. 6	Standard Underground Cable Co. of Canada, Ltd. 9
D	J	Stewart, Robt. H. 15
Darling Bros.	Jenckes Mach. Co. 3	Sullivan Machinery Co. 2
Dept. of Mines, Canada.	Johnson, Matthey & Co. 15	T
.....Inside Front Cover	Jones & Glassco (Reg'd) 14	Toronto, Iron Works, Ltd. 4
Deloro Mining & Reduction Co. 17	K	Tyrrell, J. B. 15
Diamond Drill Contracting Co. 5	Kingston Smelting Co. 5	Toronto Testing Laboratory, Ltd. 15
Dominion Coal Co., Ltd. 9	L	W
Dominion Engineering & Inspection Co. 15	Ladysmith Smelting Corp. 5	Wettlaufer Co. 9
		Wettlaufer Co. 13

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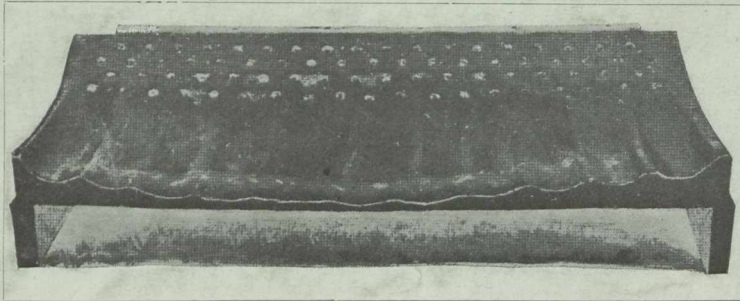
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