

JULY 15, 1915

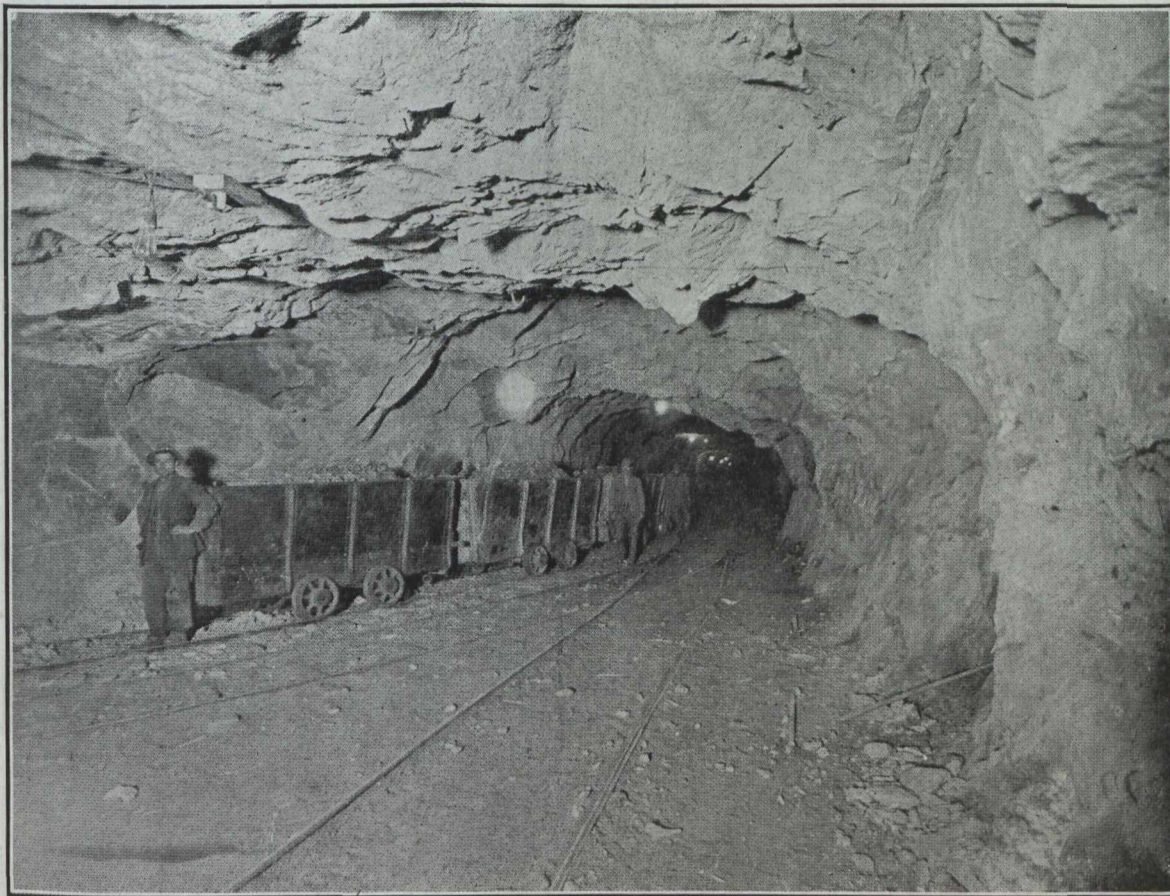
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CANADIAN  
MINING JOURNAL

VOL. XXXVI

TORONTO

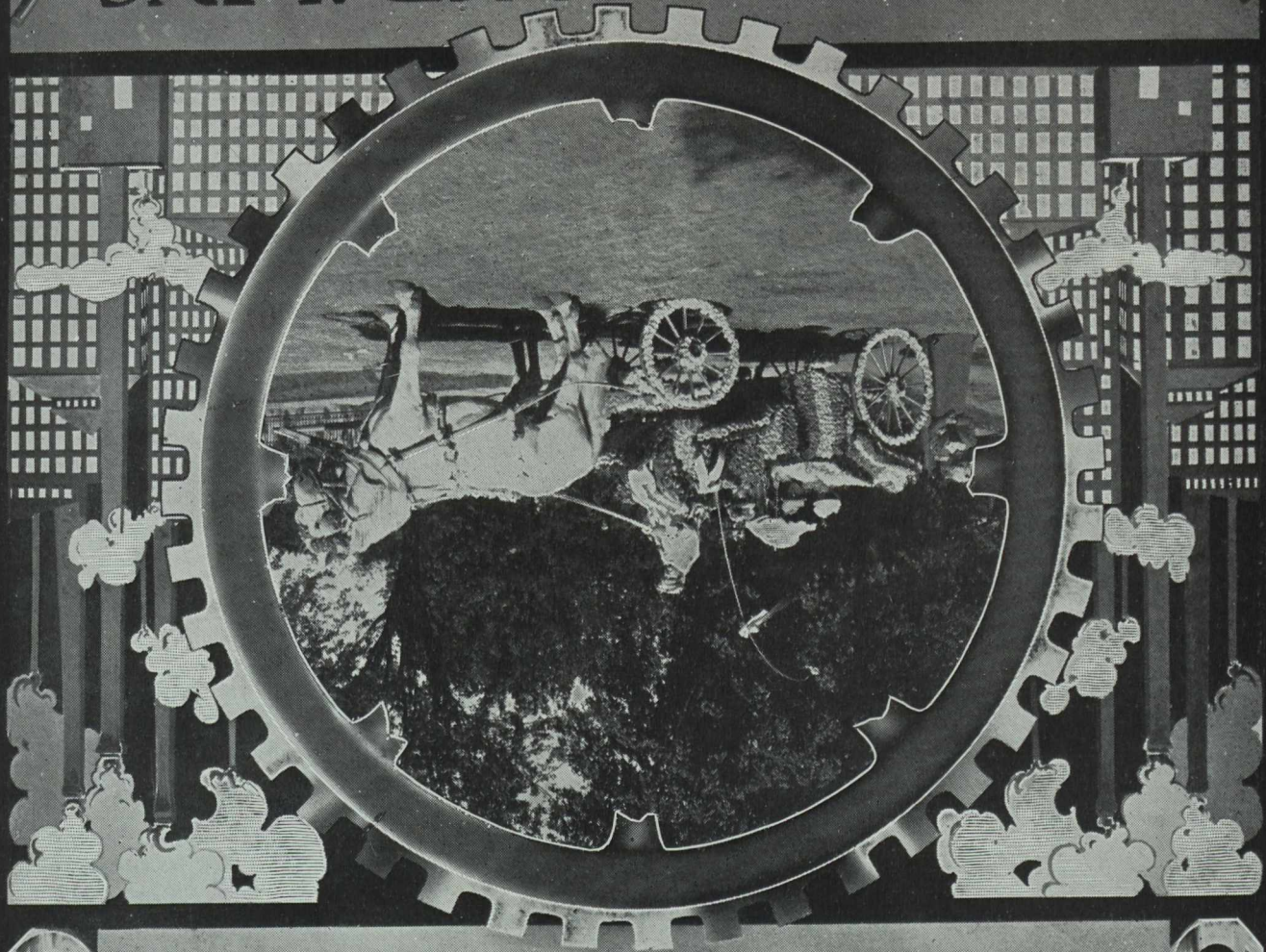
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TRAMMING LEVEL, DOME MINE, PORCUPINE

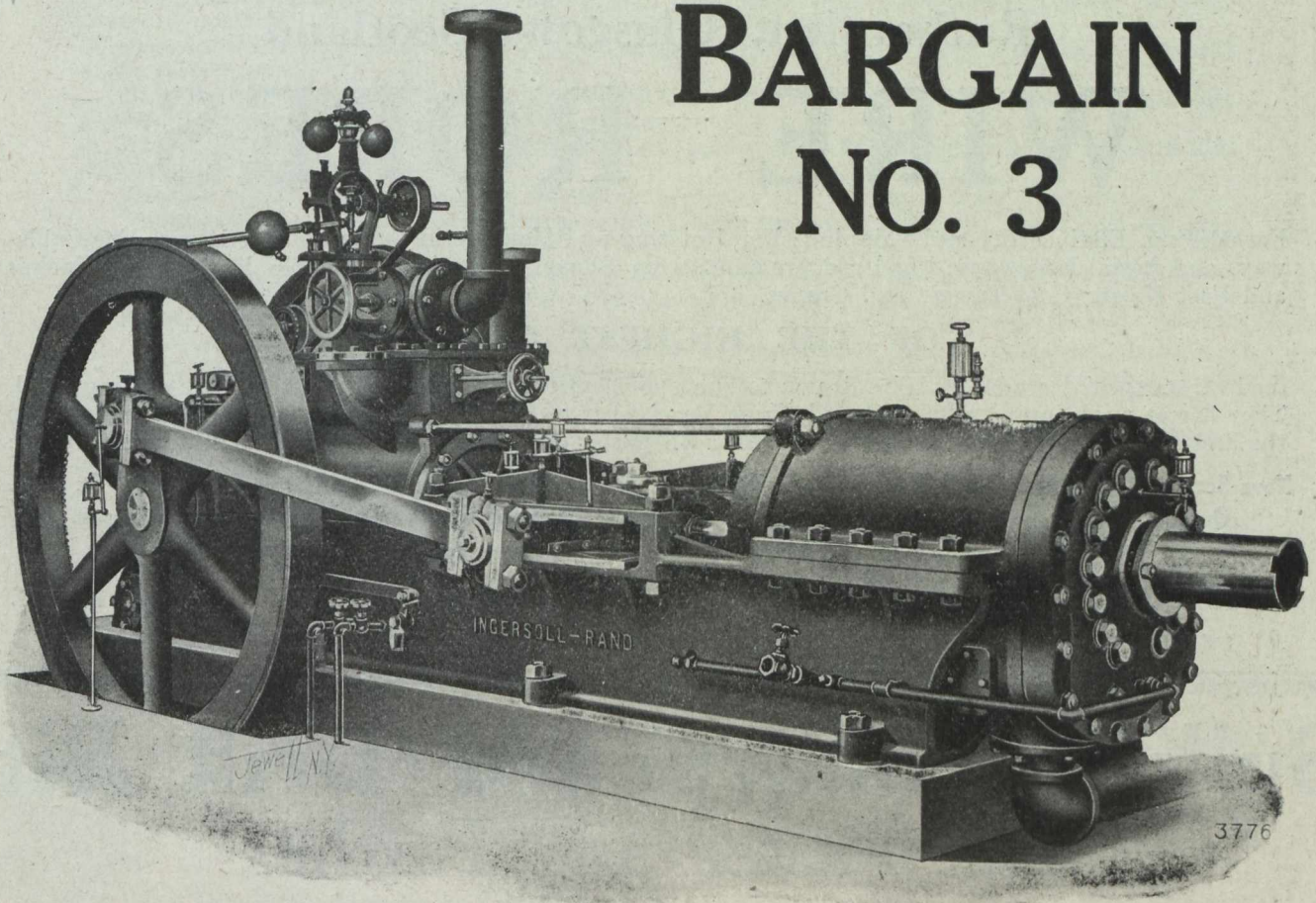
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## INGERSOLL-RAND Straight Line, Steam Driven Air Compressor

For this month's bargain we are offering three machines of the type illustrated, in capacities ranging from 400 to 700 cubic feet.

We have not discontinued the manufacture of machines of this type. In fact the three compressors we are offering were just recently completed. However, our stock is too large, and one of each size will be sold at two-thirds of the regular price.

We have nothing better to offer for mining and contracting work. More of these machines have been sold than of any other type we have manufactured.

*Only three machines at these prices.*

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Old drillmen know that a bit resharpened a few times on the anvil will "hold its edge" better, cut faster and wear slower than the same bit when first made up. This illustrates our point when we say that "hammering preserves the quality of your drill steel."

**THE SULLIVAN SHARPENER** is a mechanical blacksmith that forges drill bits entirely by hammering. One powerful air-hammer upsets the steel and forms the face of the bit by rapid blows on a loose dolly. A second, vertical air-hammer draws out the wings and corners in steel dies, one striking, the other holding the steel.

All this is done at one heat, in a minute or less, whether the bit is forged new from blank stock, or whether it is simply resharpened.

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Other features of Sullivan all-hammer Sharpener are its quick-acting air vise, that holds the steel in an unshakable grip while it is being upset; its compactness, 5 feet by 2½; its solidity and strength—it weighs 4000 pounds; its power, its economy of air, its safety for the operator, and its convenient arrangement.

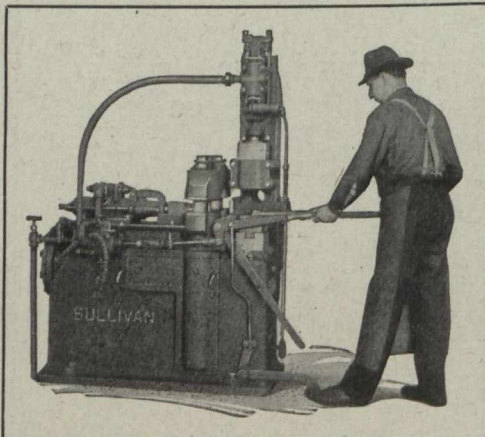
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HAMMER YOUR DRILL BITS

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# The Minerals of Nova Scotia

The extensive area of mineral lands in Nova Scotia offers strong inducement for investment.

The principal minerals are:—Coal, iron, copper, gold, lead, silver, manganese, gypsum, barytes, tungsten, antimony, graphite, arsenic, mineral pigments, diatomaceous earth.

Enormous beds of gypsum of a very pure quality and frequently 100 feet in thickness are situated at the water's edge.

The Province contains numerous districts in which occur various varieties of iron ore practically at tide water and in touch with vast bodies of fluxes.

The Gold Fields of the Province cover an area of approximately 3,500 square miles. The gold is free milling and is from 870 to 970 fine.

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Tungsten-bearing ores of good quality have lately been discovered at several places and one mine has recently been opened up.

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Fuel is abundant, owing to the presence of 960 square miles of bituminous coal and 7,000,000 acres of woodland.

The available streams of Nova Scotia can supply at least 500,000 H.P., for industrial purposes.

Prospecting and Mining Rights are granted direct from the Crown on very favorable terms.

**Copies of the Mining Law, Mines Reports, Maps and Other Literature may be had free upon application to**

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**Commissioner of Public Works and Mines,**  
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## PROVINCE OF QUEBEC

**Department of Colonization, Mines and Fisheries**

*The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, etc.*

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

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

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

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

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

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

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

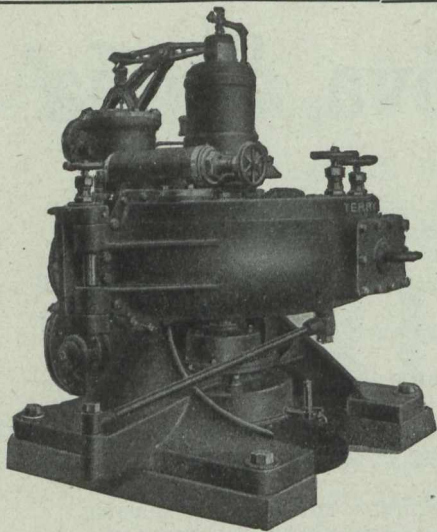
The attention of prospectors is specially called to the territory in the North-Western part of the Province of Quebec, north of the height of land, where important mineralized belts are known to exist.

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

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

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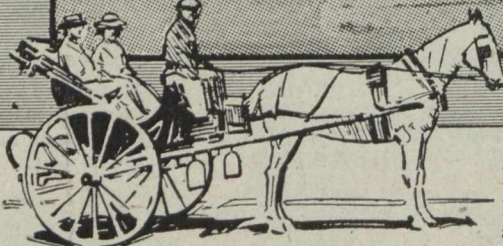
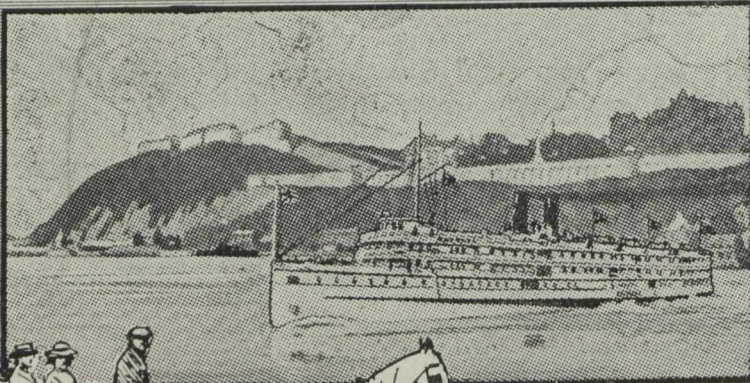
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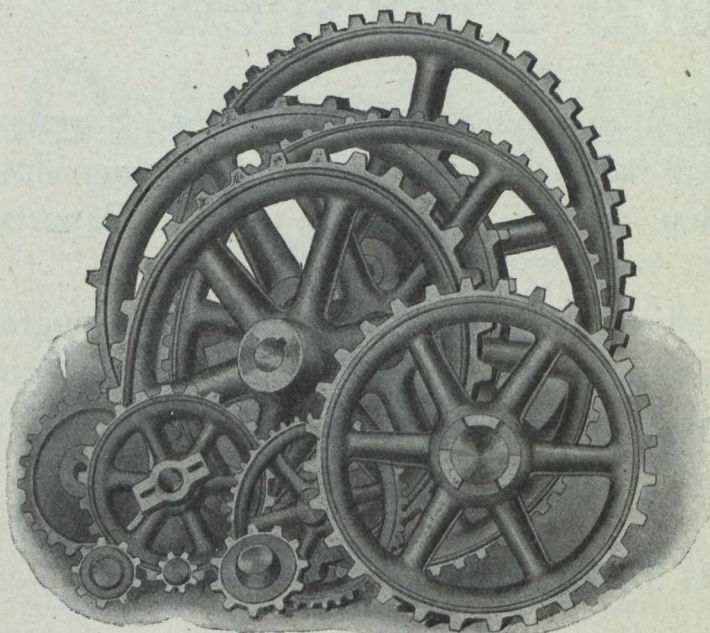
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## Synopsis of Coal Mining Regulations

**C**OAL mining rights of the Dominion, in Manitoba, Saskatchewan and Alberta, the Yukon Territory, the North-West Territories and in a portion of the Province of British Columbia, may be leased for a term of twenty-one years at an annual rental of \$1 an acre. Not more than 2,560 acres will be leased to one applicant.

Application for a lease must be made by the applicant in person to the Agent or Sub-Agent of the district in which the rights applied for are situated.

In surveyed territory the land must be described by sections, or legal subdivisions of sections, and in unsurveyed territory the tract applied for shall be staked out by the applicant himself.

Each application must be accompanied by a fee of \$5 which will be refunded if the rights applied for are not available, but not otherwise. A royalty shall be paid on the merchantable output of the mine at the rate of five cents per ton.

The person operating the mine shall furnish the Agent with sworn returns accounting for the full quantity of merchantable coal mined and pay the royalty thereon. If the coal mining rights are not being operated, such returns should be furnished at least once a year.

The lease will include the coal mining rights only, but the lessee may be permitted to purchase whatever available surface rights may be considered necessary for the working of the mine at the rate of \$10.00 an acre.

For full information application should be made to the Secretary of the Department of the Interior, Ottawa, or to any Agent or Sub-Agent of Dominion Lands.

W. W. CORY, Deputy Minister of the Interior.

N.B.—Unauthorized publication of this advertisement will not be paid for.—58782.

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We wish to draw the attention of mining, metallurgical, and development corporations to our excellent facilities for compiling, arranging, illustrating, printing and distributing Annual Statements, Special Reports, Descriptive Pamphlets, etc.

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There are many millions of acres in Eastern, Northern, and Northwestern Ontario where the geological formations are favorable for the occurrence of minerals, the pre-Cambrian series being pre-eminently the metal-bearing rocks of America.

The phenomenally rich silver mines of Cobalt occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Helen, Magpie, and Moose Mountain.

Many other varieties of useful minerals are found in Ontario:—cobalt, arsenic, iron pyrites, mica, graphite, corundum, talc, gypsum, salt, petroleum, and natural gas.

Building materials, such as brick, lime, stone, cement, sand and gravel, are abundant.

The output of the mines and metallurgical works of Ontario for the year 1913 was valued at \$53,232,311. Ontario has the largest mineral production of any of the Provinces.

The prospector can go almost anywhere in the mineral regions in his canoe; the climate is invigorating and healthy, and there is plenty of wood and good water.

A miner's license costs \$5.00 per annum, and entitles the holder to stake out three claims a year in every mining division.

For maps, reports of the Bureau of Mines, and mining laws, apply to

**HON. G. H. FERGUSON,**

Minister of Lands, Forests and Mines,

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## Dominion Coal Company

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**Ingots** -

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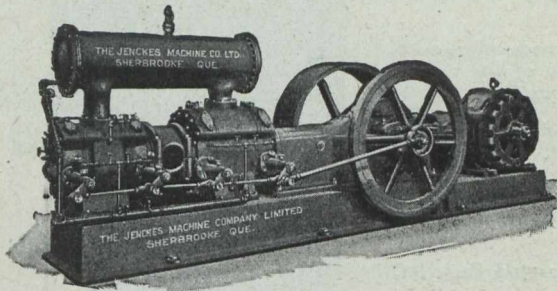
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- ☐ Most compressors are rated too high, many sources of loss of power being ignored.
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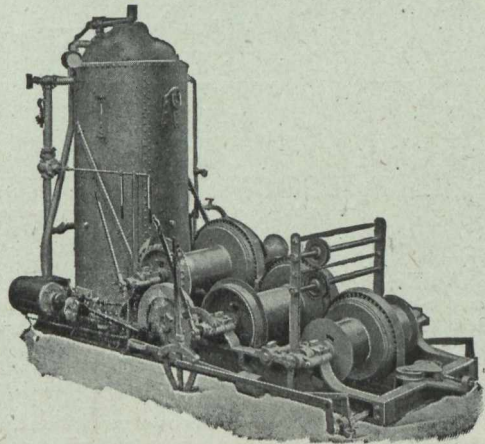
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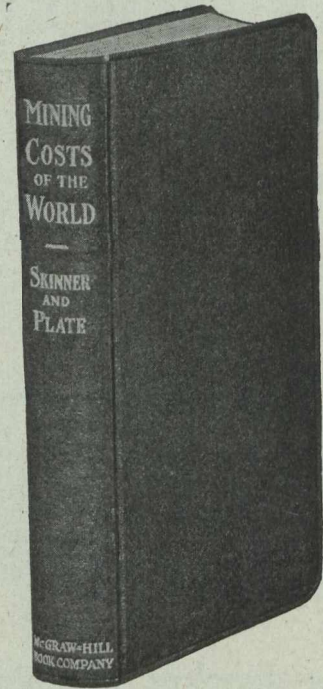
An Engineer's and an Operator's Pocket Book giving the production costs and operating data of about 325 of the principal metal mines of the world. It is the first book to cover the field in such an extensive manner.

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It is an invaluable reference work for Engineers, Managers, Superintendents, Operators and Students; affording as it does, cost data on the principal mining districts of the world.

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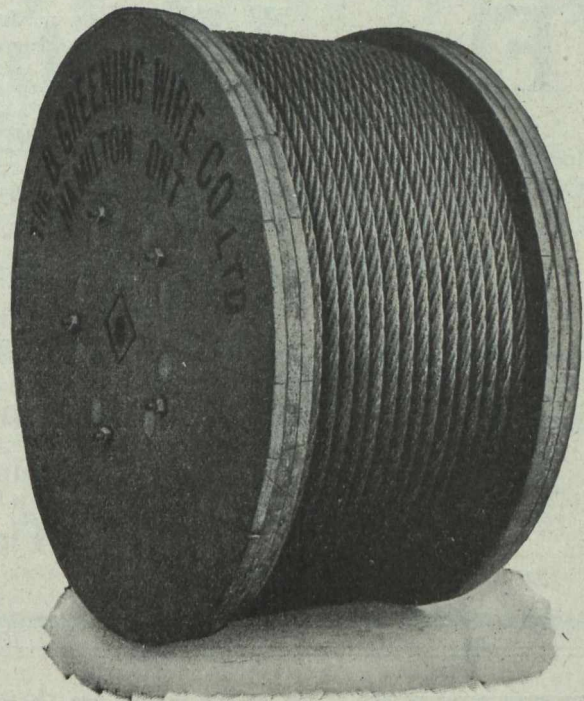
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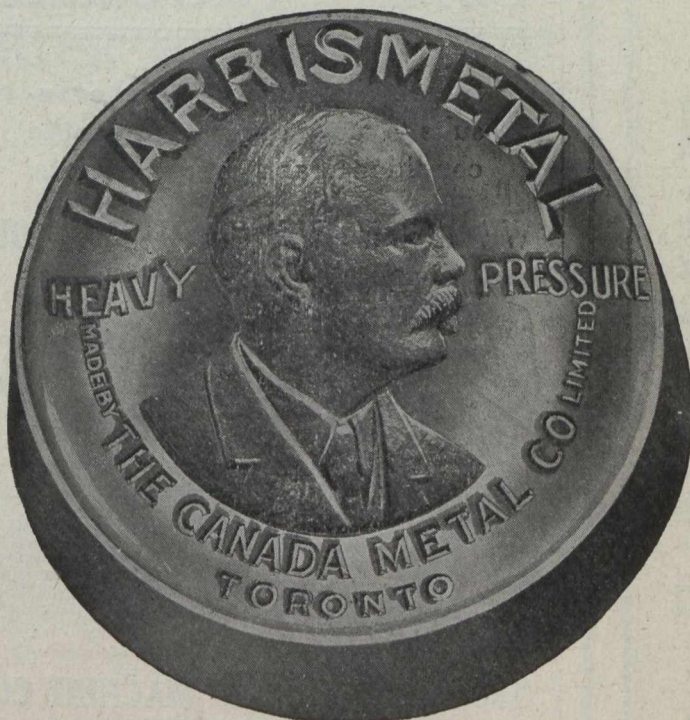
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CRUCIBLE CAST STEEL, BEST PLOW STEEL, ACME BRAND,  
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The Flory Cableway System is superior to any on the market.

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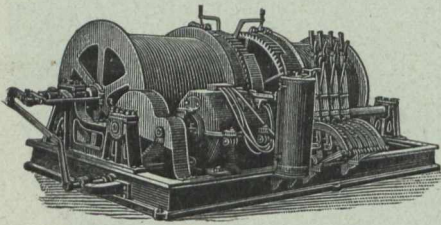
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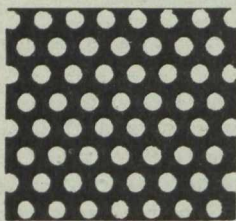
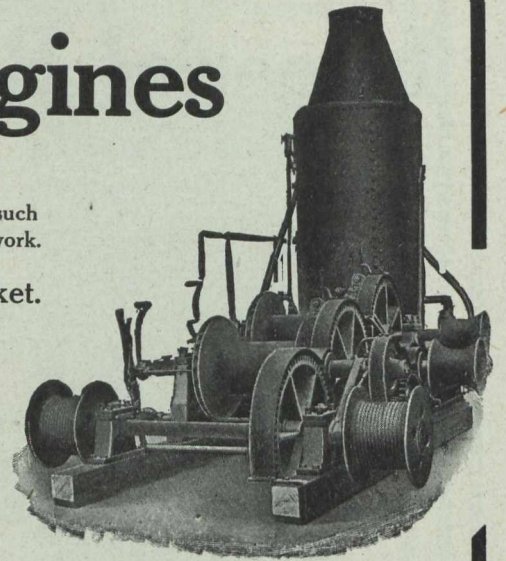
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For Every, and All Purposes in all Metals

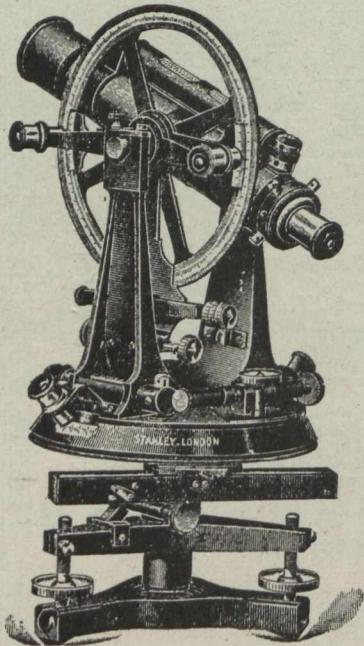
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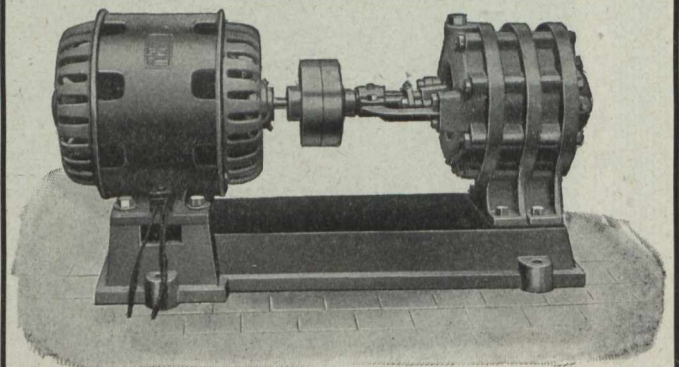
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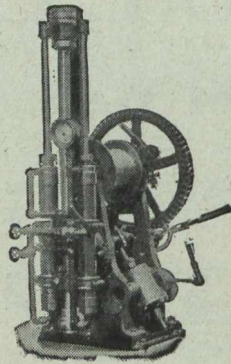
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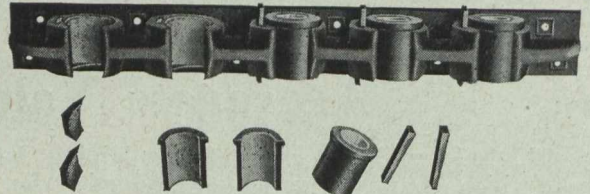
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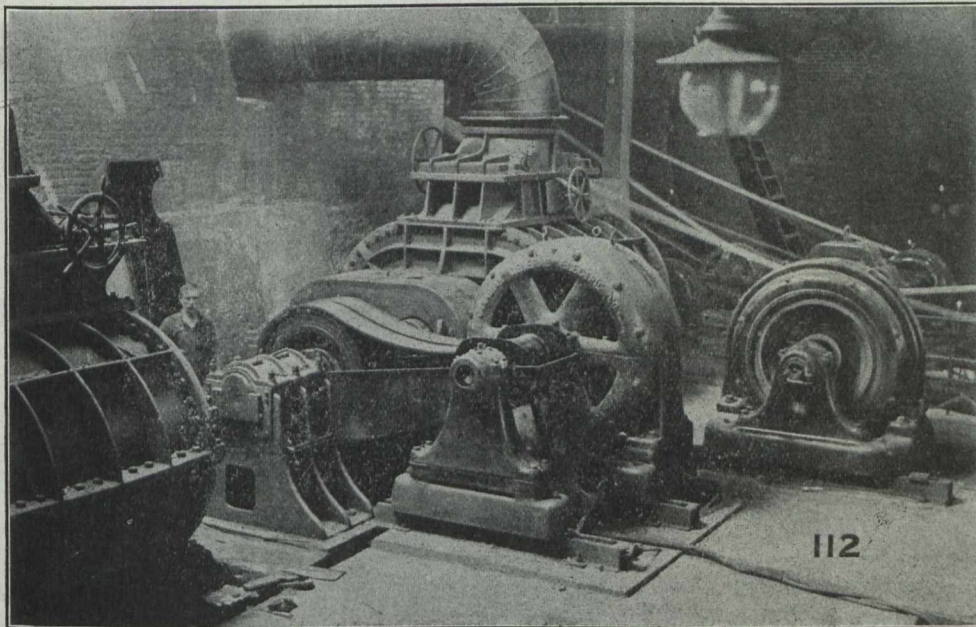
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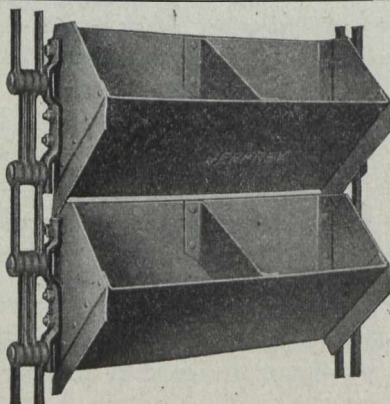
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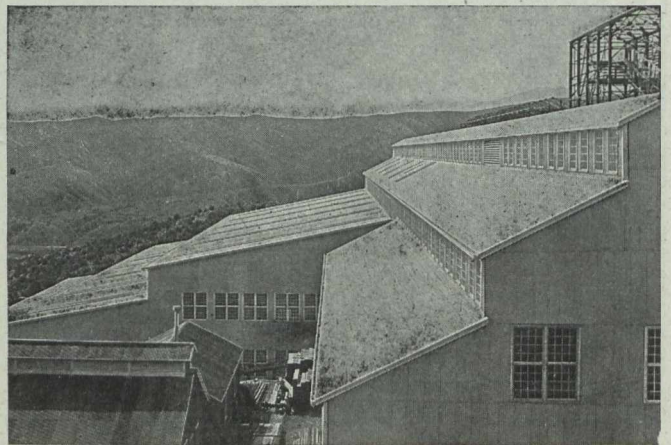
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# THE CANADIAN MINING JOURNAL

VOL. XXXVI.

TORONTO, July 15, 1915.

No. 14

## The Canadian Mining Journal

With which is incorporated the  
"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

### MINES PUBLISHING CO., LIMITED

Head Office . . . . . 263-5 Adelaide Street, West, Toronto  
Branch Office . . . . . 600 Read Bldg., Montreal  
London Office . . . . . Walter R. Skinner, 11-12 Clement's Lane  
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Editor

REGINALD E. HORE

SUBSCRIPTIONS — Payable in advance, \$2.00 a year of 24 numbers, including postage in Canada. In all other countries, including postage, \$3.00 a year.

Advertising copy should reach the Toronto Office by the 8th, for issues of the 15th of each month, and by the 23rd for the issues of the first of the following month. If proof is required, the copy should be sent so that the accepted proof will reach the Toronto Office by the above dates.

#### CIRCULATION

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd, 1879."

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## INCREASE PRODUCTION

The world's resources are being used up at an unprecedented rate. The nations at war are piling up enormous debts. What are we doing in this country to keep our credit good? What are we doing to assist the Empire?

We have sent several thousands of our most worthy sons to the front and they have fought so valiantly that we have reason to be proud of them. What Canadian could read Sir John French's report of the battle of St. Julien without a thrill of satisfaction? In recounting the part played by the Canadian contingent he said: "The left flank of the Canadian division was thus left dangerously exposed to serious attack in the flank, and there appeared a prospect of their being overwhelmed and of a successful attempt by the Germans to cut off the British troops occupying the salient to the east. In spite of the danger to which they were exposed the Canadians held the ground with a magnificent display of tenacity and courage, and it is not too much to say that the bearing and conduct of these splendid troops averted a disaster which might have been attended with most serious consequences." Such words from so great a soldier in this stupendous war will ever live in the annals of Canadian military history.

There are thousands of young Canadians who would willingly make any sacrifice to render such service as did the men of the First Canadian Contingent at St. Julien. They need but to be instructed as to the seriousness of the situation. Mining men are taking a big part in the war and more of them may be expected to participate now that a better realization of the power of the enemy is permitted. Long preparation and masterly organization has enabled the Germans to perfect a fighting force that would be magnificent were it under humane control. In the hands of men more savage than the savages the German army is extremely dangerous. Mining men must be prepared to give serious consideration to the calls for recruits.

In supplying munitions Canada has also played no mean part. It is true that we might have supplied vastly larger amounts; but the evidence seems to indicate that the Canadian manufacturers were ready to handle large orders if they could have obtained them. It is to be hoped that the difficulties of the past will not be further rehashed; but that every effort will be made to increase the output.

The production of munitions has resulted in a much increased demand for several mine products. This is a particularly pleasing feature of the situation in that it makes both possible and profitable an increase in production of metals. This is very much to be desired, for it will help to preserve the country's credit, while it is

at the same time giving unusual profits to the producers.

An interesting article on the advantages to be gained by increasing production at this time was published editorially in the "Mail and Empire," Toronto, July 10, in part, the editorial follows:

"It may on first sight seem that enlarged, and still more enlarged, production on the part of this country is not of vital consequence to the success of British arms. It may be contended that, even if Canada produced no surplus of foodstuffs for exportation, Britain would be able to obtain all she requires from the United States and other neutral nations. But it is the duty of the farmers of Canada to do all they can to make Britain independent of foreign sources of supply. The question of making the Empire as nearly as possible self-reliant in the matter of food supply is one that has long engaged the thoughts of the largest minds concerned with the study of Imperial defence and Imperial organization generally. Apart from Imperial patriotism, national patriotism makes it the bounden duty of all who are occupied in the natural industries to employ their capital and their labor to the best economic advantage for increasing the output of those industries. Thereby they not only add to the wealth and prosperity of their country and increase the war supplies available within the Empire for the Empire's forces in the field, but also they assist to keep the trade between British and neutral countries on an even keel. The trade balance as between Britain and the United States has listed tremendously to the side of the latter country—nearly as much, indeed, as nine months ago it listed to the British side. As between Canada and the United States, the balance has greatly increased in recent years in favor of our neighbor. We must do more producing and less importing. In this war time Britain is not sending out merchandise on anything like the scale of her exports in normal times. The vast energies she applied to trade are now being largely concentrated in war and on war account. Nor are the efforts of her own workers yet sufficient for the production of war supplies that are produced in manufacturing plants. Her exports having shrunken greatly and her imports having still more greatly expanded, the external trade account keeps going heavily against her, and is likely to continue to do so for some time to come. Even as between this country and the Mother Country the visible balance of trade is far more heavily in our favor than ever. At the same time, the invisible balance is not being changed in Britain's favor as in years of peace, for the reason that British capital is being husbanded on war account, and the flow of it to this country has almost ceased.

"The situation presents its opportunities as well as its duties to all Canadians who have a will to produce. Our farmers ought to till every acre and bring out its fullest yield. They ought to widen their labor market so as to afford the amplest demand for the service of all city and town workers who can turn their hands to agricultural production. The present time is one that offers new inducements to enterprising men for the or-

iginating of production in other fields of natural industry. Prospectors ought to return to the wilds and explore the mineralized areas. Every commodity we can add to the list of home products should now be added. Existing gold mines that can be profitably worked ought to be fully manned and operated, and gold mines that are still hidden should be brought to light. The precious metal is now needed as it was never needed before. It would be a highly fortunate development were Canada suddenly enabled to quadruple the output of its gold mines, and by this means help to wipe out the adverse trade balance. All metals are needed by the Allies. As this country has almost unlimited natural resources of this description, the demand should be very much to our present advantage and permanent benefit."

It is, of course, a difficult time to raise money for any enterprise, but for those who are willing to take a mining chance the present time offers many incentives. Silver is at present selling at the lowest price since the Cobalt deposits were discovered, but other metals are selling at unusually high prices, and many metal mining companies are exceedingly prosperous.

## PERSISTENCE OF ORE IN DEPTH

In a contribution to the discussion of a paper presented by Mr. T. A. Rickard before the Institution of Mining and Metallurgy, Mr. P. A. Robbins enters a plea for the recording of observations. He says: "When a man dies, the cause is known only to the engineers attending the case, and usually no attempt is made to add to the general store of information."

The question of persistence of values with depth is obviously an important one. The more closely an estimate approximates to the size and character of an orebody, the more economically can the ore be mined. The estimate decreases in value as the ore is worked out. It is most useful when operations are just to be commenced. It is least useful when the ore has all been removed. But, as Mr. Robbins points out, the information gained may become valuable if it is recorded. Especially is this so of similar deposits on neighboring properties. Useful less directly are data gathered from all sorts of ore deposits in all parts of the world.

In mining, as in other industries, information is contributed very freely by some operators and very closely held by others. As a rule the successful companies give out more information than do the unfortunate; but even among the most successful are some companies whose directors carefully guard against giving out real information concerning the nature of the ore reserves and their probable extent. Naturally, therefore, broad discussions of the question of persistence of ore in depth are at best based on data gathered from a few mines. Some venture to theorize without even searching the literature for the known facts, and in many cases the conclusions deduced are unwarranted. Mr. Robbins advocates the compilation of the evidence.

Theories are useful insofar as they enable us to understand and correlate facts and permit the making of predictions regarding the unknown. Hence, the value of assembling the facts depends upon the success in interpreting them. But we must have the data before we can expect anyone to act as interpreter.

## BITUMINOUS SANDS OF ALBERTA

A writer in a recent issue of "Canada" in an article entitled "The Riches of the North-West," makes some remarkable statements about the bituminous sands of the Athabasca. That there are enormous deposits there has long been known and recent investigations carried on by Mr. S. V. Ells, of the Mines Branch, lead to the hope that some of the sands may be utilized for paving purposes. At present an experimental pavement is being laid at Edmonton. Under the circumstances it is strange to find a writer who claims to have intimate knowledge of his subject stating, as he does in "Canada," that "no doubt exists that, when this part of Alberta is opened by rail, it will supply all the requirements of mankind in bitumen for many centuries to come." Such extravagant statements do no good.

The superintendent of the Morro Velho mine proposes to use a refrigerating plant to cool the air sent into the lower levels of the mine. An interesting account of investigations carried on in this deep mine to solve the problem of working at great depths has been given by the superintendent and will be published in our next issue.

In connection with the discussion of persistence of ore in depth the recently issued report on the Morro Velho mine, the deepest in the world, has some valuable information. According to the report "the lode has so far shown no signs of failure in size or value in the lowest explorations yet made upon it."

The development of the Hollinger and Aeme mines is likely soon to result in an increase in milling facilities being made. At present ore from both properties is being treated in a 100-stamp mill.

The demand for nickel and copper has resulted in another mine being opened in the Sudbury district. Mr. J. A. Holmes and associates are operating a small property and selling ore to the Mond Nickel Company. This is the first time for years that anyone in the Sudbury district has attempted to compete with the big companies.

At a meeting of the Porcupine branch of the Canadian Mining Institute, Mr. D. Dorfman, superintendent of the McIntyre mill, described some experiments which indicate that in the precipitating process much more

zinc dust is generally used than is necessary. In view of the present price of zinc dust, operators of cyanide plants will be pleased to hear more about these experiments.

## U. S. LEAD AND ZINC MINES SHOW INCREASING ACTIVITY.

"The high price of spelter that has obtained almost continuously since the European war began, has greatly stimulated the mining and smelting of zinc ore in the United States. The recent rise in the price of lead has given a double impetus to mining in those regions, such as the Joplin district, where the zinc ores are associated with lead ores." This is the introductory statement in the mid-year review of the lead and zinc situation, by C. E. Siebenthal, of the United States Geological Survey.

The present smelting capacity is scarcely equal to the demands upon it. This renders it imperative that as much spelter as possible be produced per retort, and puts a premium upon high-grade ores. The Joplin district blende averages about 58 % zinc content, though a considerable quantity of the concentrates averages 60 per cent. and higher and contains very little iron or lead; that of Eastern Tennessee averages over 60 per cent., and Butte, Mont., 55 per cent.; Wisconsin district blende averages 55 to 60 per cent. after roasting and magnetic treatment to remove the iron. High-grade calamine ores are also in demand, and an increased yield is being made from Arkansas and Missouri; also, lead-free New Jersey ores are in demand.

The spelter required for the manufacture of munitions of war must be of good quality, suitable for making sheet zinc and brass, and particularly of the highest grade for brass cartridge shells. This puts a further premium on the higher grade, purer zinc ores. To meet the demand for such metal, some smelters are redistilling their output to bring it up to a high standard, and are thus able to use a lower grade of ore. Such a method reduces the output of the plant by one-half, however, and adds greatly to the cost of the product.

The lack of smelting capacity has resulted in starting up old coal-fired plants in Missouri and Kansas that had been out of commission for years. All smelters are being rushed to their maximum capacity and additions to capacity are being rushed to completion.

The high-grade zinc ores of the Joplin regions are in greatest demand, and the district is teeming with activity. Churn drills are prospecting on every hand. Innumerable new shafts are being sunk, and old ones reopened. Old diggings are being unwatered, for ground too lean to work at previous prices can now be operated at a profit. The drilling campaign that has been proceeding north of the Miami, Okla., district for more than a year has resulted in many rich strikes and a number of concentrating plants are being built. This region is just now the most active part of the Joplin district.

Demand for lead during the early part of 1915 was not sufficient to increase prices materially, but in March the price per pound averaged above 4 cents for the first time since February, 1914. In April and May the advance continued, and during June there was a marked increase past 5 cents and well beyond 6 cents per lb. The lead-zinc, and silver-lead mines will, of course, benefit by return to favorable prices for lead, and this market, so slow to respond to the general revival, has thrown another favorable factor into the metal mining situation at the half-year end. The lead production had probably been above normal demands for it in 1914, however, and amount of surplus stocks is not known.

### NEW MINE TELEPHONE.

A new mine telephone has recently been developed and is being placed on the market by L. T. Weiss, of New York City, N.Y.

The phone is a result of experimental work covering two years' time. It is the invention of A. A. Weiss, a telephone engineer.

A serious study of conditions and the means of best meeting them was undertaken. It developed that the troubles in the generally accepted mine telephone were due to rapid battery deterioration, grounding of the battery, breaking of parts, corrosion of small wires, corrosion of transmitter diaphragm, breaking down of induction coils, etc.

Another trouble was the fact that the average mine electrician is not very familiar with telephones and is generally equipped with large plyers, screw drivers, etc., and his efforts at repairs are comparable to those of the proverbial bull in a china shop.

It became evident that the magneto mine phone, from its necessarily complicated nature, was not capable of meeting mine conditions. The mine phone was merely an old bridging type magneto phone enclosed in a heavy iron case, with an outer and inner door, the bell, generator, battery, hook switch, transmitter, induction coil, and wiring being behind the inner door, the hook, receiver, receiver cord, generator handle, transmitter mouth piece, being exposed when the outer door was open. This outer door generally closed against a rubber gasket and had some form of ice box lock. As a matter of fact the outer door was never closed, in a great many cases being held open by hooks and nails so it could not be shut. An attempt made to avoid this condition resulted in some doors being broken off entirely. Miners are hardly noted for gentleness.

After continued study a central energy system and phone were considered and the present circuit, and phone worked out.

This phone consists of a heavy iron case enclosing a receiver, a transmitter and two push buttons, all mounted so as to be unbreakable, the wiring is of heavy wire and is of the simplest character, anyone familiar with an electric bell and push button circuit can understand the new circuit. The waterproof bell is placed on the phone or wherever most desirable. A small bell or a load ringing bell can be used interchangeably. The central station consists of a simple relay and battery a trifle larger than battery equipment used for one of the old phones, also some form of ringing current which may be of any character most suitable to local conditions.

The central relay and battery are located in a suitable place on the surface. The whole system can be quickly installed on the old wiring without change.

The phone itself consists, in outward appearance, of an iron box with an opening to speak into, an armored rubber hose for listening purposes and the two buttons. No cord, wiring or instrument is visible. The transmitter and receiver and wiring are permanently locked up. The transmitter is connected to the speaking opening by a connection also in the box which prevents any moisture, expectoration, or mechanical injury to the diaphragm. The only damage that can be done is the removal of the armored rubber listening tube. Even this would not put the phone out of service and anyone could readily slip the hose or another one in place, or could listen at the hole over which the tube was placed.

It is a phone reduced absolutely to its lowest terms and has been in actual operation in several mines for over a year with satisfactory results. All the small

mechanical difficulties inherent in new apparatus have been removed gradually as actual conditions demonstrated the necessity, until to-day it is absolutely fool-proof and will meet any possible condition. It is the result of telephone engineering becoming familiar by actual experience with mining conditions.

It should also be noted that the phone is a lockout system, in other words two parties speaking are assured of privacy. This is a feature which will appeal to the mine officials and is not a part of the ordinary mine phone. It often becomes necessary for a mine captain to defer a conversation with a shift boss on account of the lack of this feature.

### U. S. PRODUCTION OF EXPLOSIVES.

The total production of explosives in the United States during the year 1914, exclusive of exports, according to figures compiled by Albert H. Fay, of the United States Bureau of Mines, was 450,251,489 lb., or 225,126 short tons, as compared with 500,015,845 lb., or 250,008 short tons for 1913. The production for 1914 is segregated as follows: Black powder, 206,099,700 lb.; "high" explosives other than permissible explosives, 218,453,971 lb., and permissible explosives, 25,697,818 lb.

The figures represent a decrease of 23,839,831 lb. of black powder, 23,932,573 lb. of high explosives, and 1,987,952 lb. of permissible explosives, as compared with 1913.

Mr. Fay says: "As explosives are essential to mining, and the use of improved types of explosives tends to lessen the dangers attending this industry, the Bureau of Mines undertook the compilation of information showing the total amount of explosives manufactured and used in the United States, its first report dealing with the year 1912. The report for 1914 is therefore the third technical paper issued by the bureau relating to the production and distribution of explosives.

"In the year 1902 only 11,300 lb. of permissible explosives were used in coal mining, whereas in 1913 the quantity so used was 21,804,285 lb., as compared with 19,593,892 lb. in 1914. The quantity of permissible explosives used in the United States is larger than in a number of foreign countries. In 1912, it represented about 5 per cent. of the total quantity of explosives produced, and in 1914, 5.7 per cent. The total amount of explosives used for the production of coal in 1914 was 220,622,487 lb., of which about 8.9 per cent. was of the permissible class, as compared with 9.5 per cent. in 1913."

### MORE CALIFORNIA GOLD IN 1915.

There are few changes in the mining industry in California for the first six months of the year, as compared with the conditions in 1914. Mr. Charles G. Yale, of the United States Geological Survey, reports that some gain in gold yield is apparent, however, the United States Mint at San Francisco, and local smelters and refiners, having received \$598,822 more California gold in the first five months of 1915, than in the corresponding period of 1914.

### The German's Prayer.

She: "One of the most touching things about the war is the way France became religious. All the Frenchmen pray."

He: "Und all der Chermans Bray, too! Dey Bray gott damn England!"—Life.

## LOVE'S LABOR LOST—THE ORIGIN OF NATURAL GAS AND PETROLEUM

Almost ever since its first appearance above the horizon, even while its present secretary was still basking amid the roses and the sunshine of Vancouver's western isle, and long before his pilgrimage to Mount Royal's frowning front, the Canadian Mining Institute, at many of its annual meetings, made a specialty of discussions on the Volcanic or Inorganic Origin of Natural Gas and Petroleum. The result of these discussions was that the organic hypothesis seemed to most of us to have passed into oblivion along with theories of the flat earth and innumerable other pre- and post-Columbian myths.

That, in the earlier years of these discussions, some of the members of the Institute were unconvinced, and inclined to be at least facetious when contributing to the debate, is shown by the awful conundrum that Mr. G. R. Mickle propounded to the shocked gathering of 1903. He asked: "What is the difference between a vegetarian and a man who believes in the organic origin of natural gas and petroleum?" No answer was attempted by the bewildered audience, a profound silence ensuing until finally the questioner himself replied: "The former draws the line at meat, while the latter will swallow anything!"

But, in spite of such digressions from seriousness, discussions continued until scarcely a man in the Institute attempted to attack the volcanic hypothesis. Through cold logic, and probably in some cases partly through compulsion, the members accepted the Costean theory. Even Mr. Mickle has long since come to be looked upon as a defender of the faith (vide his recent illuminating paper entitled, "The Chemical Composition of Natural Gas?"). To many of us, however, the acceptance of the inorganic hypothesis meant a long struggle accompanied by much mental anguish. We had been nurtured from early youth on the organic theory. There was something in this theory that appealed to our boyish imaginations, although from the economic point of view it might not appear adequate to account for the vast supplies of gas and oil stored in the rocks. In youthful fancy we ran over the limitless hosts of mammals, marsupials, birds, reptiles and fishes, not to say invertebrates and plants, that have appeared in never-ending succession, generation after generation, since earth's early dawn. We pictured these creatures passing from youth to old age, then being entombed and turned into, as the text-books say, "those materials, natural gas and oil, most useful to man." When we carried the family coal oil can from the country grocery, or read Bellum Britannicum beside the parental hearth, under a lamp or a gas jet, we often pondered on the source of the lighting and heating material. Had it once been a constituent of the body of a mammoth or of that of a gigantic plate-covered fish or of one of those terrible flying reptiles of the Mesozoic. Byron's line, "The dust we tread upon was once alive," often recurred to us. It was indeed a wrench to forsake the organic theory for the volcanic. No Latimer or Knox, or Newman, or Manning, ever went through a severer mental searching when seeking the light regarding the fundamental concepts of theology than did those of us who gave up the organic for the Costean articles of faith.

And now in our old age must we give up our dearly cherished hypothesis, adopted after long years of mental struggle? Must we again set sail on the troubled

waters of uncertainty, as of yore Aeneas, after all he held sacred had been destroyed, left ravaged Troy for beckoning Latium? It would appear that such must be our fate—judging from the following extract from the recently published report, "Petroleum and Natural Gas Resources of Canada," No. 291, page 70, of the Dominion Mines Branch, Ottawa:

"This feeling has grown so strong that seldom was any explanation of the origin of petroleum put forward, except the organic theory, until 1903, when an ardent advocate of the inorganic theory, Eugene Coste, appeared upon the scene and presented a fairly able defence of the theory. He claimed to have applied the principles of this theory in the practical development of several oil and gas fields, and he expressed full confidence that it applied to all occurrences of such hydrocarbons. Mr. Coste presented no new evidence, and consequently made no addition to existing knowledge. He attempted to explain every phenomenon connected with an oil field by volcanic or solfataric action, but unfortunately most of his evidence was derived from the reports of others and he was apparently deceived by the term mud volcanoes, thinking them phenomena of true vulcanism."

It is cruel to tell us that our champion "made no addition to existing knowledge." It is thrice cruel, however, to say that our vulcanist, in all his applications of the volcanic theory, was merely mistaking the activities of "mud" volcanoes for the phenomena of true vulcanism. Must the volcanic theory disciples now be classed as "mud geologists" along with the clay men?

The use of the term "mud" at one annual meeting of the Institute nearly led to a riot. There had been some discussion as to certain dredging or other operations which had not been a great success, financially or otherwise, when our first secretary said, in sweet Scottish tones, to the man who had been chiefly concerned in the operations: "A Moses went through rock and struck water. You went through water and struck mud, and now your name is 'Mud.'" Let us hope that no animosities will be engendered by the accusation that the pseudo-volcanoes of mud have been mistaken for the real.

We can picture to ourselves the state of mind of the author of the volcanic theory as, after perusing the Mines Branch report, he gazes in rueful meditation on the Rockies' lonely, snow-capped peaks from Calgary's distant towers. No sadder reflections must have come to that other great leader of the race as he looked from Elba's prison strand towards France's ungrateful shores.

Our leader's use of a striking simile in a memorable debate a few years ago seemed to us to shatter all belief in the origin of oil and gas from the larger organisms at least. His statement was to the effect it would be as reasonable to expect to obtain oil and gas by putting a turkey in cold storage for a hundred years, or other long period, as to have it produced by the burial of organisms under normal conditions of heat and pressure.

During late years the "organics" seem to have narrowed the field of application of their theory until we find them claiming that gas and oil in some great areas at least have come from the distillation of the remains of microscopic organisms that lie on the bor-

der land between the animal kingdom and that of the vegetable. This last defence would also probably have been shattered ere this, had we called to our assistance the members of that new science known as Biochemistry. But the science is so new that, in so far as I recall, the name has never before appeared on the pages of the Journal, even in the days of the first editor with his adjectival fecundity. The controversy between the organic and inorganic adherents has not as yet been entered by biochemists. But in the future, if the discussion is continued, they are destined to play a leading part on the side of the vulcanists. Let us call them in at once and save the situation.

The following quotations from papers by two of these brethren show how strongly the men whose business it is to deal with the very beginnings of life, or "spontaneous generation," support the volcanic theory:

(1) "The question which we now must face is this: Did conditions ever exist in the history of the globe which favored the production by natural means of such ultra-microscopic organisms? The answer which I would make to this question is an affirmative one.

"There must have been present also in the atmosphere hydrocarbons of all kinds for the action of water on the hot rock crust must have formed them from the metallic carbides, such as carbide of iron and of calcium, as probably happens to-day also in the production of petroleum compounds in connection with hot subterranean rocks.

"This formation of amino acids and their synthesis to form proteins would take place countless millions of times and in every variety of constitution until one giving the right composition resulted in ultramicroscopic particles which, endowed with the chemical properties of ultramicroscopic organisms, would thrive and reproduce themselves in water which contained amino-acids and would thus supply readily assimilable food to the newly-formed living structures."

(2) "The protamic nucleus may be taken to represent the first form in which self-generating matter might be said to have the characters of protoplasm, but previously to its synthesis there must have occurred an increasingly complex series of carbon compounds, with hydrogen, oxygen, nitrogen, sulphur and phosphorus, while iron, calcium, magnesium and potassium are also involved in its activities at the present time . . . . the possible interactions and combinations might result in the synthesis of very complex substances, well up toward the simpler forms of living matters."—M.

#### BRITISH COLUMBIA'S EXHIBIT AT THE PANAMA-PACIFIC.

It will be remembered that in 1909 the Canadian Government exhibition pavilion at the Alaska-Yukon-Pacific Exposition was a decidedly creditable one and that the display made there of Canadian scenes, fauna and resources, especially in respect of the last-mentioned, was one that Canadians had good reason to be proud of. There is little doubt, though, that the Canadian exhibit, now being made at San Francisco is far and away ahead of that made at Seattle, and that it is widely representative of the Dominion as a whole. The knowledge that this might be expected to be the case led the Government of British Columbia to take full advantage of this exceptional opportunity to give publicity to the resources of this Province, especially as a fine display, in particular of its fruit and minerals, was to be included in the Dominion exhibit. Prominent in this work of directing widespread attention to the pro-

ducts of the Province was the British Columbia Department of Mines, which has already sent to San Francisco for gratuitous distribution about 16,000 printed pamphlets, including the following mining bulletins: No. 1, "Preliminary Review and Estimate of Mineral Production, 1914"; No. 2, "Atlin Mining Division"; No. 3, "Skeena Mining Division"; No. 4, "Omineca Mining Division."

On June 18 there was issued from the Provincial Government Printing Office, Victoria, B.C., also for distribution at San Francisco, a useful publication, a pamphlet of about forty pages, entitled "British Columbia, the Mineral Province of Canada," got up in attractive form and well illustrated. This pamphlet contains a short history of mining in the Province, a synopsis of the mining laws in force, statistics of mineral production to date, and a brief summary of the progress of mining in British Columbia during 1914. The statistical information presents in a convenient and telling way the main facts of mineral production and the comments on the chief minerals produced last year are instructive and calculated favorably to impress readers with the great value and extent of the mineral resources of the Province.

#### TIN, TUNGSTEN, AND MOLYBDENUM.

Three of the minor metals present interesting phases in the mineral situation, and are discussed by F. L. Hess in a United States Geological Survey mid-year review. Although the United States consumes about 40 per cent. of the world's tin output, it produces an insignificant quantity and smelts practically none. On the other hand, Great Britain controls about three-fourths of the tin output of the world and a somewhat larger percentage of the smelted tin. On account of the war Great Britain has placed restrictions on the export of tin which have given American manufacturers trouble in getting needed supplies. Therefore, many schemes have been launched for building and operating tin smelters in the United States.

The Bolivian ore, which has hitherto been shipped to Europe for reduction has comprised the largest quantity of ore free from British governmental domination and towards securing this ore efforts have been directed. It will be remembered that a few years ago a tin smelter to operate on ore from the Malay Peninsula was erected at Bayonne, N.J., but the British Government placed a heavy export duty on tin ores, and the smelter was converted to other purposes.

Early in June it was announced that a tin smelter, to have a capacity of 3,000 to 5,000 tons a year, was being built at Perth Amboy, by the American Smelting and Refining Company. The smelter is to operate on Bolivian ores, but will undoubtedly also be in the market for other ores which may be offered, such as the lots which are mined in Alaska and occasionally at other places in the United States.

At the outbreak of the European war the American tungsten market was very dull and prices were comparatively low, about \$6.50 a unit (one per cent. of a short ton). The ores mined in Burma, Australia, and other countries, came into competition with the American ores and many of the prospects were unworked. There is a normal demand for tungsten to be used in "high speed" tool-steels, which fluctuates with the steel trade, and a smaller but growing demand for tungsten for incandescent electric lamp filaments, for electric contacts, wire for dental work, etc., but when the orders for shrapnel shells and other war steel began to be filled the demand for high speed steel for tools with which to turn and bore the shells became very great.



## PERSISTENCE OF ORE IN DEPTH\*

By P. A. Robbins.

The importance of the question of persistence of ore in depth is attested to by the already lengthy discussion which has taken place on Mr. Rickard's paper. The profit of the discussion to the membership as a whole may be approximately measured by the value of the original paper, for throughout the discussion there have been but few new specific data submitted.

The paper of Dr. Malcolm Maclaren has been referred to in the discussion, and, in fact, this paper, together with that of Mr. Rickard, may be taken as the basis of the entire discussion.

Taking a broad survey of the whole question, the lessons seem to be: Mr. Rickard teaches that "Ores usually do not, but sometimes do, persist to the limit of 5,000 ft.; therefore, be cautious in going to depth, but bolder in widening the search at shallower horizons." Dr. Maclaren teaches that "Ores usually do not, but sometimes do, persist to the limit of 5,000 ft.; therefore, do not be discouraged (if conditions are favorable) from continuing somewhat further in depth beyond the seeming limit of ore, and do not neglect the possibility of locating parallel orebodies which may be the means of continuing operations to greater depths."

Twenty-seven years ago, after a general discussion upon the extent and formation of fissures, S. F. Emmons in a paper entitled "Structural Relations of Ore Deposits," said, "The practical lesson to be learned from the above phenomena is that the miner should not confine his explorations to a single fissure in which his ore occurs; but when he runs out of bonanza in that, he should seek a continuance of it in some adjoining fissure or plane, in a direction to be determined by the study of the system of the fracturing of the region and of the general direction of the bonanzas."

The lesson taught by Mr. Emmons would seem to lie between, or rather to embrace, both the views of Mr. Rickard and of Dr. Maclaren.

Mr. Rickard has presented facts and figures, having, as it were, measured his "positive ore." Dr. Maclaren draws attention to the "possible ore" which may exist, and we may deduce the "probable ore" from a consideration of the opinions of both authorities, receiving caution from Mr. Rickard and hope from Dr. Maclaren; being restrained upon the one hand from going too far, while on the other hand being encouraged to seek somewhat farther.

I do not read in the paper of Mr. Rickard any desire to belittle the actual potentialities of mining, but merely a desire to preach a policy of conservatism in dealing with a question of vital importance.

It is of interest to the profession that Mr. Rickard should record the deductions arrived at by him, and we appreciate the concrete examples presented by him in support of his deductions. To prepare, for presentation in debatable form, data concerning all of the orebodies which have come within the scope of his experience would be a task of very large dimensions, and to be ready to defend his proofs would necessitate the laying aside of all other business, hence our thanks are due to him for the very considerable amount of data submitted.

In the discussion which has taken place, no attack has been made upon basic facts presented; it is the author's deductions which have been challenged.

Unfortunately, in most cases the challengers have not supported their arguments with definite figures, but have resorted to a variety of platitudes and reasons with which to confront Mr. Rickard, even going so far as to present the argument that the author was wrong in his judgment, because mining promoters and brokers will not employ engineers (?) who agree with his views.

At the outset of Dr. Maclaren's paper, the author clearly defined the limits of depth by the statement: "In this review then depth is understood to be a zone extending downward from 500 ft. to 6,000 ft. below the earth's surface." His discussion is further limited to the "(presumably) primary ore." The qualifying of "primary ore" by "presumably" is a clear intimation that the author does not feel justified in accepting as finally correct the usual conception of the meaning of "primary ore."

Dr. Maclaren goes as far as possible in giving the results of his observations and deductions, presenting enough evidence to illustrate, but not attempting to substantiate, his reasoning. As in the case of Mr. Rickard, voluminous statistical proof is not necessary, it is sufficient to know what convictions have been the outcome of Dr. Maclaren's search after truth. He has had unusual opportunities for observation, and is by nature and training a scientist, not given to the expression of carelessly formed opinions.

The whole tenor of the discussion has brought out forcibly that the Institution of Mining and Metallurgy is a practical organization, as much interested in settling the "bread and butter question" as in following the subterranean delvings of fancy.

Mining men grade by imperceptible degrees, from the visionary, optimistic promoter, to the unseeing, unimaginative pessimist, and their angles of vision must be known before their opinions can be properly weighed. It is no wonder then that the untrained owner or mine director is often befogged by the diversity of opinion which he will find to exist upon seemingly simple questions.

Mr. Rickard's comments upon the lack of boldness of engineers in developing the properties under their charge, prompt me to draw attention to the fact that the determination as to whether or not "rock is ore," does not depend upon metal contents alone. There are many instances where rock has remained waste, until funds became available for boldly converting it into ore. The directors, shareholders, or other financial backers of a mining enterprise have far more to do with the economic results than is generally accredited to them. The methods employed in development are not always indicative of the engineer's faith, more often than not he is limited in the amount of capital available and must lay out his work accordingly.

It requires years of training to produce a directorate who have the courage to acquiesce in the expenditure of such sums as those given by Mr. Holford in his recent paper. The Hammond-Rhodes episode is a classic in mining tradition. Mr. Hammond has received the rewards which his foresight deserved, and due credit should be given to Mr. Rhodes and others for the confidence with which they accepted geological deductions and made a bold advance in a problem which could have been but imperfectly understood by them.

\*A contribution to the discussion of a paper by T. A. Rickard, published in Bull. No. 129, by the Institution of Mining and Metallurgy, London.

It was their training and experience in large problems, their well developed breadth of vision, their belief in mining as an industry, and their faith in the professional miner, which caused them to attack the problem in a large way, and furnish the necessary funds for the work of proving the "persistence of ore to depth."

Experience is the great teacher, and the broader the opportunities for observation and study, the more exact and valuable will become the engineer's knowledge.

When a man or animal dies, the doctors hold a post-mortem examination; the symptoms of the illness are noted, and the findings of the final examinations are recorded. By carefully compiling the observations from thousands of cases, a basis for exact diagnosis in new cases is eventually arrived at.

When a mine dies, the cause is known only to the engineers attending the case, and usually no attempt is made to add to the general store of information.

Should we not follow the example set by the medical profession, laying bare the contents of the great graveyard of mining ventures, exhuming the remains, and by means of post mortems arriving at definite conclusions for our future guidance?

An opinion upon the persistence of any orebody to depth, is formed by combining visual physical properties, with geological deductions, combining theory with experience.

It would seem that there are possibilities for the formation of a new orebody in this contact zone between theory and practice. May not the ascending warm solutions from the regions of pure geology, mixing with the cooling vadose waters of experience, lead to the precipitation of a deposit of enormous value, which by scientific treatment may be reduced to a condition of comparative accuracy?

Many members have displayed a desire to contribute to a fuller knowledge of the subject which has been under discussion, and there can be no doubt that many others are equally willing and able to do so.

I propose that the contending forces lay down their arms and unite in gathering together the multitudinous scraps of information which must be available, and that instead of tearing up one another's exhibits, these be reduced to one comprehensive epitome of the subject.

Evidence submitted in a contentious spirit must be biased and of doubtful value, but the same evidence produced in a spirit of friendliness may be of great value.

The present time is propitious. The European war, the Mexican troubles and the general tightness of money have all helped to throw a large number of mining men out of employment. These men, collectively, possess a vast fund of information in the way of memory, notes and reports, which could be brought together for analysis, and in view of the general slackness, it would no doubt be a pleasure for many to occupy themselves with the working up of the information possessed by them.

The information so gathered would be of great value to members of the profession, and in fact, all connected with the mining industry, and as information which costs nothing is thought lightly of, I would propose that a fund be collected for the purpose of carrying on the work, and that all who will profit from the study of this important subject, be prevailed upon to contribute to the fund.

I would suggest that a salaried committee be appointed to direct the work, that salaried territorial agents be appointed in various parts of the world to cover the

work in the territories, and that they in turn select suitable engineers for the research work.

At the present time, when such a number of men are available, many would no doubt be willing to devote their time to this work for a remuneration which in ordinary times they could not afford to accept; in a word, it appears to me a most excellent opportunity to inaugurate some profitable relief work.

Many members of the Institution are in positions where they can make clear to their employers and clients the value of the work to be undertaken, and there should be no difficulty in collecting funds for the purpose.

Individual effort has been made along the lines proposed, and it is the excellent work of Maclaren, Curle and others which encourages me in a belief that a united effort would produce striking results.

Might we not arrive at a mathematical solution of our problem? It is not inconceivable that, given sufficient data, we might learn how to arrange our various factors for differentiation between known or assumed limits, and obtain a derivative which would approximate closely the truth.

Of what value as indicators for good or bad are the various minerals encountered in gold quartz veins? In contacts between igneous rocks, what and where are the likely disposition of values? Such questions are to be answered, not by chemical-geological reasoning, but by the cold facts of accumulated evidence.

In discussions of questions relating to orebodies there is usually a line of cleavage between the geological scientist and the practical miner, a lack of appreciation by both parties of the merits of one another. Has the time not arrived when the experiences of all may be welded together to form a powerful tool in our equipment?

Twenty-seven years have elapsed between the messages of Emmons, and those of Mr. Rickard and Dr. Maclaren, and yet the messages are not greatly different. The evidence for more positive declarations is available, why not compile it?

I have before me a paper read by Prof. Geo. R. Mickle before the Cobalt branch of the Canadian Mining Institute in May, 1912, entitled "The Probable Total Production of Silver from the Cobalt District." It is a unique paper, applying mathematics to a study of the possibilities of the Cobalt field. In it, the author, by applying the method of least squares to his probable errors, arrives at figures for the probable production of the then known orebodies, and he further deduces the probable production of orebodies at that time undiscovered. To anyone acquainted with the vagaries of the Cobalt field, the prognostications seemed unwarrantably bold, and yet the indications are that Prof. Mickle was within reasonably correct bounds in his figures.

Given a larger scope for observations, and the more complete data of the entire field of mining, it would seem that a series of mathematical deductions might be made which would greatly enhance our present knowledge of the chances for the "Persistence of Ore to Depth."

The coroner's jury empanelled to enquire into the circumstances connected with the explosion at the Western Fuel Co.'s Reserve mine, Nanaimo, Vancouver Island, B.C., returned a verdict to the effect that the death of the twenty-two men who lost their lives in that disaster, was accidental, and added, that "after hearing the evidence of thirty-three witnesses we cannot attach blame to any person. We also find that every precaution and care had been fully exercised by the management of the Western Fuel Company."

# NOTES ON HOMESTAKE METALLURGY\*

By Allan J. Clark

(Continued from last issue.)

## Slime Treatment.

The slime plant is equipped with 30 Merrill presses, each of 90 frames, 4 ft. by 6 ft. by 4 in. One press holds 26 tons of slime, and has a capacity of about 70 tons a day.

The entire treatment is given in the presses, which successfully meet the conditions for which they were designed, holding a tight and homogeneous cake during aeration periods (which impose a most exacting requirement on the machines) and discharging readily, without requiring manual labor. In this connection it may be mentioned that all the operations incident to the filling, aerating, leaching, washing, and discharging of 30 presses—totaling about 75 charges daily—are

definite time. So long as this amount of solution is passed, the extraction is accomplished. Thus the treatment time is a function of the leaching rate.

The minimum working strength is determined by our ability to precipitate the effluent solution, and in developing this minimum much of the treatment is given with very dilute solutions, with the result that the consumption of cyanide has been reduced to an extremely low figure. For instance, a 10-day period, concluding as this is written, gives the following:

Sodium Cyanide (128 per cent.) consumed per ton of slime treated: In treatment, 0.127; added for precipitation, 0.008; total, 0.135.

The precipitation of the "low solution" (first and final effluents, low in both gold and cyanide) is difficult; doubly so on account of the low alkalinity; and after trial of many expedients to assist it we are not able to improve upon Carter's old system of a drip of strong solution.

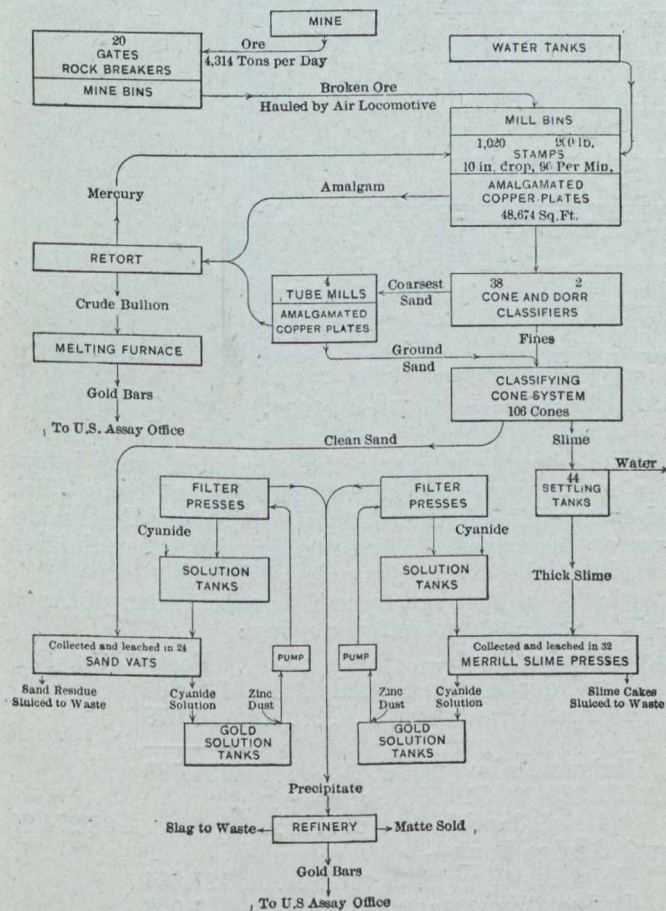
This, usually added with the feed of zinc dust at the rate of 1 lb. per hour (or per 25 tons of solution precipitated) constitutes from 5 to 10 per cent. of the cyanide used. An excessive amount of zinc dust is also necessary to insure clean precipitation of these solutions, and this entails further expense, not merely in the first cost of zinc, but in the refining of the larger bulk of low-grade precipitate. Combined, these costs consume about 25 per cent. of the profit won through the reduction of cyanide consumption, a satisfactory enough result in a plant where treatment methods have been so well established as is the case here, even though the impression may be conveyed that one branch of the work has lost efficiency.

Some assistance in this precipitation difficulty is received through the application of this barren low solution as a preliminary wash.

Double cloths are used on the treatment presses, the lighter one being in contact with the frame. This is of unbleached muslin twill, and is in turn covered with a cloth of No. 10 canvas duck. Joints are made with Thermalite paint.

During the early days of the plant, when the equipment was not equal in capacity to the tonnage of available slime, a suit of cloths was used for as much as 30 months, it being preferable to lose slime rather than to stop to repair leaks. It should be remembered that the arrangement of ports and channels in the presses is such that treatment may be given in either direction, so that a single leak would in no wise affect treatment, but would merely entail the wasting from the plant of a certain amount of untreated slime. At this time, as much as 500 tons was wasted in a month. As the plant has been brought to full capacity, the cloths have been renewed, first after 18 months' service, now after 16 months; the leakage loss on the latter basis has been brought to an average of less than 40 tons monthly over an entire year, with a minimum of 8 tons in a single month. This in treating a total monthly tonnage of more than 58,000.

The "flow gravity" system of tonnage measurements, elaborated by W. J. Sharwood (Mining Magazine, vol. i, No. 3, p. 226, Nov., 1909) finds an interesting application in the estimate of slime treated at this plant. Here, even were it possible to determine the weight of the slime cakes, it would still be impos-



Flow sheet, showing ore treatment at Homestake mine

conducted by three men on each shift. The actual time required by one of these men in the performance of every step in the treatment of a charge is slightly less than 15 min.

Treatment is in principle identical with that of the sand, periods of aeration and treatment alternating with sufficient frequency to maintain the activity of the solutions. The alkalinity is carried at a very low point, and the working solutions are of low cyanide strength. Within the restrictions imposed by practice, there seems to be no solution so weak that it will not freely extract gold from the aerated slime. The problem seems to demand the passing of a definite volume of solution through the slime cake, rather than treating with solution of a definite strength or for a

\*Extracts from a paper to be read at the San Francisco Meeting, American Institute of Mining Engineers, September, 1915

sible to know the tonnage treated, since the amount of slime retained in a press after sluicing cannot be absolutely known. Certain classes of slime are more difficultly discharged than others; the stoppage of a single sluicing nozzle leaves 1.1 per cent. of the press unsluiced. Frequent testing sluicing bars and examination of presses after sluicing protect us from loss of efficiency from this cause, so that the sluicing is never

A is filled, the time and volume are noted, the valve from B is closed, the pulp turned to tank B and the discharge valve from tank A is opened. These alterations continue throughout the period assigned for measuring. Changing, which is at intervals of about 35 min., is not instantaneous, but the actual measurements cover 90 per cent. of the total time, sufficient to insure a correct average rate.

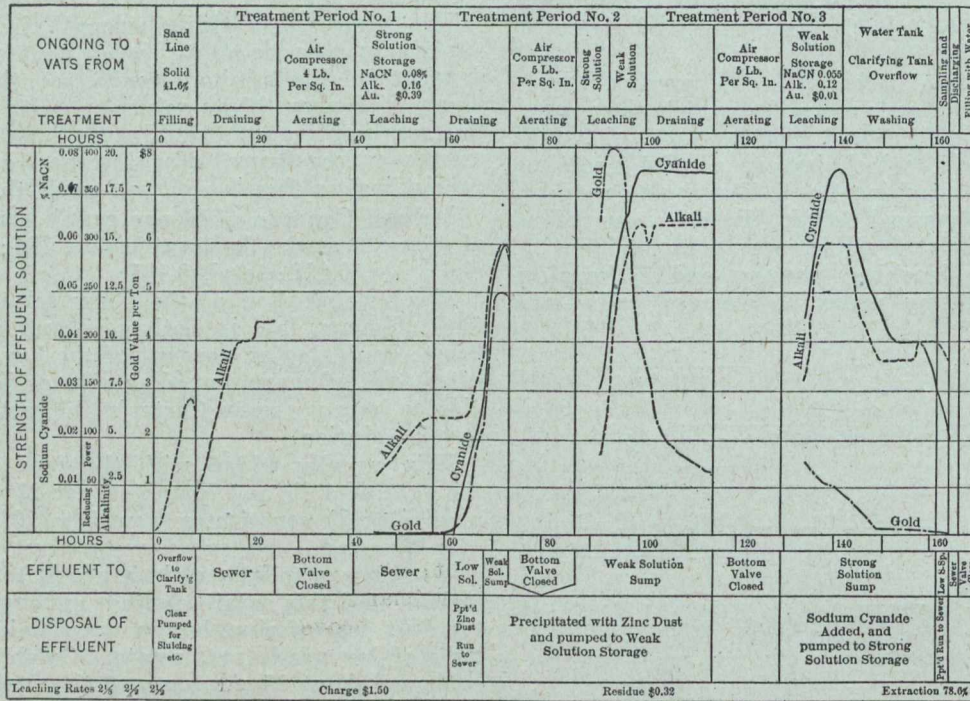


Chart showing treatment at Sand Plant No. 1. Data secured in March, 1914.

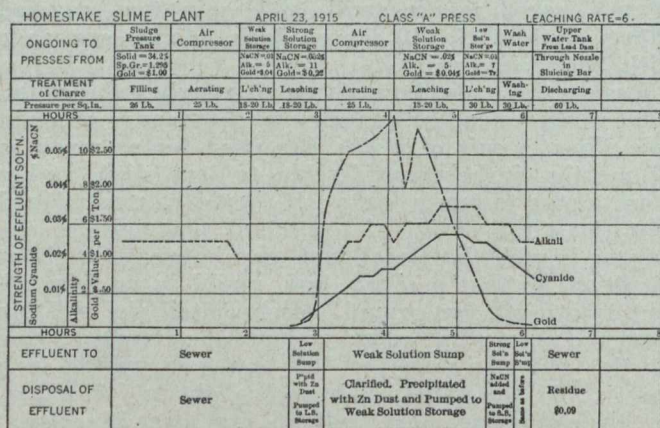
less than 96 per cent. efficient, and is at present, in my judgment, close to 99 per cent.

To at once determine the net capacity of a press, the "flow-gravity" system is used in a large way, measuring the total tonnage received at the plant during a 24-hr. period. This method is simple, thorough, and convincing, and since it is not so generally known as

At half-hourly intervals the stream of pulp is cut by a mechanical sampler, a 5-gal. bucket being filled and the weight of pulp determined. These determinations are averaged. A specific gravity determination is made on the average sample of slime.

Estimate of tonnage treated between noon of April 8, 1915, and noon on following day:

|  | Feet.   | Cu. Ft.    |
|--|---------|------------|
| North Sludge Tank—   |         |            |
| Total depth pulp to tank . . . . .                           | 132.667 |            |
| Deduct, lime water . . . . .                                 | 1.078   |            |
| Balance, slime pulp . . . . .                                | 131.589 |            |
| 131.589 × 518.85 (cu. ft. per ft. of depth) . . . . .        |         | 68,274.95  |
| South Sludge Tank—   |         |            |
| Total depth pulp to tank . . . . .                           | 125.334 |            |
| Deduct, lime water . . . . .                                 | 1.003   |            |
| Balance, slime pulp . . . . .                                | 124.331 |            |
| 124.331 × 514.42 . . . . .                                   |         | 63,958.35  |
| Total cu. ft. for 22.05 measured hours. . . . .              |         | 132,233.30 |
| Estimated pulp for 24 hr. . . . .                            |         | 143,927.28 |
| Correction for excess pulp in tanks at end of test . . . . . |         | 3,590      |
| Cubic ft. of pulp run to presses during test. . . . .        |         | 140,337+   |



Treatment of Fast-Leaching Charge at Homestake Slime Plant.

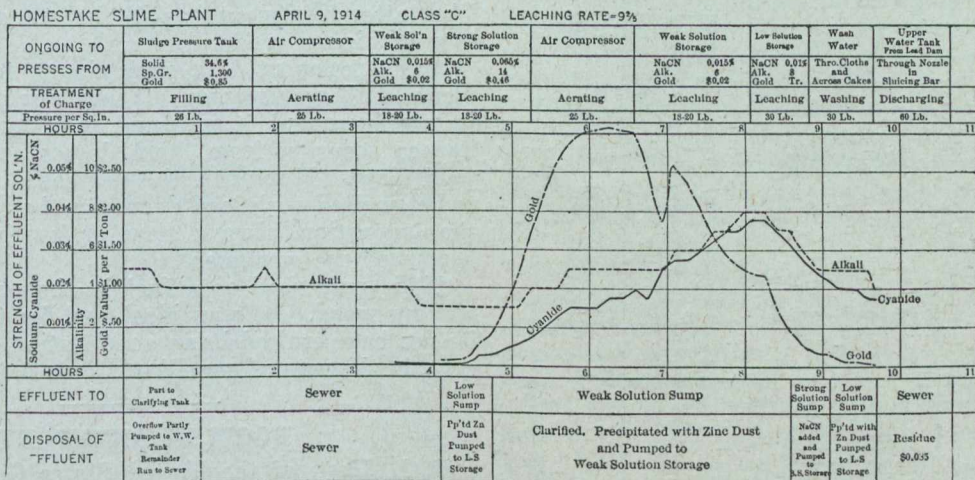
its value warrants, the full report of such a test is given herewith.

Procedure—Valves on the two "sludge tanks" receiving the incoming stream of pulp are closed. The depth of slime in each tank and the time are noted. The stream of pulp is now diverted to tank A, the discharge valve from which is closed, the presses being served with pulp delivered from tank B. When tank

During the test, 39 determinations were made of the weight of 5 gal. of pulp. The average of these determinations gave the following data:  
 Percentage of solids in pulp. . . . . 33.68  
 Weight of 1 cu. ft. of pulp, lb. . . . . 80.60  
 Solids in 1 cu. ft. of pulp, lb. . . . . 27.146

Total solids to presses during test =  $140,337 \times 27.146 = 3,809,600$  lb. = 1,904.8 tons, which was divided among 73 presses, making the average charge 26.09 tons. This scheme of tonnage measurement has been elaborated at our mills during the past eight years, and has found many useful applications. Two more of these may be cited. One, another application in a large way, was described in Transactions of the Institution of Mining and Metallurgy, vol. xxii., p. 201 (1912-13) from which I quote:

- 29.062 dry lb. sand per cu. ft.  $\times 92,711$  cu. ft.  $\div 2,000 = 1,347.2$  tons [sand in vat].
- (c) Total dried sand from 116 buckets ... weighed 2,261 lb., or 29.24 lb. per cu. ft. pulp.  $29.24$  lb. per cu. ft.  $\times 92,711$  cu. ft.  $\div 2,000 = 1,355.4$  tons.
- (a) Tonnage for a depth of 160 in., based on former accepted weight of cu. ft. boxes = 1,344.0 tons. Maximum variation = 11.4 tons = 0.85%.”
- Another convincing demonstration of its accuracy,



Treatment of Slow-Leaching Charge, Homestake Slime Plant.

“At the start the sand vat was completely filled with water. A large tank (1,246 cu. ft.) was arranged so that the entire overflow (equalling in volume the entering pulp) could be switched into it, and the time of filling the 1,246 cu. ft. noted. This tank was filled 53 times at equal intervals during the 48 hours required to fill the sand vat, the total volume of pulp being thence calculated as 92,711 cu. ft. Meanwhile the pulp was systematically sampled by a mechanical cutter, a standardized bucket of 2/3 cu. ft capacity (5 U. S. gallons), being filled and weighed

under more difficult conditions, has recently been noted. A detail of stamp milling was under investigation. Tonnage measurements of the trial battery and of a standard battery were made by diverting the entire flow of a five-stamp battery into a 15-gal. container, noting the time required to fill the container and the weight of the impounded pulp. The time required to fill the container, under these conditions, is from 20 to 25 sec.; the water ratio is over 10:1. Although many repetitions carried conviction of the general accuracy of the observations, it was thought

Slime Plant Operating Costs for 1914.

|   | Operating Labor. | Other Labor. | Power.   | Chemicals. | Miscellaneous. | Total.   |
|---|------------------|--------------|----------|------------|----------------|----------|
| Superintendence . . .                     | \$0.0093         | .....        | .....    | .....      | .....          | \$0.0093 |
| Assaying . . . . .                        | 0.0021           | .....        | .....    | \$0.0005   | \$0.0005       | 0.0031   |
| Thickening . . . . .                      | 0.0033           | .....        | .....    | .....      | 0.0001         | 0.0034   |
| Neutralization . . . . .                  | 0.0055           | .....        | \$0.0004 | 0.0144     | .....          | 0.0203   |
| Treatment . . . . .                       | 0.0342           | \$0.0027     | 0.0152   | 0.0433     | 0.0119         | 0.1073   |
| Precipitating and pumping solutions . . . | 0.0039           | 0.0006       | 0.0016   | 0.0096     | 0.0008         | 0.0165   |
| Heating . . . . .                         | 0.0004           | .....        | .....    | .....      | 0.0013         | 0.0017   |
| Refining . . . . .                        | 0.0026           | .....        | .....    | .....      | 0.0040         | 0.0066   |
| Miscellanies . . . . .                    | 0.0057           | 0.0009       | 0.0012   | .....      | 0.0010         | 0.0088   |
| *Repairs . . . . .                        | .....            | 0.0042       | .....    | .....      | 0.0026         | 0.0068   |
| Total Operating . . . .                   | 0.0670           | 0.0084       | 0.0184   | 0.0678     | 0.0222         | 0.1838   |

\*Minor repairs are carried as Miscellanies; heavy items of repairs, necessitating the presence of carpenter's crew, are included here. Press cloths cost \$0.0100 per ton of slime treated.

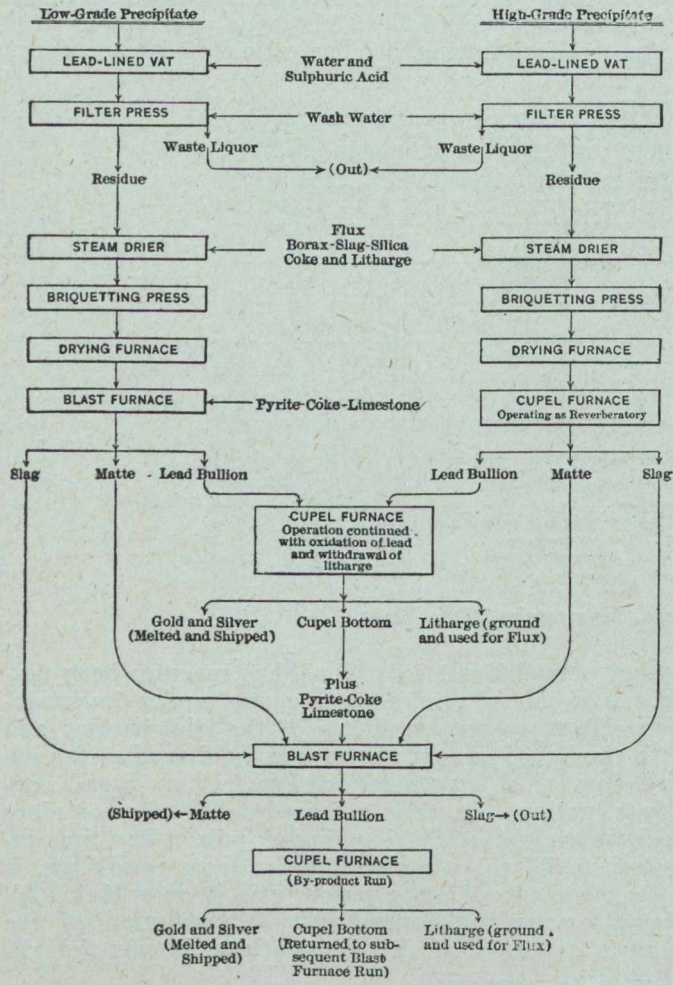
116 times at equal intervals. The samples were all thrown upon a filter, to be dried and weighed later. The specific gravity of the dry solid was accurately determined. From these data the following computations were made:

- (b) Sp. gr. of ore 2.985. Average weight of 116 buckets of 5 gal. = 54,575 lb., or 81.862 lb. per cu. ft. pulp. Average sp. gr. of pulp = 1.31, whence 1 cu. ft. contains 29.062 lb. dry sand.

best to confirm the results by weighing all ore supplied to the batteries, this decision being based upon the double liability to a large percentage error on account of the brief sampling time and the dilute pulp. Accordingly, a scale was installed, with the result that the earlier determinations were confirmed within 2 per cent.

A statement of operating costs at the slime plant is appended. This plant was the pioneer of its type. It

is interesting to note that the presses are now practically as at first designed, and that the process, in its essentials, is unchanged. Certain refinements in the press design have been dispensed with as unnecessary; a study of the operations has made possible some simplification and systematization, which have made it possible to reduce the costs each year.



**Refining of Precipitate at Homestake.**

**Unit Consumptions per Ton of Slime Treated.**

|                             |  |
|-----------------------------|--|
| Sodium cyanide . . . . .    | 0.161 lb.                                    |
| Zinc dust . . . . .         | 0.118 lb.                                    |
| Lime . . . . .              | 3.84 lb.                                     |
| Hydrochloric acid . . . . . | 0.393 lb., costing \$0.0093 per ton treated. |
| Power . . . . .             | 1.15 kw-hr.                                  |

**Precipitation.**

The Merrill system of precipitation with zinc dust is used at all cyanide plants, as is the Merrill filter press of triangular section. This method has been fully discussed in the paper already cited, and the technique remains about as there described. It has been mentioned that the effect of the recent variations in treatment has been adverse to precipitation, since the tonnage of solution requiring precipitation has been increased at the same time that the content of solution in gold and cyanide has been reduced. Beyond the natural effects—increased zinc consumption and lower-grade precipitate—no difficulties have been encountered.

Double cloths are used on the frames, the outer one being taken off when the press is cleaned and replaced by the inner cloth, which is in turn replaced by a new cloth. The outer cloth is burned, the ash going to refining.

Experiments are still in progress to find the lightest and cheapest cloth that can be used for this purpose

without unduly increasing the hazard of leakage.

All washing of cloths is eliminated by this system. Against the added cost of cloth may be set the advantage of security from leaks due to rotten or wrinkled cloths and the labor of washing soiled cloths.

**Refining.**

In its essentials, this remains as described in the earlier paper, except that after acid treatment of the lower-grade precipitate, the briquets are charged to the blast furnace instead of being fused in the cupel. The latter treatment is still the standard for precipitate of higher grade.

Acid treatment is a preliminary to furnace treatment of all precipitates. It may not be necessary, but in my judgment it is sound metallurgy, since it enhances security from stack losses and insures more fluid slags. Moreover, the decreased bulk of product to be smelted with lead decreases the time required for that operation, always more or less hazardous to the health of the workmen.

Oil is now used as a fuel in the cupel furnace, replacing wood. It is an ideal fuel for the purpose, and its use has resulted in an acceleration of nearly 50 per cent. in the rate of cupelling.

**BOOM IN ANTIMONY.**

F. L. Hess, of the United States Geological Survey, describes the unusual situation in antimony as follows:

Before the outbreak of the European war the leading brand of antimony, Cookson's, was quoted in New York at about 7 cents a lb., with other brands ranging from 5.30 upward. The outbreak of hostilities was followed by a rise in prices, and quotations for Cookson's soon rose above 20 cents, and after some fluctuations the year closed with the quotations at 15 to 15.50 cents a lb., and other brands at 13 to 14.40 cents. The British Government placed an embargo on the shipment of antimony and the price rose, so that in May Cookson's was listed at 40 cents or more a lb., but in a few days quotations ceased, for the stock in this country was sold. Quotations for other European brands, Halletts and Hungarian, ceased a little later, leaving the market to Chinese and Japanese (made from Chinese ore), which were quoted in the latter part of June at 37 to 37.50 cents a lb.

The demands for antimony to use in type, bearing (babbitt), and white metals to be used as a foundation for silver plate, coffin trimmings, is large and persistent, and is not satisfied by the Chinese output, although that has been greatly increased.

It seems safe to predict that soon after the close of the war the price of antimony will again drop to or near its ante-bellum level. Most buyers of ores seem to be discounting heavily against this contingency, and many owners refuse to sell at the prices offered, which seem to range from 50 cents a unit (one per cent. of a short ton) for clean ores running 35 to 50 per cent. antimony and \$1.00 to \$1.50 a unit for ores running above 50 per cent. f.o.b. railroad station near mine.

The permanent good which may be hoped for from the present abnormal situation is that the consequent exploitation may develop some mine with ore bodies rich and large enough to be worked at a profit even at the normal low prices.

The output of bituminous coal in the United States for the first six months of 1915 is estimated by C. E. Leshner, of the United States Geological Survey, to be between 180,000,000 and 190,000,000 short tons, the rate of production having been from 85 to 90 per cent. of the average for the previous year.

# THE COAL TRADE IN NOVA SCOTIA DURING THE FIRST HALF OF 1915

By F. W. Gray.

The unusual circumstances of the present time seem to require and to warrant a departure from the time-honored custom of annual trade reviews, and the writer has therefore gathered some approximate statistics showing the production of the coal mines of Nova Scotia during the first six months of 1915, as compared with the corresponding period of 1914.

A tabulation of the production of the various coal companies, over the periods mentioned, is as follows. The figures are closely approximate:

|                                     | 1st Half 1914.<br>Long Tons. | 1st Half 1915.<br>Long Tons. |
|-------------------------------------|------------------------------|------------------------------|
| Dominion Coal Co.:                  |                              |                              |
| Glace Bay Mines . . . . .           | 2,254,000                    | 2,075,000                    |
| Springhill Mines . . . . .          | 200,000                      | 199,000                      |
| N. S. Coal & Steel Co. . . . .      | 396,500                      | 256,300                      |
| Acadia Coal Co. . . . .             | 207,600                      | 144,000                      |
| Inverness Coal & Ry. Co. . . . .    | 125,800                      | 103,000                      |
| Intercolonial Coal Co. . . . .      | 107,000                      | 90,000                       |
| Maritime Coal & Ry. Co. . . . .     | 73,500                       | 76,000                       |
| Minudie Coal Co. . . . .            | 31,000                       | 38,000                       |
| Colonial Coal Co. . . . .           | 26,000                       | 20,000                       |
| Cape Breton C. I. & Ry. Co. . . . . | 12,000                       | 6,000                        |
|                                     | 3,433,400                    | 3,007,300                    |
| Decrease . . . . .                  |                              | 426,100                      |

These figures disclose a diminution in production of about twelve per cent., and it may be remarked that the major portion of the decrease occurred during the first three months of the year.

The decrease in tonnage for the twelve months of 1914 as compared with the twelve months of 1913, for the Province of Nova Scotia, was about 600,000 tons, and it is a point worthy of note that the reduction in tonnage coincided almost exactly with the lessened use of coal for coke-making. That is to say, the decrease in production of coal was entirely attributable to the lessened activity of the steel trade, as may be gathered from a study of the outputs of the two large Cape Breton operators, namely, the Dominion Coal Company and the Nova Scotia Steel & Coal Company. The same feature is noticeable in the tonnages of the first six months of the present year.

The demand for manufacturing and domestic coal has been well maintained, and has in fact materially increased. Bunker enquiries have been particularly vigorous, as many steamers engaged in transatlantic service are taking double bunkers on this side.

The demand for steel for the fabrication of munitions of war has during the past three months had an enlivening effect upon the steel-making industry, and is now helping the coal demand very considerably.

While the forecasting of future events is perhaps a more unsafe amusement at the present time than it is in more normal times, there seems good reason to hope that the second half of 1915 will not show the same decrease in tonnage as the first half of the year has done, and may even show a respectable increase in production over the last half of 1914. Indeed, it will not be surprising if, when the twelve months are ended, the coal production of the Province is within one or two hundred thousand tons of the production of 1914.

As is to be expected, there has been a slackening in new construction and development. With the exception

of the completion of the new washery of the Nova Scotia Steel & Coal Company at Sydney Mines there has been no notable addition to the equipment of the collieries.

The Cape Breton Coal, Iron & Railway Company suspended mining operations in February last, and it is not probable that operations will be resumed at the Broughton Colliery until after the close of the war, or until financial conditions improve.

The Acadia Coal Company suffered from the temporary loss of the Allan Shafts following the explosion of last December. The recovery operations were successfully carried out, but practically no output has been contributed by the Allan Shaft mines during the first half of the year.

Some of the smaller producers, notably the Maritime Coal Company and the Minudie Coal Company, show a small increase in tonnages over 1914, showing that, as previously pointed out, the local demand for coal has been well maintained.

The cost of freighting coal has been considerably enhanced by the requisitioning of vessels by the Admiralty. This has particularly affected the Dominion Coal Company, as will be noticed from a perusal of the report of the president of the Dominion Steel Corporation to the shareholders presented at the annual meeting in June. The peculiar conditions attending the coal trade in the St. Lawrence and Gulf have evolved a type of coal freighter that is unique. The necessity to deliver large quantities of coal within a period of time strictly limited by climatic conditions has brought into use a type of vessel characterized by large carrying capacity, up to 12,000 tons, and possessing specialized features, such as speed, cargo holds with large clearances, unusual provision of water ballast, etc. These special features have rendered these vessels particularly desirable for the purposes of the Admiralty. At the same time, the impossibility of replacing them by other vessels is telling very severely upon the coal companies.

The shadow of the war is cast upon every feature of industrial life, and it is to be met with in most unexpected places. Large numbers of the mining population have gone to the front. For example, the Dominion Coal Company alone has suffered the loss of over one thousand men, approximately half of this number being comprised of Belgians, Frenchmen, Russians, and other reservists of the Allies, and the other half represented by enlistments in the various Overseas Contingents or in the local militia forces. This number does not include the enlistments at the Springhill mines, where the proportion of recruits has been as high, if not higher, than in any part of the Province. At Sydney Mines also and Westville enlistments have been heavy, and the mining population of Nova Scotia will compare very favorably with the remainder of the Dominion in their response to the Empire's supreme appeal. As an example may be quoted a case that came under the writer's notice recently, where a miner and his three sons are serving together in one company of the Second Contingent. This man left behind him a wife and seven other children, but conceived it to be his duty to be with his three sons, "in case anything should happen to them." The same circumstance is to be noted that has been commented on in English papers, namely, that it is the married men who are enlisting. Many reflections arise when this fact is considered, but it is a

fact, and the pension list will some day be a grievous reminder of the fact.

In any review of the coal trade of Nova Scotia so largely dependent for its existence on transportation by water, it would be ungrateful not to refer to the services of the navy that is protecting our costs. It is a navy that we never see, whose ships come and go unheralded and unpublished, but so far it has kept us in safety. That our industries continue their prosperous operation, and that the "long wharf" of Nova Scotia has not yet sighted a hostile craft, is, and should be, a source of gratitude to all who appreciate the vulnerable nature of our geographical location, and is evidence of the good work of those who patrol the North Sea.

Summarizing the situation, therefore, it would seem that there is reason for optimism as regards the outlook for the coal trade in Nova Scotia, as compared with the outlook six months ago, and there seems good reason to believe that the improvement will continue at least until the close of St. Lawrence navigation.

#### COLORADO'S MINES BUSY.

The output of Colorado mines during the first six months of 1915, according to Charles W. Henderson, of the United States Geological Survey, will show no increase in actual metal contents, except for gold. The increase in average prices for lead, copper, and zinc, based on the normal production, will, however, add greatly to the total value of the output, and the undoubted activity in mining promises at least the normal production of metals for the year 1915, which at the exceedingly high average prices at this stage of the year, promises a greatly enhanced total production.

Colorado, in the last five years, 1910-1915, has averaged \$19,225,500 in output of gold (dropping from \$20,507,058 in 1908 to \$18,146,916 in 1911, but increasing in 1914 to \$19,883,105); silver has averaged 8,400,000 oz.; copper, 7,000,000 lb.; lead, 76,600,000 lb., and zinc, 104,000,000 lb., reaching its height in 1912, with 132,222,812 lb., but dropping to 96,774,960 lb. in 1914. The total value for the five metals has averaged \$34,480,000, when silver ranged from \$0.53 to \$0.615, copper from \$0.125 to \$0.165, lead from \$0.039 to \$0.045, and zinc (spelter) from \$0.0510 to \$0.069.

Cripple Creek annually produces 60 per cent. of the State yield of gold, and in the first six months of 1915, has proportionately exceeded the production of \$11,996,116 for the 12 months of 1914. The San Juan region has produced normally on a basis of \$4,000,000 per year, and Leadville probably has exceeded its normal gold production because of shipments of siliceous gold ores from Breece Hill mines, while the Clear Creek-Gilpin region has produced slightly in excess of the normal production. The Summit County dredges have maintained a production of about \$300,000 for the half year.

#### A GOOD MINING YEAR IN ALASKA.

In the Geological Survey's mid-year review for 1915, Alfred H. Brooks reports that there is every reason to believe that the mining industry of Alaska has begun a prosperous year. The present high price of copper has encouraged the continuation of development work on many copper properties on which operations were suspended in mid-summer of 1914. It is probable that about a dozen copper mines will be on a productive basis in 1915 compared with 6 in 1914. A considerable increase of copper production will, therefore, take place. The gold lode production from the Southeastern Alaska, Prince William Sound, and Willow Creek districts will also be increased this year.

#### INCREASED MINING ACTIVITY IN NEVADA.

The United States Geological has received reports from V. C. Heikes of satisfactory conditions in Nevada that promise well for the 1915 output of metals. Since May, the mines and mining districts of Nevada are more lively than they have been in years and more ore is being shipped than for months past.

Over 100 cars of ore per month are being shipped from the Yellow Pine district, in Clark County, where nearly every zinc and copper property is working, but zinc producers without contracts for their product are experiencing a hard time selling it at the present high prices. The silver mills at Tonapah are operating at usual capacity, treating about 10,000 tons of ore weekly.

On the Comstock lode the pumps of the Mexican and Ophir winze have lowered the water to the 2,700 level. Nothing that has happened on the Comstock in twenty-five years is of such importance as a vast quantity of virgin ground that has been opened up in the north end mines. Last month the first ore in thirty years was brought up from the 2,500 level of the Comstock. Rochester District is equipped with a custom mill, and recently made a second shipment of silver bullion valued at \$26,000 after a run of sixteen days. The Nevada Consolidated mill and smelter at Ely are operating at full capacity. A flotation process has been added to its concentrator.

#### SPECIAL DEMAND FOR QUICKSILVER.

The quicksilver industry has been active during the first six months of 1915, according to H. D. McCaskey, of the United States Geological Survey. Up to the beginning of the European war the price per flask of 75 lb. in San Francisco had not reached a monthly average of \$40 since January, but in August embargoes closed the important foreign sources of supply, except the Italian, and the average was quoted as \$80, and much higher prices were quoted for individual sales. In September the price dropped slightly, and in the last quarter shipments came in from Italy to take advantage of the domestic market, and the prices ranged from \$53 to \$55. Demand increased and supplies were not immediately available, so that in February the monthly average price reached \$60, in March \$78, falling to \$77.50 in April, and \$75 in May. Italian supplies could no longer be expected to compete when that country entered the war, and in June the prices rose from \$80 to \$90.

#### GOOD OUTLOOK FOR MONTANA MINES.

Soon after August 1, 1914, two of the three copper smelters in Montana closed, and another curtailed production of copper until metal prices improved. Mining and smelting were, however, resumed, as the demand for metal increased, until the production at the end of June, as reported by V. C. Heikes, of the United States Geological Survey, is about 97 per cent. of the normal output. The Anaconda Copper Company announced in April that the point had about been reached where 90 per cent. of the mineral values in the ores are recovered. In May, the Pittsmtont smelter was started.

More than 15,000,000 of the 16,500,000 tons of iron ore produced annually in France, worth about \$13,000,000, comes from department of the Meurthe and Moselle, occupied by the Germans; 74 per cent. of French iron industries are immobilized.

Even the hens are making and filling shells.—The Wall Street Journal.



# DOMINION STEEL CORPORATION, LTD., ANNUAL REPORT

At the annual meeting held on June 24, the directors of the Dominion Steel Corporation submitted the following report:

The net earnings of the corporation and its constituent companies, after making full provision for bad and doubtful debts and after adjustment of the values of materials on hand, were \$3,571,058.98. From this amount there has been reserved for depreciation sinking funds and proportion of discount on bonds, the sum of \$1,064,279.88. The undivided profits carried forward have been increased by \$225,256.24. The business of the Steel Company was seriously disturbed during the year, and the directors were obliged to postpone payment of the dividends on its preferred stock.

The operations of the Coal Company were affected unfavorably by the closing down for some months of the steel plant, but its business was on the whole well maintained. The prospects for the coming year are good, but the requisition of our colliers by the Admiralty is seriously affecting the question of transportation.

In the early part of the year a distinct revival in the demand for iron and steel in Canada was apparent, but business came to a standstill with the outbreak of war. We have as yet experienced no revival of the Canadian demand, but there is a considerable tonnage of steel required for war purposes, and the demands for export trade are large, while prices abroad have risen to a level more in keeping with the heavy cost of transportation. The company is receiving a full share of business in these lines.

The only material addition to the properties since the last annual report is a plant for the recovery of benzol and other hydrocarbons, the erection of which was undertaken in February. This plant, although not quite complete, is producing a considerable quantity of these by-products, which are now greatly in demand. Even under normal conditions the plant should yield a very good return on its cost.

On the whole the directors are pleased to be able to report a marked improvement in the outlook for the constituent companies in the coming year, as the result mainly of the special demands from abroad.

### Consolidated Profit and Loss Account.

For the fiscal year ending March 31, 1915.

|   |                     |
|---|---------------------|
| Net earnings, after deducting all manufacturing, selling and administrative expenses, but before charging provision for sinking funds and depreciation and interest . . . . . | \$3,571,058.98      |
| Deduct — Provision for sinking funds, exhaustion of minerals, depreciation and permanent improvements . . . . .   | 920,093.18          |
| Deduct also—Interest on bonds and loans . . . . .   | \$2,650,965.80      |
| Proportion of discount on bonds and notes sold . . . . .  | 144,186.70          |
| Net earnings . . . . .  | <u>\$855,256.54</u> |

|  |            |
|--|------------|
| Add—Balance at April 1, 1914 . . . . . | 796,907.07 |
|--|------------|

\$1,652,163.61

Less—Dividends:

|   |              |            |
|---|--------------|------------|
| On preference shares . . .                                | \$420,000.00 |            |
| On preferred stock of Dominion Coal Company, Ltd. . . . . | 210,000.00   | 630,000.00 |

|                         |                       |
|-------------------------|-----------------------|
| Balance, March 31, 1915 | <u>\$1,022,163.61</u> |
|-------------------------|-----------------------|

President J. H. Plummer reports on the business of the corporation as follows:

### Coal Business.

The output of coal for the year ending March 31st, 1915, was cut down by the closing of the blast furnaces of the Steel Company, so that our figures show a shrinkage for almost the first time on record. The reduction in the Cape Breton Collieries for the year amounted to 541,641 tons; the total production at all collieries for the last four years was as follows:

|  | Tons.     |
|--|-----------|
| Year ending 31st March, 1915 . . . . . | 4,550,512 |
| Year ending 31st March, 1914 . . . . . | 5,047,683 |
| Year ending 31st March, 1913 . . . . . | 5,051,603 |
| Year ending 31st March, 1912 . . . . . | 4,406,263 |

The capacity of our collieries on a full summer working basis, is just 500,000 tons per month, and it is hoped that the output in the current year will again exceed 5,000,000 tons.

No new work was undertaken on the coal properties during the war, but in the new collieries in the Langan district expenditures in the completion of work under way amounted to \$75,457.80. This practically completes Nos. 12, 14, 15 and 16. Some further work has been done on No. 17, but under the conditions prevailing it was not thought well to push the development of that colliery. The total capital expenditure for the year was \$127,860.55.

During the year we closed one of our oldest collieries, No. 8, where the supply of coal has been exhausted, and the time is approaching when No. 3 must be abandoned. The equipment and organization of the latter are already being transferred to No. 11, which underlies it. I might remind you that as against the loss of the output of these exhausted collieries we have in recent years opened the four Langan collieries mentioned above, and Nos. 21 and 22 in the Morien district and have also re-opened colliery No. 11.

The working of the Springhill collieries property has been much improved and its value is now fully demonstrated. The opening of the new colliery has been postponed until times improve, but we have contracted for the installation of a modern compressor plant to replace the steam power now used underground, which under the increased depth of our workings has become inefficient and costly.

The efficiency of the company's arrangements for transportation has been maintained as fully as possible, but we have suffered severely through the requisition by the Admiralty of some of our best colliers. The company has lost in this way the services of the Twickenham, 8,100 tons dead-weight capacity; Kendal Castle, 6,750 tons; Lord Stratheona, 11,000 tons; Ka-

mouraska, 7,400 tons; Wabana, 7,400 tons, and Maskinonge, 7,400 tons; a total carrying capacity of 48,050 tons. The completion of the Dagchild has been indefinitely postponed by the Admiralty requirements.

These losses interfere seriously with the delivery of coal by water, and while we have been able to secure a number of smaller steamers, chiefly from the upper lakes, the lost tonnage has not been fully replaced, and in any case the cost of transportation must be much increased over last year.

#### Iron and Steel Business.

For the first two or three months of the fiscal year the operations on the steel plant were fairly active, especially in the rail mill. Immediately after the outbreak of war all orders were suspended, and some material already made was left on our hands to be taken when conditions improve. The business was at a standstill from August to November; orders from Great Britain from that time forward enabled us to keep the plant in partial operation, but the prices obtainable, coupled with the high cost of transportation—due largely to excessive delays in British ports—left little margin of profit. Since the spring set in this condition has greatly changed for the better, and unless we should meet with other unforeseen changes, the large export trade which we have secured should be fairly profitable.

The following shows the output of the year, with the figures of the previous year:

|                               | Year ending<br>March 31,<br>1915.<br>tons. | Year ending<br>March 31,<br>1914.<br>tons. |
|-------------------------------|--|--|
| Pig iron .....                | 187,262                                    | 333,919                                    |
| Steel ingots .....            | 243,313                                    | 331,256                                    |
| Blooms and billets for sale.. | 38,231                                     | 35,299                                     |
| Rails .....                   | 99,929                                     | 176,027                                    |
| Wire rods .....               | 39,762                                     | 30,764                                     |
| Bars .....                    | 14,319                                     | 16,738                                     |
| Wire .....                    | 27,175                                     | 24,788                                     |
| Nails .....                   | 10,912                                     | 14,089                                     |

Our exports of iron and steel during the year amounted in all to 109,151 tons, in addition to which there were over 20,000 tons on hand on 31st March made on export orders. Notwithstanding the tonnage of materials on hand awaiting shipment under contracts already made, the inventories of the Steel Company were reduced to the extent of \$719,435.51 as compared with 31st March, 1914, and we hope to continue the reduction.

The demand for iron and steel in Canada has fallen to a very low point. The depression began in the fall of 1913, it was temporarily interrupted in the spring of 1914, but with the war it became acute. In many departments there is no demand whatever. We have, however, made large contracts for the supply of steel for high explosive shells, on which we are now working.

This condition is not unnatural, if we look back at the extraordinary amount of expenditures in recent years on new railways, additions to existing railways, and railway equipment. A relapse at the close of this constructive period was to be looked for, but it came with a severity and suddenness that no one could have expected. There are, unfortunately, no indications yet of a change in the direction of normal conditions, yet business in the country is on the whole fairly active, our agricultural interests are extremely

prosperous, and the natural demands of a population with fair spending power must lead to the revival of a demand for our ordinary products. For rails, however, we must look for our chief markets abroad. I am glad to say that the many railway lines we have served throughout the Empire seem pleased to return to us, and most willing to entrust us with their orders when circumstances permit.

So far as can be judged the demand for iron and steel for the British and foreign markets must be very large during the war, and for a certain period after its close. We are not without hope that the business we are now building up will to a considerable extent be permanent, but a great deal depends on the conditions in Europe when the war is over.

I should add that the difficulties of transportation have formed the chief obstacle to the building up of the export trade. The cost was greatly increased, and at the same time the quantity we could move greatly diminished, by the extraordinary delays and wasted time from which we suffered. The congestion of traffic at British and French ports has in effect almost cut in two the amount of steel which our vessels were able to deliver on the other side.

The only addition to the property in the year is the benzol plant hereafter referred to, but a great number of minor improvements have been effected, all tending to greater economy and efficiency. The effect of this is shown in the favorable costs we have reached this spring, which are lower than for many years past.

We have had before us for some years past plans for the erection of a benzol plant, but before the war the prices for benzol, toluol and similar products were low. Since the war the condition has greatly changed, and we found the erection of a plant desirable. On the 20th February we entered into a contract with the War Office for the supply of toluol, which was subsequently extended to trinitrotoluol, and at once began the erection of the plant at Sydney; a nitrating plant being simultaneously erected by the Canadian Explosives, Ltd., to enable us to carry out our contract. Both plants were erected in record time; about two months for each; and are now in operation. The benzol plant still needs some additional equipment for its full completion, but it is already doing excellent work.

The demand for pit rails, for rail fastenings which are necessary in connection with our export rail orders and for rolled sections somewhat larger than our bar mill will produce, has caused us to undertake the construction of another small rolling mill. This will be ready in ten or twelve weeks; it has been planned so that it can be readily extended as the market grows. If the demand for shell steel should continue this mill will enable us to supply it.

#### U. S. LEAD EXPORTS.

More than 200,000,000 lb. of lead has cleared for export from the United States during ten months ended April 30. This was a record-breaking tonnage, by a wide margin. Of the total shipped out, 49,989,653 lb. was lead of foreign origin that had been treated in the United States under bond, and 151,497,474 lb. was American lead. During April exports of domestic lead amounted to 39,772,895 lb., while foreign lead cleared was 10,265,819 lb. more, against 7,325,686 lb. last year. The value of lead originating in and exported from the United States in the ten months period was \$6,153,474, of which \$1,801,658 cleared during April. The average export price of April's shipments was 4½ cents a lb.

## THE LAKE SUPERIOR IRON RANGES

By P. B. McDonald.

The ordinary facts about Lake Superior iron mining are fairly well known. Most mining men understand that in Northern Michigan and Minnesota are situated a great number of huge iron mines. It is a district equaling the Rand in point of magnitude and vastness. Immense, irregular masses of ore are extracted by a variety of ingenious caving, sub-level, and open-cut systems, and put into railroad cars with a neatness and celerity that is amazing, when the difficulties from water, quicksand, and soft walls are considered. The further characteristics of the district, stock-piling the hoist in winter due to stoppage of the lake steamers by ice, circular concrete shafts sunk by the caisson-and-sand-hog method through deep overburden, the distinct Cornish element among the miners and bosses making for many "Cousin Jack" stories of vast eating proclivities and dialectic peculiarities, etc., are also more or less well known in mining circles.

**Variety of Methods.**—To a visitor, probably the most extraordinary fact apparent on the iron ranges is the remarkable variety of the mining and of general conditions as witnessed on the different ranges and in different districts of the same range. On the Marquette range, around Ishpeming and Negaunee, are seen old mines that have been producing steadily for a generation, and with some of the same men working that were present when the first shaft was sunk. Perhaps a half-mile away in some flat field another company will be diamond-drilling to a depth of several thousand feet in the expectation of finding ore for a new mine deep down in some fold of the footwall slates. One mine will be hoisting a hard, specular ore that can be extracted by open-stope systems, while the next mine to it will be top-slicing and caving a soft, wet ore that resembles mud in appearance.

In contrast to the vertical shafts customary on all the other ranges, the Gogebic range has some deep, inclined shafts, as well as peculiarly formed ore-bodies seemingly caught between the inclined footwall and intruded dykes which cut across the other formations at an angle.

On the great Mesabi, in a country of flat, swampy wilderness, are the vast open-cuts in which railroad trains circle around in a wide spiral from the sides of the pit and finally get down to the busy steam shovels which take the soft ore directly from the deposit and place it in 50-ton steel cars for shipment to docks at the head of the lakes.

Of late years one of the most active of the Lake Superior districts has been that around Iron River, Michigan. Only a few years ago, Iron River was a sleepy, disregarded little place, with one or two indifferent mines and no particular prospects. To-day it boasts of fifteen or twenty different mining companies, with big, well-equipped mines and all kinds of activity, including two railroads, a street car line, new buildings, pavements, banks, etc. The bringing about of this change has been due to the work of the diamond drill, which found unexpected thicknesses of a medium grade ore scattered in the tabular masses under a hundred or two hundred feet of surface soil of the farms of settlers and residents. When the surprising richness of the Iron River field began to be known, through the take-a-chance operations of two or three pioneers, iron mining companies on the other ranges and furnace interests in the East sent representatives to the district followed by trained executives, who

started acquiring, exploring and developing properties until quite a boom materialized.

**Administration.**—The iron mining companies are well administered by capable, sensible staffs of employees. There are a number of level-headed old Cornishmen among the officials at the mines, who know mining from generations of mining forbears. Engineers from the nearby Michigan College of Mines, Minnesota School of Mines, and Wisconsin University, are plentiful both on surface and underground, surveying, exploring, cutting costs, etc.

**The miners** include Finns, Austrians, Italians, Poles, Slavs of several types, with a sprinkling, in the older towns, of Cornishmen. In addition the region has drawn an element of native-born Americans from the nearby lumbering and farming sections—bright-eyed clerks, woodsmen, men of contracting proclivities, who all tend to make for efficiency and satisfactory conditions. It will be remembered that, when the copper miners of Michigan went on their long and disastrous strike, the iron miners refused to strike with them.

**The exploration phase** of the ore business is important. As the outcroppings and obvious showings of the ore formation became taken up, recourse was made more and more frequently to the diamond drill for probing at depth by vertical, angle, and flat holes, under thick overburdens, into favorable folds of the footwall slates for concentrations, and around the various dykes of diabase and diorite. Several companies maintain their own diamond drills, crews, geologists, etc. The Cleveland-Cliffs Iron Company is very complete in all its appointments for finding, mining and transporting ores to the markets of the lower lakes. Most companies let their diamond drill exploration to contractors who furnish all equipment, men, etc., and do the work for two, three, four or five dollars per foot, depending on the formations to be cut, distance from railroads, etc. Cole & McDonald, of Virginia, Minn., one of the largest of the diamond-drilling contractors, have dozens of drills at work on all the ranges and in the copper country. The Longyear Company, of Minneapolis, is a large exploring company which also manufactures diamond drills at a shop in Marquette, Mich., and will guarantee to furnish expert geological advice as to the best way of drilling a property. Lately the Longyear interests have been branching into the mine owning and operating end of the business.

**U. S. Steel Co. Interests.**—The recent decision in the United States Courts declaring the United States Steel Corporation not a "monopoly" makes pertinent the corporation's position on the iron ranges. Way back in the 90's several far-sighted business men identified with blast furnace interests around Pittsburg began to realize that iron and steel manufacturing was consuming vast quantities of iron ore, but that the ore fields at Lake Superior had been overlooked, due to attention being concentrated upon other phases of the industry. A man named Henry Oliver went to Andrew Carnegie and told him that the great iron ore ranges in Michigan and Minnesota "had certain definite geographical and geological limits," and offered him some options on extensive lands containing possibilities of ore-bodies. Mr. Carnegie was not much impressed, and declined to be interested. But some time later the Scotsman's canny mind arrived at the shrewd

opinion that the proposition was sound. He summoned Oliver and told him he had decided to take over his ore land options at the price named. Oliver replied that since their last interview the price for the lands had gone up something scandalous, realizing that Carnegie had determined to pay. Carnegie paid, and thus was formed the nucleus for the enormous ore holdings that were later consolidated into the Steel Corporation.

**No monopoly.**—But contrary to past opinions, the Steel Corporation has not a monopoly on Lake Superior ore reserves. It is true that of the total shipments each year, the Oliver Iron Mining Co. (which is the iron mining end of the Steel Corporation in the district, and incidentally was named for the same Henry Oliver who interested Carnegie) frequently contributes slightly over 50 per cent.; but the independent operators are increasing every year, and are getting stronger while the Steel Corporation stands still. In 1912 R. C. Allen, the State Geologist of Michigan, after a careful estimate, stated that of the known iron ore reserves in the State, of merchantable grade at that time, the Steel Corporation controlled about 28 per cent. In Minnesota, particularly on the Mesabi range, the corporation is stronger than in Michigan, but by its recent relinquishment of the Hill leases its holdings were materially reduced.

When the Steel Corporation was formed in 1901, nearly all of the then largest iron mines were purchased, and both in Michigan and Minnesota the "Oliver Company" became the dominant factor in the mining field.

Wholesale provision for the immediate improvement and efficient operation of these mines was made on the same elaborate plan as marked all of the corporation's early activities, but the general rule was followed of retaining the old officials to manage the mines. These staffs of officials found the task of administering such a large combination of plants to be greater than had been supposed, and naturally as time went on and their ambitions having been satisfied as to being the largest operators in the field, they sat back and became conservative. Then a crop of new and energetic mining concerns entered the field, as other iron and steel interests saw the advantage of owning their own ore mines; and the several companies that had stayed out of the combination were quietly at work acquiring likely lands, exploring, developing, and producing. In a few years the Steel Corporation became known among mining men as standing for the principle of "let well enough alone," and it was evident that the vast organization was satisfied to merely hold what it had acquired, and was willing to let competition take its course unmolested in any but a friendly manner.

Of course, had the area of iron ore possibilities at Lake Superior been small and confined, or even definitely determinable, the Steel Corporation would have had no compunctions against going right in and scooping up all in sight. But in spite of much geological mapping and careful detailed tracing of the different rock formations by able, experienced geologists, such as President Van Hise, of Wisconsin University, and Professor Smythe, of Harvard, there remains to this day considerable areas where, due to the thick overburden of glacial sand and surface soil, it is impossible to say whether or not iron ore can exist, without expensive and protracted drilling to depths of hundreds of feet.

There are six principal ore ranges, three in Michigan called the "old ranges" and three in Minnesota, be-

sides several outlying districts usually classed as auxiliaries to the main ranges. Thus in Michigan, the oldest range of all, the famous Marquette has an offshoot to the southeast, commonly styled the "Swanzy Range," or the "Gwinn district," while between the Republic trough of the southwestern portion of the Marquette Range and the Crystal Falls area of the Menominee Range is a wild, trackless patch of territory which may or may not contain valuable bodies of merchantable ore. And the discoveries by numerous "independent" companies in the Iron River field of deposits beneath flat farming lands, substantiates the truth that in the Lake Superior soil-covered territory "you never can tell." An added factor which has made for diversity of ownership during late years at Lake Superior is the presence of numerous owners of farms and tracts of land acquired in various ways, by lumbering, settlement, etc. By this multiplication of owners over an extensive area of two States, the conditions were unfavorable to the acquisition by one large company of all likely and promising land for holding or tying up in reserve.

The three Michigan ranges, or "old ranges" are the Marquette, Menominee, and Gogebic, named in order of their settlement and opening up. The three Minnesota ranges are: The Vermilion, an old hard-ore range of no great size; the famous Mesabi, a producer of soft ores, the largest of all six ranges, and the Young Cuyuna, down near the Mississippi river.

From Brainerd on the Cuyuna range in Central Minnesota, to Negaunee on the eastern end of the Marquette Range in the northern peninsula of Michigan, is over 300 miles as the crow flies, or twice the length of the State of Massachusetts, and between these two extreme points lie the complicated and ramified chains of ore deposits which, with appendages and possibilities are grouped into "ranges." It is thus apparent that it was, and is, a very difficult job to corner the Lake Superior iron ore reserves, extending as they do over a vast territory with the land cut up by hundreds of ownerships of settlers, lumber operators, farmers, etc.

Incidentally it is interesting to note that the Steel Corporation's new steel plant at Duluth is approximately at the centre of the mining region, the only steel plant which has been located in the ore territory rather than in the coal district.

#### BRITANNIA MINE.

The Britannia Mining & Smelting Company, Howe Sound, B.C., is arranging to install in connection with the mine haulage system a motor-generator set for supplying direct current at 550 volts to the trolley. This set will consist of one 300 kw., 600-volt commutating pole type railway generator, 900 r.p.m. direct-connected to one 500 kw.a. self-starting synchronous motor, 3-phase, 60 cycles, 6,600 volts. One 15 kw., 125-volt commutating pole exciter will also be mounted on the same shaft with the main machines. This unit will be of the 3-bearing type, and the motor end of the shaft will be extended for the reception of the runner of an impulse water wheel which may be installed at a future time. The synchronous motor will have a large capacity for power factor correction. These features will make the set very complete, inasmuch as the synchronous motor may be used as an alternating current generator, and when the water wheel is in operation it would be unnecessary to use a hydraulic governor, as the synchronous motor, being attached to the main alternating current system, will maintain a constant speed.

## PROGRESS OF MINING IN BRITISH COLUMBIA

The year 1914, during its first half, gave promise of being an exceedingly favorable one for mining in British Columbia, and it was even expected that its mineral production would exceed that of any previous year. These expectations, however, were shattered by the unprecedented conditions which confronted the mineral industry during the last half of the year.

The production for 1914, although it is materially less than for the years 1912 and 1913, is nevertheless about the same as for the year 1910, while it is considerably greater than that of any other year and is much greater than the average production for the last ten years.

The decrease shown this year, while it is partially caused by a lesser quantity of the metals produced, is not entirely attributable to that cause, but is partially due to the lower average price of the metals prevailing in 1914 as compared with those of 1913. For example, the average market value of silver in 1914 was about 4.9 cents an oz. lower than in 1913; copper was 2.27 cents a lb. lower; lead, 0.5 cent a lb. lower; zinc, 0.45 cents a lb. lower. If the metal prices of 1913 had been maintained during 1914 and applied to the output for that year, this output would have been valued at some \$1,170,117 greater than it appears. The lower average prices for the metals prevailing in 1914 are partially attributable to the war, but to some extent were occasioned by the financial stringency which preceded the war and possibly foreshadowed it.

The gross value of the mineral production for 1914 was \$26,388,825, a decrease from that of the year 1913 of \$3,907,573, or about 12.2 per cent.

The tonnage of ore mined in the lode mines of the province during the past year was less than that of 1913. The ore mined amounted to 2,175,971 tons, showing a decrease from that of the previous year of 487,838 tons.

The tonnage mined in 1914 was produced by the various districts in about the following proportions: Boundary, 50.3 per cent.; Rosslund, 13.6 per cent.; Cassiar, 12.1 per cent.; the Coast district, 11.7 per cent.; Slocan district, 4.7 per cent.; Ainsworth, 3.1 per cent.; Nelson, 2.7 per cent.; East Kootenay, 1.7 per cent.; and all other parts of the province combined, 0.1 per cent.

The following table shows the number of mines which shipped ore during the year 1914, the districts in which they are situated, and the tonnage produced in each district, together with the number of men employed, both above ground and underground:

TABLE SHOWING DISTRIBUTION OF B.C. SHIPPING MINES IN 1914

| District  | Tons of Ore shipped | No. of Mines | Men employed in these mines |       | Total |     |
|---|---------------------|--------------|-----------------------------|-------|-------|-----|
|   |                     |              | Below                       | Above |       |     |
| Cariboo and Cassiar:  |                     |              |                             |       |       |     |
| Omineca, Atlin, Skeena, Queen Charlotte, and Portland Canal | 263,107             | 10           | 4                           | 253   | 125   | 378 |
| East Kootenay:  |                     |              |                             |       |       |     |
| Fort Steele   | 36,384              | 2            | 2                           | 76    | 32    | 108 |
| Windermere - Golden   | ..                  | ..           | ..                          | ..    | ..    | ..  |
| West Kootenay:  |                     |              |                             |       |       |     |
| Ainsworth   | 66,441              | 14           | 6                           | 176   | 87    | 263 |
| Slocan and Slocan City                                      | 104,510             | 23           | 10                          | 406   | 156   | 562 |
| Nelson  | 57,879              | 19           | 12                          | 239   | 124   | 363 |
| Trail Creek   | 297,260             | 5            | 3                           | 600   | 153   | 753 |
| Other Divisions   | 149                 | 3            | ..                          | 11    | 6     | 17  |
| Boundary:   |                     |              |                             |       |       |     |

|   |           |    |    |       |       |       |
|---|-----------|----|----|-------|-------|-------|
| Grand Forks, Green wood, and Osoyoos .. | 1,093,229 | 12 | 10 | 568   | 284   | 852   |
| Ashcroft - Kamloops ..                  | 279       | 1  | 1  | 20    | 12    | 32    |
| Similkameen - Vernon                    | 150       | 1  | 1  | 3     | 4     | 7     |
| Lillooet .....                          | 120       | 1  | 1  | 4     | 2     | 6     |
| Coast .....                             | 256,463   | 7  | 6  | 248   | 365   | 613   |
| Total .....                             | 2,175,971 | 98 | 56 | 2,604 | 1,350 | 3,954 |

In explanation of the table it should be said that, in its preparation, a mine employing twelve men for four months is credited in the table with four men for twelve months, so that the total given is less than the actual number of individuals who worked in the mines during the year.

TABLE SHOWING B.C. NON-SHIPPING MINES AND MEN EMPLOYED

| District          | Number of Mines |      |       | Men Employed |       |       |
|-------------------|-----------------|------|-------|--------------|-------|-------|
|                   | Working         | Idle | Total | Below        | Above | Total |
| Coast and Cassiar | 3               | 9    | 12    | 24           | 11    | 35    |
| East Kootenay     | ..              | 2    | 2     | ..           | ..    | ..    |
| Ainsworth         | 5               | 5    | 10    | 16           | 6     | 22    |
| Slocan            | 8               | 16   | 24    | 37           | 12    | 49    |
| Nelson            | 2               | 8    | 10    | 8            | 2     | 10    |
| Trail Creek       | 2               | 7    | 9     | 7            | 5     | 12    |
| Lardeau           | 2               | 3    | 5     | 3            | 1     | 4     |
| Boundary          | 7               | 21   | 28    | 41           | 45    | 86    |
| Lillooet          | 1               | 1    | 2     | 1            | 1     | 2     |
| Total .....       | 30              | 72   | 102   | 137          | 83    | 220   |

QUANTITIES AND VALUE OF MINERAL PRODUCTS OF BRITISH COLUMBIA FOR 1913 AND 1914

|                                  | Quantity   |            | Value        |              |
|----------------------------------|------------|------------|--------------|--------------|
|                                  | 1913       | 1914       | 1913         | 1914         |
| Gold—                            |            |            |              |              |
| Placer, oz. . . . .              | ..         | ..         | \$510,000    | \$565,000    |
| Lode, oz. . . . .                | 272,254    | 247,170    | 5,627,490    | 5,109,004    |
| Silver, oz. . . . .              | 3,465,856  | 3,602,180  | 1,968,606    | 1,876,736    |
| Lead, lb. . . . .                | 55,364,677 | 50,625,048 | 2,175,832    | 1,771,877    |
| Copper, lb. . . . .              | 46,460,305 | 45,009,699 | 7,094,489    | 6,121,319    |
| Zinc, lb. . . . .                | 6,758,768  | 7,866,467  | 324,421      | 346,125      |
| Coal, tons . . . . .             | 2,137,483  | 1,810,967  | 7,481,190    | 6,338,385    |
| Coke, tons . . . . .             | 286,045    | 234,577    | 1,716,270    | 1,407,462    |
| Miscellaneous products . . . . . | ..         | ..         | 3,398,100    | 2,852,917    |
|                                  |            |            | \$30,296,398 | \$26,388,825 |

### THE COPPER INDUSTRY HIGHLY PROSPEROUS.

The mid-year review of the copper situation by B. S. Butler of the United States Geological Survey records a general betterment in the six months period.

At the beginning of the year 1915 most of the large copper producing companies of the United States had for nearly five months been operating on a 50 to 60 per cent. basis, and probably none were producing at normal capacity. A considerable proportion of the smaller producers had shut down their plants, where this could be done without great loss. Developments and improvements had been generally suspended. Copper was selling below 13 cents a pound and had been considerably lower. Wages had been reduced in most of the camps and many men had been either laid off or were employed only part time.

Soon after the first of the year, however, there was a notable improvement in the demand for copper, and the price has rather steadily advanced from below 13 cents to about 20 cents a pound, the highest price reached since 1907. With the increase in demand, and the advance in price, there has been a corresponding steady increase in the production of the metal, and at the present time most of the larger producers have brought their output to normal, while many of the smaller producers have resumed operations. The output of copper has also probably nearly or quite reached the normal. Wages have been raised in the camps where reduction had taken place and the industry in general is in a highly prosperous condition.

# THE BRITISH COLUMBIA COPPER COMPANY'S SMELTER, GREENWOOD, B.C.\*

By Frederic K. Brunton.

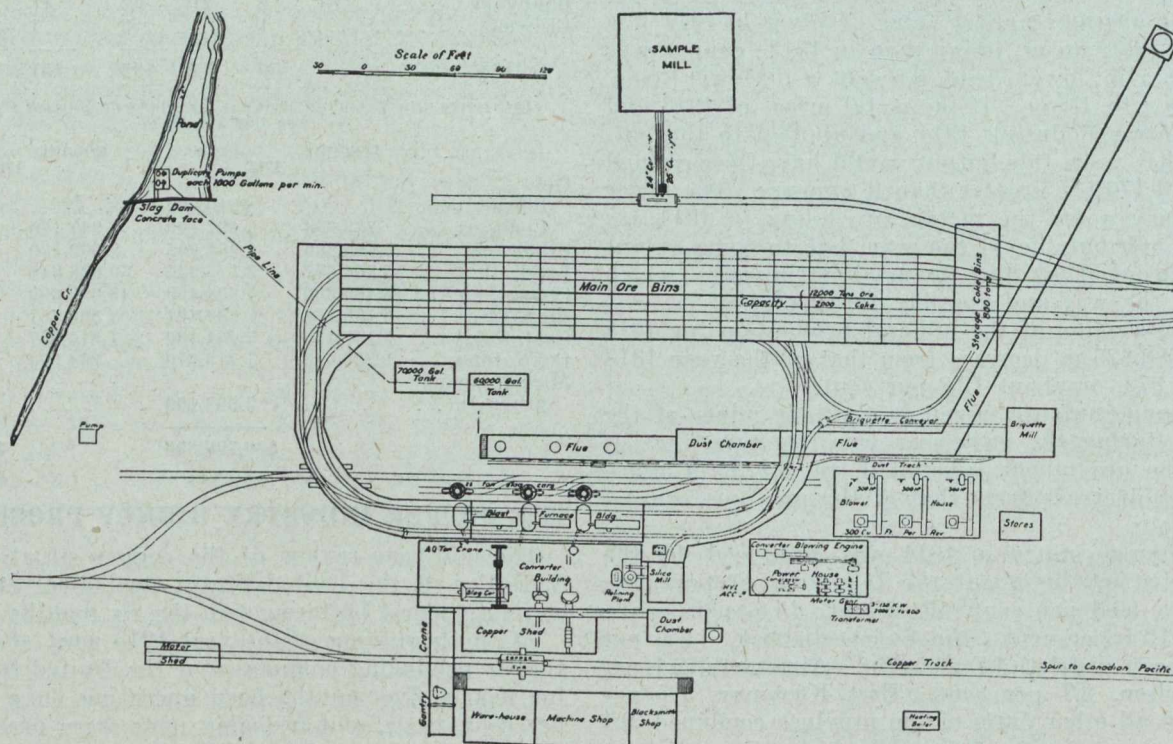
The smelting plant of the British Columbia Copper Co. at Greenwood, B.C., now closed because of the decline in the price of copper due to the European war, is of special interest to metallurgists for several reasons.

It was successfully smelting in blast furnaces the lowest grade copper ore of all plants in America. In order to do so, it had to run at very high efficiency, which necessarily required a large tonnage per square foot of hearth area, together with the minimum amount of labor and other costs.

The furnaces smelted daily 2,250 tons of ore (6.62 tons per sq. ft. of hearth area), carrying 0.85 per cent. of copper, at a smelting cost of \$1.18 per ton. The

umbia and Western branch of the Canadian Pacific Railway. It was originally built in 1900 by Paul Johnson, to handle 600 tons of ore a day in two small furnaces of 300 tons capacity; but in 1907 the old furnaces were torn out, the plant was remodelled, and three blast furnaces of 48 by 240 in. area at the tuyeres were installed. In 1910, two of these were enlarged to 51 by 360 in. and the other to 51 by 240 in., making the total smelting capacity about 2,400 tons per day.

The Canadian Pacific Railroad delivered ore and coke to the smelter, which is situated on a hillside above the valley, by eight of the nine spurs of track which enter the plant at three different levels; the ninth spur, coming into the plant on the lowest level,



Ground Plan of Reduction Works, British Columbia Copper Co., Greenwood, B.C.

entire plant required 130 men to operate it and keep up repairs, showing a labor efficiency of about 17.5 tons per man per day.

In the present paper, the method of obtaining these results is shown. Most of the information contained in this description I obtained as assistant superintendent, during the two years preceding the present shut-down. Other sources of information to which I am indebted are: The British Columbia Copper Co., Ltd., by Alfred W. G. Wilson, in the Copper Smelting Industry of Canada; Greenwood Smelting Works, by J. E. McAllister, Engineering and Mining Journal, vol. xci., pp. 1011 to 1015 (May 20, 1911); and Description of the Copper Smelter of the British Columbia Copper Co., by W. L. Bell, in Transactions of the Canadian Mining Institute, vol. xvi., pp. 151 to 154 (1913).

**Locations and connections.**—The smelter of this company is about half a mile south of Greenwood, in the Boundary district of British Columbia, on the Col-

took care of the incoming supplies, converter slag, and copper shipments. The ore as received was either dumped into the bins above the sampling works or directly into stock bins above the charging floor of the smelter. The sampling mill was served by three of the nine spurs, one of which, running over a 200 ton bin, brought ores from the company's own mines, while another, running over two small bins of about 60 tons capacity, was used for custom ores.

## Blast Furnace Department.

**Blast furnaces.**—The blast furnace building is 150 ft. long by 60 ft. wide and contains three water-jacketed blast furnaces placed end to end, with space between them for the minor axis of a 10 by 18 ft. oval settler. The two outside furnaces, Nos. 1 and 3, are each 51 by 360 in., while the middle one, or No. 2, is 51 by 240 in. in area at the tuyeres. The vertical distance from the centre of tuyeres to the feed floor is 16

\*Extracts from a paper to be read at the San Francisco Meeting, American Institute of Mining Engineers, Sept., 1915.

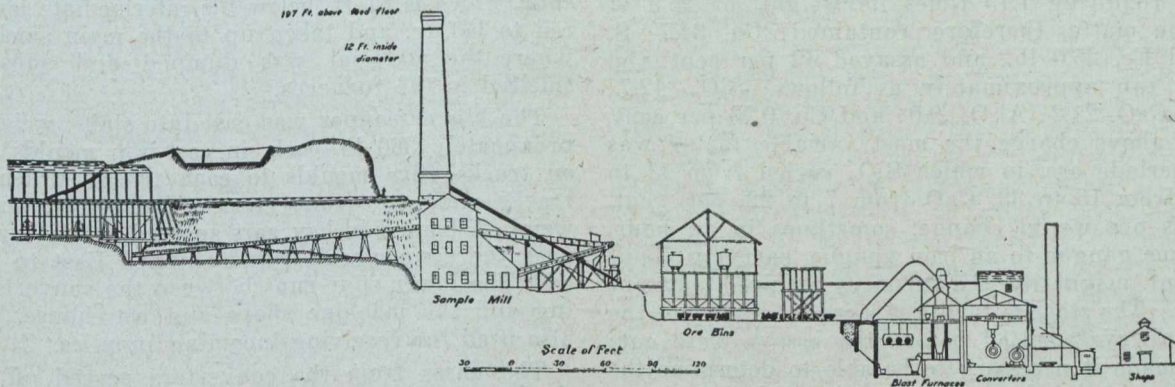
ft., and to the sole plate 37 in., the other furnace dimensions being as follows:

|   | 30-ft. Furnace            | 20-ft. Furnace |
|---|---------------------------|----------------|
| Hearth area, sq. ft. . . . .  | 127.5                     | 85             |
| Centre tuyeres to tapping floor   | 5 ft. 3 in.               | 5 ft. 3 in.    |
| Height bottom jackets . . . . .   | 9 ft. 0 in.               | 9 ft. 3 in.    |
| Width of side jackets . . . . .   | 3 ft. 4 in.               | 3 ft. 4 in.    |
| Width of end jackets bottom.  | 3 ft. 8 in.               | 3 ft. 8 in.    |
| Width of end jackets bottom.  | 6 ft. 2 in.               | 6 ft. 2 in.    |
| Number of tuyeres . . . . .   | 72                        | 48             |
| Diameter of tuyeres . . . . .   | 4 in. bushel to 3 1/4 in. |                |
| Area of tuyeres . . . . .   | 597.4 sq. in.             | 602.9 sq. in.  |
| Tuyere area per sq. ft. of hearth area . . . . .                                | 4.65 sq. in.              | 7.09 sq. in.   |
| Centre line to centre line tuyeres  | 9.25 in.                  | 9.25 in.       |
| Water space in jacket, 4 in.; plate used on inside 5/8 in.; on outside, 3/8 in. |                           |                |

The furnaces and settlers are set upon concrete foundations about 4 ft. above the converter floor. The settlers are 10 ft. wide, 18 ft. long and 4 ft. 8 in. deep, lined on the bottom with a layer 6 in. deep of chrome bats ground up and tamped in with clay, and this covered with a course of firebrick set on end, and on the sides with two courses of chrome brick, backed by crushed silica, for about 22 in. above the bottom. Above that line silica or firebrick are used instead of

in. heavy hydraulic pipe, which is supported by the end castings of the furnace on a level with the charge floor. To insure further the even distribution of the feed, the furnaces were fed first on one side, then on the other. When the plant was running under normal conditions, the two 30 ft. furnaces smelted from 12 to 16 5,000 lb. charges an hour, or about 112 charges per shift, each, and the 20 footer from 8 to 12 5,000 lb. charges per hour, or 80 per 8 hour shift, making a total of 912 charges of 5,000 lb., or 2,250 tons, per day. The blast varied from 16 to 24 oz., according to conditions, and was supplied by three No. 10 Roots blowers, each having a capacity of 25,000 cu. ft. per minute running at 88 rev. per minute and belted by a 40 in. leather belt to a 300 h.p., 2,200 volt, induction motor. The blowers are so arranged that, through a common header, any blower could be used on any furnace, the air going in iron pipes, 43 in. in diameter, from the header to the furnace bustle pipe, which extended around both sides of the furnace.

The slag and matte ran out of the furnaces at the end through a water-jacketed, copper breast jacket and thence through a water-jacketed spout with a water cooled copper lip, into the settler. The spouts are set to have about a 7 in. trap. The slag overflow-



Section through Reduction Works at Greenwood.

the chrome brick, except directly under the slag and matte spout of the furnace, and under the settler slag-discharge spout. The top of each furnace is connected with a dust chamber of 550 sq. ft. cross-section by a sheet steel downtake, 7 ft. in diameter, in the form of an inverted V. This dust chamber is hopper bottomed, and the dust was drawn off in a small steel mine car and trammed to the briquet mill, where it was mixed with about 3 per cent. water and made into briquets in a White three-plunger press, having a capacity of 5 tons per hour, and driven by a 40 h.p., 550 volt, induction motor. The briquets were fed back to the furnaces again as extra coke when needed, since they contained about 70 per cent. of coke dust. The flue dust recovered amounted to about 1 1/2 per cent. of the total charge fed to the furnaces. The gases from the dust chamber passed through an inclined flue 180 sq. ft. in cross-section to the stack, which is 121 ft. high, with an inside diameter of 12 ft. The total height of stack above the top of the furnace charge floor is 200 ft., which, under normal conditions, gave a good draft and kept the feed floor free from fumes.

**Operation of the furnaces.**—The ore and coke were charged into the furnaces from the side, the furnace door being lifted by compressed air. The cars of coke were dumped first, and the train was then backed up and the ore dumped. The charge fell against baffle plates, suspended on both sides of the furnace on 4

ed continuously into a cast iron pot of 250 cu. ft. capacity, hold from 20 to 25 tons of slag, and mounted on standard gauge trucks, in which it was hauled to the dump by a 35 ton, 240 h.p. Baldwin-Westinghouse locomotive, and there dumped by means of a 15 h.p. D. C. motor, operated from the cab of the locomotive through "jumpers." While one pot was being removed from the settler and another one spotted, the slag was caught in a cast-iron spoon, supported upon a swinging arm and operated by hand from the side of each settler, which intercepted and received the slag stream and dumped its contents into the empty pot after the change was completed.

**The labor required** to operate the three furnaces per shift was as follows:

| Kind of Labor             | Number of Men | Wages Per Shift | Total Wages per Shift |
|---------------------------|---------------|-----------------|-----------------------|
| Shift bosses . . . . .    | 1             | \$5.25          | \$5.25                |
| Furnace men . . . . .     | 3             | 4.00            | 12.00                 |
| Furnace helpers . . . . . | 3             | 3.00            | 9.00                  |
| Slag motorman . . . . .   | 1             | 3.40            | 3.40                  |
| Slag switchman . . . . .  | 1             | 3.00            | 3.00                  |
| Charge motormen . . . . . | 3             | 3.15            | 9.45                  |
| Head loaders . . . . .    | 3             | 3.15            | 9.45                  |
| Second loaders . . . . .  | 3             | 3.00            | 9.00                  |
| Feeders . . . . .         | 1             | 4.00            | 4.00                  |
| Binman . . . . .          | 1             | 2.75            | 2.75                  |
| Power house . . . . .     | 1             | 3.40            | 3.40                  |
| <b>Total . . . . .</b>    | <b>21</b>     |                 | <b>\$70.70</b>        |

In addition, there were, on the day shift only, four men in the briquet mill and four men grading on the slag track. Of these, six received \$2.75 and the other two \$3.50 a day, making a total of \$23.50. These two crews were also used, whenever needed, in general roustabout work around the plant; so that not all of their time was really chargeable to the furnaces.

**Furnace Charge, B. C. Copper Co.**

An average furnace charge was about as follows:

| Ore                                  | SiO <sub>2</sub> |              | Fe         |            | CaO        |             | S         |     | Cu        |     |      |
|--------------------------------------|------------------|--------------|------------|------------|------------|-------------|-----------|-----|-----------|-----|------|
|                                      | Lb.              | Per Cent.    | Per Cent.  | Lb.        | Per Cent.  | Lb.         | Per Cent. | Lb. | Per Cent. | Lb. |      |
| Motherlode . . . . .                 | 2,500            | 32           | 800        | 18         | 450        | 22          | 550       | 2   | 50        | 1.0 | 25.0 |
| Rawhide . . . . .                    | 1,600            | 36           | 576        | 16         | 256        | 19          | 304       | 3   | 48        | 1.2 | 19.2 |
| Napoleon . . . . .                   | 500              | 30           | 170        | 30         | 150        | 7           | 35        | 17  | 85        | 0.2 | 0.5  |
| Republic, SiO <sub>2</sub> . . . . . | 400              | 80           | 320        | ..         | ..         | 7           | 28        | ..  | ..        | ..  | ..   |
| <b>Total . . . . .</b>               | <b>5,000</b>     | <b>1,846</b> | <b>856</b> | <b>917</b> | <b>183</b> | <b>44.7</b> |           |     |           |     |      |

This gave approximately 4,300 lb. of slag carrying off 0.23 per cent. or about 10 lb. Cu, and leaving 34.7 lb. for the matte, which required one-fourth of its weight, or 8.7 lb., of sulphur. By reason of the poor construction of the furnaces for handling ores so low in sulphur, 88 per cent., or 160 lb., of the sulphur was volatilized in the furnace, leaving 23 lb. for the matte. Since the Cu took 8.7 lb. of S, there was left for iron 14.3 lb. of S, requiring 1.75 times its weight, or 25.0 of iron. The matte, therefore, contained: Cu, 34.7; S, 23.0; and Fe, 25.0 lb., and assayed 42 per cent. Cu. The slag ran approximately as follows: SiO<sub>2</sub>, 42.7; Fe, 19.7; CaO, 21.2; Al<sub>2</sub>O<sub>3</sub>, 9.0; and Cu, 0.23 per cent.

In the above charge, the most variable factor was the Motherlode ore, in which SiO<sub>2</sub> varied from 17 to 38, iron from 15 to 33, CaO from 7 to 22 per cent. Since this ore would change, sometimes in an hour, from a lime gangue to an iron gangue, carrying about 30 per cent. magnetite, the furnaces required constant watching. The storage facilities were so small that the ore was always smelted before the assays were cut; and this made it necessary to be able to determine the composition of the charge by the physical appearance of the matte and slag and the condition of the furnaces, so that the charge could be changed to meet requirements at a moment's notice.

**Resume of Furnace Operating Data, B. C. Copper Co.**

Tons smelted per day, 2,250.0; tons smelted per sq. ft. of hearth area, average, 6.62; tons smelted per sq. ft. of hearth area, maximum, 8.70; tons smelted per man per day, 35.70; Cu, on charge, per cent., 0.8 to 1.2; Cu in matte, per cent., 30.0 to 45.0; Cu in slag, per cent., 0.22 to 0.27; S on charge, per cent., 2.00; S burnt off, per cent., 85.00 to 90.00; coke used on charge, per cent., 12.00 to 14.00; coke ash, per cent., 20.00 to 28.00; blast, cu. ft. per minute, 25,000; blast, temperature, atmospheric; cooling water for jackets, gallons per minute, 2,500; men per 8 hour shift, 21.0; matte, per cent. of total charge, 1.65; matte, specific gravity, 5 to 0; slag, per cent., SiO<sub>2</sub>, 38 to 45; slag, per cent. Fe, 13 to 20; slag, per cent. CaO, 20 to 26; slag, per cent. Al<sub>2</sub>O<sub>3</sub>, 6 to 9; slag, specific gravity, 3 to 2.

**Converter Department, B. C. Copper Co.**

The converter building is 150 ft. long by 44 ft. in width, stands parallel to and about 4 ft. lower than the blast furnace tapping floor, and contains the following equipment:

Two hydraulic converter stands; seven converter shells, each 84 by 126 in.; a 40 ton Niles electric traveling crane, a 6 ft. Carlin silica mill driven by a 40 h.p., 550 volt induction motor, a pneumatic tamping

machine, copper casting trucks, slag and matte pots, and a set of platform scales for weighing the blister copper. The converters were lined with siliceous gold ores from Republic, Wash., or from the Snowstorm mine in Idaho, mixed with local clay, as a binder, in the Carlin mill. The life of a lining was from two to three charges.

The matte, containing from 30 to 45 per cent. Cu, was tapped from the settlers into 5 ton ladles, handled by the Niles crane, and poured into one of the con-

verters, where from two to three ladlefuls were blown to blister copper at one heat. The slag was poured off into old matte ladles and was cast in hollows in the ground into buttons, which when cool enough, were lifted by the crane, placed on grizzlies over 50 ton steel dump cars, and there broken up, with hammers, small enough to pass through the grizzlies. These cars, when full, were switched out over the ninth and lowest railway spur, which is 61 ft. below the intermediate level referred to before, and taken up to the main smelter bins, where the material was dumped and subsequently smelted in the furnaces.

The blister copper was cast into slabs, weighing approximately 360 lb. each, in cast-iron moulds mounted on trucks (five moulds to each truck) which ran on tracks under the converters. The copper slabs were weighed, loaded in box cars spotted on the lower spur, near the copper scales, and shipped East to be refined. The lower spur runs between the converter building and the machine shops and warehouse, and was also used for receiving incoming supplies.

The gases from the converters passed off into an iron flue, connected with an expansion chamber of 281 ft. cross-section, and thence into a steel stack 72 in. in diameter and 75 ft. high; the flue dust collected being fed back into the molten converter charge.

The converter department produced per day about 30,000 lb. of blister copper, carrying about 7 oz. of gold and 30 of silver per ton. It required a crew of 21 men which, divided as follows into two 8 hour shifts, was able to handle all the matte produced:

| Kind of Labor          | Day Shift        | Afternoon Shift   |
|------------------------|------------------|-------------------|
|                        | 7 A.M. to 3 P.M. | 3 P.M. to 11 P.M. |
| Foremen . . . . .      | 1                | 0                 |
| Converters . . . . .   | 2                | 2                 |
| Crane . . . . .        | 2                | 2                 |
| Laborers . . . . .     | 3                | 1                 |
| Lining . . . . .       | 5                | 3                 |
| <b>Total . . . . .</b> | <b>13</b>        | <b>8</b>          |

**Power** was purchased from the West Kootenay Light & Power Co. on a wattmeter basis and usually came from the Bonnington Falls power plant, about 85 miles away. It was brought by two 3-phase, 60-cycle, 60,000 volt high tension lines, to their Greenwood substation, where it was transformed to 2,200 volts, at which intensity it was delivered to the smelter power house, to be used direct, or further transformed to suit the individual motor supplied.

The power house is divided into two parts, one of which contains the Roots blowers for the furnaces, already described, and the other a cross-compound Nordberg blowing engine for the converters, having a



40 in. air cylinder, 42 in. stroke, and a capacity of 5,000 cu. ft. per minute at from 8 to 10 lb. pressure per sq. inch, driven with a rope drive by a 300 h.p., 2,200 volt Canadian General Electric variable speed induction motor. A compound duplex Canadian Rand compressor of 340 cu. ft. capacity, belt-driven by a 50 h.p., 550 volt induction motor running at 150 rev. per minute, supplied air at 80 lb. pressure for the converter tampers, the blast furnace doors, the pneumatic hammer in the blacksmith shop, and for odd jobs around the plant where compressed air was required. Direct current at 250 volts for the crane, slag locomotive, charge-train motors, and an electric arc for burning frozen tap holes and furnace connections was supplied by two of three motor-generator sets working in parallel, one of 75 kw., and the other of 150 kw. capacity, the third, of 100 kw. capacity, being held in reserve. The Gould hydraulic accumulator, with a ram 24 in. in diameter and a 10 ft. stroke, for tilting the converters, was operated by a triplex plunger pump, 5 in. in diameter, with an 8 in. stroke, running at 60 rev. per minute, with a capacity of 120 gal. per minute at 200 lb. pressure, belt driven by a 20 h.p., 550 volt induction motor.

**General mechanical equipment.**—The plant has a well equipped machine and blacksmith shop, where almost all repairs could be made. The shop contains one large and one small Bertram lathe, one large and one small radial-arm drill press, one large and one small pipe threader, and a planer, a bolt cutter, splitting shears, and a 1½ ton air hammer, together with forges, and all ordinary tools of an up-to-date shop, including a portable oxyacetylene welding outfit. There is also a carpenter shop and an electrical shop, where motors are rewound and general repairs made.

The mechanical crew consisted of a master mechanic, one machinist, one blacksmith, one carpenter, two electricians, one blacksmith helper, one carpenter helper and seven machinist helpers, making a total of 15 men to keep the entire plant in repair.

**Costs.**

The following costs do not include overhead expenses, depreciation or insurance:

|  |         |
|--|---------|
| Cost per ton of smelting ore to matte* . . . . .               | \$1.18  |
| Cost per lb. of copper of converting matte to blister. . . . . | 0.0048  |
| Cost per ton of copper of converting matte to blister. . . . . | 9.60    |
| Cost per ton of smelting ore to blister copper. . . . .        | 1.23    |
| Cost per ton of copper to produce blister copper. . . . .      | 0.105   |
| Cost of coke per ton of ore smelted to matte. . . . .          | 0.851   |
| Cost of flux per ton of ore smelted to matte. . . . .          | 0.114   |
| Cost of labor per ton of ore smelted to matte. . . . .         | 0.15    |
| Cost of power per ton of ore smelted to matte. . . . .         | 0.033   |
| Cost of supplies per ton of ore smelted to matte. . . . .      | 0.03    |
|  | \$1.178 |
| Cost of coke per ton f.o.b. smelter bins. . . . .              | \$6.00  |
| Cost of flux per ton f.o.b. smelter bins. . . . .              | 2.75    |
| Cost of power per kilowatt-hour. . . . .                       | 0.0065  |

Briquet mill handled 1,057 cars of blast furnace flue dust and made 398 tons of briquets.

Briquet cost \$0.945 per ton for labor.

Distribution of smelter payroll for same month and cost of labor per ton of ore smelted:

|                           | Payroll<br>Distribution | Cost of Labor per<br>Ton of Ore Smelted |
|---------------------------|-------------------------|---|
| Sample mill . . . . .     | \$318.05                | \$0.00462                               |
| Bins . . . . .            | 729.35                  | 0.01060                                 |
| Briquet . . . . .         | 376.65                  | 0.00546                                 |
| Furnaces . . . . .        | 6,508.35                | 0.0958                                  |
| Slag disposal . . . . .   | 1,413.65                | 0.0206                                  |
| Linings . . . . .         | 615.60                  | 0.0078                                  |
| Converters . . . . .      | 1,016.85                | 0.0147                                  |
| Crane . . . . .           | 277.25                  | 0.00403                                 |
| Water system . . . . .    | 224.65                  | 0.00326                                 |
| General surface . . . . . | 430.15                  | 0.00624                                 |
| Power house . . . . .     | 585.60                  | 0.00850                                 |
| Total . . . . .           | \$12,496.15             | \$0.18161                               |

\*Note.—The furnaces were slowed up with an excess of silica on the charge because of shortage of ore, hence the higher cost per ton of ore smelted to matte. They only smelted 6.55 tons per sq. ft. of hearth area against 6.66 tons per sq. ft. when the cost of smelting was \$1.084.

**CANADIAN MINING AND FINANCE CO.'S POWER PLANT AT TIMMINS, ONT.**

The Canadian Mining and Finance Co., Ltd., has completed the construction of a central power plant on the south side of Gillies Lake. The building is of steel frame construction, with concrete curtain walls and roof. It is 51 ft. wide x 120 ft. in length, and is designed to accommodate four compressors each of 4,500 cu. ft. of free air per minute capacity. Three compressors are now in commission, with space left for an additional unit. One compressor, designed and built by Fraser & Chalmers, of London, England, is of special design, being fitted with Hoerbiger valves of variable volume gear of the Doerfel type, which automatically adjust the output of the machine to the exact requirements of the demand for air, thus doing away with peak loads, and thereby reducing the cost of power which is purchased upon a basis of peak loads. The cylinders are 22½" x 38" x 30" stroke. The speed is 125 r.p.m. This machine has a complete range of capacity from zero to full load, automatically controlled by suitable governor gear. The other two compressors were designed and built by the Nordberg Manufacturing Company, of Milwaukee, Wis. They are designed to run at full load continuously, and have no variable volume gear, the cylinders are 22" x 37" x 31" stroke. The valves are Corless and the speed is 125 r.p.m. These compressors possess the unique advantage of being reversible; thus in the event of an interruption to the supply of electric power they may be operated as steam engines and their motors may be driven as generators of electric power. The supply of steam for this purpose can be obtained from a battery of four Wickes vertical water tube boilers, each having 3,000 sq. ft. of heating surface and connected through suitable breeching to an induced draft fan which enables the boilers to be run at a high overload during such time as the compressor plant is being used as an auxiliary steam driven electric power plant.

In addition to the usual intercoolers each compressor is equipped with a Fraser & Chalmers vertical after-cooler, each having 1,100 sq. ft. of cooling surface and so designed that the tubes and tube plates can be lifted out of the cooler shell for cleaning.

The boiler house is built on the east end of the compressor building and is of the same type of construction. It accommodates the electrically driven pumps for mill water. A concrete intake and suction well has been built to insure a liberal supply of clean water at all seasons of the year.—A. A. Cole.

## 1915 PROMISES GOOD MINERAL OUTPUT FOR UNITED STATES

"The mid-year finds the mineral industries of the United States generally prosperous and enjoying a revival of active development." With this statement the Director of the United States Geological Survey opens an official review of mining conditions as reported to him by the Government geologists and statisticians working on this subject. "This revival is particularly true of some of the metals for which increased demands have been noted during the past six months. This country has been first thrown upon its own resources for mineral products required and next, given the opportunity to supply the needs of foreign countries who have offered us their trade. Comparative freedom from foreign competition and, in some important cases, increase of foreign markets have stimulated production and a general mining advance has set in."

Summarizing the special reports at hand, Director Smith continues his review:

The six months' record in iron is reassuring in that hopes at the beginning of the year have been realized. Ore shipments from the Lake Superior mines have begun well, May, 1915, showing a 30 per cent. increase over May, 1914. The pig iron output is also promising in its steady increase month by month, so that a reasonable prophecy is for a greater total pig iron production for 1915 than for last year. Enlargement and extensions at the iron and steel plants furnish unmistakable evidence of returning business confidence.

The half-year period just completed has witnessed great changes in the copper industry and in every particular the improvement has been notable. Prices, output, and wages have shown an upward trend, and prosperity is the word in the copper districts of the United States.

The demand for spelter and lead, with the present high prices, have given a double impetus to mining in the zinc-lead districts. In the Joplin region old mines are being reopened, new shafts are being sunk, and prospecting is most active. Smelters are pushed to capacity operation. The six months' period has been altogether favorable for zinc mines and smelters, and the June advance in the price of lead makes the outlook bright for all lead mining.

In the minor metals, the first American mine to be extensively operated for molybdenite has been opened in Colorado; a tin smelter is reported as being built in New Jersey; and the Colorado tungsten mines are working full handed on full time; an antimony smelter in California has resumed operations, and a new one has been erected in the same State to work California ores; and antimony ores have been shipped from Nevada and Alaska. The demand for quicksilver has increased with the result that the California, Nevada, and Texas producers are expected to work at top capacity.

An unusual feature affecting coal mining has been the loss of bunker trade at the Atlantic ports, which is only partially offset by increasing exports. Reports from the West, on the other hand, show an increase in coal production over last year, and in the East the coke output has increased considerably of late, thus showing at last the effect of the recent activity in iron and other metals.

The petroleum production for the six months just closed is believed to exceed that for the corresponding period last year. Unfortunately for the producers, this increase has not been in response to a demand expressed in higher prices. On the contrary the persistent flood of oil from the Oklahoma fields and from the new pools

in Louisiana and Texas has prevented any permanent advance in price.

Reports from the Survey's western offices are, in the main, optimistic. Colorado already shows an increase in gold output over the same period in normal years, and while the six months has shown no increase in tonnage for other ores, there has been a large increase in value, and the present high prices give the promise of increased mining activity during the rest of the year. Utah is expected to reach a record output and Nevada mines are being operated at usual capacity, with new activity on the old Comstock. The lead and silver production of Idaho has only recently been stimulated, but a large increase in zinc output has already been shown. In Montana, the copper mines have about reached normal condition, the zinc production already shows a notable increase, and the gold output will be larger. New Mexico reports increases in gold, silver, and zinc, while lead production has fallen off. The six months' output of copper in New Mexico was probably equal to one-half last year's total output, so that there is good expectation of a better total for the year. Arizona, as a copper State, has shown the usual improvement during the six months, while the gold mines promise a record-breaking year. No large increase in Arizona's output of lead or zinc is expected in 1915 over other years. In California some gain in gold yield is reported and copper conditions are much improved over last year. Oregon shows a slight increase in gold output; while in Alaska the outlook is good for increased output of copper as well as gold. More Alaska mines are on a producing basis this year and more dredges are in operation.

Shareholders in the Canadian Goldfields Syndicate, which owned mineral claims in British Columbia and 4,270 shares in the Consolidated Mining and Smelting Co. of Canada, Ltd., will shortly receive a final dividend. The Consolidated shares have been distributed among syndicate shareholders as far as has been practicable, and a small lot left over has been sold, the proceeds of which sale form the final realizable asset available for distribution. Years ago the syndicate sold a group of mineral claims adjoining the St. Eugene group at Moyie, East Kootenay, to the St. Eugene Mining Co., and received shares in that company as part consideration. Later, when the St. Eugene was included in the Consolidated merger, the syndicate received 4,270 shares of the larger company, and since that time whenever the Consolidated Co. paid a dividend, the Canadian Goldfields made a proportionate distribution.

The steamer Victoria, which arrived at Seattle, Washington, from Nome, Alaska, on June 24, took from the North to banks and the United States Assay Office in that city \$570,000 in gold from Fairbanks, Iditarod, Ruby, Innoko, Nome and other Alaskan mining fields. Her cargo also included 160 tons of antimony ore from Fairbanks district consigned to San Francisco.

A press despatch published in Edmonton, Alberta, was to the effect that G. F. Cunningham, manager of a colliery at Rosenroll, twelve miles east of Camrose, in that Province, had been drowned on June 22, in Dried Meat lake by the upsetting of a boat from which he was fishing. The deceased was a married man, having a wife and four children at present in Scotland. His parents live in Missouri.

## U. S. IRON OUTLOOK BETTER

In a Geological Survey mid-year statement, E. F. Bur-  
chard thus reviews the six months trend of the iron in-  
dustry:

At the close of 1914 it was generally believed that  
conditions in the iron industry had reached about as  
low an ebb as was possible and that a reaction must  
soon begin. Aside from this feeling, however, the pros-  
pects at the beginning of 1915 seemed fairer than they  
had been for many months, although it was realized that  
many restraining influences would likely continue to  
operate well into the year.

A glance over the course of the iron industry during  
the first half of 1915 is at least reassuring, for it indi-  
cates that the moderate hopes entertained at the begin-  
ning of the year have been fairly well realized. The  
beginning of 1915 found the lower lake docks and the  
blast furnaces dependent on lake ores, well stocked with  
ore, for which there was little demand, yet the mines  
were equipped to supply more than has ever been re-  
quired. Precedents generally pointed to an increase in  
output of ore in 1915, for, with only a few exceptions,  
there has been a large output of iron ore each year  
following a year of declining production. The iron min-  
ing season has begun auspiciously for the Lake Superior  
district, for in the month of May, 1915, the shipments  
were 5,012,357 long tons, compared with 3,852,063 long  
tons in the corresponding month in 1914, according to  
the Iron Age, an increase of 1,160,294 tons, or more  
than 30 per cent.

As to pig iron output there has been a steadily in-  
creasing production for each of the first five months of  
1915. This contrasts most favorably with the monthly  
output in 1914, which reached its maximum in March  
and then trended steadily downward to the end of the  
year. The production in May, 1915, while not quite  
reaching that of March, 1914, was about 8 per cent.  
greater than that of May, 1914, and all indications now  
point to an increased total output of pig iron in 1915.

Prices of Bessemer and basic pig at Pittsburg in June,  
1915, showed an advance of 5 to 15 cents a ton over  
those of May to March, 1915, but they were about 30  
cents a ton lower than prices of those grades in June,  
1914. Prices of No. 2 foundry at Pittsburg have re-  
mained practically stationary this year and are about  
45 cents a ton lower than in June, 1914, while the price  
of Southern No. 2 at Birmingham has declined 25 cents  
a ton within the last month, and is 95 cents lower than  
in June, 1914. Pig iron prices, therefore, are not par-  
ticularly consoling at present.

Among the indications of returning confidence, how-  
ever, is the gradual resumption in 1915 of much con-  
struction work at iron and steel plants that had been  
abruptly stopped at the outbreak of the European war,  
as well as the beginning of considerable new work. Im-  
portant extensions at the plants of the Bethlehem Steel  
Company have been resumed; important new, or re-  
sumed operations of the U. S. Steel Corporation are un-  
der way at the Homestead, Newcastle, Sharon, Gary,  
Edgar Thomson, and Duluth plants; a benzol recovery  
plant is being constructed at Fairfield, Ala., and a plant  
for the production of phosphate fertilizer from basic  
open-hearth slag at Ensley, Ala. The construction of  
benzol recovery plants is especially active at present, for,  
besides those already mentioned plants are being erected  
by the Thomas A. Edison Co., at Woodward, Ala., the  
Northwestern Iron Company at St. Louis, Mo., and the  
Republic Iron and Steel Company at Youngstown, Ohio.

One American industry, which requires large quanti-  
ties of iron and steel, for which the future appears par-  
ticularly bright just now, is that of shipbuilding. The

great destruction of ships in the war, coupled with the  
inability of European builders to replace them, on ac-  
count of the high prices of steel and of labor, and also  
because practically all European shipyards are busy in  
naval construction work, has caused a flood of orders  
to be poured into American shipyards, especially in the  
East. It is probable, therefore, that with the work now  
in hand and in sight, American shipbuilders will have  
all the business they can handle for several years.

The general outlook for the latter half of 1915 is bet-  
ter than that at the beginning of the year, yet in the  
face of considerable enforced idleness, especially in  
southern iron and steel centres, the situation must ne-  
cessarily show very marked improvement before it can  
be regarded as satisfactory.

## THE CHIEF INSPECTOR OF MINES, B.C.

In the Canadian Mining Journal of June 15 there  
was printed a letter from Mr. E. Jacobs, of Victoria,  
B.C., relative to what he characterized as unjustifi-  
able attacks that had been made in the public press  
of the coast cities of Victoria and Vancouver on Mr.  
Thos. Graham, chief inspector of mines for British  
Columbia. On July 1 the Daily Herald, Nanaimo,  
Vancouver island, B.C., published the following:

"We, the undersigned, the underground employees  
of the Western Fuel Company, desire to place our-  
selves on record as follows:

"Whereas certain grave allegations have been pub-  
licly made against the ability and integrity of Mr.  
Thomas Graham, chief inspector of mines in this pro-  
vince, on the strength of which certain labor organi-  
zations have demanded his retirement:

"That, therefore, we declare these allegations to be  
untrue, beside being uncalled for, and denounce such  
tactics as in the last degree unfair and against the  
best interests of the miners of this province.

"We also wish to express our unbounded confidence  
in Chief Inspector Graham's ability, and, from long  
experience, can testify to his care and zeal in all mat-  
ters of safety underground. Above all we cannot too  
strongly emphasize the fact of his standing in the com-  
munity as a man of sterling qualities and irreproach-  
able integrity, and we especially deplore the base at-  
tacks that have been lately made against a man of  
such exceptionally high principle.

"We also desire to voice generally our confidence in  
the staff of mine inspectors under Mr. Graham, know-  
ing their efficiency and reliability."

The Herald's comments on the foregoing follow:

The above memorial has this week been forwarded  
to the Acting Minister of Mines at Victoria. There is  
little explanation necessary. The memorial was an  
entirely voluntary affair, inspired, in the minds of the  
men who got it up, by the attacks that have been made  
upon Chief Inspector Graham. It was signed by prac-  
tically all the men employed underground by the  
Western Fuel Co., less than a dozen out of the whole  
number refusing to sign their names. Its value lies  
in its voluntary character, and in the general unani-  
mity with which it was signed. It is a common enough  
thing for public servants to be made the butt of poli-  
tical factions, and nowhere in the world is the prac-  
tice exercised with greater bitterness and less decency  
than in British Columbia. It is not so common for the  
harassed and abused public servant to be defended in  
a public memorial, and it is all the more gratifying  
when it does occur. The sense of public decency is  
more to be relied on than the consciences of warring  
politicians.

## PERSONAL AND GENERAL

Mr. W. Munroe Archibald, of the Consolidated Mining and Smelting Company's mining engineering staff, has returned to Trail, B.C., from a trip to Chicago, Ill.

Mr. A. J. Beaudette, of Vancouver, B.C., is now retained by the Pacific Great Eastern Railway Co., to advise and assist prospectors relative to the development of mining property along the company's railway line from Vancouver through Lillooet and Cariboo districts to Prince George.

Mr. C. Victor Brennan, of the Utah Consolidated Mining Company's Highland Boy mine, Bingham, Utah, has been examining mining properties in Kootenay district, British Columbia.

Mr. R. W. Brock, dean of the College of Applied Science, University of British Columbia, returned to Vancouver last month from a trip to eastern parts.

Mr. Alfred H. Brooks, of Washington, D.C., Geologist in Charge of Alaskan Mineral Resources, U. S. Geological Survey, is expected to proceed to Alaska during July. During recent months twelve U. S. Geological Survey field parties passed through Seattle, Washington, on their way to different parts of Alaska to enter on their season's work in that country.

Mr. E. A. Collins, inspector of mines, Ontario Bureau of Mines, was one of the speakers at the smoker and banquet held at St. Louis, Missouri, on June 9, in connection with the eighth annual meeting of the Mine Inspectors' Institute of the United States of America. Mr. Thomas Graham, of Victoria, chief inspector of mines for British Columbia, has since that date been advised of his election as first vice-president of the institute, of which he was a third vice-president last year.

Mr. P. E. Crane is now superintendent at the British Columbia Copper Company's Mother Lode mine, near Greenwood, Boundary district, B.C., at which operations have been resumed after suspension of work since last August.

Mr. Howard W. DuBois, of DuBois, Mixer & Armas, consulting mining engineers, of Philadelphia, is in Alaska.

Mr. Peter MacLaren is at Gowganda.

Mr. A. R. Whitman, lately geologist of the McIntyre Company, has been engaged by the Peterson Lake Mining Company, to examine the property.

Mr. F. M. Connell is at Goodfish Lake.

Mr. J. A. Holmes and the members of the firm of Smith and Travers, are operating a nickel-copper mine in the Sudbury district.

Mr. Chas. Spearman has returned to Haileybury.

Mr. A. G. Burrows and Mr. Percy Hopkins are at Timmins.

Mr. Mark Harris was at Haileybury last week.

Mr. Stewart Thorne has recovered from his recent illness and is again at Cobalt.

Dr. F. W. McNair, president of the Michigan College of Mines, has returned to Houghton, after a visit to Cobalt, Porcupine and Sudbury. At each camp he was entertained by graduates of the College.

Mr. G. S. Eldridge is now conducting the assay business formerly held by Mr. Noble W. Pirrie, who three months ago went to England to engage in military service.

Mr. George Watkin Evans, coal mining engineer, has returned to Seattle, Washington, from a professional trip to New York City.

Mr. R. D. Fetherstonhaugh, of Vancouver, B.C., was at Prince George, on the Grand Trunk Pacific railway, on June 19, in company with several men from Edmon-

ton, Alberta, en route to the headwaters of Peace river, and thence to Fond du Lac, northeast of Edmonton. A press despatch stated that at Mt. Selwyn, near the confluence of the Parsnip and Finlay rivers, a promising quartz showing would be examined, while at Fond du Lac reported occurrences of ore containing silver and cobalt were to be investigated.

Mr. R. W. M. Hunter, of Victoria, B.C., has been examining mineral claims in the neighborhood of Great Central lake, Vancouver island.

Mr. W. H. Lanagan left San Francisco, California, last month to visit British Columbia.

Col. R. G. Edwards Leekie has been honored by the King with the C. M. G. decoration, in acknowledgment of distinguished service on the battlefield in Europe.

Mr. Lewis A. Levensaler, of Tacoma, Washington, who last month was in Ashcroft mining division of British Columbia, has since proceeded to Alaska to investigate conditions at some of the Guggenheim mines in that country.

Mr. J. F. Longworth, who, following the suspension of operations last summer at the British Columbia Copper Co.'s Napoleon mine near Boyds, Washington, engaged in mining in Republic camp, in the same State, is now assistant superintendent at the company's copper smelting works at Greenwood, Boundary district of British Columbia.

Mr. Dudley Mitchell, of Victoria, B.C., Provincial Instructor in First Aid to the Injured, after having given instruction to coal miners at Cumberland, Vancouver Island, in the use of oxygen breathing rescue apparatus, proceeded to the Crowsnest district. He will go thence to Phoenix, Boundary district, to reorganize First Aid instruction classes there, and then to Rossland to attend a demonstration of First Aid work by local miners on the occasion of the meeting there on July 15 of the Western Branch of the Canadian Mining Institute.

Mr. F. S. Norcross, Jr., superintendent of mines for the British Columbia Copper Co., now makes Copper Mountain, Similkameen, his headquarters, the company having in progress important development work on copper claims there.

Mr. M. E. Purcell, superintendent of the Consolidated Mining and Smelting Company's Centre Star-War Eagle group of mines at Rossland, has returned from a visit to the Panama-Pacific International Exposition at San Francisco, California.

Mr. R. W. Racey, of the Consolidated Mining and Smelting Co.'s mining engineering staff, Rossland, B. C., was married on June 24 at Summerland, Okanagan, B.C., to Miss Olga Watson.

Mr. Emil F. Voigt has returned to Voigt's camp, near Princeton, Similkameen, B.C., from a visit to Portland, Oregon.

Mr. W. R. Wilson, of Fernie, B.C., general manager for the Crow's Nest Pass Coal Co., has been in Victoria and other places on Vancouver Island lately.

The Roberts and Schaefer Company, engineers and contractors, Chicago, have just been awarded a contract by the Cherry Tree Coal Company, which is owned by Peale, Peacock & Kerr, for the building of a new "Marcus" Patent Coal Tipple, complete with screening and picking facilities, for installation at Mine No. 15, St. Benedict, Pa. The George's Creek Coal Company have also given the Roberts and Schaefer Company an order for a mechanical equipment for a four-track, frame constructed "Marcus" Patent Coal Tipple, using "Rand" Shaker Loading Boom, for installation at Ethel, W. Va.

## SPECIAL CORRESPONDENCE

### BRITISH COLUMBIA

Evidence of the gradual enlargement of the field of mining operations in Kootenay and Boundary districts of British Columbia is found in the recent inclusion in the list of mines shipping ore to the Consolidated Mining and Smelting Co.'s smelting works at Trail of several that had not previously in this year shipped any ore. In some instances there had not been any production for a year or more. While the quantities of ore shipped recently by these mines are not large, the fact that they are again being operated is gratifying, indicating, as it does, progress in the mining industry of the districts chiefly concerned. The Monarch, near Field, Northeast Kootenay; the Cork and the Silver Hoard, in Ainsworth mining division; the Wonderful, near Sandon, Slovan; the Nettie L., near Ferguson, Lardeau district; the Carmi, Rob Roy and Sally, up the west fork of Kettle river, Boundary district; and the Iron Mask, near Kamloops, appear on the June lists of ore receipts at Trail. In addition, work has been resumed on several properties that had long lain idle. Prominent among these is the Galena Farm group, situated near Silverton, Slovan lake, which about nineteen years ago was acquired by English investors who organized the Galena Mines Company, Ltd., of London. A steam power plant was put in and development work—shaft-sinking and other underground work—was undertaken. However, conditions for operating the mine became unfavorable, so work was suspended and there has since been a long period of inactivity, until now much energy is being displayed with the object of determining the value of the property as an ore producer.

**Some air bubbles pricked.**—Much fiction relative to mining in the province is from time to time published on the coast. One enthusiast was lately quoted in a prominent daily newspaper as having first told of the certainty that a property (not yet a producer) is "a big mine," and then characterized the Hedley mine as "the only other great gold mine in the province." Now, not with the slightest intention to belittle the Hedley gold mine, which in recent years has produced nearly 40,000 oz. of gold a year, but rather to make a statement of fact, the following figures are submitted: In 1914 Rossland mines—the Centre Star group, Le Roi and Josie group—produced about 138,000 oz. of gold, against nearly 137,000 oz. in 1913 and 132,000 in 1912. In 1912 Boundary district mines produced, in addition to the output of the Hedley mine, nearly 68,000 oz. of gold, in 1913 about 71,000 oz., and in 1914, which was a short operating year, owing to the war having compelled suspension during the greater part of the latter half of the year, about 45,000 oz. These figures show that of what the irresponsible talker designates "great gold mines" there are several in the province beside that at Hedley. Then a notorious romancer, whose pretty fairy tales are readily published, was quoted in the same issue of the newspaper referred to, as having said: "The output of gold from the Rossland district alone is at the rate of \$5,000,000 a year. . . . Over 40,000 tons of lead a year is now being mined. The production is expected to be increased to 60,000 before long. More than 100,000 tons of zinc could be produced if only there were plants to handle the mineral." Official records show that in

ten years—1905-1914—the total value of the gold produced in Trail Creek mining division, in which the Rossland mines are situated, was \$25,441,546, or an average of \$2,544,154 a year. The highest total for any individual year was \$2,941,630 in 1908; the total for 1914 was \$2,864,201, and this with the bigger mines having worked full time. It is true that the total quantity of ore shipped to Trail during six months to July 1 of this year is about 173,000 tons against 128,000 tons for the corresponding period of last year, yet the increase of about one-third thus shown, even if maintained throughout the second half of the year, cannot be expected to result in an output of gold being made to a total value of \$4,000,000, not to say the \$5,000,000 indicated by the romancer quoted. Again, the highest yearly output of lead made by the province in ten years was in 1905, with a recorded production of 28,000 tons, which quantity was nearly reached in 1913, but other years of that period ranged down to a minimum of 13,436 tons in 1911. It would seem that only one possessed with a vivid imagination would venture to guess that there is any probability of a total output of 40,000 tons being reached this year, while 60,000 tons is only a remote possibility at present. As to a production of 100,000 tons of zinc a year—that seems like the wildest kind of a guess, having in view the comparatively limited known zinc resources of the province. The publication of such fictitious figures cannot do any good at all to the mining industry of British Columbia nor to any newspaper printing them; rather does it warrant the oft-heard remark, "Oh, that is only newspaper talk!"

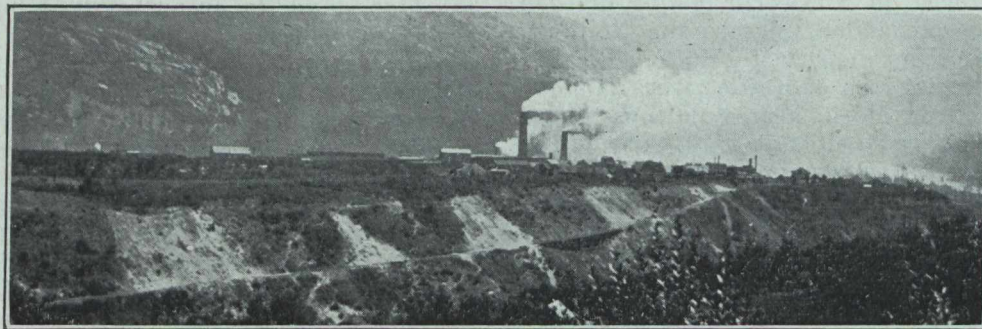
**Zinc in British Columbia.**—At this time, when there is a general tendency to over-estimate the zinc resources of British Columbia, it is well to take into account the conclusions of those who have given the subject close and intelligent attention. In 1906 the Mines Branch of the Department of the Interior published the "Report of the Commission appointed to investigate the Zinc Resources of British Columbia and the conditions affecting their exploitation." The work of that commission was directed by Mr. W. R. Ingalls, of New York, and he had the assistance in the field of Mr. Philip Argall, of Denver, Colorado, and others. In the course of his report Mr. Ingalls observed: "I have already estimated that Ainsworth and the Slovan are now capable of producing (when the necessary milling facilities have been provided) about 30,000 tons of blende per annum of an average (nominal) zinc content of 50 per cent. This would correspond to a spelter production of upward of 12,000 tons, or approximately four times the present consumption of the Dominion. . . . As previously pointed out, the immediately available zinc resources of British Columbia are those of Ainsworth and the Slovan." Of course, these observations are in sharp contrast to the airy views of some newspaper contributors, but then Mr. Ingalls is in the habit of stating facts, which habit makes all the difference in what is written.

**Dividends.**—Dividends for the second quarter of 1915 declared by metalliferous mining companies operating in British Columbia total \$430,296, as compared with \$176,098 for the first quarter of the year. The total for the half-year is therefore \$606,394. The several companies concerned and their respective amounts are shown in the following table:

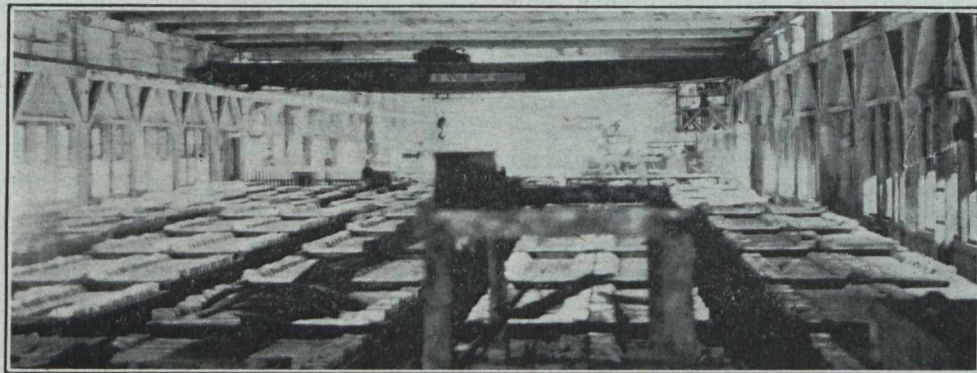
| Company                              | First<br>quarter. | Second<br>quarter. |
|--------------------------------------|-------------------|--------------------|
| Consolidated M. and S. Co . . . .    | \$116,098         | \$116,098          |
| Granby Con. M. S. and P. Co. . . . . |                   | 224,978            |
| Hedley Gold Mining Co. . . . .       | 60,000            | 60,000             |
| Le Roi. No. 2, Ltd. . . . .          |                   | 29,220             |
| Totals. . . . .                      | \$176,098         | \$430,296          |

With the exception of the Le Roi No. 2, Ltd., the companies included in the foregoing statement paid similar amounts as dividends in the first six months of 1914. The last-mentioned company was not on last year's dividend list at all. On the other hand, the Standard Silver-Lead Co., which during the first half of 1914 distributed profits to a total of \$350,000, is not yet on this year's list, though it may be expected to resume dividend payments shortly.

Howe sound, Vancouver mining division, are now available as follows: Total receipts for the last fiscal year, \$1,195,161.78; expenditures, \$1,169,530.58; balance, net profit \$25,631.20. Included in the expenditures were the following items properly chargeable to capital account: Construction, \$249,101.35; equipment, \$162,032.22, so that the actual profit on the year's operations was \$436,764.77. Information relative to production given out at the beginning of this year was that there had been mined 239,174 tons of ore and that shipments to the smeltery at Tacoma, Washington, of crude ore and mill concentrate had totaled 38,750 tons, the approximate gross metal contents of which were 250 oz. gold, 70,000 oz. silver and 12,000,000 lb. copper. The annual report shows that of a total of 2,945,680 tons of known ore there is broken in the stopes 479,638 tons. Good progress has been



Consolidated Mining and Smelting Co.'s Smelter at Trail, B.C.



Lead Refinery, Trail, B.C.

**Surf Inlet.**—Announcement has been made that the Tonopah-Belmont Development Co. has cut the vein at depth on the property of the Surf Inlet Gold Mines, Ltd., on Princess Royal island, which it has been exploring under option of purchase, in connection with which a six months' extension of the term of the bond was granted a few weeks ago. The crosscut adit intersected the vein at more than 2,500 ft. from the portal of this exploratory tunnel. The depth below the old workings is approximately 700 ft., and it is stated that the vein where cut at depth is 9 ft. wide between walls. The average gold value is reported to be about \$8 a ton. Extensive development of the vein is now to be undertaken. It is confidently expected that the bonding company will take up its option on the property and proceed ere long to make provision for mining and milling the ore, so as to place the mine on a regular producing basis.

**Britannia.**—Figures showing the results of operations at the Britannia mine and concentrating mill on

made toward completion of the first 1,000 ton unit of the new concentrating mill, which is to eventually have a capacity of 2,000 tons, and of the transportation system between mine and mill, this consisting of a 3 ft. gauge track with 45 lb. steel the full length of the crosscut adit driven 4,336 ft. into Britannia mountain and thence from the portal of the adit three and a half miles to the top of a 5,500 ft. incline, having an average grade of approximately 30 per cent., down to the concentrating mill, the incline being double-tracked with 56 lb. steel rails, over which 20 ton skips will be operated by a winding engine at the head of the incline.

## COBALT, GOWGANDA, SOUTH LORRAIN

The situation in the Cobalt camp continues to be one of diminished profits. The price of silver during the second week of July was the lowest ever experienced in the history of the Cobalt camp. This and the fact that

everything used by the mining companies remains as dear and most materials much higher makes the situation not very satisfactory. There is, of course, a disposition on the part of all the companies to direct their energies to store bullion as much as possible beyond the point where dividends and current expenses have been taken care of. The second quarter of the year will probably show a decrease in production at least as great as the first quarter of the year.

**New Finds.**—This is in spite of the fact that several valuable new finds have been made. For the past six weeks the Mining Corporation of Canada has been working a rich vein on the City of Cobalt. The vein is in several places seven inches wide, of very high-grade ore. It is heading directly for the Cobalt Lake, which is also included in the Mining Corporation of Canada and therefore can be worked as far as it runs. The discovery seems important not only to the City of Cobalt but to the Cobalt Lake Company. On the surface no veins have ever been found, prospecting always being difficult, as it has to take place in the very centre of the town of Cobalt. The new discovery does therefore add materially to the reserves of known ore in the Cobalt camp. The pumping out of Cobalt Lake has been completed to its first stage. The lake has been dewatered with the exception of a shallow pool around the pumps themselves. Contrary to the general expectation there is little or no odor from the bottom of the lake. Most of the bottom of the lake is covered with the sands and slimes from the concentrators which have for years poured tailings into the lake.

**New Cyanide Plant**—The practice of cyaniding the slimes at the Cobalt Reduction Plant has now reached the stage where it is possible to give figures. It seems most likely from these figures that the saving in extraction will more than repay the company for the outlay in plant within a very short time. Over 300 tons of Cobalt Townsite and City of Cobalt ore are being treated in the Cobalt Reduction plant. It is the slimes alone that are affected by the new process. The mill heads run from 25 to 30 oz. to the ton after hand picking, but before jigging. After jigging they will run 18 to 22 oz.; after crushing and classifying the 140 tons of slimes go to the cyanide plant. By the new process a further extraction of 20 per cent. is made on the slimes and the smelting charges of about 1.10 per ton on the slime concentrates is saved because the precipitate is now refined on the property and shipped as bullion.

**Foster**—The lease of the Foster mine to the Glen Lake Cobalt mines has been extended for a further five years. The original lease was for five years, so that the Glen Lake now has the lease until 1922. The royalty paid on low-grade ore was also cut down from 25 net to 15 net. The Glen Lake has operated a crosscut for 850 ft. from the shaft of the Foster and Glen Lake. The objective of the management is to crosscut veins in the conglomerate. The crosscut should soon be in that formation.

**Currie.**—On the Currie mine in South Lorrain a very rich find is now being worked. It is on the 230-ft. level about 6 in. of cobalt and silver, which will run about 7,000 oz. in silver. It has been raised on and holds good for 40 ft. It is very strong in the bottom of the drift and the vein appears quite promising.

**Wettlaufer.**—There was a possibility that the Wettlaufer might be worked again, but the negotiations for the renewing of operations fell through.

**Gowganda.**—Conditions in the Gowganda camp show little improvement. That this is largely due to the wretched transportation conditions, cannot be de-

nied. The Gowganda road from Elk Lake is now in a condition which renders travelling most difficult and tedious. The heavy rains of this spring have washed away the sand and the road is little better than a mountain trail. Leaving the Miller Lake-O'Brien mine in the afternoon at three o'clock an official of that company did not arrive in Elk Lake until ten o'clock that night. Under present conditions no one will go into the camp unless they have the most urgent business.

The Miller Lake-O'Brien is now running both mill and mine full time again; both turbines of the power plant are working and 500 horse power is available. The mine is being worked for the 24 hours. The mill is being run during the day time only. Now that more power is available work has again been started on the Millerett.

The Montreal Syndicate controlling the Powerful Mining Company is again working a small gang of men at Calcite Lake. The option which the Oliver Mining Company had on this property expired, and the Powerful Company again decided to do some work themselves.

**Temiskaming.**—No stoping of high-grade ore is in practice in the Temiskaming mine, but two hammer drills are engaged in breaking down milling rock. A new vein or the extension of an old vein found in the back of an old stope on the 400-ft. level is still furnishing very good ore. It is six inches wide in the face. The ore sent to the mill is running much higher than usual.

Last month from the mill alone there was produced between 60,000 and 70,000 oz. in silver. There is on hand and ready to ship a considerable amount of high grade ore.

**Nipissing.**—The production of the Nipissing for June showed a gain of about \$11,000 in comparison with last month. Ore valued at \$186,791 was mined in June. Considerable success was obtained in opening up new ore on several branch veins at the fourth level of the Meyer. New development on one of these raises shows the vein to be two inches wide, of 2,000 oz. ore, 47 ft. above the fourth level. The raise is also 82 ft. on the branch vein. For the last 50 ft. the vein averaged two inches and ran 2,500 oz. Two drills are running on veins discovered on the shore of Peterson Lake last week. The best of these are in the Keewatin formation. The best is about 50 ft. long. It will average one to two inches in width and runs about 2,000 oz. to the ton. The high grade mill treated 180 tons and shipped 764,559 fine oz. Of the total production 101,842 was from low grade ore and 84,949 from high grade.

**Bullion shipments** from the Cobalt camp for the year to date amount to 4,561,134 oz.; of this, Nipissing has contributed from its own and ore bought from other mines in the camp 3,339,103 oz. A factor of the shipment is the reopening of the Silver Leaf. They have now made two considerable shipments in bullion refined from low-grade ore; in addition to this there is on hand a considerable quantity of high grade.

**Peterson Lake Mining Company** have retained the services of Mr. A. R. Whitman in order that they may have his experience as to the geology of their section. Mr. Whitman was very successful in discovering the ore beyond the fault planes on the McIntyre mine.

Another old Cobalt property has been leased on the royalty basis. Mr. E. V. Neelands is now operating the Silver Queen mine, upon which the Cobalt Aladdin had a lease for two years, but which was allowed to lapse.

Work on the Right-of-Way, adjoining the Silver Queen mine revealed possibilities to pick up extensions of orebodies and the lease was taken accordingly.

### PORCUPINE AND KIRKLAND LAKE

**Deloro.**—There is apparent in the Porcupine camp a steady increase in the range of operations. Discovery on the Wright claims in Deloro Township has led to a revival of interest in that section.

The intention of Mr. Taylor to work the Imperial has also led to a better disposition towards that part of Deloro in which the Imperial is situated. Among the large operating mines themselves there has also been a general disposition to steadily increase the size of their operations.

**Hollinger** is steadily raising tonnage at its mill. Owing to the fact that costs are now down to \$3.50 a ton, it is possible to include much ore that it had previously left in the mine as too low to treat. This has naturally kept down the grade of ore until it now stands at about \$9.50. Seventy stamps are available for the treatment of ore, but the mine is now so much ahead of mill conditions that it is certain that within a fairly short period it will be necessary for the Hollinger to take over the 30 stamps now being used by the Acme. Whether the Acme will build a separate mill or will add an extension to the Hollinger mill to treat their ore is a question which has not yet been decided. Owing to the large increase in the operations at the Hollinger it is now absolutely necessary to build a new office. This will be erected within a very short time. Tenders will soon be let.

An experiment in order to use iron balls in tube mills has received a check owing to the fact that the wear and tear caused by the balls on the liners is at present too excessive. An order has been given for a set of steel liners, and these will be used in order to see if they will meet the difficulty.

**Gibson.**—The development on the Gibson claims at Goodfish lake is quite satisfactory. The shaft is now down to the 100-ft. level on ore. Below the 10-ft. sump several additional stringers have been cut, and it now appears that a grade of from \$15 to \$18 can be obtained across 6 or 7 ft. Drifting on the vein on the 100-ft. level will be commenced at once. Mr. C. E. Foster, who has a third interest in the Costello claim, is also preparing to develop that property. A road has been cut from the Tough-Oakes and supplies are now being taken in along this route.

**The Tough-Oakes** had a successful month in June. The grade was very high and the extraction has been raised to about 95 per cent. The improvement in extraction is largely due to the much greater efficiency in amalgamation on the plates. Mr. Randall uses coconut matting, which proves to be a very successful trapper of the coarse gold which defied amalgamation and which passed through the decantation system without being dissolved. The ore in the west drift on the 300-ft. level is very rich indeed. Beyond the fault on the same level the vein has been picked up again. It is rich, but by no means as rich on the east side of the fault. The shaft will be put down to the 400-ft. level with all dispatch.

**The Teck-Hughes** at Kirkland Lake has been dewatered and resampled. This is being done by a Cobalt company and it is not known yet whether they will decide to go ahead and work it or not.

**The Hollinger Reserve** in Ogden township is under option to the Dominion Reduction Company, now engaged in sampling it. The Hayden claims in the same

district are also likely to be active this summer, as the owners will install a plant and resume work on the known veins.

**Lake Shore.**—An improvement is apparent in the Lake Shore mine, Kirkland lake. Fifty ft. from the shaft on the 200-ft. level the sludge from the diamond drill will average \$48 a ton over a width of three feet. The ore in the west drift on the 100 ft. level has remained of very good grade. A crosscut will now be run from the 200-ft. level to pick up the main vein at the point where it was cut by the diamond drill.

**The McIntyre Mining Company** has decided to issue a regular statement of production either monthly or quarterly. In the month of June the production both in tonnage and bullion output was very satisfactory. Development at the No. 5 shaft also tends to bear out the optimism of the management. The vein that they cut with the diamond drill at about the 300-ft. level has now been struck in a crosscut and is proving quite satisfactory.

**Moneta.**—According to the annual report of the Moneta Porcupine Mining Company, it is not probable that that company will resume operations very shortly. It was debated whether it might not be advisable to sell the 453,900 shares still left in the treasury, but Sir Henry Pellatt, who is at the head of the company, did not deem it advisable to do so just at present. No doubt later on the stock will be issued in order to provide money for further development. On March 31 there had been expended a total of \$86,785, and there was a balance of \$1,213 in the bank. Quite an extensive sale of town lots netted the company nearly \$90,000.

**North Thompson.**—Good progress is being made with the new shaft and other improvements at the North Thompson. A 125 horse power boiler has been ordered which will increase the available horse power on the property to 225. The three compartment shaft is now almost completed to the 200-ft. level and the head frame is finished. There is every indication that the Huronia Belt Company has decided to push development on the North Thompson with much vigor.

While the reorganization meeting of the Porcupine Branch of the Canadian Mining Institute was only sparsely attended it was most successful. The following officials were elected: Charles Williams, chairman; C. H. Poirier, vice-chairman; C. B. Morgan, secretary-treasurer; and Executive Committee, C. A. Randall, R. W. Ennis, H. W. Darling, D. Dorfman, N. Evered, H. Heine, H. Seavelin, J. Houston, A. R. Brown, William Hatch, and J. Church. A most interesting discussion was started by Mr. Dorfman, of the McIntyre, on precipitation. He said that precipitation had been neglected by mill men and he gave facts and figures as the result of his experiment at the McIntyre mine, which provoked a lively surprise and a most interesting discussion. It is felt that the executive elected is most representative and that meetings in Porcupine will be extremely interesting and important to the profession.

Chino Copper Co., which is now speeded up to a production rate of 75,000,000 lb. per year, is claimed to have the lowest cost per pound, 6.4 cents, of all the "porphyry" coppers.

The new Rogers Pass Tunnel of the C. P. R. under the Selkirks in British Columbia, five miles long, is a quarter of a mile longer than the famous Hoosac Tunnel of Massachusetts, begun in 1851, where power rock drills, nitroglycerine, and electric firing were first used in North America.



## NEW YORK

It is interesting to note that, when a German high official claimed that a large proportion of the German soldiers killed in a certain series of battles with the French were killed by American ammunition, the French Government issued a flat statement that it has received no ammunition from the United States. However, if the German soldiers were killed by American ammunition, the sentiment would not be entirely absent from American minds that 'twere well.

Henry Ford, who will not admit anything is impossible until he has failed at it, plans a new blast furnace to make iron for Ford automobiles. He says: "We expect to have our fleet of boats to carry ore and transport machines destined to foreign countries through the Welland Canal."

Anaconda Copper Mining Company, which is succeeding to the status and power of Amalgamated Copper Company, now being dissolved, is reported to be investigating copper prospects in the Andes, and to be directing attention to the feasibility of smelting Bolivian tin ores in the United States, which country consumes 43 per cent. of the world's tin, but mines or smelts scarcely any.

Just as Nova Scotia is increasing coal exports to foreign countries on account of the call for British coal at home, so is the United States increasing coal exports, and it is hoped to develop a legitimate business in selling American coal abroad. The United States is now shipping bituminous coal to Italy, Mexico, Cuba, South America, and is considering a large contract in France.

There is a miner's strike in the Joplin, Missouri, zinc fields.

A street car ride in Juarez, Mexico, costs 10 cents Villa paper money. Ten cents in Villa's money is worth four-tenths of a cent in United States money.

Lake Superior iron-ore shipments are beginning to brisk up a little after an unusually dull period. It is hoped to reach 40,000,000 tons for the season, as compared to about 33,000,000 in 1915 and 50,000,000 in 1913.

Zinc miners are interested in the recent announcement that the United States Steel Corporation would spend two or three millions on a new zinc smelter near Pittsburgh, Pa., since in that case the corporation would change from buying spelter for galvanizing iron to buying zinc ores and concentrates. It is reported now that a contract has been made for a supply of Australian ore formerly smelted in Germany and Belgium.

## OBITUARY

On June 7 Patrick Clark died in Spokane, Washington, in which city he had had his home for about 28 years. He was one of the best known mine operators in the Northwest, having been engaged in mining in Butte, Montana, Coeur d'Alene district, Idaho; Republic camp, Washington; in various parts of Kootenay and Boundary districts of British Columbia and elsewhere. More than twenty years ago he became interested in Rossland mining properties, first doing development work on the Josie and, after relinquishing his bond on that property, taking the War Eagle under option of purchase. Within a short time of his undertaking the development of the War Eagle he was so successful that on February 1, 1895, a dividend of \$32,500 was paid out of profits derived from this mine. Mr. Clark and his associates later sold the War Eagle to the Gooderham-Blackstock syndicate, Toronto. In late years he gave attention to Slo-can mines, as well as keeping up his large mining inter-

ests in Montana, Idaho, and other parts. During the course of his years of activities in mining he was associated with the late Marcus Daly and former Senator W. A. Clark, both mine operators on a large scale. At the time of his death he was about 65 years of age.

John A. Finch, who died at his summer home at Hayden lake, Idaho, on June 20, aged 61 years, was widely known in the Northwest as a successful mine operator. He had large mining interests in the Coeur d'Alene district for many years, and as well, had long been actively associated with mining in Kootenay district, British Columbia. Among his enterprises was the development of the St. Eugene lead mine in East Kootenay, a considerable interest in which he held years ago at a time when another part owner, James Cronin, was in charge of the mine. With George H. Aylard, he developed the Standard silver-lead mine, situated near Silverton, Slo-can lake, B.C., from a mere prospect into a producing mine, which during recent years has paid \$1,550,000 in dividends and still has large reserves of ore. His business partner in the well-known Spokane firm of Finch & Campbell died a year or two ago. Both partners were highly esteemed, and were prominent in the commercial and financial life of Spokane, a flourishing city that has benefited greatly by the mining undertakings of a group of men of whom but few are now left.

On July 1, Archibald Dick, for many years, until his retirement about five years ago, senior inspector of mines in British Columbia, died at his home in Nanaimo, Vancouver Island, B.C., after having been on the Pacific coast fifty years. He leaves a widow and eight children, one of whom is Mr. W. J. Dick, of Ottawa, mining engineer to the Commission of Conservation. The late Mr. Dick was about 75 years of age.

Mr. Frederic Keffer and Mr. Henry Johns have formed a partnership, with office at 214 Hutton building, Spokane, for the purpose of conducting a general mining business, particularly as regards the examination, reports upon and the management of mining properties. Mr. Frederic Keffer has for the past seventeen years been associated with the British Columbia Copper Co., Ltd., of Greenwood, B.C., as its general manager through the earlier years of its operations, and afterwards as its consulting engineer and geologist. Mr. Henry Johns has also been associated with the above company for about fifteen years as superintendent of a number of its mines. They have recently severed their connection with the company in order to engage in the present business.

Reports of the discovery near Dawson, Yukon Territory, of platinum-bearing ore have been published in local newspapers. It is stated that one assayer at Dawson as a result of several tests has obtained buttons that he believes are platinum, but has not been prepared to assert positively that such is the case. He has sent samples of the ore to several other assayers in various cities and is awaiting their results. Meanwhile a number of quartz locations have been recorded. Apart from these reports, it is known that platinum occurs in gold recovered from streams in the neighborhood of Dawson, for a definite statement has been made by one of the officials that the presence of that mineral was conclusively shown some time ago in determinations made at the Provincial Government Assay Office at Victoria, British Columbia.

## MARKETS

### SILVER PRICES.

|      |    | New York,<br>cents. | London,<br>pence. |
|------|----|---------------------|-------------------|
| June | 23 | 49 $\frac{5}{8}$    | 23 $\frac{1}{8}$  |
|      | 24 | 48 $\frac{3}{4}$    | 23 $\frac{3}{16}$ |
|      | 25 | 48 $\frac{1}{2}$    | 23 $\frac{1}{8}$  |
|      | 26 | 48 $\frac{5}{8}$    | 23 $\frac{1}{8}$  |
|      | 28 | 48 $\frac{1}{2}$    | 23                |
|      | 29 | 48                  | 22 $\frac{7}{8}$  |
|      | 30 | 48                  | 22 $\frac{7}{8}$  |
| July | 1  | 48 $\frac{1}{4}$    | 22 $\frac{1}{8}$  |
|      | 2  | 48 $\frac{1}{4}$    | 22 $\frac{1}{8}$  |
|      | 3  | 48 $\frac{1}{4}$    | 22 $\frac{1}{8}$  |
|      | 5  | 48                  | 22 $\frac{1}{8}$  |
|      | 6  | 48                  | 22 $\frac{1}{8}$  |
|      | 7  | 47 $\frac{3}{4}$    | 22 $\frac{1}{8}$  |
|      | 8  | 47 $\frac{1}{2}$    | 22 $\frac{1}{8}$  |
|      | 9  | 47 $\frac{5}{8}$    | 22 $\frac{5}{8}$  |

### STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Building,  
Toronto, Ontario.)

July 8, 1915.

#### New York Curb.

|                       | Bid.                | Ask.                |
|-----------------------|---------------------|---------------------|
| Alaska Gold           | 37.75               | 38.50               |
| Braden Copper         | 6.87 $\frac{1}{2}$  | 7.00                |
| California Oil        | 274.00              | 276.00              |
| Chino Copper          | 44.50               | 44.75               |
| Goldfield Cons.       | 1.37 $\frac{1}{2}$  | 1.87 $\frac{1}{2}$  |
| Green Can.            | 36.00               | 38.00               |
| Granby                | 52.50               | 53.00               |
| Inspiration Copper    | 30.25               | 30.62 $\frac{1}{2}$ |
| International Nickel  | 150.00              | 152.00              |
| Miami Copper          | 26.87 $\frac{1}{2}$ | 27.12 $\frac{1}{2}$ |
| Nevada Copper         | 14.12 $\frac{1}{2}$ | 14.37 $\frac{1}{2}$ |
| Ray Cons. Copper      | 23.00               | 23.12 $\frac{1}{2}$ |
| Standard Oil of N. Y. | 183.00              | 185.00              |
| Standard Oil of N. J. | 398.00              | 400.00              |
| Tonopah Mining        | 7.12 $\frac{1}{2}$  | 7.25                |
| Tonopah Belmont       | 4.00                | 4.12 $\frac{1}{2}$  |
| Tonopah Merger        | 40.00               | 41.00               |
| Yukon Gold            | 2.50                | 2.75                |

#### Porcupine Stocks.

|                    | Bid.              | Ask.              |
|--------------------|-------------------|-------------------|
| Apex               | .03 $\frac{1}{4}$ | .03 $\frac{3}{8}$ |
| Dome Extension     | .12               | .12 $\frac{1}{2}$ |
| Dome Lake          | .22 $\frac{1}{2}$ | .23 $\frac{1}{4}$ |
| Dome Mines         | 19.50             | 19.95             |
| Foley O'Brien      | .30               | .32               |
| Hollinger          | 26.10             | 26.75             |
| Jupiter            | .08 $\frac{1}{4}$ | .08 $\frac{3}{4}$ |
| McIntyre           | .48               | .48 $\frac{1}{4}$ |
| Moneta             | .05               | .05 $\frac{1}{2}$ |
| Pearl Lake         | .01 $\frac{1}{4}$ | .01 $\frac{3}{4}$ |
| Porcupine Gold     | $\frac{1}{2}$     | $\frac{7}{8}$     |
| Porcupine Imperial | .05               | .05 $\frac{1}{2}$ |
| Porcupine Crown    | .70               | .80               |
| Preston East Dome  | .02 $\frac{7}{8}$ | .03 $\frac{1}{4}$ |
| Rea                | .10               | .15               |
| P. Vipond          | .56               | .57               |
| P. Tisdale         | .01               | .02               |
| West Dome          | .06 $\frac{1}{4}$ | .06 $\frac{1}{2}$ |

### Cobalt Stocks.

|                  | Bid.               | Ask.              |
|------------------|--------------------|-------------------|
| Bailey           | .02 $\frac{1}{4}$  | .02 $\frac{3}{8}$ |
| Beaver           | .29                | .30               |
| Buffalo          | .50                | .65               |
| Chambers Ferland | .21                | .24               |
| Coniagas         | 4.87 $\frac{1}{2}$ | 5.25              |
| Crown Reserve    | .55                | .61               |
| Foster           | .03 $\frac{1}{2}$  | .07               |
| Gifford          | .01 $\frac{7}{8}$  | .02 $\frac{1}{8}$ |
| Gould            | $\frac{1}{4}$      | $\frac{5}{8}$     |
| Great Northern   | .02 $\frac{3}{8}$  | .02 $\frac{1}{2}$ |
| Hudson Bay       | .18                | .21               |
| Kerr Lake        | 4.25               | 4.50              |
| La Rose          | .48                | .51               |
| McKinley         | .22                | .24               |
| Nipissing        | 5.60               | 5.70              |
| Peterson Lake    | .22 $\frac{1}{2}$  | .23               |
| Right of Way     | .03                | .04               |
| Silver Leaf      | .02 $\frac{1}{2}$  | .03 $\frac{1}{4}$ |
| Teck Hughes      | .05 $\frac{1}{2}$  | .06               |
| Temiskaming      | .32 $\frac{1}{2}$  | .33               |
| Trethewey        | ...                | .10 $\frac{1}{2}$ |
| Wettlaufer       | .03 $\frac{1}{2}$  | .05               |
| Seneca Superior  | ...                | 1.00              |

### TORONTO MARKETS.

July 12, 1915—(Quotations from Canada Metal Co., Toronto)—  
 Spelter, 30 cents per lb.  
 Lead, 7 cents per lb.  
 Tin, 45 cents per lb.  
 Antimony, 40 cents per lb.  
 Copper casting, 22 cents per lb.  
 Electrolytic, 22 cents per lb.  
 Ingot brass, yellow, 13c.; red, 15 cents per lb.

July 12, 1915—(Quotations from Elias Rogers Co., Toronto)—  
 Coal, anthracite, \$7.50 per ton.  
 Coal, bituminous, \$5.25 per ton.

### NEW YORK MARKETS.

July 9, 1915—Connellsville Coke (f.o.b. ovens)—  
 Furnace coke, prompt, \$1.60 per ton.  
 Foundry coke, prompt, \$2.00 to \$2.40 per ton.

July 9, 1915—Tin, straits, 38.95 cents.  
 Copper, Prime Lake, 19.62 $\frac{1}{2}$  to 19.87 $\frac{1}{2}$  cents.  
 Electrolytic copper, 19.37 $\frac{1}{2}$  to 19.62 $\frac{1}{2}$  cents.  
 Copper wire, 21.00 to 21.50 cents.  
 Lead, 5.75 cents.  
 Spelter, 22.50 to 23.00 cents.  
 Sheet zinc (f.o.b. smelter), 27.00 cents.  
 Aluminum, 32.00 to 33.00 cents.  
 Nickel, 50.00 cents.  
 Platinum, soft, \$40.00 per ounce.  
 Platinum, hard, 10 per cent., \$42.00 per ounce.  
 Bismuth, \$2.75 to \$3.00 per lb.  
 Quicksilver, \$92.00 to \$95.00 per 75-lb. flask.

Mr. Cadwallader Evans has resigned from the position of general manager of the Acadia Coal Company and has been succeeded by Mr. Hector Prudhomme of Montreal, who has for some time been the secretary-treasurer of the company. Mr. Evans has left for California, where he will join Mrs. Evans, and expects to take a well-earned rest before he again takes up mining work.

# PROFESSIONAL DIRECTORY.

The very best advice that the publishers of the Canadian Mining Journal can give to intending purchasers of mining stock is to consult a responsible Mining Engineer BEFORE accepting the prospectus of the mining company that is offered them. We would also strongly advise those who possess properties that show signs of minerals not to hesitate to send samples and to consult a chemist or assayer. Those who have claims and who require the services of a lawyer, with a thorough knowledge of Mining Law, should be very careful with whom they place their business.

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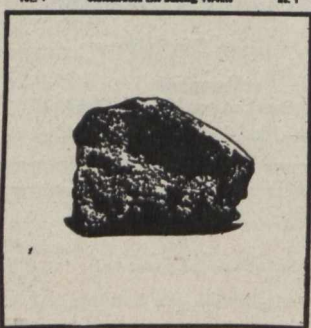
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 SUBSCRIPTION IN CANADA, \$2.00  
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PUBLISHED ON THE FIRST AND FIFTEENTH OF EACH MONTH  
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FEBRUARY 15, 1927  
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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

### REPORTS RECENTLY ISSUED:

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Memoir 59. Coal Fields and Coal Resources of Canada, by D. B. Dowling.  
Summary Report of the Geological Survey for the year 1914.

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Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.

Memoir 60. Arisaig-Antigonish District, Nova Scotia, by M. Y. Williams.

Memoir 41. The "Fern Ledges" Carboniferous flora of St. John, New Brunswick, by Marie C. Stopes.

#### QUEBEC

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 72. The Artesian Wells of Montreal, by C. L. Cumming.

#### ONTARIO

Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.

Memoir 40. The Archaean Geology of Rainy Lake Re-studied, by Andrew C. Lawson.

Museum Bulletin No. 8. The Huronian Formations of Timiskaming Region, Canada, by W. H. Collins.

#### NORTH-WEST PROVINCES

Memoir 53. Coal Fields of Manitoba, Saskatchewan, Alberta and Eastern British Columbia (Revised Edition) by D. B. Dowling.

Memoir 65. Clay and Shale Deposits of the Western Provinces (Part 4), by H. Ries.

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#### BRITISH COLUMBIA

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Memoir 56. Geology of Franklin Mining Camp, British Columbia, by Charles W. Drysdale.

Museum Bulletin 11. Physiography of the Beaverdeil Map Area and the Southern Part of the Interior Plateaus of British Columbia, by Leopold Reinecke.

#### YUKON AND NORTH-WEST TERRITORIES

Memoir 50. Upper White River District, Yukon, by D. D. Cairnes.

Memoir 67. The Yukon-Alaska International Boundary, between Porcupine and Yukon Rivers, by D. D. Cairnes.

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Map 91A. Geological map of the Dominion of Canada and Newfoundland. Scale 100 miles to 1 inch.

#### NEW BRUNSWICK AND NOVA SCOTIA.

Map 27A. Bathurst and vicinity, Gloucester County, New Brunswick. Geology.

Map 39A. Geological Map of Nova Scotia.

Map 121A. Franey Mine and Vicinity, Victoria County, N. S.

#### QUEBEC

Map 95A. Broadback River, Mistassini Territory, Quebec. Geology.

Map 100A. Bell River, Quebec. Geology.

#### ONTARIO

Map 124A. Wanapitei (Falconbridge, Street, Awrey, and Parts of MacLennan and Scadding Townships), Sudbury District, Ont. Geology.

Map 49A. Orillia sheet, Simcoe and Ontario Counties, Ontario. Topography.

#### NORTH-WEST PROVINCES

Map 55A. Geological map of Alberta, Saskatchewan and Manitoba.

Map 117A. Wood Mountain Coal Area, Saskatchewan.

#### BRITISH COLUMBIA

Map 33A. Nanaimo sheet, Vancouver Island, British Columbia. Topography.

Map 70A. Victoria sheet, Vancouver Island. Geology.

Map 72A. Saanich sheet, Vancouver Island. Geology.

Map 109A. Prescott, Paxton and Lake Mines, Texada Island. Topography.

#### YUKON AND NORTH-WEST TERRITORIES

Map 113A. Canadian routes to White River District, Yukon, and to Chisana District, Alaska.

NOTE.—Maps published within the last two years may be had, printed on linen, for field use. A charge of ten cents is made for maps on linen.

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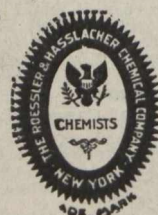
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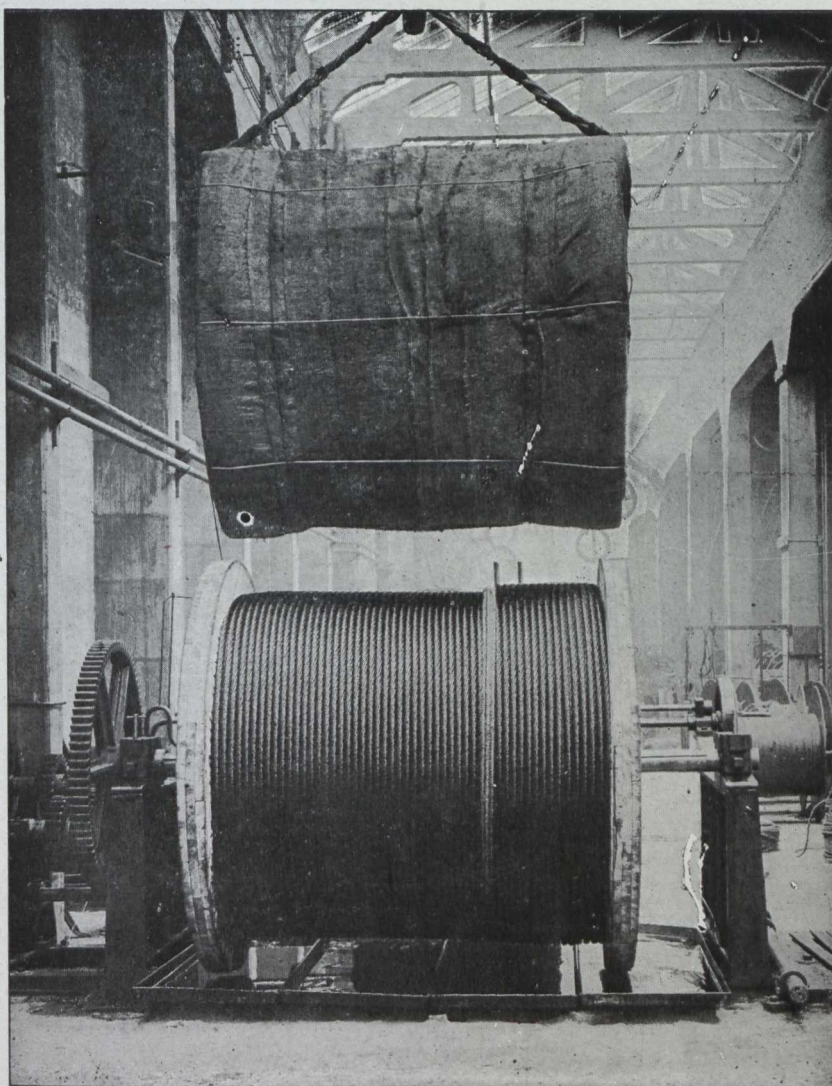
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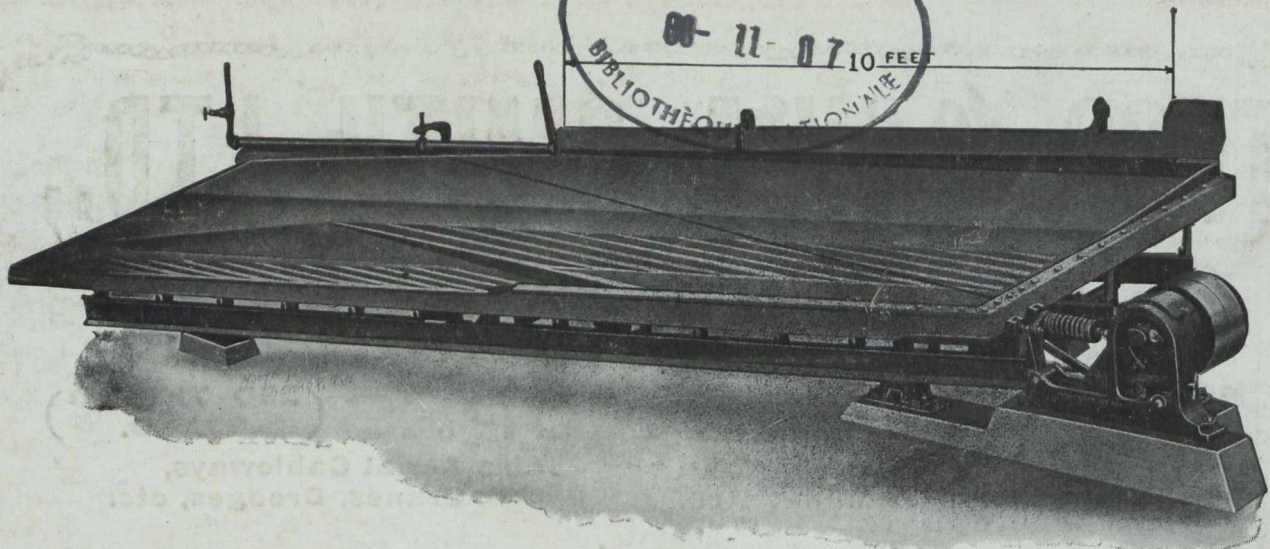
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