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### CIRCULATION.

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## BALL MILLS AND STAMPS

Now that the Vipond and McIntyre mills have been in continuous operation for several months, interesting comparisons are being made between the plants using rolls and ball mills and those using stamps for the main crushing operation in treating Porcupine gold ores.

The large plants, Dome and Hollinger, are equipped with stamps, and most of the published data on Porcupine metallurgical processes is that which has been gathered at these two plants. Comparisons have been made with results obtained at the Vipond and McIntyre; but these have been of a rather general nature and unsupported by actual figures. Such figures should now be obtainable, and there seems a probability that the rolls and ball mills will make a better showing than the stamps.

In a paper written for the Canadian and American Mining Institutes, and published in the February 15 issue of this Journal, Mr. Noel Cunningham says:

"At the Vipond and the McIntyre mills, rolls and ball mills are doing the work done by stamps at the other mills. The ore is chiefly soft schist and the ball mills have been entirely satisfactory; power per ton of ore ground appears to be slightly higher than with stamps for the production of identical results. Steel consumption is about the same, the stamps perhaps having a shade the better of the argument in this respect; cost of operation and repairs is in favor of the ball mill, while first cost and uniformity of operation (what might be termed lack of operating "grief") are decidedly in favor of the ball mill. While my own experience in the district has been entirely with stamps, and their performance was satisfactory, I am of the opinion that the ball mill is preferable for breaking down the Porcupine ore ahead of the tube mills."

Mr. C. H. Poirier, who designed the Vipond plant, says in its favor that first installation and upkeep is less than one-half that of stamps for equal capacity, that the capacity in tons per horse power is double, and that there is a reduction of one-quarter the amount of solution required, and consequently reduction in cost in handling solution after crushing. Overhead mill space is also reduced one-half.

Mr. Cunningham, on the other hand, states that power per ton of ore ground appears to be slightly higher than with stamps. He says that the latter crush 5 to 6 tons per 24 hours per horse power.

At the recent meeting of the local branch of the Canadian Mining Institute the topic was discussed; but no figures were presented.

As long as power remains one of the chief problems in Northern Ontario, it is of vital importance that the cost of power for milling operations be very carefully determined. It is to be hoped that an open discussion will take place in order that the experience gained may be promptly taken advantage of. We will be pleased to publish contributions to the discussion.

## PORCUPINE ORES AND ROCKS

The ores and rocks at Porcupine have been variously described. Owing to the completely altered character of the wall rocks there is difficulty in determining to which of the more common igneous rock types they should be referred. This is, however, no excuse for calling the laminated ore an "iron silicate schist," as one prominent metallurgist does.

Some geologists at Porcupine call the schistose wall rock a basalt schist. For this terminology some support might be found, for there is a possibility that the rock may have been originally a basalt. Otherwise the term is a misnomer.

Why not call the rock what it is, instead of what it may have been once. The wall rock in most places is a grey schist composed largely of carbonates and quartz, with numerous minute flakes of sericitic mica and grains of pyrite. In places the wall rock is of darker color, owing chiefly to the presence of numerous particles of chlorite. In the vicinity of the Hollinger and the McIntyre mines, the wall rocks are such carbonate schists, some grey and sericitic, some darker colored and chloritic. At the McIntyre the wall rock in places is a less altered rock which retains its distinctly igneous character. It is a porphyry which, in the opinion of the company's geologist, Mr. Whitman, intrudes the schists.

## THE CRIME OF THE LUSITANIA

A new adjective, "lusitanian," is suggested by a New York newspaper as a probable addition to the languages of the world—with the exception of German—for the proper describing of deeds of such gigantic and incredible infamy as the sinking of the "Lusitania," should the future of the race bring forth another such crime, a crime to which the past presents no parallel.

This is as it may be, but there is crystalizing in the consciousness of all nations, outside the league of the Teuton and the Turk, one sharp-edged adamantine fact, the certainty that to this generation and many yet to come the name "German" will be a synonym for calculating cruelty, for barbarism expressed in the terms of twentieth century scientific efficiency, for the primeval instincts of lust and murder carried into effect by submarine torpedo-boats, by Zeppelin bombs, by the truly Prussian weapon of gas fumes—a "technical device" designed not merely to kill—but to

cause a death of lingering agony that exceeds in exquisite diabolism the refinements of the Chinese torture known as "li-chi," and might, in the words of Coleridge, give the Devil an idea "for improving his prisons in hell."

We will say nothing about the existence of a calculated system of "frightfulness" as disclosed by the report of the British Commission on the Belgian Atrocities, except that it should be read by any persons who may yet have lingering doubts on the authenticity of the Belgian horrors.

From time to time in the history of the world have barbaric hordes emerged from the North and East and written a record of horror, but future historians will place the German name higher on the shameful roll of savagery than Tartar or Hun, than Vandal or Turk, than the Dervishes of the Sudan, or the "assassins" of the Old Man of the Mountain.

Great has been the opportunity of the German nation. Appalling will be its shame. Nor will the indelibility of the stain on her escutcheon be fully disclosed until Time has applied his cleansing touch to the "garments rolled in blood" which to-day screen Truth from our eyes.

Readers of Carlyle's "French Revolution" will remember his iteration of the wonderful metaphor of the upward spewing of the abyssmal morass of barbarism, the uprising of the powers of darkness and anarchy from the bottomless depths that underlie our civilization, the breaking-up of the fountains of the great deep of human wickedness; and it is against this recurrent danger that the British Empire and its Allies are to-day contending.

Our own death-roll in this warfare is high, and we know that we must steel ourselves against still greater toll of our best and our bravest. We can therefore sympathize feelingly with our friends in the United States, who, in the sinking of the "Lusitania," have experienced for the first time the ruthlessness of the Prussian doctrinaire. The death-roll of the Lusitania included notable figures in United States life, men who, not mean in their lives nor small in their achievements, proved even greater in the hour of their death, men like Vanderbilt, of whom it may be said—"Nothing in his life became him better than the leaving of it."

Among this notable list the name of Dr. Fred. S. Pearson is not the least, and perhaps he was the most notable and truly American citizen among those who perished at the hands of Germany. Dr. Pearson has played an important part in the industrial development of the whole Continent of America, for his activities included our own Dominion, Mexico and Brazil, in addition to his own country. To a large extent Dr. Pearson was the father of electric street-traction in the United States. He was a moving spirit in the early days of the Dominion Coal Company, and his ingenious and daring gift for design is still in evidence in the equipment of this company's collieries.

Regarding Dr. Pearson as typical of the group of American citizens that were murdered on the "Lusitania," we see how futile must be any attempt at "reparation" by the German Government.

We extend to the American Institute of Mining Engineers the sympathy of all Canadian members of the profession in the loss of this distinguished member, and must at the same time express our detestation of a system that has brought about this loss, that, as President Wilson has well said, "cannot be used without an inevitable violation of many sacred principles of justice and humanity."—F. W. G.

## THE UTILIZATION OF OUR FUELS

Mr. B. F. Haanel, chief of the fuels and fuel testing division of the Mining Branch, has written a very instructive report on the value of peat, lignite and coal as fuels for the production of gas and power in the by-product recovery producer. The report is especially valuable, because it directs attention to means of utilizing our low grade fuels.

It is well known that Canada has enormous deposits of good coal, for Nova Scotia, British Columbia and Alberta are very large producers. But the producing districts are far apart and the central provinces have no coal. It is important that fuel should be readily obtainable in all parts of the country.

The report of Mr. Haanel shows how our peat and lignite deposits might be economically developed. Past failures are for the most part to be charged against the methods employed, rather than against the fuel.

Mr. Haanel says:

"The fuel problem which confronts Canada is, not conservation; but the best means of rendering available the various supplies of low grade fuels. The great Coal Measures of Canada are situated in the extreme east and west; but, lying between these points is a vast territory devoid of coal measures, which is, at the present time, dependent on some foreign source for a fuel supply. In one sense conservation is being practised to a very high degree, because, in certain parts of the country, practically all the coal required for industrial and domestic purposes, is being imported from the United States, while valuable fuel deposits are lying practically intact. But this kind of conservation never leads to commercial or industrial prosperity, and cannot, therefore, be recommended. In order to render those portions of Canada which are devoid of Coal Measures independent of foreign supplies of fuel, at least to some extent, it is necessary to convert into some convenient form the great source of potential energy represented by the peat bogs, which are of great extent and well distributed throughout the middle provinces; and the same necessity applies to the lignite coals which are found distributed throughout the prairie provinces.

"Many of the peat bogs, which are peculiarly adapted for manufacture into fuel for domestic and power pur-

poses, are conveniently situated as regards transportation facilities, and contiguous industrial communities. But notwithstanding this, the manufacture of the raw peat, contained in certain of the bogs, into a marketable fuel has not, up to the present time, met with much success; due, on the one hand, to the long list of failures recorded by those who have impracticably interested themselves in this problem during the past years, and on the other hand to unscrupulous speculators, promoters and so-called inventors. The failures, so far recorded, may be ascribed principally to the methods employed for manufacturing the fuel. It is a fact that a flourishing and permanent peat industry has been established in Europe for almost a century, but no one, in this country, thought of turning to the European peat-using countries for advice and enlightenment concerning the best process to employ for the manufacture of peat fuel in Canada. This seems incredible, especially at the present day, when the inventor of processes is still able to hold the attention and sometimes the purse strings of astute business men.

"In Europe the annual production of peat is large. In Russia alone, during the last year, over 2,500,000 metric tons were produced; together with a large output in Germany, and other countries. The process employed in all the European countries is the air-dried machine peat process, sometimes called the "wet process"; and this is the only economic process for the manufacture of peat fuel known to-day.

"Unless the manufacture of peat fuel is conducted on a bog situated reasonably near a community which is able to take over the entire output produced, peat manufactured for domestic or fuel purposes alone would not prove a profitable venture. This is due to the comparatively low heating value of the peat, to its moisture content, and to the large volume it occupies, per heat unit, as compared with coal; and when to these disadvantages is added that of high freight rates per ton, the reason of the foregoing statement will be obvious. But while peat may serve as a domestic fuel in only certain cases, it may be well adapted for the production of power, or as a fuel gas. This is especially so in the case of peat, which has a high nitrogen content, since this element can be profitably recovered in the ammonia gas formed in the by-product recovery producer. According to the process employed in by-product recovery work, the ammonia gas is fixed with sulphuric acid, and the resulting product "ammonia sulphate" is then sold for agricultural purposes. The demand for this commodity is, to-day, greater than the supply, consequently its price per unit is somewhat high. Whenever, therefore, the nitrogen content of the peat is sufficiently high, the production of a fuel, or power gas, accompanied by by-product recovery, would prove profitable. But in the case of the production of power, the same economies must be introduced into the manufacture of the fuel that apply to a domestic fuel, and even though the content of nitrogen is well above the average, any increase in the cost of fuel rapidly decreases the expect-

ed profits. Peat is a low grade fuel which must be manufactured and sold at a comparatively low cost, if it is desired that it should serve as a substitute for coal. It is evident, therefore, for the foregoing reasons, that the manufacture of peat fuel does not hold forth any glowing prospects for getting rich quickly, although reasonable and very good profits should in almost every case be realized when the industry is run on a business-like basis. But the element of speculation, and some of the commonly practised methods of promotion must be eradicated if the peat industry is ever to become an accomplished fact.

"There are certain bogs in Canada, of very large extent, well suited for the manufacture of peat fuel for domestic purposes, and the production of power, and such bogs might be cultivated and colonized. All plowing, harvesting, etc., could be performed by electric power, and the homes, in addition, lighted by electricity. In this way, a worthless tract of land could be converted into agricultural land of value."

In his report, Mr. Haanel has described, in some detail, the methods for manufacturing peat fuel, and has laid considerable stress on the problems encountered in removing by pressure or by means of artificial heat the contained water. It is shown that the artificial drying of peat cannot be accomplished economically, and that to attempt to reduce the water content of the raw peat to below 76 per cent. by hydraulic pressure will result in commercial failure. It is further shown that, with peat costing \$1.50 per ton delivered at the producer plant, and having a nitrogen content of 1.5 to 2 per cent., power can be produced as cheaply as with some hydro-electric plants; and, that where only gas is generated, the revenue derived from the sale of the ammonium sulphate produced is sufficient to pay a profit on the investment, and to deliver the gas free of charge.

The announcement of the Calumet and Hecla Mining Co. that on June 12 all employees will share in a distribution of about \$500,000 has naturally been well received by the miners. Early in the war the price of copper was so low and demand so poor, it was found necessary to make a great reduction in output. Rather than dismiss a large number of men the company announced a lower scale of wages and shorter working hours. Then came the great rise in the price of copper, and the old wage scale and full working time were restored. Now the company is undertaking to pay the difference between what the employees earned and what they would have earned at the regular scale of wages. The Calumet and Hecla Company has many good things to its credit besides the dividend record.

There should be an important branch of the Canadian Mining Institute in the Sudbury district. There are many engineers there.

The reorganization of the Porcupine branch of the Canadian Mining Institute was an immediate result of the excursion of the Porcupine branch to Cobalt. Such excursions are greatly to be desired. The Porcupine branch should visit Cobalt, and both should visit the Sudbury district.

The demand for benzol and toluol for war purposes is giving a great stimulus to the by-product coke oven industry. The high price now being obtained for these substances is being taken advantage of by several firms in Canada and the United States. The plants now being built to make supplies for the Allies will later on help to establish other industries here.

During the early months of the war cargoes of copper for Italy were held up at Gibraltar until guarantees were given that the metal would not be transhipped to the enemy. Copper is now going across the border in large quantities; but the form in which it is being delivered is not calculated to be highly acceptable to the Austrians.

#### HOLLINGER.

Hollinger Gold Mines, Ltd. made a gross profit of \$141,457 in the four week period ending April 22nd.

The mill ran 87 per cent. of the possible running time, treating 27,183 tons, of which 22,952 tons was Hollinger ore and 4,231 tons was treated for the Aeme Gold Mines Limited.

The average value of Hollinger ore treated was \$10.40. Milling cost on 22,952 tons was \$1,033 per ton.

Shortage of water power interfered somewhat with operations throughout the four weeks. The spring thaw has occurred and there is now ample power for all purposes.

#### GRANBY CONSOLIDATED.

Although directors of Granby Consolidated took no action on the dividend at their Tuesday's meeting, it should not be considered finally settled that there will be no dividend action during the company's fiscal year which ends June 30. A special session of the board may be called early in June to place the stock back in the dividend ranks later in the month.

Granby's earnings were never so large and in this prosperity the stockholders will share. As the floating debt has not actually been paid off, although arranged for, this situation doubtless resulted in decision to defer dividend declaration for a few days. On June 1 this debt will have been eliminated.

Development work at Hidden Creek will be pushed this summer. The 9,000,000 tons of known ore reserves will, it is expected, be materially increased.

By July 1 the fourth furnace at Hidden Creek should be ready to be blown in, and from that time on the new plant will be in position to keep three furnaces in continuous operation. The nominal capacity of the plant as it stands has been considerably exceeded, which has been a factor in the low costs already attained.—Boston News Bureau.

## ALIEN ENEMIES

The latest infamy of the Germans has caused a feeling of intense bitterness throughout the world and the crystallization into something resembling genuine hatred of public opinion throughout the British Empire. The systematic destruction of German property in Johannesburg, rioting in Vancouver and throughout many of the large industrial cities of Great Britain, is a reflex from the more volatile and less responsible elements of the population of the general resentment that the act of the Germans in sinking the "Lusitania" has occasioned. Up to the present time the peoples of the British Empire, and particularly those in the United Kingdom itself, have acted with supreme sanity and with an apparent realization of the seriousness of the situation, and it is a little disturbing to hear of these popular outbreaks.

As one of the magistrates sitting on the riot cases in London remarked, a proper way to show resentment against the Germans is to enlist and fight in Kitchener's army, and for any man of military age to be concerned in acts of this nature is a confession of cowardice and general undesirability on his part.

It must not be forgotten that by far the greater proportion of the law-abiding and orderly citizens of the United Kingdom are now engaged in military duty, and there must necessarily be a greater proportion of the less useful members of the community in the residue. As the Mayor of Middlesboro remarked the other day, the voluntary system of recruiting has to a large extent proved to be a process of the natural selection of the best elements of the male population, and in too many cases the men who are at the "benches" at home should be in the trenches and men who are in the trenches should be at the "benches."

Considering the wide extension and the insidious nature of the German spy system, the anxiety for the internment of alien enemies in Great Britain is quite understandable, but it is no less certain that in the carrying out of the wholesale internment order which has just been issued by the British Government, many innocent persons will suffer with the guilty.

The position of Great Britain, however, in relation to persons of alien enemy nationality is very different to the position of the British dominions. Great Britain is the nerve centre of the Empire, the most important strategic point in our world-wide Empire.

The German residents in Great Britain are to a large extent persons who displace British citizens in the different branches of industrial activity; their presence could be dispensed with in most instances without any loss to the United Kingdom. In Canada, however, as in the other British dominions, we have hitherto welcomed to our shores all desirable elements for the colonization of a great and sparsely populated country, and we expect eventually, as has been the case hitherto, to turn all our immigrants into British citizens owning allegiance to the British flag and British institutions and to none other. There should be no doubt of our ability to do this, for the power of the British Empire to assimilate other nationalities and make of them loyal citizens of the Empire is the greatest testimonial extant to the durability and the righteousness of our institutions. In a country so vast as Canada, it is inconceivable that any great material damage can result from the machinations of alien enemies, even supposing such enemies to be men of

intelligence, ably led and provided with large supplies of money. As a matter of fact, however, the large bulk of persons of alien enemy nationality in Canada belong to the laboring class, and the chief thought in their minds at the present time is gratitude and thankfulness for being safe in Canada and away from the bloody business of war. Many of the countries of Europe that have yielded the greatest flow of emigration to Canada are now becoming a debatable ground, as for example, Poland, Galicia and Bukowina. It is more than probable that the territory which lies between the present frontier of Russia and the Carpathian Mountains will eventually become a possession of Russia. The fate of Poland is less certain, but there seems little reason to suppose that the Poles as a nation should be consumed with any great love for either Germany, Austria or Russia. Generally speaking, with the possible exception of a minority of educated Germans and Austrians, whose antecedents and general character it should not be hard for the police to determine, the great bulk of the alien enemy population in Canada belongs to the laboring class, and they are at the present time doing useful work as producers in Canadian industries. If it was worth while in times of peace to spend large sums of money in advertising the Dominion of Canada as a desirable home for these people, as a place which offered them a chance of independence and uplift, surely we as Canadians should have sufficient confidence in our own institutions to allow these people, so long as they behave themselves, to earn their living and add to the general prosperity of the country.

There has been a good deal of criticism of some of the large industrial concerns in Canada because of their continued employment of workmen of alien enemy nationality, and this has been particularly evident in connection with the operations of the Dominion Iron & Steel Company and the Dominion Coal Company in Cape Breton. The opposition has not arisen from the workmen of these companies, but has proceeded more from outside persons, who desire nothing better than a popular handle for an attack upon any big corporation. At the present time, workmen of enemy nationality are employed both at Sydney and in the mines at Glace Bay. They are comparatively few in numbers and the positions they hold are usually very subordinate. Nevertheless, the loss of these men would hamper to a very large extent the work of the skilled Canadian miners who depend to a large extent upon unskilled labor for the performance of the less important and usually more laborious operations connected with mining and steel making. To intern these men at the present time would not only entail a bill of expense upon the country, but would turn men who are now peaceful and law-abiding citizens into sullen and dissatisfied enemies, who would take the first opportunity that presented itself of obtaining revenge.

Their wives and families would also have to be maintained at the expense of the community, and there would be added all the evils of concentration camps, moral and physical, among which the possibilities of political mal-administration and reprisals are not the least. At the present time these alien enemy workmen are assisting in the production of coal and steel, upon which to a very large extent depends the ability of Canada to manufacture munitions of war and to transport these munitions and men to the battle line.

There seems therefore to be good reason to caution people against being led away by mistaken appeals, not to their patriotism, which is not in doubt, but to less noble feelings that lead to riots, reprisals and the infliction of indignities upon people who are merely the victims of their circumstances.

For the convicted traitor and spy, and the man who attempts to perform hostile acts in our midst, there should be a short, sharp shrift, but it should be pointed out in no uncertain way that all nationalities who have accepted the hospitality of this Dominion should, so long as they pursue their peaceful avocations and indulge in no overt acts, be allowed to earn their daily bread and otherwise be treated as potential citizens of this great Dominion.

Many persons of German nationality throughout the British Empire have repudiated the infamous deeds of their countrymen and, more than this, many Canadians of undoubted German ancestry, removed by but one or two generations from actual residence in the Fatherland, have offered their services to take arms against the common enemy of mankind.

Those persons who attempt to inflame public sentiment by the writing of incendiary articles directed against persons of enemy nationality living in our midst, or who take part in actual violence, brand themselves in the first instance as cowards, and in the second instance as traitors to the British principle of fair play and to all traditions under which our great Empire has become a refuge for the oppressed, and the beacon of liberty to distressed nationalities the world over. In a campaign of reprisals we are bound to be beaten, because, as one speaker in the British House of Lords remarked recently, "in a competition of brutality against the Germans the British people must be beaten."

### DOMES EXTENSION.

The annual meeting of Dome Extension shareholders was held May 27, with President W. S. Edwards in the chair. The president said that while no work had been carried out on the property, developments on the Dome indicate a bright future for the Dome Extension. He explained that drilling had proved the value of the mine, but with the present condition of the market the directors did not consider it advisable to place the million shares held in the treasury upon the market, as they would not produce enough money to carry on the work satisfactorily. The financial statement shows a cash balance of nearly \$4,000. The board was re-elected.

### CONIAGAS.

Cobalt, May 27.—The new vein cut in the west cross-cut from the fourth level of the Coniagas No. 4 shaft, is the first ore made on the southern end of this property. No. 4 shaft is located on the corner of Silver Street and Prospect Avenue, one of the busy corners of the town. The new vein, located in virgin ground, shows four in. of 2,000-oz. ore, being composed of calcite, heavy niccolite, and silver. There is little smaltite associated. In the wall rock milling ore will extend over some distance. No work has been done on the vein, but a drill will be started this week to drive in a northerly direction.

## MINERAL PRODUCTION OF ONTARIO

The Bureau of Mines has received returns showing the production of the metalliferous mines and works of Ontario during the three months ending 31 March 1915. The figures show gains in gold, nickel and iron ore as compared with the corresponding period of 1914, but decreases in silver, copper, pig iron, cobalt, and cobalt and nickel oxides.

	1st. 3 mos. 1915		Increase or Decrease
Gold.....	\$1,568,043	I	365,541
Silver.....	2,486,909	D	1,060,647
Copper.....	526,338	D	65,650
Nickel.....	1,496	I	50,610
Iron Ore.....	50,592	I	37,664
Pig Iron.....	1,158,462	D	1,344,988
Cobalt.....	3,718	D	5,180
Cobalt and Nickel Oxides.....	19,686	D	149,279

**Gold**—The gold was for the most part the product of the Porcupine camp, where the Hollinger, Dome, McIntyre-Porcupine, Porcupine Crown, Vipond, Acme and Mines Leasing companies are now all turning out bullion. In other parts of Ontario the producing mines were Canadian Exploration, Tough-Oakes and Cordova.

**Silver**—The number of mines marketing their products, whether ore, concentrates or bullion, was 20. One large mine made no shipments during the quarter, and others produced more silver than they sold. Present low prices of silver offer no inducement to increase production, and the shortage of water for power purposes impeded mining and milling operations. Another cause of the falling-off is the closing down or partial exhaustion of some properties which formerly produced freely.

**Nickel and Copper**—The nickel-copper mines are working at high pressure. The Creighton mine is employing 750 men underground, and a seventh furnace is being put in at the Copper Cliff smelter. At Coniston the Mond Nickel Company is working every Department at full capacity.

**Iron**—The Helen was the only iron mine making shipments during the quarter. The market for pig iron is depressed, and there will be a restricted output until a decided improvement is apparent in the demand.

**Oxides**—The war has shut off all exports of cobalt or nickel oxide to the continent of Europe, where the materials, particularly the former, were in demand.

### INVESTIGATION OF PEAT BOGS.

The Mines Branch, Ottawa, has issued a report on an Investigation of the Peat Bogs and Peat Industry of Canada by A. v. Anrep.

This report includes a detailed examination of nine peat bogs in the Province of Quebec, and on account of a preliminary investigation of a number of peat bogs situated in the immediate vicinity of Sudbury and Selkirk, in the Province of Ontario.

### ACCIDENT AT NANAIMO.

Nanaimo, B. C. May 27.—About 40 miners were trapped by a gas explosion in the reserve mine of the Western Fuel Company here late to-day. Sixteen have been rescued and two bodies recovered. The fate of the others miners, who are still imprisoned, has not been determined.

# THE PRINCIPLES UNDERLYING THE OCCURRENCE OF OIL AND GAS AND THEIR APPLICATION TO WESTERN CANADA

By Justin S. DeLury

In this article an attempt will be made to show, from the similarity of geological conditions in Alberta and other parts of western Canada to the usual conditions accompanying the hydrocarbons throughout the world, that great possibilities await the exploiters of petroleum and natural gas in these western fields. It is recognized that the economic geologist cannot reason safely from analogy; at the same time, he would be wrong, while investigating one field, in disregarding conditions in other fields and refusing to apply them. Without the presumption of trying to show that western rocks are reeking with oil, there will be no harm in pointing out the similarity in conditions in these fields to the proved oil and gas fields of the world by means of a geological comparison.

Oil and gas occur in rocks of all geological ages from Silurian to those of recent formation. Of the oil and gas fields of the United States, which has a much greater production than any other country, the largest, or Appalachian field, has the oil and gas distributed in many favorable formations of a great series of Palaeozoic rocks. The Ohio-Indiana, the mid-continental of Kansas and Oklahoma and the Illinois fields are all represented by Palaeozoic formations, generally by the younger groups. California oils are found in rocks ranging in age from Jurassic to Quaternary, but are chiefly in the Tertiary. The Texas-Louisiana oil-bearing strata are of Cretaceous to Quaternary age. Colorado and the bulk of Wyoming oils are in Cretaceous. In Alaska, formations from Jurassic to Tertiary are the favorable ones. Most of the oils of Europe and Asia are in rocks of age from Jurassic to Tertiary, frequent occurrences being known in even the latest of the Tertiary formations.

**Oil and gas reservoirs.**—Any porous rock or cavity or open fissure may be a reservoir for oil or gas, provided that other conditions are suitable. Sandstones are the most abundant of the very porous rocks and are, as would be expected, the most important oil and gas holders. Porous limestones also hold large quantities. Rocks made porous by fracturing and fissuring may and do hold workable pools. Series of alternating sandstones, shales and limestones seem to offer the best facilities as a source and place of accumulation for the hydrocarbons. If these rocks exist with the proper structural relations, we have what may be described as geologically possible oil and gas ground.

Besides a porous rock to serve as a reservoir, there is needed an impervious overlying rock to keep the hydrocarbons from gaining access to the surface, where they would be lost. In general, oil and gas are collected in the highest underground places they can reach, and most of them are under a pressure sufficient to cause their escape through any but the most impervious rocks. As a rule, oil and gas are found under a stratum of damp clay or shale, which is the common impervious rock in the sedimentary formations. It is on account of the general tendency of the lighter hydrocarbons to work upwards, evidently driven and compressed by water currents from below, that they are generally found in the apex of low anti-

clines or domes in the strata. There have been doubts cast on the applicability of the anticlinal theory of accumulation of oil and gas, but, with a few exceptions, it has proved to be, when combined with good judgment, the only valuable hypothesis of general application available for the prospector. In areas where dry wells exist, the hydrocarbons, not being under the influence of underground waters, are likely to be found in an opposite condition than would be indicated by the anticlinal theory. In some of the other fields where the application of this theory has failed, local conditions seem to upset the applicability of the theory rather than the theory itself.

**Gas nearly always accompanies oil**, but the finding of gas in a well, on the other hand, in no way assures us that oil will be found, though it may be regarded as a favorable indication of the presence of oil. As a general rule, where the two are found, the gas is above the oil; this does not exclude the possibility of there being two horizons, one above the other and each containing both of the hydrocarbons. On account of these definite relations between gas and oil, it is important that an oil well be sunk in the right place to avoid complications with gas in getting the oil and to make use of the pressure of the gas to force out the oil.

**Surface indications.**—Oil and gas pools have been located without any real surface indications beyond formations and structures which would indicate geologically favorable ground. These formations and structures point to a good locality for prospecting, but as a rule surface indications are looked for and are desirable, especially in unproven territory. In most of the fields that have been discovered there have been gas springs and often oil seepages. These escapes generally, and especially in a plains country, indicate that the hydrocarbons are under pressure and that they are of the normal type. Having found surface indications, the general structures of the area are examined in order to find the most likely location of the reservoir. As a rule it is found at the crest of an anticline. If the anticline is low or the rocks are horizontal, it is more difficult to decide on the best location for a well, and it is then that surface indications in the way of gas escapes under pressure and oil seepages from below may prove helpful in giving a clue as to the location of the pools.

**In summing up the principal features in regard to oil and gas formations**, it might be said that favorable conditions are afforded by thick series of sandstones, conglomerates, limestones and shales of age from Silurian to Recent, that have been left undisturbed except for general elevation or have suffered only minor folding. The conditions which are essential for the accumulation of large pools of oil and gas are: first, a source for the oil; second, porous rock to serve as a reservoir; and third, an impervious stratum to prevent escape. The sources generally favored by geologists are thick beds of shales, preferably those which show evidence of abundant life, either animal or plant or both, and limestones, which in themselves always

give evidence of animal life. The reservoir rocks that favor accumulation are sandstones and porous limestones. The impervious stratum that prevents escape is nearly always a clay or shale and generally a wet one. The following conditions, while not essential, favor the storing of the hydrocarbons; first, the occurrence of low anticlinal arches or domes; and second, the saturation of the surrounding rocks with water. Surface indications, though not essential for sane prospecting, give confidence and sometimes aid to the operator.

**Application of principles to Western fields.**—Before applying the above principles to Western fields, it might be well to point out that there are places in which the essential conditions and many of the favorable ones exist, which do not yield oil or gas. In other words, there are areas which are geologically possible and some even geologically probable, which do not yield oil and less often gas.

For the purpose of applying the principles underlying the occurrence of petroleum and natural gas as outlined above, to conditions in Western Canada, a brief outline will follow, of the geology of a wide belt lying east of the Rocky Mountains and extending from the United States on the south to the Arctic ocean on the north.

**The accompanying table of formations, compiled from the reports of the Geological Survey of Canada, include formations recognized over considerable areas and those of interest in connection with the hydrocarbons.**

**Tertiary.**—Paskapoo. Exposed over large areas in Western Alberta. Light colored sandstones with bluish and greenish shales. In the foot-hills there is a thickness of over 5,000 ft., but the formation thins out on the plains. In the southern and western fields of United States, there are evidences of oil in rocks of similar age. Fossils indicate a fresh water origin.

**Cretaceous.**—Edmonton. St. Mary river beds of southern Alberta. Large areas exposed in central and western Alberta. A series of light colored clays and sands containing coal seams and forming a brackish water transition formation between the fresh water Paskapoo and the marine Bearpaw series. Thickness is at least 700 ft. in central Alberta. North and west of Edmonton are surface indications of oil. The Edmonton and Paskapoo beds in this area represent the transition period between the Cretaceous and Tertiary, known as the Laramie.

**Bearpaw.** (Pierre-Foxhill). Exposed in large areas in the foot-hills, in central and eastern Alberta, in southern Saskatchewan and southwestern Manitoba. Mostly marine, but in places, brackish and fresh water formation. Variable thickness up to and over 1,000 ft. No authentic indications of oil.

**Belly River.** (Judith River). Sandstone and shale formation resembling the Edmonton. Thickness up to and over 1,000 ft. Similar age to Dunvegan beds in the Peace River area. Found in the foot-hills and over a large part of southeastern Alberta. Indications of oil, and gas have been found in several places in Alberta in this series.

**Niobrara-Benton.** Shales, some calcareous and many dark colored and sandstones. From a few hundred feet in thickness on the plains to several hundred in the foot-hills. Marine origin. Oil is found in rocks of this age in the Western States and there are indications in Canada. Besides the occurrence in the foot-hills, there is a large area exposed in the Athabaska River country, north of Edmonton.

**Dakota.** Fresh water sandstones in southern Alberta. Marine sands in northern Alberta. Gas wells between Bow Island and Medicine Hat have good flow and strong pressure. Farther north on the Athabaska country, the Dakota seems to have served as a reservoir rock for oil coming from underlying Devonian limestones.

**Kootanie.** Sandstones and shales found in the Rocky Mountains and their foot-hills. Found in Dakota and Montana on the plains, so will likely be found to underlie the younger formations over large areas of the Canadian plains.

**Jurassic.**—Ferne Shale. Black and brownish shales of marine origin, found in the mountains and foot-hills and varying in thickness from 1,600 ft. in the former to 200 ft. in the latter. They are traceable north to the Athabaska. It is probable that they may continue for some distance eastwards from the foot-hills as a gradually thinning formation.

**Triassic.**—Upper Banff Shale. Red, sandy shales, capped by a bed of limestone. Traced north to the Brazeau and probably correlated with the Triassic of the upper Peace and Pine river areas. Marine origin.

**Carboniferous.**—Thick beds of limestones occur in the Rocky Mountains and may continue eastward into the plains as a thinner formation.

**Devonian.**—Like the Carboniferous, they occur in the mountains and probably continue eastward as a hidden formation. Limestones of this age are found over large areas from northern Alberta to the Arctic. Here, they are of special interest as being the probable source of the oil that impregnated the tar sands.

The country lying to the north and northwest of Alberta has been only slightly studied by geologists, and very few of the formations found there have been assigned to their definite horizons. It is well known, however, that large areas of Tertiary, Cretaceous and Devonian and probably Jurassic-Triassic rocks are exposed in this wide belt.

**The following list of the probable succession of events, compiled from the areal geology, will give an idea of the structural geology:**

1. A subsidence of probably the whole of the area in Canada between the Cordilleras and eastern Manitoba as far north as the lower Mackenzie basin, throughout Palaeozoic times, is evidenced by the exposures of a fairly complete series of Palaeozoic formations in Manitoba and in the Rocky Mountains, and by the extensive occurrence of Devonian limestone in the Mackenzie basin.

2. At the close of the Palaeozoic, there was probably a fairly general emergence, as submergence during early Mesozoic times is represented only by a belt of Jura-Triassic rocks appearing in the Rocky Mountains and widening to the north.

3. During Cretaceous times, there was an oscillation of the crust, providing alternating land, shallow water and marine formations, and too complicated to allow even a brief outline of the succession of events.

4. Oscillation of the crust continued during the Laramie and was followed by a general upward movement of the Rocky Mountain area.

5. Tertiary lakes probably covered considerable areas east of the mountains.

6. Elevation, erosion and later glaciation.

It will be of interest to know: the thickness in different localities of the several Cretaceous formations east of the mountains; to what extent the Palaeozoic and early Mesozoic underlie the Cretaceous on the plains; and whether the structures of the older formations below, conform with the newer ones above.



Information on these points will be of interest in the search for oil and gas.

Important flows of gas have been met in several parts of southern Alberta and some also in central Alberta. Farther north, especially in the vicinity of Athabaska river, there are evidences both from borings and from natural gas escapes, of great accumulations over wide areas.

**The outlook for oil in southern Alberta** has been brightened by the recent finds and reports of occurrences near Calgary and at points farther north. But it is in the northern part of Alberta and in the vast area to the north and west of that province, that the best surface indications of the existence of oil are to be found.

Cairnes, in his report on the Moose Mountain district of southwestern Alberta, says: "There are several likely gas horizons in this district, any or all of which may be gas-producing at favorable points. Medicine Hat gas comes from about the middle of the Belly River formation; Langevin gas comes from the same horizon; the Cassils gas is from a higher horizon, just at the bottom of the Pierre. There is also a likely horizon at the bottom of the Edmonton, and one higher in the same formation." Of the indication of gas in the country between the Peace and Athabaska rivers, McConnell writes: "The natural gas springs have less value in themselves at present than in the indications they afford of the existence of petroleum beneath." Referring to the bitumens found in the valley of the Athabaska, the same writer says. "The tar sands represent an upwelling of petroleum to the surface unequalled elsewhere in the world, but the more volatile and valuable constituents of the oil have long since disappeared, and the rocks from which it issued are probably exhausted as the flow has ceased. In the extension of the Tar Sands under cover the conditions are different, and it is here that oils of economic value should be sought." He then points out that in other parts of the field the corresponding sands are overlaid by impervious shales, and that there is a probability that small anticlinals or other conditions in the beds and overlying shales may supply the necessary conditions for oil accumulation. Indications of oil as afforded by bitumen are not confined to the above locality, but are found on Peace river, Lesser Slave lake, and in many parts of the Mackenzie basin where Devonian limestones are exposed. Camsell, in a recent paper on the Mackenzie River region, writes: "The most important mineral products of the lowland portion of the basin, however, and possibly of the whole of this portion of Canada are oil and gas, evidences of which are found from the height of land on the south to the Arctic ocean on the north. The original source of both these substances is believed to be in the Devonian rocks, and since these rocks cover about half of the total area of the whole Mackenzie basin, the possibility of discovering oil pools of importance in this region is excellent. Gas has been proven in great quantity by several drill holes, but little intelligent effort has so far been directed to the search for oil."

In summing up, it might be said that there is a wide belt of country lying to the east of the Rocky mountains and extending from the United States on the south to the Arctic ocean on the north, which may practically all be regarded as geologically possible oil and gas country. The occurrence in this belt of large areas presenting all the essential conditions and many of the favorable ones for the accumulation of hydro-

carbons, makes it seem not too unreasonable to classify some large parts of the belt as geologically probable fields.

It would not be right to consider the probabilities of an area without noting some of the factors which may make more uncertain the finding of oil and gas. Overlying beds may not be sufficiently consolidated to check loss. The exposure of reservoir beds by erosion, which has caused an enormous loss of oil and gas in many parts of the world, is well illustrated by the occurrence of bitumen in the Dakota sands overlying Devonian limestone in the Athabaska basin. As was mentioned, this bitumen is undoubtedly the heavy residual oils left by the lighter oils of petroleum pools which had gained access to the surface. There are also the crucial possibilities that there was not sufficient oil and gas in the original sources, and that there were not the right conditions for accumulations. Unfortunately, the investigations relative to the hydrocarbons, have not put us in a position to hazard a guess on these points, and we are forced to reason by comparison to proved oil and gas fields.

#### U. S. IRON PRODUCTION IN 1914.

Output of iron ore in the United States in 1914 decreased about 33 per cent. from preceding year, according to estimates of the Geological Survey.

Iron ore mined in the United States in 1914 is estimated at between 41,000,000 and 42,500,000 long tons, and quantity shipped from the mines to receiving ports and iron manufacturing centres between 39,500,000 and 41,000,000 long tons. In 1913, 61,980,431 long tons were mined. These estimates are based on preliminary reports from 52 of the important iron mining companies which represent the principal iron producing districts and whose combined output in 1913 was more than 90 per cent. of total tonnage of iron ore mined in that year.

The average decrease in quantity mined by these 52 companies was 33 per cent., compared with their output in 1913, and if this average decrease should hold for all the iron mining companies in the United States, the total output of iron ore in 1914 should approximate 41,440,000 long tons, compared with 61,960,437 long tons mined in 1913. A curve of iron ore production would, therefore, show the output of 1914 to be about on a par with that of the years 1905 and 1911.

In the Lake Superior district, where about 85 per cent. of the domestic iron ore is mined, the average decrease in production was about 37 per cent., thus indicating a total production for that district of about 32,915,000 long tons in 1914, compared with 52,516,156 long tons mined in 1913. The shipments of ore from this district apparently decreased about 34 per cent., and accordingly the shipments should approximate 32,790,000 long tons in 1914, compared with 50,168,134 long tons in 1913.

According to the preliminary reports the stocks of iron ore at the mines apparently increased more than 500,000 long tons during 1914, so that the total stocks at the close of 1914 should range between 13,400,000 and 13,500,000 long tons, compared with 12,918,633 long tons on hand at the close of 1913.

Prices generally were 50 to 75 cents a ton lower than in 1913—as low as or lower than those of 1912 and 1905. The depression in the iron industry affected seriously the lake carrying trade, which depends largely on the transportation of ore from the Lake Superior districts to ports at the head of Lake Michigan and at the foot of Lake Erie.—Boston News Bureau.

## NEWFOUNDLAND

By P. B. McDonald.

There has long been talk of Newfoundland becoming part of the Dominion of Canada; but nothing has resulted from it and nothing is likely to. Newfoundlanders do not care for nor take to the idea, any more than they sympathize with the ideals of the other great country to the south of them the United States. Possessed of an island of 42,000 square miles (which is more than the area of Ireland), and with important privileges in Labrador, this quarter of a million people who have grown up mostly along their far-away east coast, desire principally to govern themselves, live their own lives, and continue undisturbed in the practice of the old-fashioned ways they like best.

It is realized in St. Johns that, in case of confederation, many of their present businesses and viewpoints would appear out-of-date; and it is not entirely clear that the sudden grafting of modern ways on a people devoted to other standards would be as satisfactory as the promoters claim. It must be understood that primarily and fundamentally Newfoundland is a coast line, four or five hundred miles from anywhere, out of touch with railroads and possessed of interests and knowledge only in fishing, shipping and the like.

### Mineral Resources of Newfoundland.

**Iron**—In a mineral way, Newfoundland is of course famous for its two great iron mines under the storm-lashed waters of Conception Bay. Their product, a blocky, hard ore of excellent furnace qualities, is known in all the principal iron markets of the world. With a location on tidewater in the North Atlantic, shipping to America or Europe is equally convenient. It is these two great mines, owned by the Dominion Iron & Steel Co. and the Nova Scotia Steel & Coal Co., which German interests identified with Krupps were so anxious to acquire when, as they fondly hoped, the British colonies would fall to them. Both of the companies on Bell Island have developed their iron ore seams in the most up-to-date manner for the economical handling of large tonnages, and the long slopes extending under the sea for thousands of feet can produce immense quantities of ore for conveying across the little island to sheltered anchorage where the ore steamers are loaded.

Newfoundland's iron ore is accessible, developed, sure. There are many millions of tons in reserve and the various conditions of success, such as labor, transportation and cost have been worked out satisfactorily.

**Other Minerals**.—Aside from the Bell Island iron mines, whose accessibility is exceptional, the mineral wealth of the colony is locked up from lack of roads and by the general difficulties of doing business in a far-off barren wilderness where the expenses of development become prohibitive. In addition, much of the land liable to become valuable is held by individuals or companies waiting for the boom that never comes. Coal, oil, metals, are known to exist, particularly along the desolate west and south shores; but the combination of qualities necessary for their successful development has never materialized.

**Copper ore and pyrites** have been mined in Notre Dame Bay on the northeast coast, and several English and one or two American companies have made some profits. The Cape Copper Co. in particular, an English company which operated for many years around Tilt Cove, has been successful in its ventures and is

still working, though with reduced forces, at a new prospect farther north.

**Operation difficulties**.—Occurrences of valuable minerals of various kinds have been noted scattered over the island. A few attempts have been made at developing them. In the majority of cases the difficulties inherent in so doing are tremendous. A band of oil-drillers or miners set down on a lonely bit of coast with instructions from London or Montreal to proceed in a certain manner, soon run into complications which they find difficult to explain to far away directors. Back from the fishing villages there are no roads. Transportation is slow and expensive. Mails are tedious and the barren, desolate country gets on the nerves of the workmen. Due to peculiarities of the problems encountered, it requires an unusual combination of qualities in a superintendent or responsible head to achieve the initial results aimed at, so that when irregularities, which must be expected are met with in the geological nature of the deposits, it is usual to find disagreement among the directors as to the proper course to pursue. The entire undertaking is a venture requiring optimism and agreement in all matters to make the necessary difference between success and failure.

**Undeveloped coal and oil**—Thus, there remain undeveloped the important coal areas in the southwest section undoubtedly a continuation of the Cape Breton occurrences and the oil fields at Parsons Pond farther north along the west shore. The former have been withheld to a certain extent by landholding interests with exorbitant ideas as to their recompense for being there first, and the titles are a little clouded by litigation. The oil lands had a start at being drilled several years ago when a British company engaged some American well-drillers from the Pennsylvania field, but difficulties and disagreements arose and the work was finally stopped after a few holes had been put down and one small well discovered.

Other attempts at mining gold, copper, and miscellaneous minerals have not succeeded much better. It is not that the substances are not there in at least moderate quantities and values, but the extraordinary problems of profitable extraction and marketing have proved too great for the continuance of effort necessary for a final success.

At present there is talk of a big industry to employ between one thousand and two thousand men for the west coast at Bay of Islands. The company is known as the Newfoundland Products Co. with a capital in the millions, and the government is passing on water powers, land and mineral grants, in accordance with the company's intention to manufacture carbide phosphates, etc. It is possible that, as time goes on, the west coast, where are said to be the most attractive lands for settlement in the island, will build up to some comparison with the Nova Scotia side of the Gulf of St. Lawrence. The natural conditions there for varied industries are more favorable than along the other shores where fishing will undoubtedly continue to be the staple calling. The west coast has coal, oil, water-powers, the most attractive areas of real soil on the rocky backbone of the island, and is more adjacent to the mainland. As things are now, however, the great bulk of the colony's population lives in the numerous bays on the storm-beaten east coast. The west coast, like the south and north coast, is a vast, lonely expanse of desolateness and solitude.

# STRUCTURAL FEATURES OF THE ALBERTA OIL FIELDS\*

By D. B. Dowling.

The interest which has been aroused in prospecting for oil in the foot-hills of southern Alberta, and in the oil-possibilities of the known gas-fields situated in the less-disturbed areas, called for a much closer examination of structure, thickness, and composition of the underlying rocks of the region than had hitherto been made. The areal geology of the larger part of the great plains was outlined by Dawson, McConnell, and Tyrrell, between 1881 and 1885. The foothill area was not critically examined at that time, owing to the

tions south into Montana have been critically examined.

The structure of the outer portion of the foothills has been partly mapped and a comprehensive view of its general character may be gained from the accompanying sketch and sections, Figs. 1 and 2. It will be seen from them that there was an uplift of the lower measures toward the mountains, accompanied by profound fracturing throughout the disturbed zone. Since the lines of fracture penetrate below the beds containing the possible oil supply the fault

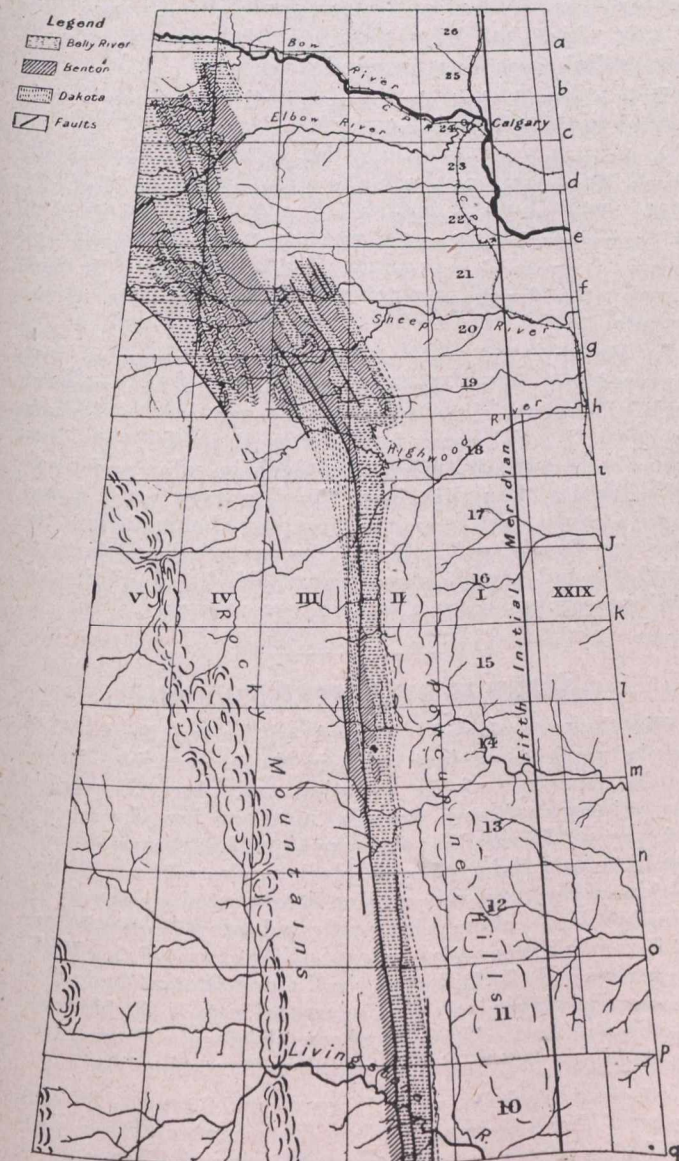


Fig. 1. Perspective diagram, Foothills of Southern Alberta

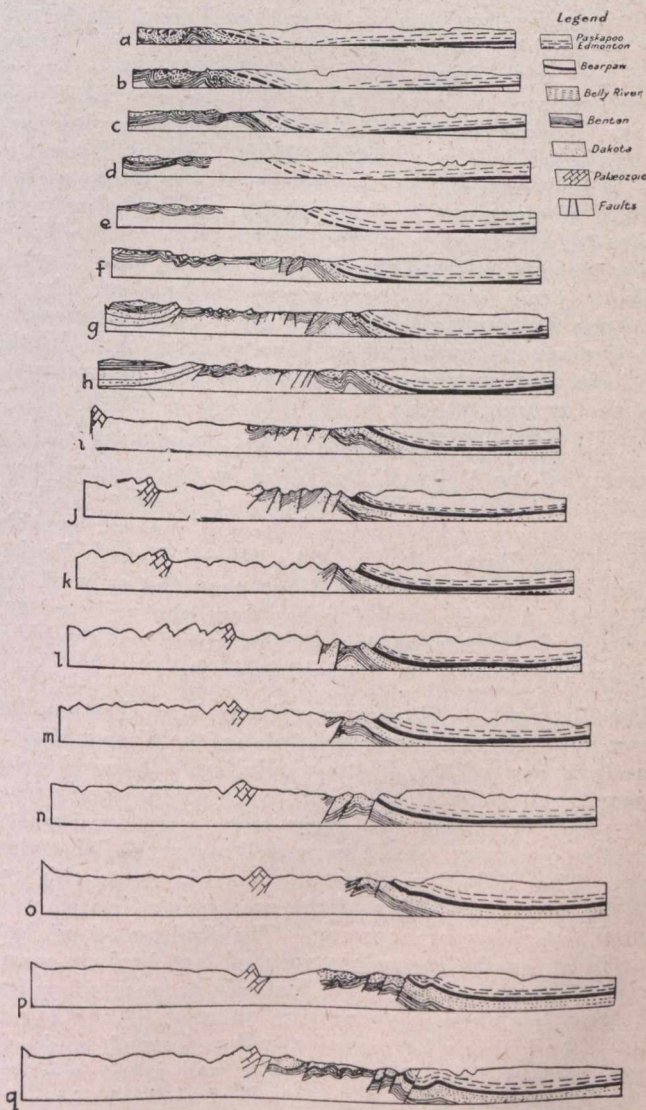


Fig. 2. Structure section, Southern Alberta Oilfields.

time which would have been required for its proper study and the difficulty that was found in recognizing in the foothills the divisions which had been adopted in the mapping of the formations of the plains. This was due in great measure to the paucity of exposures in continuous sections of the lower divisions of the Upper Cretaceous. Since the pioneer work in the plains was published, the beds which form continua-

blocks have necessarily a limited oil-drainage area and do not afford promising ground for wells. Our field of study has been limited, therefore, to the eastern edge of the broken country in the hope of finding anticlines in close connection with the less-disturbed beds of the Alberta syncline which lies to the east. One of these on Sheep Creek is being thoroughly prospected and one well is now producing a small quantity

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

of very light oil. Another in Township 23 west of Elbow River has yielded heavier oil.

In the country to the east of this broken area and the syncline indicated in Figs. 3 and 4, the beds are so slightly flexed that they seem at any one point to be almost horizontal. They are as a rule less consolidated than the beds near the mountains, and the rivers are deeply trenched. This river erosion is accompanied in nearly every case by a series of land slips, extending back for some distance from the banks. This already has been interpreted as faulting by several "experts" and an intricate structure showing anticlines and faults has been pictured providing many "oil companies" with attractive prospectuses. There is a wide anticline, however, in Southern Alberta, between the outer foothills and the Cypress Hills at the eastern boundary of the province, which extends from Northern Montana well into Alberta. This had already been the subject of investigation for a possible natural gas reservoir; and the wells at Bow Island which supply Lethbridge and Calgary are located on it. Attention has again been called to it by the discovery of slight signs of oil in springs on the slopes of the Sweet Grass Hills in Montana, and several drilling rigs have been placed in the valley of Milk River and even at the Boundary line, on the flanks of the above-named hills. The borings in this vicinity will probably penetrate the sandstones of the lower part of the Belly River series, and also the Benton, before reaching the Dakota, from which there seems to be some chance that gas at least will be obtained. The thickness of the Cretaceous measures is here smaller than in the foothills, and very deep wells will not be necessary to test the ground.

A flat anticlinal structure is also indicated by the outcrop of the Belly River rocks in the eastern part of Alberta. This anticline runs in a northwest direction and is crossed by several stream valleys, notably that of the Battle River. The Grand Trunk Pacific Railway crosses the Battle River near the axis of the anticline. A well, sunk for gas near the railway but to the west of the centre of the anticline, struck a small gas reservoir at a depth of 2,340 ft.

**Development.**—Oil seepages have been known for many years in the mountains along the International boundary east of the Flathead Valley. Several companies bored wells at the outer edge of the mountains, and about six years ago there was some excitement over the discovery of oil in a well near the Waterton lakes. The difficulty of getting machinery to this region and the probability of the area being limited prevented extensive prospecting. The finding of oil last year in an easily accessible area of less broken country at the outer edge of the foothills at once attracted the attention of the speculative element of the population; and many companies were formed and oil leases applied for. The discovery well is situated on an anticline of Benton shales, flanked on both sides by sandstone ridges cut through by the valleys of three streams. Since the sandstone at the crown of the anticline has been removed by denudation, the direction of the anticlinal axis is marked by a series of transverse valleys eroded in the shales. These depressions afford favorable locations for derricks; and 11 wells are now being bored. In the country to the west of this anticline many other drillings are being made so that in the portion of Alberta shown in Figs. 1 and 2 there were during 1914 about 36 separate points of attack, mainly in the foothill belt. Two wells have reached depths of more than 3,000 ft. with-

out success. Seven, including the discovery well, are over 2,000 ft. deep. Fourteen are over 1,000 ft. deep and thirteen others have reached smaller depths.

Three companies are boring in the Milk River Valley and four in the foothills north of Bow River. In a few cases it may be considered that the ground has been found to be barren of productive reservoirs; but in the majority of cases the mechanical difficulties have been so great, owing to the depth to the prospective oil-sands, that no positive result has been reached. In some cases the wells have been badly located from the viewpoint of structure.

In the discovery well, light, gasoline oil and a heavy gas flow were found at 1,550 ft. in sandy beds in the lower Benton. At 2,700 ft. another flow of gas and oil was found in the Dakota or in sands of about that horizon. This oil was also light in specific gravity (about 55 deg. Baume) and was accompanied by a heavy flow of gas which has been shown by experiment to produce a light gasoline on condensation.

It is claimed that showings of oil have been got in several wells in the vicinity.

A discovery of oil 40 deg. Baume in the well of the Moose Mountain Oil Co. was announced on Nov. 24, 1914. The well has since been shot and a yield of 25 bbl. per day is claimed. The oil is dark brown and shows a greenish color by reflected light. It was struck at a depth of 1,690 ft. in the top beds of the Dakota.

In March, 1915, two wells near the discovery well reported oil. The Heron-Elder well, on the western limb of the anticline, reached the top of the Dakota at 2,746 ft. Oil came into the well at 2,774 ft. and rose about 2,000 ft. The oil is dark in color and probably heavier than that from the discovery well. About a mile south and near the crest of the anticline the Western Pacific well reached the top of the Dakota at 2,150 ft. and report gives about 300 ft. of oil in the well accompanied by a strong gas pressure.

### LASSEN IS AN ACTIVE VOLCANO.

The latest reported outbreak of Lassen Peak, California, marks a distinct point in the progressive change in the character of the eruption and places Lassen in the category of sure enough, more or less dangerous, volcanoes. Heretofore the eruptions have carried only boulders and light ashes as black smoke without illumination. The present eruption is reported as involving genuine lava whose cloud-reflected glow reminds one of Stromboli, the active volcanic lighthouse of the Mediterranean. J. S. Diller of the United States Geological Survey has just received a telegram from J. R. Milford, Superintendent of the Northern California Power Co., at Redding, California, dated May 20, stating that:

"Lassen Peak in violent eruption 9.30 to 11.30 last night. Fire observed coming from crater. Incandescent ejecta roll down the mountain side. I observed spectacle from Volta (10 miles from Lassen Peak). Many in Sacramento Valley saw same. At Manzanita Lake (3 miles from the crater) to-day storm clouds prevented complete observation. Activity immensely increased."

The present eruption means, according to Mr. Diller, that the explosions are getting down into real hot stuff and that the activity is more completely volcanic. Heretofore the ejected fragments blown out by the steam explosions were rarely ever red hot. Vulcan is evidently on the job and giving a most attractive exhibit for the Panama-Pacific Exposition.

## FIELD OPERATIONS OF THE GEOLOGICAL SURVEY IN 1915

### In the Maritime Provinces.

The Geological Survey is placing several parties in the field to carry on geological investigations in the Maritime Provinces during the summer of 1915. The economic possibilities of a number of districts will receive attention.

Mr. E. R. Faribault, who has made a special study of the gold-bearing series of Nova Scotia, will continue the geological mapping of this series in Queens and Shelburne counties.

The geological mapping of the vicinity of St. John, New Brunswick, will be completed by Dr. A. O. Hayes. Dr. Hayes will make an examination also of the productive coal measures of New Glasgow, Nova Scotia, and vicinity, and will commence the detailed mapping of this area on a scale of 200 ft. to 1 in.

Mr. W. J. Wright will complete the work for the geological map of the Moncton area and will continue his studies of the oil-bearing shales of the railway belt between Moncton and St. John.

Under the supervision of Dr. L. Reinecke an investigation will be made in southern New Brunswick of materials suitable for road metal and the locations of these will be indicated on maps.

Mr. C. L. Cumming will continue his examination of the igneous rocks of the vicinity of St. John; Mr. W. A. Bell will carry on palaeobotanical studies near New Glasgow, N.S., and some localities in Nova Scotia will be visited by Dr. E. M. Kindle, the invertebrate palaeontologist.

### In Ontario and Quebec.

The Geological Survey is continuing its geological investigations in Ontario and Quebec during the summer of 1915 by placing a number of parties in the field in each province. Studies of the economic possibilities of the better known sections will be carried on, and exploratory work will be conducted in the more remote sections.

An investigation of the asbestos deposits will be conducted by Dr. R. Harris, who will map the country in the vicinity of Thetford Mines on a scale of 1 mile to 1 inch.

Dr. M. E. Wilson will continue the geological examination of the Buckingham area, paying particular attention to the deposits of mica, graphite and apatite. Mineralogical investigations in the neighborhood of Templeton will also be carried on by Dr. Auguste Ledoux.

An investigation of the mineral and other natural resources of the Lake St. John region will be conducted by Mr. J. A. Dresser. This will include the Palaeozoic basin surrounding the lake and the deposits of iron ore in the region to the east. Dr. J. A. Bancroft will complete the examination of Mount Royal tunnel.

Exploratory work will be carried on to the south and east of James Bay. Dr. H. C. Cooke will make a geological reconnaissance of the Waswanipi river basin, and Mr. T. L. Tanton will continue the reconnaissance of the Harricawaw river, special attention in both cases being given to areas of economic importance. A survey of the east coast of James Bay will be made by Mr. W. E. Lawson, of the Topographic Division.

Ornithological investigations will be carried on by Mr. P. A. Taverner. Perce will be again visited, and about a month will be spent on Magdalen islands dur-

ing the bird migrations. A visit will probably be paid to Anticosti island and the north shore of the Gulf of St. Lawrence, where work will be done in conjunction with Dr. Charles Townsend, who is making an intensive study of the ornithology of Labrador and the north shore of the Gulf.

Dr. W. H. Collins will continue his work on the correlation of the pre-Cambrian formations north of Lake Huron, and will start the areal mapping of the Sudbury district and an investigation of the nickel-copper deposits.

The study of the silurian formations of southwestern Ontario and Manitoulin island will be continued by Dr. M. Y. Williams.

Mr. W. A. Johnston will complete the mapping of the Orillia, Brechin, Kirkfield, Beaverton, Sutton and Barrie sheets, after which he will carry on special soil surveys in the district about Ottawa. Soil surveying, which includes the classification and mapping of the surface soils, is a new activity of the Geological Survey, and the resulting maps and reports will be great aids to the agriculturist seeking allotments of land and to the Government in securing the utilization of different classes of land to the best advantage.

A study of the pleistocene geology in southwestern Ontario, between London and Lake Erie, will be undertaken by Mr. J. Stansfield, who will give special attention to such economic deposits as clays, sand and gravel, road metal, building stone and materials for lime and cement.

Triangulation of the Sudbury district will be done by Mr. S. C. McLean, and a topographic map of the same district will be made by Mr. E. E. Freeland.

The economic possibilities of certain clay and shale deposits in both provinces will be examined by Mr. J. Keele, and their suitability for the manufacture of structural material, paving brick, sewer pipe, etc., investigated.

Dr. L. Reinecke will study and map materials suitable for road metals between Ottawa and Prescott and south of Montreal. This work is of very great importance in connection with the construction of better highways.

Mr. F. H. S. Knowles will carry on studies in physical anthropology among the Iroquois Indians.

Archaeological investigations will be conducted in Ontario. Mr. W. J. Wintemberg will continue the excavation of the old Indian village site at Roebuck, Grenville county, after which an examination will be made of certain prehistoric mounds on the north shore of Lake Ontario.

### In Western Canada.

Field operations by the Geological Survey will be continued in western Canada during the summer of 1915, and particular attention will be given to our economic resources in minerals, both metallic and non-metallic.

Dr. E. L. Bruce will continue his investigations of the ore deposits of Amisk (Beaver) Lake district in northern Manitoba and Saskatchewan, and Mr. A. McLean will complete the mapping of the Pembina Mountain area near the U. S. boundary.

A geological exploration of the Churchill River area from South Indian lake to Hudson bay will be made by Mr. F. J. Alcock.

Mr. Charles Camsell will examine the geology at the east end of Lake Athabaska and look into the reported occurrence of silver at Fon du Lac. The latter part of the season will probably be spent by Mr. Camsell in making an exploration of the region traversed by the

Grand Trunk Pacific Railway between Fort George and Telkwa.

Mr. S. E. Slipper, in addition to completing the geological field work for the special map of the Sheep Creek area, Alberta, will make an investigation of the underground waters of an area in southern Alberta in the vicinity of Lethbridge, and will continue the collection of boring records in the oil and gas areas.

Further investigations into the coal resources of the western provinces and of the oil prospects will be made by Mr. D. B. Dowling.

Dr. Bruce Rose will study the geology of the Flathead and Crownsnest coal areas, mapping the productive coal measures and inquiring into the prospects for oil. An examination will also be made by Mr. F. H. McLean of sections of the Benton, Kootenay, Fernie and Blairmore formations of these areas, and fossils will be collected. Mr. J. S. Stewart will also have charge of a party under Dr. Rose's supervision studying the structure of the disturbed belt of the foot-hills south of the Oldman river.

Dr. S. J. Schofield, after completing the investigation of the silver-lead and zinc deposits of Ainsworth and the geological mapping of the country between Kootenay lake and Cranbrook, will start mapping the geology of the Windermere area.

Mr. O. E. Le Roy will be occupied with work entailed by his appointment as a member of the commission named to investigate the iron resources of Canada. Should time permit the mapping of the Slocan area will be completed.

Dr. C. W. Drysdale will map the Lillooet area on a scale of 2 miles to 1 inch and make an examination of the ore deposits.

Mr. J. D. McKenzie will study the geology of the Hazelton-Aldermere area, paying particular attention to mineral deposits.

A geological examination of an area on Stewart river, Yukon, will be made by Dr. D. D. Cairnes, special examinations being made of the gold-bearing quartz in Dublin gulch, McQuestion river, and of silver-lead deposits in the vicinity of Mayo lake.

Dr. E. M. Kindle will carry on stratigraphical and palaeontological investigations in Rocky Mountain park, and Mr. E. L. Burling will examine geological sections along the main lines of the Canadian Pacific and Grand Trunk Pacific Railways.

Mr. C. H. Sternberg will collect dinosaurian and other reptilian remains from the vicinity of the Canadian portions of Milk river and its tributaries, and will explore this region to locate the most promising areas for fossil collecting. Mr. Geo. F. Sternberg will collect reptilian remains from the Edmonton formation on Red Deer river. Both of these parties will also make careful search for fossils of primitive mammals.

Topographical work will be carried on at a number of points. Mr. B. R. McKay will complete the survey of Lake Athabaska; Mr. C. H. Freeman will complete the map of the Sheep Creek section of Alberta; Mr. S. C. McLean will carry on triangulation in coal areas of the Rocky mountains; Mr. D. A. Nichols will make a topographic map of the coal area of Highwood river; Mr. F. S. Falconer will continue the mapping of the district to the north of Revelstoke, and Mr. A. G. Haultain will make a topographic map of the Mayo district, Stewart river, Yukon.

Professor John Macoun and James Macoun will conduct botanical investigations on the islands in the

Gulf of Georgia and on the east side of Vancouver island.

Mr. J. A. Teit will make ethnological studies among the Athabaskan tribes of northern British Columbia. Mr. Christian Leden is collecting anthropological specimens among the Eskimos of the west coast of Hudson bay.

Archaeological investigations will be carried on by Mr. H. I. Smith in the vicinity of Fort Fraser and Hazelton on the Grand Trunk Pacific Railway, and by Mr. W. B. Nickerson in Manitoba.

#### MINING IN NORTHERN BRITISH COLUMBIA.

The sixth annual report of the Board of Trade of Prince Rupert, British Columbia, has been published in pamphlet form. It contains much information relative to activities of the board and the industries and progress of the sea-port city the large area of country for which it is the chief distributing place. In a sense, though, the report is misleading; not that there is any improper attempt at deception, but that the proportion of the immense area of territory that may correctly be designated "Northern British Columbia" included within the scope of the commendable efforts of the board is comparatively small. That this is so may be at once recognized if a map of the province be taken and the extent of the country included in the board's review be compared with the large area of Northern British Columbia as a whole. However, allowance may be made for the natural enthusiasm and optimism that seem to characterize the members of the Prince Rupert Board of Trade responsible for the publication of the pamphlet above referred to, for their home sea-port city is certainly the most populous and important commercial and industrial centre in the British Columbia coast north of Vancouver, which probably accounts for the failure to keep in mind that years before the city of Prince Rupert was thought of gold-mining was important much farther north in British Columbia, the total value of the output of gold from Atlin mining division alone having to date exceeded \$6,000,000.

Concerning mining in the district tributary to Prince Rupert, the board's sixth annual report which was presented last January, says:

"Steady progress in development work has been the feature of 1914, although the existing crises have considerably retarded further growth in development. The outstanding feature of the war has been the blowing in of the smeltery at Anyox and the consequent completion of the development part of the work undertaken by the Granby Consolidated Mining, Smelting, and Power Co., Ltd. This company expended close on \$3,000,000 in purchasing and developing its mines at Hidden Creek and in building and equipping its smelting works at Anyox. The quantity of ore developed is estimated at 12,000,000 tons containing 2.2 per cent. of copper with a small additional value in gold and silver. At 14 1/2 cents a lb. for copper the gross production from this mine will amount to \$78,000,000. It is probable that about 75 per cent. of the gross value will be spent for labor and supplies, and it is certain that a large portion of this amount will find its way to Prince Rupert.

"In the Hazelton district development work has proceeded steadily and several of the mines in that district are beginning to show up very favorably. Proved mines have been made of several prospects and others are in a fair way to prove that they are worthy of taking a place among the producing mines of British Columbia.

"In other districts there has also been a certain amount of work done. Of these districts Portland Canal is worthy of mention on account of the tunnel driven by the Portland Canal Tunnels, Ltd., of Victoria, which has proceeded far enough to show that the work and money spent on this enterprise has been justified. The Omineca district, owing to rumors of a projected railway, has had considerable attention paid to it, in connection with hydraulic leases.

"There are not any new developments in the several coal fields of Northern British Columbia. Most of these districts will take considerable time to develop.

"Considering financial conditions, which are always a large factor in governing development work in mining areas, Northern British Columbia from a mining point of view is showing a steady improvement in its position, and it is a matter of satisfaction to be able to say that there is no doubt that eventually Prince Rupert will become one of the recognized mining centres of British Columbia."

**U. S. BRASS MILLS ARE ABSORBING COPPER.**

The extraordinary efforts being put forth by the brass mills of the United States to expedite deliveries on big orders received for account of foreign countries, have commenced to be reflected in clearances from American ports. Figures show that all previous records have been broken, particularly in the exportation of bars, plates and sheets.

Furthermore, those sceptics who have been unable to reconcile extremely heavy copper sales with small exports of the metal, even after making allowances for the fact that Germany has taken no copper since last August, will find partial answer in data concerning our exports for the month of March just at hand.

In that month exports of brass, including scrap and manufactured bars and plates, amounted to 11,772,727 lb., against 7,624,026 lb. in the preceding month and 3,363,089 lb. a year ago. During the nine months ended with March, covering the period to date, exportations of brass in all forms amounted to 35,747,415 lb., against 23,270,975 lb. in the same period of the preceding year.

The significance of the growth in these shipments was not so much in the total of 36,000,000 lb. as in the fact that an 18,000,000 lb. gain was recorded in the shipment of finished brass as bars, plates and sheets. Heretofore the principal form of brass exports has been as scrap fit only for remanufacture.

Comparative figures are appended:

	1915.	1914	1913.
Brass exports (lb.)			
January . . . . .	5,216,028	2,776,661	
February . . . . .	8,624,026	2,547,250	
March . . . . .	11,772,727	3,363,089	
Nine months (lb.)—	1915.	1914.	1913.
Scrap and old . . . . .	12,795,716	19,108,419	13,503,640
Bars, plates etc. . . . .	22,952,699	4,162,556	5,792,543
Total . . . . .	35,747,415	23,270,975	19,296,183
*Total value . . . . .	\$8,727,397	\$5,691,280	\$6,330,264

\*Includes articles made from brass in addition to scrap and bars.

As brass constitutes 75 per cent. copper and 25 per cent. spelter, the relation of these figures to the copper industry may be readily seen.

Exports of copper in March, according to the Government returns, amounted to 66,583,350 lb., against 96,519,947 lb. last year. Up to March 31 there had been exported in the fiscal period 508,369,337 lb., against 728,767,917 lb. In the period under review,

however, shipments to Germany had dropped to 22,-253,505 lb., whereas in the previous like period there had been exported to that country 239,919,180 lb. Consignments to Holland, chiefly for German consumption, also fell off heavily, the total being but 30,589,-939 lb., against 128,374,858 lb.

With brass mills doubling their capacity in this country and every one of these plants now running three 8-hour shifts, copper is being consumed as never before, and with enlarged capacity will soon be in position to handle a greater tonnage of the metal than ever before in our history. —Boston News Bureau.

The introduction of the tube mill in 1904 had much to do with the development of heavy stamps. Until that time fine crushing in the battery was necessary, in order to secure good recovery by amalgamation and cyaniding; but with the advent of the tube mill it became possible to use screens of coarser mesh, the limiting factor being the coarseness permissible for good amalgamation. It was obvious, therefore, that if battery amalgamation plates could be dispensed with, the only factor limiting coarse crushing would be the size of particles permissible in the tube-mill circuit. The removal of battery plates was therefore the next step toward attaining maximum stamp duties; and now in all the newest mills amalgamation is only carried on after tube milling. We thus find the function and scope of the stamp quite altered; it is now recognized as a crushing device pure and simple, hampered in capacity by tube-mill limitations only; so that, beginning with duties of a few tons from 900-lb. stamps when screens of 900 mesh were necessary, we are now obtaining duties of approximately 30 tons, with 9-mesh screens (0.27 in. aperture) from 2,000-lb. stamps. There is still, however, a considerable range in weight and duty of stamps on the Rand. Many older plants still retain battery plates, and are not provided with the same tube mill facilities as newer mills. This is because capital expenditure on old plants is not always warranted by the life of the mine and the financial position of the company.

Mills on the properties of other groups are obtaining stamp duties as high as 20 tons per day, from 2,000-lb. stamps, with 9-mesh and 4-mesh screens; but the highest duty yet recorded is that of the 2,000-lb. Nissen stamps at Modderfontein B., 29 tons through 9-mesh screen.

**EXPLOSION-PROOF MOTORS.**

Among its investigations dealing with the means of lessening such dangers as attend the use of electricity in the mining industries, the U. S. Bureau of Mines has undertaken one that has for its purpose the establishment of permissible explosion-proof motors for use in places where an electric spark or flash might ignite inflammable gases or dusts.

Technical Paper 101, "Permissible explosion-proof Electric Motors for Mines; Conditions and Requirements for Test and Approval," which has just been issued, mentions the details of construction that the bureau considers essential for satisfactory service, and describes tests of an explosion-proof mining machine motor and its accessories approved by the bureau. The author of the paper is H. H. Clark, electrical engineer.

The U. S. Bureau of Mines has applied the term "Explosion-proof" to motors constructed so as to prevent the ignition of gas surrounding the motor by any sparks, flashes or explosions of gas or of gas and coal dust that may occur within the motor casing.

Before it undertook to establish a list of permissible motors the bureau made a large number of preliminary tests. No motors were approved as a result of this preliminary investigation, for none of the motors tested was considered to possess the characteristics of permissibility. As a direct result of these preliminary tests, however, the bureau decided to make tests to establish a list of permissible explosion-proof motors, and issued its Schedule 2, "Fees for Testing Explosion-proof Motors." This schedule gave the general conditions under which motors could be submitted for test and the fees to be charged for making such tests. Technical Paper 101 sets forth more fully than Schedule 2, the details that the bureau considers essential to satisfactory explosion-proof motor construction.

The Bureau of Mines considers a motor to be permissible when it is the same in all respects as the sample motor that passed certain tests made by the bureau and when it is installed and used in accordance with the conditions prescribed by the bureau.

The paper gives the requirements for approval of motors, outlines the nature of the approval of the bureau and describes the approval of an explosion-proof coal-cutting equipment.

### A PRIMER ON EXPLOSIVES

The United States Bureau of Mines, several years ago, issued a primer on explosives for coal miners which has been in considerable demand ever since.

Now the bureau has issued a primer on explosives for metal miners and quarrymen, by Charles E. Munroe and Clarence Hall. The bulletin, which has just come from the printing office, says in its introduction; "In accidents resulting from the use of explosives in metal mines and quarries in the United States more than 130 men were killed and 250 seriously injured during the calendar year 1913. Moreover, an unknown number of miners suffered from the effects of breathing the harmful fumes and gases given off by the burning or the incomplete explosion of some explosive. Consequently, the Federal Bureau of Mines, which is endeavoring to increase safety in mines and to abolish conditions that tend to impair the health of miners, is studying the kinds of explosives used in mining and the conditions under which these explosives can be used with least danger to the miner.

"Inflammable gas or dust is seldom, if ever, found in quarries or metal mines, and the danger from using explosives there is less than in coal mines; but, as the figures show, the number of men killed and injured yearly in accidents caused by explosives prove the need of both miners and mine officials striving to see that none but proper explosives are used and that these are used properly."

The bulletin contains chapters on combustion and explosion; blasting and mine explosives; fuse, detonators, and electric detonators, firing blasts by electricity; the use of explosives in excavation work; the use of explosives in quarrying; the use of explosives in metal mining and tunneling; drilling and blasting methods on New York rapid-transit tunnel; magazines and thaw houses; permissible explosives, etc.

This publication is Bulletin 80 and it may be obtained free of charge by those interested writing to the Director of the Bureau of Mines, Washington, D. C.

The Third Annual Joint Field Meet of the United States Bureau of Mines, the American Mine Safety Association and the California Metal Producers Association will be held at the Panama-Pacific Exposition September 23 and 24. It is expected that there will be a large attendance of mining men, as the joint meet will either precede or follow the annual meetings of a number of institutions allied to the mining interests, such as the American Institute of Mining Engineers, September 17 and 18; The International Engineering Congress, September 20 to 25; the American Mining Congress, September 20 to 22; the California State Mine Rescue and First Aid Contest, September 22; and the National Safety Conference, under the joint auspices of the National Safety Council and the California Industrial Accidents Commission, September 27 to 30.

On September 23, on the athletic field of the Panama-Pacific International Exposition, there will be a mine-rescue demonstration at 10 o'clock; at 2 o'clock in the afternoon there will be a first-aid demonstration; and at 4 o'clock a demonstration of the explosibility of coal dust.

On September 24, at 10 o'clock, will be held a first-aid contest for inter-state supremacy; at 2 in the afternoon a rescue contest for inter-state supremacy; at 4 in the afternoon a rock drilling contest; and at 8 o'clock in the evening, there will be an award of prizes and souvenirs at the Convention Hall.

The establishment of a plant for copper refining will likely take place, following a conference between the Minister of Militia, General Hughes, the chairman of the Shell Committee, Col. Bertram, Col. Carnegie, Dr. Wilson of the Department of Mines, Messrs. W. D. Matthews and Warren of Toronto. It is intended to have every part of the shells which Canada is supplying made in Canada, and as far as possible of Canadian products. According to a despatch from Ottawa the refining of copper in Canada is now considered probable, and the plant will in all probability be located in New Ontario. Canada is now turning out 30,000 shells a day, and Canadian factories are making high explosives as well as shrapnel shells. A very large amount of Canadian lead has been used in the manufacture of munitions for the British army.

The Railway Age Gazette announces that Russia has placed orders for 22,000 cars with concerns in Canada and the United States, divided as follows:

Pressed Steel Car Co., 7,000 cars, Seattle Car & Foundry Co., 7,000, Eastern Car Co. of Canada, 2,000, Nova Scotia Car Co., 2,000, American Car & Foundry Co., 2,000 and Canadian Car & Foundry Co., 2,000.

All of the cars, except those bought from the Seattle concern, will be the regulation two-truck cars; but those built in Seattle will be four-wheeled carriers.

"Central Station Power in Coal Mines" is the title of a pamphlet just issued by the Westinghouse Electric & Mfg. Co. This pamphlet deals with the subject of electric power for coal mines and shows the advantages to be gained by the operator from using power from central station plants. A number of tables are given showing the cost of operation; curves are also given showing the day and night load in the mine.



# METALLURGICAL PRACTICE ON THE WITWATERSRAND

By F. L. Bosqui

(Continued from last issue)

## Classification.

The necessity of providing a specially thickened and classified pulp for tube mills gave fresh impetus to the study of classification, which hitherto had been chiefly confined to the rather crude methods in vogue of separating sand from slime. The earliest classifiers were of the inverted pyramid type, a first series of spitzluten with small pockets being designed to eliminate the coarse sand and concentrate, which were collected and given a special treatment, and a second series of much larger pockets being used for separating sand and slime. A further separation of sand and slime took place in the sand collectors, the overflow of which passed to a series of return-sand spitzkasten for the further elimination of sand, the final overflow product from the latter going to the slime plant.

When tube mills were introduced in 1904, the coarse product was no longer separately collected but run to these mills; and the apparatus for classification gradually took the form of a simple series of spitzkasten, provided with underflow nozzels of different apertures. This underflow passed to the tube mills, while the overflow went direct to the sand collectors, in which the slime was separated from the sand and discharged by means of adjustable overflow weirs into so-called return-sand classifiers, which in turn discharged their overflow to the slime plant.

The first step in the much-needed improvement in classification was taken in 1908, when Messrs. Caldecott and Smart developed what is known as the diaphragm cone, now generally employed for thickening and classifying tube-mill pulp. This consists of a sheet steel cone, 5 to 6 ft. in diameter and 7 to 9 ft. deep, provided near the apex with an iron disk or diaphragm. This disk is 8 to 10 in. in diameter, and the annular space between it and the sides of the cone is 2 to 2½ in.

The proper action of this diaphragm is obtained only when the cone is full of solids. The mass of sand in the cone then assumes a concave surface, the deepest point from the plane of the overflow edge being immediately under the central pulp inflow. At this point, where the coarsest and heaviest product accumulates, the surface is seen to be in a state of slow continuous subsidence. This slowly subsiding mass of heavy material, conceivably irregular or conical in shape, may be presumed to act as a descending wedge, retarded in its downward course by the supporting diaphragm; while the finer sand, with the slime, tending to adhere to the sides of the cone, would appear to be literally pushed aside and crowded upward by the central column, so reaching the overflow rim and escaping. The slow, thick stream issuing from the apex carries only from 26 to 30 per cent. moisture, and a minimum of the fines which it is desirable to exclude from the tube mill.

These cones have a large capacity, and, barring the one disadvantage of vertical height required, may be considered the most simple and suitable means yet devised for providing all the conditions requisite for a tube-mill feed that will enable the mill to work at highest efficiency. This device is now used either as the sole means of classifying mill pulp, or in con-

junction with hydraulic classifying cones. An important aspect of this innovation was its having made possible the introduction, in 1907, of the Caldecott sand-filter table; a device whose success obviously depended upon securing a suitable thickened pulp, containing a small amount of water and a minimum of slime. The primary object of this appliance, as explained by the inventor, was to obtain sand in such a condition for treatment as would warrant the elimination of sand-collecting vats, which could then be used for treatment purposes. Obviously, the effect of this was to increase very considerably the capacity of a leaching plant.

**Single treatment of sand**—Metallurgically considered, however, the significant feature of this appliance was its revival of the old question of the possibility of single treatment of sand after proper classification. In this connection it is interesting to note a prediction made by Charles Butters in 1895, that "the whole question of double treatment really resolved itself into a matter of filling the vats with clean stuff, and he was confident that the day would come when there would be no double treatment." The first notable success in America in collecting and treating sand in the same vat was at the Homestake mill; but in Africa, with the single exception of the East Rand Proprietary, double treatment has been retained until quite recently.

In 1910, when the new plant for the Modderfontein B. mine was being designed, I undertook to evolve a simpler method than the filter table for obtaining a clean sand, with a view to the subsequent elimination of separate collecting tanks. This classifying plant consists of eight small primary hydraulic cones, 2 ft. 9 in. in diameter and 2 ft. 6 in. deep designed as concentrators for insufficiently ground sand particles from the tube mills. The overflow from these gravitates to four larger hydraulic cones, 8 ft. in diameter by 6 ft. 9 in. deep, which effect a very satisfactory separation of sand from slime, the overflow gravitating direct to the slime collectors. The underflow of the large cones is evenly distributed in the collectors by the Butters and Mein distributor, a device recently revived on the Rand Mines group after several years of disuse.

This system, in view of the possibility of treating a considerable amount of fine (—200) sand in the Butters filter, was found to be well adapted to this mode of filtration, the correct proportion of fine sand and slime being easily obtainable. Moreover, an evenly distributed sand charge was secured, free from lumps and layers of slime. This system has been adopted by other mines of the Rand Mines group; and in newer plants has, with a few modifications, superseded the primitive method of charging sand and slime together into collectors and depending upon a Kaffir and a movable hose for even distribution.

At the Crown Mines, an improved hydraulic attachment for cone classifiers was devised by H. Brazier, the reduction foreman at "C" mill. This consists of an adjustable nozzle for discharging water in proximity to the apex of the classifying cone in the form of a thin circular sheet, directed horizontally between the nozzle and the cone. By means of this system of cone separators, the classification of sand is

permissible within a wide range, and has enabled us to obtain a charge of sand so permeable and uniform that after practical trials the separate sand collector is now recognized to be superfluous, and will be omitted in forthcoming plants to be erected by the Rand Mines group.

We have then at the present time on the Rand two very satisfactory methods for classifying sand: (1) the Caldecott sand-filter table, and (2) the system of hydraulic cones just described. The former possesses the advantage of delivering a solution-borne sand to the treatment tank, and so shortening the time of treatment and increasing the capacity of existing plants, which is a very desirable thing, especially where the saving of capital outlay is imperative, as at the City & Suburban, where the sand-filter table obviated an expensive and awkward extension of plant. But for new mills adopting single treatment of sand, the indirect saving in sand plant would appear to be offset by the lower initial expense of the hydraulic-cone system itself, the small amount of attention required, and its negligible cost of maintenance and operation, as compared with the filter table.

#### Treatment by Cyanide.

It was only after the introduction of the cyanide process that the distinctive terms "sand" and "slime" came into common use. In the early days of cyaniding the bugbear was slime, or the unleachable, finely divided portion of the mill pulp, which the mill man endeavored to avoid making, in order to secure as large a proportion as possible of leachable sand. Until a method of treating slime was devised, this product was impounded in dams; these accumulations have been for the most part treated.

When the decantation process made it possible to deal with current slime direct from the stamp mill, the production of the latter was no longer avoided. Until vacuum filtration was introduced, the slime represented between 30 and 40 per cent. of the total product of crushing; but this proportion has gradually increased with the progressive improvements in treatment, until now as high as 60 per cent. of the pulp is treated as slime. We may say, therefore, that tube mills, improved classification, and the vacuum filter have made possible (1) the treatment of a greater proportion of slime than formerly, which has improved the total extraction, and reduced the cost of treatment, since slime can be more cheaply treated than sand, and (2) the treatment of more finely crushed sand, with consequent improvement in extraction. In the best plants, a recovery of 90 per cent. of the gold from sand and 93 per cent. from slime is now being obtained, or a total recovery of 96 per cent., which is probably the highest extraction economically attainable on the Rand. The metallurgist in Johannesburg to-day is therefore chiefly concerned with those improvements in appliances, general technique, and administration, which, in view of the much reduced grade of ore, will minimize cost of treatment.

#### Treatment of Sand.

The treatment of the sand by leaching with cyanide solution in steel tanks, ranging in size between 45 and 56 ft. in diameter, is still the accepted practice. In the early days an attempt was made to collect and treat sand in the same tank, but an imperfect knowledge of classification, or a failure to recognize its importance, made this scheme impracticable. Until very recently, the prevailing practice was to collect the sand in a series of tanks, known as "collectors," from which it was shoveled out by natives and transferred to the treatment tanks. The majority of plants

were built with the collector superimposed on the treatment tank, but this arrangement was finally superseded by the erection of collectors and treatment tanks on the same level, the transference of sand from one to the other being by means, first, of trucks, and later, by belt conveyor. The latter was supposed to be cheaper in first cost, as it eliminated the expensive steel superstructure for supporting the enormous weight of superimposed tanks, and also reduced the height of pulp elevation. But it would appear now, after a pretty thorough experience with both systems, that, as regards first cost, the superimposed system has a slight advantage; while owing to the rapid disintegration of conveyor belts in the dry atmosphere of the Rand, and the considerable maintenance cost of conveyor systems in general, the superimposed tanks are less expensive to operate, in spite of the higher pulp lift required.

**Methods of collecting sand**—At the present time there is still considerable variation in the modes of collecting sand. The following methods are in use:

1. In the older plants all the mill pulp is run into a collector, through a rubber hose 4 to 6 in. in diameter, manipulated by a Kaffir who moves about in the tank changing the position of discharge to prevent undue slime accumulations; the slime and water, with varying proportions of fine sand, overflow through discharge gates provided with an adjustable canvas blind, which is raised to suit the overflow as the tank fills.

2. The total mill pulp is distributed to the collector by means of a peripheral launder provided with outlets; the water and slime overflow through an adjustable opening at the center.

3. The sand is classified and thickened in diaphragm cones, dewatered on a sand-filter table, and delivered in cyanide solution either to a collecting or treatment tank by means of a Butters and Mein distributor.

4. The sand is classified in hydraulic cones and delivered in water to a collecting tank by means of a Butters and Mein distributor; in one plant the sand will go direct to the treatment tank.

It was formerly customary in some plants to give the sand a preliminary treatment with a weak cyanide solution in the collectors; this practice has now been generally abandoned, and the only operation that takes place in the collector is the forced drainage of the charge by means of pumps, thus reducing the moisture to about 14 per cent. The sand is discharged from the collectors by (1) hand shoveling through discharge doors into treatment tanks or to belt conveyors; (2) by means of the Blaisdell excavator. The high capital outlay required for the latter, without compensating economy in operation, has led to the retention in newer plants of the older system of hand shoveling by natives. All plants using a belt conveyor from collectors to treatment tanks have, however, retained the excellent Blaisdell distributing mechanism for distributing the sand in the treatment tank.

**The system of applying cyanide solution to the sand** does not differ essentially from practice elsewhere, and need not be particularized here. The standard strength of strong solution used ranges between 0.10 and 0.25 per cent., depending upon local conditions, the tendency in recent years being to use weaker solutions than formerly. From 6 to 8 days' contact is usually allowed in the treatment tanks, and about 2 parts of solution to 1 of ore is the average quantity required for leaching purposes.

**The methods in vogue of disposing of the residue** are by hand shoveling or excavation with the Blaisdell machine into (1) trucks, (2) Bleichert aerial con-

veyor, or (3) belt conveyor. The second method is used at only one property, the Brakpan mines, where it is reported to be giving satisfaction; the third method is used on two mines, but whatever advantages it may possess have not been generally recognized; while the first method, namely, truck haulage by surface cable, is in general use. It is considered the cheapest, most flexible, and best adapted to local conditions, and will probably continue to be the favorite means of disposing of sand residue.

#### Treatment of Slime.

Since 1894, the continuous treatment of slime by the so-called decantation method has meant the recovery of over 80 per cent. of the gold from a very considerable portion of the total ore crushed, and has been retained by the majority of operating mines. In most cases, however, it has been retained, not because its limitations have not been recognized, but because possible improvements in recovery do not always justify the sacrifice of capital involved in replacing old plants with new, especially on mines of short remaining life.

The technique of decantation, which is well described in several technical works, need only be briefly touched upon here. The slime pulp from the classifiers is settled in what are known as collectors, large cone-bottom tanks, provided with an overflow rim and adjustable decanter, in which the slime settles to the bottom, the water escaping at the overflow rim. The settled slime charge after decantation, containing approximately 50 per cent. of moisture, is then sluiced out with a weak cyanide solution into the intake of a centrifugal pump connected with the centre of the cone bottom, and transferred to another tank, known as the "first settlement tank." Here the charge is kept in circulation by means of a pump, then allowed to settle, as in the collector, and the gold-bearing solution is decanted off to the zinc boxes. This decanted charge is again transferred, subjected to a similar settling and decantation in a "second settlement vat," and finally discharged to the dam with water or a very dilute precipitated solution. Settlement in these tanks is hastened by the use of lime, which is applied in a variety of ways, being either periodically fed to the stamps or tube mills, or to the slime pulp in slaked form, by means of feed hoppers, or as milk of lime from a grinding pan.

The limitations of decantation are obvious: The displacement of the dissolved gold is only practicable within certain economic limits, so that a certain definite gold loss in the final discharge to the dam must always be reckoned on. This loss is necessarily variable, depending upon capacity, difficulties in settlement, and general design of plant. On the other hand, the process is simple and comparatively inexpensive in operation, and, in spite of the losses through imperfect washing, is peculiarly applicable to the low-grade slime of the Rand. Even the advocates of more exact and positive methods of treatment must admit that in the latest and best designed decantation plants, in which large capacity is allowed for settlement and dilution, and all other conditions are favorable, the margin between results so obtained and the net results of filtration is not a wide one.

The first important innovation in slime treatment was the introduction of the Butters vacuum filter in 1910. The essential features of this device are too well known to require description here. There was from the first no question as to the additional recovery obtainable by the filter; the doubtful point was whether the cost of operation would offset the gain in recovery to the extent

of nullifying its advantages. This, however, has not proved to be the case. The prevailing cost of operating the filter on the Rand is from 2½d. (5c.) to 4d. (8c.) per ton of slime filtered, depending upon tonnage treated; and the additional gold recovered ranges from 6d. (12c.) to 2s. (48c.) per ton, depending upon the efficiency of the decantation plants superseded by the filter.

The vacuum filter is now generally admitted to be applicable in the following cases: (1) Where it is desirable to extend a decantation plant of inadequate capacity or obsolete design; (2) where difficulties in settlement make it impracticable to use decantation without prohibitive extension of plant; (3) in all new plants. The most notable instances of (2) were the case of the Randfontein Central mill, where a comparatively new decantation plant treating 2,000 tons of slime per day was replaced by a Butters filter, resulting in a considerably increased recovery of dissolved gold; and the case of the Robinson Gold Mining Co., where the expenditure of £32,000 in 1911, on filter and Pachuca agitators, resulted in an increased net profit of £2,500 per month.

The slime treatment in the modern plants consists in settling the slime in the same type of settlers as is used in decantation, namely, in tanks as large as 56 ft. in diameter, provided with cone bottoms, decanters and overflow launders. When the charge is settled and decanted down to about 50 per cent. moisture, it is transferred with cyanide solution to the Pachuca tanks. These tanks are of standard size, 15 ft. in diameter and 45 ft. deep, and hold between 80 and 100 tons of slime (dry weight), depending upon dilution. This agitator, requiring air representing in volume and pressure an expenditure of about 3 h.p., is considered, by reason of its simplicity and low operating and maintenance cost, to possess advantages over the various mechanical types, in spite of its great height. Agitation is continued from 6 to 8 hours, and the pulp is then transferred to a large storage reservoir, whence it is delivered to the Butters filter plant, as required.

Two modifications of this procedure will be adopted in the next plant to be erected by the Rand Mines, Ltd. The old system of intermittent slime settlement will be replaced by continuous settlement in Dorr thickeners. In trials conducted with this device it was found impossible to reduce the slime to the same low moisture as the intermittent system, without a much larger capacity than is allowed in American mills, where this device is chiefly applied to the much more simple settlement of slimed mill pulp containing a considerable quantity of fine sand. To compete with intermittent slime settlement on the Rand, a Dorr thickener 40 ft. in diameter cannot handle more than 150 tons of slime per day; but even so, in view of the labor and power consumption involved in handling intermittently settled charges, and the high capital cost of slime settlers, the continuous system would appear to possess distinct advantages.

The continuous agitation of slime is made possible by the system just described; and is particularly well adapted to the newer plants where the height of the Brown agitators can be utilized for the required gravity flow into the Butters stock tank. This system of allowing pulp to flow slowly through a series of agitators was first applied in Mexico; its first application on the Rand was at the East Rand Proprietary about two years ago. It seems likely that all plants to be erected in the future will adopt continuous slime settlement and agitation, followed by vacuum filtration.

### Precipitation.

The use of filiform zinc for precipitating gold was introduced on the Rand by MacArthur in 1890. At first no difficulty was experienced in the deposition of gold from the stronger cyanide solutions required for sand treatment; but when it was found possible to recover gold from slime with much weaker solutions, precipitation on zinc became more difficult. It was at this time that the Siemens-Halske electrolytic process, which was more effective than zinc in dealing with these weak solutions, threatened to replace the older method; but owing to serious defects in operation, already touched upon, it was finally abandoned in favor of the zinc method, which had been rendered much more efficient by the immersion of the shavings in a solution of acetate of lead, preparatory to filling the extractor boxes. With this exception, precipitation practice on the Rand does not differ materially from that in other mining districts where filiform zinc is used.

The zinc shavings are cut in the usual manner to a thickness of about 1/500 in. and 1 cu. ft. of such filaments loosely packed, per ton of solution per 24 hours, is the average allowance for capacity of extractor boxes. These boxes, usually built of steel, are from 4 to 6 ft. wide, and of corresponding depth, with 6 to 10 compartments. The existing system of gold precipitation, though highly efficient on the dilute solutions used on the Rand, admittedly possesses many awkward features which have for years stimulated investigation with a view to devising a more compact, positive and less wasteful substitute. Its weak points are: (1) the great area required for plant; (2) the labor required in dressing and cleaning up extractor boxes; (3) the uncertainty of cleanup, owing to the variable distribution of gold not immediately recoverable; (4) the impossibility of recovering at once all gold deposited within a given period; (5) the enormous loss of zinc in the destructive process of recovering its gold content.

The Merrill zinc-dust method, as perfected in America, offered certain distinct advantages over the older process. It is neater and more exact in operation, requires less labor, and possesses the very attractive feature of yielding a complete cleanup of all the gold deposited. After practical trials this process was introduced at three Rand mines; the Brakpan, New Modderfontein, and Modderfontein B.

The consumption of zinc in the Merrill presses is approximately 1-10 lb. less per ton milled than in extractor boxes. The cost at Johannesburg of cut shavings is 4.2d. per lb., of zinc dust 3.93d. per lb., so that as regards zinc consumption the presses have the advantage. But this is offset by the cost of additional cyanide required to strengthen the slime solutions sufficiently for good zinc-dust precipitation, which was found to be, at New Modderfontein, 1d. per ton milled.

The general opinion in regard to zinc dust, after three years' experience with the process, is that in effecting economies in zinc consumption and labor, and in affording a complete cleanup of gold, it has fulfilled the claims made for it. On the other hand, it requires more vigilance and care in manipulation than the zinc-shaving method, is liable to erratic fluctuations in efficiency without assignable cause, and requires the use of stronger solutions than are actually needed for dissolving purposes.

One cannot escape the conclusion that zinc in any form is far from being the ideal precipitant for gold. In 1913, about 9,000,000 lb. of zinc were consumed by the mines of the Rand. When we consider that the greater part of this irrecoverable loss is due to the destructive method employed in separating the gold

from the zinc after deposition, it is evident that the existing system is an extremely wasteful one. For this reason, the subject of gold deposition presents one of the most profitable fields for investigation in the whole realm of metallurgy, and I venture to predict that in this stage in the reduction of gold ores, the most important advances in the future will be made.

## THE BELGIAN RELIEF FUND

To tell, even in part, the story of the work in Canada for the relief of the suffering Belgians, is to unfold a record of a series of surprises which is sometimes almost staggering. When, early in September, it was decided to open the fund, and an Executive Committee was formed, it was realized by those having the direction of the campaign that appeal was being made at a time when trade depression was more or less general and when the demands of the Patriotic Fund, the Red Cross Society and other worthy organizations were not only insistent, but immediate. It was hoped, however, that it might be possible to send a shipload of goods from Canada and perhaps even two to the starving people of a brave nation.

Four ships have already been dispatched, and as this is written, arrangements are being completed for the sending of a fifth. A few days ago, Mr. Hector Prud'homme, the honorary treasurer of the Belgian Relief Fund of Canada, was able to announce that the total donations in money and in kind had reached the magnificent total of \$1,750,000. What this means can best be judged by referring to another statement recently issued by the International Committee in London, which is handling the work of distribution for several countries. This showed that Canada had given more generously for the cause than any other country in the world, with the one exception, the United States. England, of course, has done splendid work through individuals by providing homes for thousands of the refugees, but in actual cash and other gifts placed at the disposal of the committee, England, Scotland, Wales and Ireland combined, have not been more generous than the Dominion.

There can be only one explanation of a manifestation as satisfactory as it is surprising. The imagination of the citizenship of Canada had been quickened by the story of the bravery and self-sacrifice shown by the Belgians in the early days of the war. Admiration for the army of heroes who held in check the German invader, melted into sympathy for those who, having refused to barter honor for happiness, found themselves homeless and starving in a devastated country in consequence. "Oh!" wrote the mother of twelve children, who sent a parcel to the Montreal headquarters, with a note attached, "if only I could make you understand, you who will receive this, how the hearts of Canadian mothers bleed for you. We think of you, of your homes destroyed, crops ruined, sons slain, and daughters worse than slain, and we pray for you daily. We look upon our own happy children growing up in a land of liberty and of happiness, and we weep for you. I am not rich. The coin I enclose with this letter (a twenty-five cent piece) is small, but my desire to help is big. Will you write to me, that I may pray for you by name?"

This spirit of direct and personal interest in the sufferers has been shown in a dozen different ways; children have emptied their toy banks, women have

sent rings of quaint setting which were plainly heirlooms, school teachers in country districts have banded together to send sums which must undoubtedly have entailed sacrifice, factory workers have given their time and labor, rich and poor have vied with one another in endeavor to express their desire to aid the stricken country in which war is still being waged.

When the collection of goods was begun, a couple of large rooms in the Beardmore building, in which Mr. Prud'homme had his office, were secured for storage and packing purposes. Within three days the inadequacy of these rooms was made manifest. Immediately a whole building was offered rent free, then another, and still others, so that at the present no less than five warehouses are being used by the executive committee in Montreal alone. When the flood of gifts had only just begun to set in, the writer paid a visit to the two rooms at the headquarters. The collection, even at that time was varied almost to the point of the ludicrous, but the impulse to give anything and everything invested the most amazing donations with a dignity which forbade laughter.

But the end is not yet. On November 12th, last, the International Committee in London, having received reports from several special commissioners who had been sent to Belgium to make report on actual conditions at that time, issued a statement announcing that \$4,000,000 a month would be required for at least eight or nine months to feed the population. Canada, having done much, must do more and fortunately, she is doing more every day.

The action of the railways in declining longer to carry shipments free of freight charges makes it advisable that money be given wherever possible, so that purchases may be made near seaboard, but the following gifts in kind are especially acceptable at this time: Wheat, flour, canned goods, condensed milk, bacon, blankets, clothing and warm underwear. Whenever possible, would-be donors are advised to communicate through the nearest branch committee or the nearest Belgian Consul, but contributions will be accepted and acknowledged promptly by

HECTOR PRUD'HOMME,

Honorary Treasurer.

Belgian Relief Fund,

59 St. Peter Street,

Montreal, P.Q.

### EXPLORATIONS IN YUKON.

Extensive coal and mineral areas in the southwestern corner of the Yukon Territories have been mapped out during the season's operations conducted by Dr. D. D. Cairnes of the Dominion Geological Survey branch of the department of mines.

Dr. Cairnes has been in charge of some important survey work during the past few years. In 1911 and 1912 he delimited the international boundary; last year he explored the White River country and this year he has been devoting his activities to a reconnaissance survey of the Lake Kluane and Lake Aishihiki countries and the territories around the headwaters of the Donjek and White Rivers, including the Nisling district.

The principal geological features have been noted with a view of further investigation work later. While until his report has been presented to his department he said that he could not discuss his discoveries specifically, Dr. Cairnes stated that he had surveyed some important coal deposits in the vicinity of Burwash Creek in the Kluane Lake country and had located several promising placer and copper areas.

## MINING IN ALASKA IN 1914

The annual report on the mineral resources of Alaska and production in 1914 is now in preparation under the direction of Alfred H. Brooks, of the United States Geological Survey. Some of the important features of this report relative to mining development during the year are abstracted in the following statement:

Mining began in Alaska in 1880, and since that time the Territory has produced mineral wealth to the value of \$268,000,000. Of this \$224,300,000 has been in gold, \$19,800,000 in copper, \$2,251,000 in silver, \$370,000 in coal, and the rest in tin, lead, quicksilver, marble, gypsum, petroleum, etc. Copper mining began in Alaska in 1901, and the total production is about 133,000,000 pounds.

It is estimated that the value of the total mineral output of Alaska in 1914 is \$19,248,000, compared with \$19,416,000 for 1913. The preliminary figures on gold output for 1914 show a value of \$15,900,000; in 1913 the value was \$15,626,813. Silver to the value of about \$191,000 was produced in 1914, compared with \$218,988 in 1913. Though the low price of copper since mid-summer greatly curtailed the output of that metal, about 20,850,000 lb., valued at about \$2,872,000, was produced in 1914, against 21,659,958 lb., valued at \$3,357,293, in 1913. The output of the other minerals, including tin, marble, gypsum, quicksilver, coal and petroleum, in 1914 had a value of about \$285,000, compared with \$272,242 for 1913.

Had it not been for the depression in the copper market the value of Alaska's mineral product would have been considerably greater in 1914 than in 1913. The gold mining industry of the territory as a whole was prosperous during the year, as is made directly evident by the figures on output, but a more important item of progress is the extensive dead work accomplished on larger plants that have not yet reached a productive stage. No progress was made in coal mining, there being in 1914 only one small productive mine in the territory, and that in one of the lignite fields. It is expected that the new law, providing for leasing of coal land in Alaska, will lead to the exploitation of the fields containing high grade coal. The tin, gypsum, marble and petroleum mining industries of Alaska had a successful year.

The certainty of railway connection with the Yukon basin has greatly stimulated both prospecting and mining development. There was a noticeable increase in investigation of large mining enterprises in 1914 compared with previous years. This was due solely to the expectation of cheaper transportation.

### Gold.

**Placer mines.**—The data in hand indicate that the value of the placer gold produced in 1914 was about \$10,700,000, or practically the same as that of 1913, which was \$10,680,000. The distribution of this output is, however, not the same in the two years. Some increases in the output of the Ruby, Seward Peninsula, Iditarod and Hot Springs districts were made, but, on the other hand, there was a marked decline in the placer gold output from Fairbanks and lesser decreases in some of the smaller camps. The abundant rainfall which occurred in most of the Yukon and Seward Peninsula camps during the mining season of 1914 greatly favored placer operations.

The Chisana district is the only new placer camp developed in 1914. Promising discoveries are reported in the Healy River region of the middle Tanana, and also

a find of placer gold in the upper Tolovana basin, between Fairbanks and Rampart.

About 44 gold dredges were operated in Alaska for the whole or part of the open season of 1914. Preliminary estimates indicate that these dredges produced gold worth between \$2,050,000 and \$2,300,000. In 1913, 39 dredges were operated in Alaska with an output valued at \$2,200,000. The decreased output per dredge in 1914 is accounted for by the facts that in 1913 several of the dredges were working in very rich ground, and that several of the new machines were not completed in time to operate for more than a brief period in 1914. A further handicap to the dredges this year was the fact that the dredging season at Nome opened later than usual. In addition to the 44 dredges operated there were about half a dozen under construction.

**Lode mines.**—About 26 gold lode mines were operated in Alaska in 1914 and produced gold to the value of about \$5,100,000. In 1913, 30 lode mines produced \$4,814,813 worth of gold. The decrease in the number of mines is due to the fact that several which were operated in the Fairbanks district in 1913 were idle in 1914. Juneau is and will continue to be by far the most important Alaska lode camp. Important progress was made during the year in the Willow Creek district. The Port Wells district was added to the gold lode producers.

#### Copper.

The developments made up to midsummer gave promise that 1914 would be the most profitable year in the history of Alaska copper mining. The financial stringency and collapse of the copper market that followed the breaking out of the European war, not only closed down some of the producing mines, but also put a stop to some very important developments. Up to about the first of August seven copper mines were in operation, but at the close of the year only three were still working. Had it not been for the war at least nine copper mines would have been ready to ship ore before the end of the year. Probably the most important events of the year to the copper industry of Alaska were the re-opening of the Mamie mine, in the Ketchikan district; the installation of a shipping plant and the opening of the Midas mine, near Valdez; and the completion of aerial trams at the Jumbo and Mother Lode mines, in the Chitina district.

#### Tin.

The total production of Alaskan tin mines since the industry started in 1902 is about 550 tons of metallic tin, valued at \$432,000. In 1914 one dredge was operated on the Buck Creek placer tin deposits throughout the open season. Two others were operated for a part of the season on Anikovik river, working on deposits carrying both gold and tin. Operations were also continued and some tin was produced at the Lost River lode tin mine. All these localities are in Seward Peninsula. Tin was also produced from several deep placer mines in the Hot Springs district, operated chiefly for the recovery of gold. It is estimated that nearly 50 tons of stream tin was recovered from these placers in 1914. This output could be considerably increased, for only a few of the miners make a systematic attempt to recover the tin.

#### Southeastern Alaska.

**Treadwell mines.**—The four mines of the Treadwell group, in the Juneau district, were operated throughout the year on the same scale as before. In the Ready Bullion and Seven Hundred Foot mines of this group ore is being developed on the 2,200 ft. level.

**The Alaska Juneau** is the only other mine in south-

eastern Alaska which has reached a productive stage. At this property 50 stamps of the first unit were completed in the spring, and work on the installation of the rest of the 600 stamp mill was continued. The main adit tunnel and raise at this mine were completed in 1913, and the underground work in 1914 was therefore devoted to the opening of stopping ground.

#### Chisana District.

A large part of the stampers who went to the Chisana district in 1913-1914 returned without realizing their expectations in the new camp. Nevertheless some rich placer ground has been found in this district, though the total bulk of auriferous gravels so far developed is not large. The total gold output from the district in 1914 had a value of about \$250,000. It came chiefly from Bonanza creek, but there was also a considerable output from Little Eldorado and Skookum creeks.

## COAL MINING IN CHINA\*

By William Barclay Parsons.

China's mineral wealth is both varied and abundant. Coal is found in great quantities generally throughout the country; in fact, there is scarcely one of the eighteen provinces but that contains coal in paying quantities. Through lack of extensive railways and of power-consuming industries, except a few factories at Shanghai and other treaty ports, and on account of the great poverty of the people, consumption of coal per capita in China is very small. Nevertheless, something like 15,000,000 tons is produced annually from the Chinese mines. The coals found include lignite, bituminous and anthracite, with the intermediate grades of semi-bituminous and semi-anthracite.

At present the greatest producing districts are the metropolitan province of Chili, where the Kaiping mines are the largest and best known, and Shansi. The former field produces chiefly bituminous and the latter anthracite. Shantung, Hunan, and the province of a million tons each. In Kiangsi there are located the Ping Hsiang mines, producing an excellent grade of coal, which is coked on the ground and transported now by railway to the Hsiang River, and thence by boat down the Hsiang and Yangtze to be used in China's sole blast furnaces at Hankow. These mines are Chinese owned, but developed by foreign engineers, and are equipped with thoroughly modern and efficient machinery.

The mines worked by natives are very singular. The native attacks a vein at its outcrop and usually, for some unknown reason, at a point where the vein works down the seam. He drives simply a small tunnel not over five ft. high and not over four ft. wide, in order to avoid timbering, and carries this downward until he reaches a point where his native pump can no longer handle the inflow of water. When that point is reached the mine is considered as worked out and is abandoned. A Chinese coal mining district, therefore, presents a view on a larger scale somewhat like the mouths of the burrow pits of the western prairie dog, with a multitude of small waste piles dotting the hillsides. From this initial drift there are no side galleries and no rooms. On the floor of the drift are laid two longitudinal timbers, like rails. The coal is loaded into wicker baskets and then hauled up the drift on the rails by manual power. In the Hunan native mines inspected by the writer the only lighting system was that of joss sticks of punk, giving of course, nothing but a very faint glow.

\*Extracts from an article published in the journal of the Franklin Institute, April, 1915.

A great deal of Chinese coal is coking coal. Some of the anthracite is sufficiently hard and firm to stand the burden of a blast furnace, though nearly all is much softer than its American namesake, similarity existing in chemical composition. A great part of the bituminous coal, however, carries a large percentage of ash, and very much of it is in structure so friable as to produce but a small portion of lump. When the coal deposits can be worked on a large scale and generally throughout the country, it will be found undoubtedly advantageous to crush most of the coal, wash it, and then either convert it into coke or to compress it into briquettes. The principle of briquetting has already been adopted by the natives, who take the coal dust, mix it with clay, and sell the clay balls in the Chinese cities for local consumption. By washing the coal from the Ping Hsiang mines, from which is made the coke for Hankow iron works, the ash content is reduced from as high as 28 per cent. to 8 per cent., and the sulphur from 0.65 per cent. to 0.1 per cent.

There has never been any approach to a complete scientific study of either coal or other mineral resources of China. About forty years ago von Richthofen made the first attempt to describe Chinese mineral wealth, and his publications, meagre as a first survey in such a huge country must necessarily be, are still referred to authoritatively. The Carnegie Institution of Washington sent, in 1903, a staff consisting of Messrs. Willis, Blackwelder, and Sargent, who explored a portion of the country. Other writers have also taken it up in part. Until the country has been thoroughly and systematically studied, it is impossible to say how great is China's wealth in coal. Enough, however, has been shown to indicate that China probably possesses at least as much coal as does the United States.

**Of other minerals China has her share.** Iron ore, and of good grade, is found generally throughout the country, but in large quantities only in a few localities. Owing to the fact that up to date there has been but one blast furnace in existence, although others are under construction, the iron ore deposits have been developed on a large scale only at Tayeh, near Hankow, in proximity to the furnace. This ore shows, on analysis, metallic iron ranging from 60 per cent. to 62 per cent., with phosphorus and sulphur as low as 0.05 per cent. Copper is found generally throughout the western part of the country. Tin is found and worked to a considerable extent. Petroleum is found in the northern and western part of the country, and an arrangement has been recently entered into between the Standard Oil Company and the government for its development on a commercial basis. Lead, zinc, and antimony also occur; in fact, of the last metal the world's largest single producer is China. Gold and silver are also found, but up to date only in comparatively small quantities.

**The control of the mining deposits in China** has been placed in charge of the Minister of Industry and Commerce, and a set of rules has been drawn up regulating the opening and working of mines, but, unfortunately, these rules are hedged in with so many Chinese restrictions that they do not attract capital on a large scale. It is instructive as showing the Chinese view of foreign participation, and also amusing, to read the opening paragraph of the mining regulations, to the effect: "The industrial enterprises of China are still in their infancy, and the inclination of the people to launch into industrial enterprises has not yet been developed; therefore,

it is inevitable that foreign capital should be introduced, but as the nation has been so weak, it is feared that many interests and privileges will be lost. Consequently, in the question of development by foreign means there should be restrictions. Should there be foreign shares, they should not exceed forty per cent. of the total amount of the capital."

Although the regulations appear to be fair, in a detailed examination by one with a knowledge of Chinese methods there will appear all sorts of opportunities for vexations and delays.

## BOOK REVIEW.

### THE MINING MANUAL AND MINING YEAR BOOK,

1915—By Walter R. Skinner, London 1915—Price, in England, 15s. elsewhere 17s.—For sale by book department, Canadian Mining Journal.

This is the twenty-ninth annual issue of Skinner's well known manual.

The work covers every section of the Mining Market, and many mines whose shares are not dealt with on the London Stock Exchange are included. In a world-wide industry like that of mining there are continual changes in progress, and consequently to embody every new phase, unwearied labor and much time are absolutely necessary. Neither has been spared to maintain the reputation of the Mining Manual and Mining Year Book, which, for completeness and accuracy, has stood unrivalled from its very inception. Every individual notice has been carefully revised and officially verified wherever possible. In previous volumes the work has been divided into sections, but with the present volume all companies are arranged alphabetically. This innovation has been decided upon owing to many of the companies widening their scope of operations and transferring their interests from one mining field or market to another. This has been a notable feature in recent years in connection with many finance companies whose interests have become so divided that although their title suggests a certain field of operations their list of holdings proves otherwise. At the same time the Index has not been abandoned, since it is thought that—especially to those not very familiar with Stock Exchange nomenclature—it will be found helpful for cross-references. Thus "Chartered?" will be found in the Index with a cross-reference to British South Africa Company and "Gold Fields" with a cross reference to Consolidated Gold Fields of South Africa. The object of the Mining Manual and Mining Year Book has always been to keep in touch with a company from its birth until its demise, and to carry out this policy, but at the same time avoid the work becoming too unwieldy, a new feature has been introduced, viz., a Supplementary Index. This Index, which immediately follows the Index proper, contains the names of those companies which have ceased to be of public interest or are in too dormant a state to justify their inclusion in the body of the work. By turning to the volume set opposite their names full particulars can be ascertained. Thus while particulars are supplied in the volume itself of 2,420 companies, the supplementary Index with its references to earlier volumes covers no less than 2580 additional companies.

## A CHANT OF HATE AGAINST ENGLAND

By Ernst Lissauer in "Jugend".

(Rendered into English verse by Barbara Henderson.)

French and Russian, they matter not,  
A blow for a blow and a shot for a shot;  
We love them not, we hate them not.  
We hold the Weichsel and Vosges-gate,  
We have but one and only hate,  
We love as one, we hate as one,  
We have one foe and one alone.

He is known to you all, he is known to you all,  
He crouches behind the dark gray flood,  
Full of envy, of rage, of craft, of gall,  
Cut off by waves that are thicker than blood.  
Come let us stand at the Judgment place,  
An oath to swear to, face to face,  
An oath of bronze no wind can shake,  
An oath for our sons and their sons to take.  
Come, hear the word, repeat the word,  
Throughout the Fatherland make it heard.  
We will never forego our hate,  
We have all but a single hate,  
We love as one, we hate as one,  
We have one foe and one alone—

ENGLAND!

In the Captain's Mess, in the banquet-hall,  
Sat feasting the officers, one and all,  
Like a sabre-blow, like the swing of a sail,  
One seized his glass held high to hail;  
Sharp-snapped like the stroke of a rudder's play,  
Spoke three words only: "To the Day!"

Whose glass this fate?  
They had all but a single hate.  
Who was thus known?  
They had one foe and one alone—

ENGLAND!

Take you the folk of the Earth in pay,  
With bars of gold your ramparts lay,  
Bedeck the ocean with bow on bow,  
Ye reckon well, but not well enough now.  
French and Russian they matter not,  
A blow for a blow, a shot for a shot,  
We fight the battle with bronze and steel,  
And the time that is coming Peace will seal.  
You will we hate with a lasting hate,  
We will never forego our hate,  
Hate by water and hate by land,  
Hate of the head and hate of the hand,  
Hate of the hammer and hate of the crown,  
Hate of seventy millions, choking down.  
We love as one, we hate as one,  
We have one foe and one alone—

ENGLAND!

—New York Times.

### A REPLY.

(In reply to the above, and on the day of its publication, the Times received the following from Beatrice M. Barry:)

French and Russian, they matter not,  
For England only your wrath is hot;

But little Belgium is so small  
You never mentioned her at all—  
Or did her graveyards, yawning deep,  
Whisper that silence was discreet?  
For Belgium is waste! Ay, Belgium is waste!  
She welters in the blood of her sons,  
And the ruins that fill the little place  
Speak of the vengeance of the Huns.  
"Come, let us stand at the Judgment place,"  
German and Belgian, face to face,  
What can you say? What can you do?  
What will history say of you?  
For even the Hun can only say  
That little Belgium lay in his way.  
Is there no reckoning you must pay?  
What of the Justice of that "Day?"  
Belgium one voice—Belgium one cry  
Shrieking her wrongs, inflicted by

GERMANY!

In her ruined homesteads, her trampled fields,  
You have taken your toll, you have set your seal;  
Her women are homeless, her men are dead,  
Her children pitifully cry for bread;  
Perchance they will drink with you—"To the Day!"  
Let each man construe it as he may.  
What shall it be?  
They, too, have but one enemy;  
Whose work is this?

Belgium has but one word to hiss—

GERMANY!

Take you the pick of the fighting men  
Trained in all warlike arts, and then  
Make of them all a human wedge  
To break and shatter your sacred pledge;  
You may fling your treaty lightly by,  
But that "scrap of paper" will never die!  
It will go down to posterity,  
It will survive in eternity,  
Truly you hate with a lasting hate;  
Think you you will escape that hate?  
"Hate by water and hate by land;  
Hate of the head and hate of the hand."  
Black and bitter and bad as sin,  
Take you care lest it hem you in,  
Lest the hate you boast of be yours alone,  
And curses, like chickens, find roost at home

IN GERMANY!

### POTASH FROM FELDSPAR.

Owners of feldspar properties in the neighborhood of Kingston are experimenting in the extraction of potash from feldspar. Potassium is one of the commonest elements in rocks; but the difficulty of extracting it is very great. A large proportion of the potash used in America has been imported from Germany, where more easily treated potassium salts are found. The advance in price since Germany's exports were cut off is stimulating research here, and it is hoped that an economic process will be found so that the enormous feldspar deposits of Canada can be used for the production of potash, for which there is a great demand, especially for use as a fertilizer.



# PORCUPINE VIPOND MINES, LIMITED, ANNUAL REPORT.

In the report of Porcupine Vipond Mines, Ltd., for the period May 1, 1914, to Dec. 31, 1914, Mr. C. H. Poirier, manager, says: Construction of a cyanide addition of 120 tons daily capacity was started on May 10, 1914, and carried on through the summer. The plant, which is of the continuous counter-current decantation type, was put in operation on September 1st, 1914, and has been run continuously since that time.

The total cost of the addition was \$24,617. This included the stripping of the old building and the removal and replacement of various parts of the crushing section to fit into the changed flow sheet.

While the cyanide plant was being erected the mine was unwatered, and underground work was started on August 1st.

### Development.

During the period the following development was carried out:

	Drifts.	Crosseuts.	Raises.
100 ft. level ...	215.8	27.5	186.4
200 ft. level ...	133.5	26.4	....
300 ft. level ...	23.8	28.8	....

### Production.

Tons treated, 9,559 tons.	
Gold bullion produced, 3,217.95 fine oz. ...	\$66,514.58
Silver bullion produced, 413.84 fine oz. ....	200.57
Precipitate on hand Dec. 31st .....	3,758.77
Refinery slag on hand Dec. 31st .....	2,304.00
Solutions. ....	1,186.00
	<hr/>
	\$73,963.92
Tailing loss .....	8,309.25
Total value of ore treated .....	82,273.17
Average value per ton .....	8.60+
Loss per ton .....	.86+
Extraction. ....	90%

The tonnage treated was drawn from the following sources:

Stopes. ....	6,633 tons
Development. ....	988 tons
Dump. ....	1,938 tons
	<hr/>
Total. ....	9,559 tons

### Costs.

Costs for the four months during which the mill was in operation are as follows:

	Total.	Per Ton Milled.
Mining. ....	\$19,415.55	\$2.03
Milling. ....	15,187.62	1.59
Refining and marketing	1,353.27	.14
Development. ....	10,188.95	1.06
General—		
Supervision, Surface		
Insurance, Taxes		
Organization head office	15,513.56	-1.62
		<hr/>
		\$6.44

In the above are included all costs for ore broken and not milled, no deferred charges are carried for development. Mill absorption and loss due to starting new plant are written off, and extraordinary expense incident to unwatering and reopening mine and starting operations after a long shut-down are included.

There has been a constant improvement in conditions underground on the property. The continuation

of the main ore shoots has been proven to the lower levels and lateral development shows a very satisfactory extension of payable ore along the strike of the Davidson vein.

Adjustments in the mill have resulted in an increased saving, and costs have decreased in every department.

In view of the short time during which the mill was in operation during the year 1914, the following figures covering the period from Jan. 1st, 1915, to March 31st, 1915, are given for comparison:

### For Period Jan. 1st to March 31st, 1915:

Tons milled, 6,898; bullion produced, \$74,558.42; recovered per ton, \$10.81; total costs per ton, \$5.71; profit per ton, \$5.10.

The estimated ore reserves on March 1st amounted to 40,900 tons of developed ore of a gross value of \$355,055.00 and 7,400 tons of broken ore in stopes valued at \$73,355.00, a total of 48,300 tons of a gross value of \$428,410.

### Balance Sheet Porcupine Vipond Mines, as at December 31st, 1914.

Assets.	
Mine and Plant—	
Accounts receivable .....	112.01
Mine. ....	\$872,831.56
Plant as at April 28, 1914. ....	\$77,547.35
Additions to plant .....	33,848.95
	<hr/>
	111,396.30
Deduct—	
Depreciation of 5% .....	3,877.37
	<hr/>
	107,518.93
	<hr/>
	980,350.49
Bullion assets—	
Bullion in transit .....	\$12,067.32
Precipitates and slag .....	4,176.77
Mill solution .....	1,186.00
	<hr/>
	17,430.09
Current assets—	
Cash. ....	\$645.92
Materials and supplies on hand	11,844.61
Unexpired Insurance .....	1,987.74
	<hr/>
	14,581.28
Accounts in adjustment .....	3,365.36
Treasury stock reserved for contracts ..	16,125.30
Deficit Account—	
Net loss transferred from exhibit "D"	3,437.98
	<hr/>
	\$1,035,290.50
	<hr/>
Liabilities.	
Capital stock—	
Authorized. ....	\$1,500,000.00
Deduct Treasury stock ..	600,000.00
	<hr/>
	\$900,000.00
Bonded indebtedness—	
Bonds of the Ward Porcupine Mines Co., Ltd, assumed, due June 14, 1915. ....	65,400.00
Current liabilities—	
Accounts payable .....	45,390.50
Notes payable .....	24,500.00
	<hr/>
	69,890.50
	<hr/>
	\$1,035,290.50

**Profit and Loss Account.**

For the three months ended March 31, 1915

Gross proceeds from ore treated		\$74,558.42
Deduct—		
Mining costs .....	19,384.50	
Milling costs .....	11,192.77	
General expense .....	8,792.88	
Depreciation .....	4,031.96	
		43,402.11
		\$31,156.31
Deduct—		
Refining and marketing expense .....	1,207.77	
Operating profits .....		29,948.54
Deduct—		
Administration expenses .....	844.77	
Interest charges .....	1,723.44	
Organization expenses .....	775.00	
		3,343.21

Net profits transferred to Exhibit "A" .. \$26,605.33

**Porcupine Vipond Mines, Ltd., Annual Report, 1914.**

The report of President H. H. Ward is in part as follows. Inasmuch as the period up to December 31, 1914, was devoted to building the cyanide addition to the plant, unwatering and reopening of the mine, resumption of development operation, and continuance of the same during a period of five months, overhauling of the plant, which had been idle for 18 months, adjustment of added plant after putting it in operation, that part of the report covering this particular period cannot give a clear idea of present conditions. In addition to the extraordinary costs made necessary by the operations mentioned above, a considerable amount of deferred charges was carried over into this period. However, inasmuch as the fiscal year of the company begins the first of the calendar year, a separate financial report is made for the period ended December 31, 1914, and the balance as shown on that statement will be carried on to the next annual financial report.

The reports covering the period from January 1, 1915, indicate the result of operations for this period as shown by the reduction in outstanding indebtedness, increased balances of cash and bullion on hand, increased ore reserves and increased daily mill capacity. In order to accomplish this increased mill capacity it was necessary, in addition to making original adjustments, to install new classification system and make other changes, which necessitated shutting down the mill for a period of 13½ days. The results for the three months' period should, therefore, be measured as for 76½ days, and not for the full period.

Although one or two additional changes of comparatively small cost are in contemplation, the purposes of these changes being to bring the present capacity of certain units up to full capacity of the plant as a whole, the mill may now be considered as complete so far as present plans and present ore reserves warrant; and as it stands, and with the few changes proposed, will be capable under normal conditions of treating 100 to 120 tons per day.

On account of the unusually small precipitation in Northern Ontario during the past winter there has been a shortage of water power throughout the camp during the month of March. This, however, has not interfered with mill operations, but it has curtailed development work to some extent. It is gratifying to

know, however, that even during this period of reduced available power, ore development has more than kept pace with the tonnage treated, and it is anticipated that the plant will be running full capacity both above and below ground within two weeks. (Full power made available April 15th).

Owing to the fact that a large part of ore during 1914 was taken from the dump, which had never been entirely cleaned up, and therefore, contained a large percentage of ore from the original development, the mill heads were low during this period. The character of ore now being developed justifies the expectation that in the immediate future head values will more closely approximate recent figures than those of 1914. As will be seen from reports, the heads during the four months of 1914 ran \$8.60 per ton as against \$11.50 for the period from January 1, 1915, to March 31, 1915. Not only the condition of the mill, but the character of the dump ore under treatment account for an extraction of 90 per cent. during the 1914 period as against the present extraction of 95 per cent.

It is felt that the conditions as to the organization and administration of the property are now in a satisfactory condition. Although the financial plan which had been arranged when the company was organized was not carried to completion, individual shareholders will not suffer thereby. On account of the necessary abandonment of the plan upwards of 150,000 shares of stock which would otherwise have been issued are held in the treasury. The company was obliged to borrow in order to secure funds to complete the plant and meet current expenses, and the indebtedness thus created, together with the bond issue, must be entirely looked out for out of earnings instead of partly out of stock subscriptions as was the original plan.

It is recommended that bondholders be invited to extend for one year the terms of their bonds, subject to an agreement with the company, to continue interest payments at the present rate of 7 per cent. per annum; the bonds to be subject to call of the company within the one year period, on 30 days' notice, and a payment of a bonus of 1 per cent.

**John Bryden.**

The late Mr. John Bryden, who died at his home at Esquimalt, near Victoria, B.C., on Saturday, March 27, was one of the pioneers in building up the important coal mining industry of Vancouver island. He was born in Ayrshire, Scotland, on December 4, 1831, so was in his eighty-fourth year. In the autumn of 1862, he left Scotland for Vancouver island, going by way of the Isthmus of Panama and San Francisco and thence to Esquimalt. Late in that year, or early in 1863, he settled at Nanaimo, where he was joint manager with Mr. Mark Bate for the Vancouver Coal Mining and Land Co., which in 1861 had purchased from the Hudson's Bay Co. the coal mines it had been working there since 1852. In 1873 he was joined by Mr. E. G. Prior (now Colonel Prior, of Victoria), who as mining engineer and surveyor under him engaged in the work of developing the mines. Some years later, about 1880, Mr. Bryden became manager of the Wellington collieries for Mr. Robert Dumsuir, one of whose daughters he had married in 1867. Later he represented Nanaimo district in the Legislative Assembly of British Columbia, and as the years passed he was actively identified with various industrial enterprises on Vancouver island and elsewhere in the province. He was chairman of a Commission ap-

pointed about twelve years ago, following a disastrous explosion at Coal Creek, Crow's Nest Pass, to report on matters connected with coal mining in the province, and the Coal Mines Regulation Act, afterward passed, was based largely on the findings and report of that Commission. Colonel Prior, in closing a striking tribute of appreciation of his late friend, published in the daily press, said: "There are, I am sure, hundreds who think like myself that here was a man who, by his blameless life and splendid example of how a man should live, has left the world better than when he came into it."

## PERSONAL AND GENERAL

Mr. W. H. Aldridge has been in Northern Mexico on mining business.

Mr. Barclay Bonthron, of Vancouver, B.C., recently made a trip to the mining country around Hazelton, in Omineca division of British Columbia.

Mr. D. D. Cairnes, of Ottawa, has gone to Yukon Territory to do field work for the Geological Survey of Canada during the ensuing season in the neighborhood of Stewart river.

Mr. Henry Clark, of Victoria B. C., representative of Head, Wrightson & Co. England, manufacturers of mining machinery, after having spent two months in New South Wales, Australia, will visit New Zealand before returning to British Columbia.

Mr. J. C. Dufresne, who before joining the Water Branch of the Provincial Government service in British Columbia was for several years engaged in connection with the mining and smelting industry of that province, has volunteered for active service in the European war.

Mr. E. E. Guille, formerly one of the lessees of the Granite-Poorman gold mines near Nelson, B. C., has been reported as seriously wounded in France, to which country he went with the first Canadian contingent.

Mr. A. H. Gracey is continuing the development of the Venus gold mine on Morning mountain, near Nelson, B. C., and will operate the neighboring Athabasca stamp-mill in treating Venus ore.

Mr. J. Cleveland Haas, of Spokane, Washington, has been examining mining property in Ainsworth camp, on the west side of Kootenay lake, B. C., for Spokane owners.

Mr. Frederic Keffer, who with Mr. Henry Johns recently opened a mining engineers' office in Spokane, is convalescent after several weeks' serious illness. Both gentlemen filled responsible offices on the staff in British Columbia of the B. C. Copper Co. and only a few months ago retired from the company's service to commence a consulting and mine-managing business on their own account.

Mr. Frank E. Lathe, for some months associated with the metallurgical instruction department of Toronto University, has returned to the laboratory of the Granby Consolidated Co. at its big copper smeltery at Grand Forks, B. C.

Mr. Douglas Lay, for some time acting manager for the Le Roi No. 2, Ltd., at Rossland, B. C., during the absence in England of Mr. Ernest Levy with his family took passage from New York City to England the first week in May. The steamship "New York," in which he sailed, was reported as having been torpedoed shortly after the Lusitania was lost, but later advices told of her safe arrival at Liverpool.

Mr. F. Charles Merry, formerly superintendent for the Ferguson Mines Ltd., with mines in the Lardeau district of British Columbia, and who left the province

for Utah a few weeks ago, was in New York City last month.

Mr. N. J. Ogilvie, of Ottawa, is again engaged in the Northwest in connection with the completion of the work of delimiting the International boundary line between Canada and Alaska.

Mr. T. A. Rickard, of San Francisco, editor of Mining and Scientific Press, has lately been in Nevada.

Mr. Frank A. Ross, of Spokane, Washington, formerly general manager for the Marcus Daly estate of the Nickel Plate group of gold mines and 40-stamp mill in Camp Hedley, Similkameen, B. C., last month read before the Spokane Mining Men's club a paper on the subject of "Speculation in Mining Stocks." The paper aroused much interest and it has since been given publicity over a wide area.

Mr. G. Stilwell, of near Silverton, Slocan lake, British Columbia, is among a large number of Kootenay district recent volunteers for war service at the front. He had been for many years in charge of development work on the Hewitt and Lorna Doone mines, situated about five miles from Silverton, and which are now shipping ore to a concentrating mill on Four-mile creek, mines and mill being operated by the Silverton Mines, Ltd.

Mr. Frederic R. Weeks, after having been for some time engaged in directing exploration and prospecting of a large group of mineral claims on Copper mountain, Similkameen, B. C., for the British Columbia Copper Co. and associated organizations, has been examining, with Mr. C. Minot Weld also of New York City, the mining properties of the Granby Consolidated Co. for New York bankers who have since underwritten \$2,000,000 of the Granby Co.'s 6 per cent. bonds to facilitate the financing of its extensive copper mining and smelting enterprises in British Columbia and elsewhere.

Mr. Scott Turner, manager of the Arctic Coal Co. Spitzbergen, was among the passengers rescued from the Lusitania.

Capt. John Donnelly, president of the Donnelly Wrecking Co. Kingston, has been elected vice-chairman of the Board of Governors of the School of Mining, Kingston. Capt. Donnelly is a graduate of the School of Mining and an esteemed member and ex-councillor of the Canadian Mining Institute.

The Cobalt branch of the Canadian Mining Institute visited Porcupine mines last week. Dr. F. D. Adams and H. Mortimer-Lamb of Montreal and Col. A. M. Hay, J. B. Tyrrell and R. E. Hore of Toronto accompanied the party.

Three mining engineers, Julius Madero, Raoul Madero and Albert E. Blair, graduates of the Michigan College of Mines, who have taken a prominent part in affairs in Mexico during the past few years have recently been heard from. Mr. Blair is now in charge of business interests of Francisco Madero Sr. with headquarters at San Pedro. Mr. J. Madero is superintendent of cotton plantations. Mr. Raoul Madero is now governor of the state of Nuevo Leon, with headquarters at Monterey.

Mr. H. M. Hotchkin and Mr. R. E. Margenau are at Haileybury.

Mr. H. R. Lyman has returned to Cobalt from Florida.

Mr. H. D. McCaskey succeeds Mr. Parker in charge of the Division of Mineral Resources, U. S. Geological Survey.

Mr. John O'Sullivan, F.C.S., who died at Vancouver, British Columbia, last month, was one of the best known assayers on the western coast of Canada, where he had an extensive connection and enjoyed the confidence of

all with whom he came into contact. After his father and family had removed from the southwest of Ireland to Swansea, Wales, the son was taken into Vivian's laboratory, where he had the advantage of being under Dr. Suchsland, chief assayer. He diligently improved his opportunities there until, in 1897, Dr. Suchsland was instrumental in securing for him an appointment in Vancouver. Ere long Mr. O'Sullivan opened an assay office for practice of his profession on his own account, and during the comparatively long period that has since elapsed he built up a connection and established business relations over a large area of country in the Pacific North-West. In private life, too, he was held in very high esteem, having a wide circle of friends who greatly deplore his death.

### HEINZE ESTATE MUST PAY TAXES.

The Supreme Court of Canada has dismissed the appeal of the Heinze estate against the Province of British Columbia in the matter of the taxation of lands in that province. In 1895 the British Columbia Smelting and Refining Co. was organized with F. Augustus Heinze as president and H. C. Bellinger as general superintendent. By this time the Le Roi, Centre Star, and War Eagle mines had been established as ore-producers, so Mr. Heinze, who was at the head of a smelting works in Butte, Montana, turned his attention to the new mining camp, which had been shipping gold-copper ore to the Colorado smelting works, Butte. After much negotiation, he made a contract with the management of the Le Roi mine for 37,500 tons of ore on the dump, which he would pay for after the shipment and sampling of each lot, deducting \$11 a ton for freight and treatment charges; also for a second similar quantity on which the charges should be at the lowest rates obtainable in the open market. With that quantity of ore contracted for, a land grant secured from the Provincial Government, and a bonus promised of \$1 per ton smelted from the Dominion Government, the smelting company was organized, the smeltery at Trail built and equipped, a narrow-gauge railway constructed from the reduction works twelve miles to the mines, and in February, 1896, the first furnace was blown in, followed by four others later in that year. In 1896 Mr. Heinze obtained a charter for the construction of the Columbia and Western railway from Trail along the Columbia river about 30 miles and thence westward into the Boundary district, where large bodies of copper ore—those since developed by the Granby, British Columbia Copper, Dominion Copper, and other companies—were known to occur. As a bonus or subsidy for the construction of this railway, the British Columbia Government made a grant of approximately 600,000 acres of land situated in Kootenay and Boundary districts. After construction of the railway had been commenced, Heinze, in 1893 sold his smelting works and railway interests to the Canadian Pacific Railway Co., except that he retained an undivided one-half interest in the railway-subsidy lands. Under the terms of the Railways Aid Act, by effluxion of time the lands eventually became taxable; meanwhile the C. P. R. Co. had sold to the British Columbia Government all its interest in the lands. Prior to this the C. P. R. Co. had unsuccessfully brought suit against Heinze in the courts to compel him to choose his half of the lands. None of the lands having been registered in Heinze's name, all became the property of the Crown, subject of course to Heinze's half-interest. The situation having thus

become complicated by the reversion to the Crown, the position being that the government could not tax the lands because they were registered as Crown Lands, an act was passed, in 1913, by the Provincial Legislature giving power to tax and sell all such lands, and thereafter the government proceeded to assess Heinze's interest in the Columbia and Western railway lands. In July, 1914 a judge of a court of revision was appointed to hear Heinze's appeal against such tax assessment, and judgment was in due course given in favor of the Crown. Then Heinze appealed to the Court of Appeals, Victoria, B. C., and having failed in that court the Heinze estate, Heinze having meanwhile died, carried the matter to the Supreme Court of Canada, which, on May 4 dismissed the appeal, which means that the estate will now have to pay a comparatively large sum as taxes on the lands so long held free from taxation.

### INTERNATIONAL NICKEL.

The belief is held in some quarters that the current three months' period will set a record for any three months in the history of the International Nickel Co. The company's fiscal year began April 1 with a record demand for nickel and prices for copper that had not been attained in many months. The use of nickel steel in the construction of automobile engines and nickel in the manufacture of cartridges has brought about an increase in the consumption of the metal, due to the heavy demand for both of these commodities.

The recent declaration of a 5 per cent. quarterly dividend from the earnings of the fiscal year ended March 31 is an indication that business in the last quarter of the fiscal year was exceptionally good as the dividend is the largest quarterly disbursement which the company has made since it was incorporated in 1902.

Last year the company had a large amount of nickel on hand which it held in anticipation of the present higher prices.

An official of the company recently said that business is "extremely good" and in view of the fact that the present war has precipitated an abnormal demand for nickel, the company's earnings are reflecting this increase in business. Another factor favorable to the company is the high price of copper, of which metal the company produces a large amount. In the fiscal year ended March 31, 1914, the company produced approximately 18,000,000 pounds of copper and were it not for the lower level of copper prices the company would have set a new record year for earnings.

The following table gives the record of earnings which shows 1913 to have been the best previous year. Interests closely allied with the company, however, freely express the belief that the forthcoming report, for the year ended March 31, 1915, will set a new record while the current year gives every indication of even greater earnings. Results in past years follow:

Year	Total Income \$	Net Income \$	%	Year's Surplus \$
1914 . . . . .	6,566,786	6,128,974	11.1	454,759
1913 . . . . .	6,929,106	6,386,799	*11.7	994,501
1912 . . . . .	5,088,965	4,866,412	26.3	902,798
1911 . . . . .	5,256,938	5,028,874	27.9	2,432,074
1910 . . . . .	3,348,681	3,144,734	17.2	1,044,805

\*Common stock increased from \$11,582,626 to \$38,031,500.—Wall St. Journal.

## SPECIAL CORRESPONDENCE

### COBALT, SOUTH LORRAIN AND GOWGANDA

**The pumping out of Cobalt Lake** is proceeding with much rapidity. All the south end of the lake opposite the McKinley Darragh and Nipissing plants is de-watered. At the other end it is falling almost a foot a day and there is no reason to doubt that all the water will be out in a month. Before the first rock cut lowered the lake six ft. last fall it was estimated that 300 million gallons of water was contained in the lake. The pumps have each a capacity of 3,500 gallons a minute; but no necessity has been found to run them at full capacity.

**The burning of the Chambers Ferland shaft house** near the O'Brien line suspended operations for only a few days. It is up this shaft that all the ore that is now going to the Northern Customs concentrator was hoisted, no ore coming from the new shaft yet and the other old shaft near the La Rose line being closed down. The fire originated in the ore house which has not been used for some time and may have come from a short circuit or a dropped cigarette, but probably the former. The shaft house, ore house, and blacksmith's shop were all burned and it will entail a loss of about \$7,000, \$4,000 of which is covered by insurance.

**Savage**—The vein found on the Savage property of the McKinley Darragh Savage group while only eighty ft. long on the 195 ft. level and apexing at the 140 ft. is yet so rich that it is yielding a very considerable amount of ore. For 80 ft. on the 195 level it will run four to five ins. wide of ore that averages 6,000 oz. to the ton. This has enabled the Savage to maintain a production of 40,000 to 50,000 oz. a month, mill ore and high grade together. The McKinley Darragh mill is running three days a week on Savage ore and already 50,000 tons of ore has come over the aerial tramway from the Savage to the mill. Of this part has been mine ore and part dump. All this winter the mill has been running on mine ore; but dump ore is now being conveyed across again and it is estimated that there are yet on the dumps between 6,000 and 10,000 tons.

**Temiskaming**—Development at the Temiskaming mine continues to yield good results. Development on the 400 ft. level on the Temiskaming side shows ten to eleven in. of most wonderful ore and it is reported that a new vein has been cut near the Gans line.

**Nipissing**—The hydraulic plant of the Nipissing has commenced to strip the overburden off the Peterson lake area of which 95 acres were cleared last year. There is about two month's more work to do. The stripping costs just short of \$500 an acre.

**The Princess mine** has been leased to Mr. Sidney Smith of Haileybury on a royalty basis. For the present only one drill is working on the 55 ft. level, but more will be set to work later. The mine has been pumped out to the 132 ft. level.

**The Miller Lake O'Brien mine** at Gowganda is again at work at full capacity. During the spring the water was so low in Gowganda Lake that the power plant was unable to supply sufficient power to keep the mine running at capacity and the wood has been cut for such a long distance back that it was felt that it was more economical to run with reduced force than to incur the heavy expense of much further cutting.

**Homestake**—Work has been started on the Homestake claims on Wigwam Lake. Camps were built some time ago and now a small force of men have been put on to sink shafts and develop some very promising silver surface veins. Mr. Geo Rogers, who was in charge of the Mann mine for several years, is in charge of operations.

**The Temiskaming and Hudson Bay mining company** has determined to resume work at the No. 2 camp, adjoining the strip of ground once held by the Little Nipissing company south of the McKinley Darragh mine. Two shafts have already been sunk and connected. From the 350 ft. level a diamond drill was operated which showed that there was a depth of 320 ft. of conglomerate and a conglomerate area twice as large as that at the No. 1 workings. So far no ore has been found here. The management state their intention of thoroughly prospecting this ground and will devote a year to doing it.

**Nipissing**—In April the Nipissing mining company mined ore of an estimated value of \$170,577 and shipped bullion from Nipissing and customs ore of an estimated value of \$380,921. The high grade mill treated 132 tons and shipped 756,568 ozs. The low grade mill treated 5,206 tons. The production was distributed as follows: high grade mill, \$96,358, low grade mill \$74,219.

**The White Reserve mine** at Maple Mountain is again being worked. The Toronto syndicate operating it has sent in supplies for a small gang of men. Drills will be at work almost at once. All supplies have to be taken up the Montreal river from Latchford by water.

### PORCUPINE, KIRKLAND LAKE AND SWASTIKA

**The Lucky Cross mine** at Swastika is to be worked once more. A syndicate has taken an option on the property and it is understood that \$40,000 is at once available for its development. While the mine was being worked several levels were opened up exposing some orebodies which appeared to be very promising. A small mill was also built and a few gold bars produced; but the extraction was very low. It will require several thousand dollars to put the mill into condition to make efficient treatment possible.

**The Huronia mine** in Gauthier township is now being sampled in behalf of Messers L. H. and N. A. Timmins. Mr. Pare, the first manager of the Hollinger mine is in charge. It is understood that if the property is taken up the first payment will be made in June.

**Dome Lake**—After being closed down for a week only, the Dome Lake mining company has resumed work with a reduced staff. Only one shaft is being run at the mine since enough ore can be broken then to keep the mill running at capacity. In a statement made on behalf of the management by Mr. George Taylor, the president, it is stated that eleven bars of bullion worth \$4,255 have been produced and shipped to date and 123,700 lbs. of concentrates were also shipped.

**Imperial**—Mr. H. L. Taylor, president of the Porcupine Imperial has bought a three drill compressor and will take it in over the road to the property at once. He has been working for some time by steam, but since he has now drifted 300 ft. on the 100 ft level it is now getting difficult to operate without air.

**Dome**—The annual report of the Dome will show that there has been a heavy reduction in costs in every department. Last year's annual report showed total costs at \$4.19, this year they have been reduced to \$2.96 which includes 70 cents per ton charged for development. The grade is now running \$4 a ton. When a bigger proportion of the ore is hoisted from the 400 and 500 ft. levels it will run a little better than that while the costs will certainly be reduced to \$2.50. The mill costs have been cut from \$1.44 a ton to less than a dollar a ton. On the charge of transportation and crushing costs have been cut by 50 per cent. The mill is now treating 850 tons every 24 hours and it will gradually be increased to a thousand tons.

There is no immediate prospect of an extension of the mill although part of the new issue of stock is designed to finance the addition when the mine is ready for it. The mill is working very satisfactorily and making an extraction of 95 per cent.

**Alexo Nickel**—In the east drift at the Alexo nickel mine developments latterly have been very encouraging. The drift is now 237 ft. long and there is now in the face 12 ft. of ore of a good grade of nickel.

In the west drift also encouraging results are being obtained in the winze sunk below the level. During April bad roads from the mine caused suspension of shipments for a fortnight; but they were resumed on May 5. In April 664 tons was shipped in 18 cars.

**Vipond**—The diamond drill working at the 200 and 300 ft. level of the Vipond mine has been pulled up after three holes had been drilled in order to test the formation and to discover the trend of the veins being worked. A raise has now been put through from the 300 to the 200 ft. level.

**Success**—There is every probability that the Success mine will be worked again. Though no actual options have been closed several offers have been made to the Clark estate. The Success has been closed down for several years. Its four claims adjoin the east claim of the Vipond.

**Hollinger**—At the present time in order to suit the emergencies of the case seventy stamps are dropping on Hollinger ore and 30 on Acme. The forty additional stamps were originally all intended for the Acme; but the Hollinger mine is now being developed so rapidly that the ore being broken is far larger than the mill can treat and it was deemed wiser to lend ten stamps temporarily to the bigger mine.

**Tough-Oakes**—A very satisfactory extraction is being made at the Tough-Oakes mill and several substantial shipments of gold have been made from it.

In the mine the drift on the 300 ft. level to the west shaft is in very good ore. It has been pushed 300 ft. from the shaft and the face is in remarkable ore.

**Goodfish**—The ore in the shaft being put down by Mr. Frank Loring on the Gibson claims at Goodfish Lake is two and a half ft. wide at the bottom and assays very well indeed. The shaft is now down 60 ft. Goodfish Lake is about a mile from the Tough-Oakes mine.

## BRITISH COLUMBIA

**First Aid at Coal Mines**—Following the holding of classes of instruction in "First Aid to the Injured" in coal mining districts in the province, there have been recent examinations by surgeon-examiners acting under the auspices of the British Columbia Council of the St. John Ambulance Association. Those familiar with the procedure provided for in the general regulations of that association know that those who pass the first examination in First Aid are entitled to the certificate of the association, which is evidence

of the competency of the person to whom it is granted to render first aid to sick or injured along lines laid down in the authorized text book of the association. The next step is to obtain a voucher, by, a year later, passing a second examination in "First Aid"; then follows a third examination, also at an interval of twelve months, success in which entitles to the medallion of the association, and thereafter, also at yearly intervals, further examinations may be taken for the label, which is a small clasp to be worn with the medallion. Recently 60 men qualified for one or other of these distinctions. At Michel, Crowsnest district, 23 passed, as follows: For certificate 13, voucher 6, medallion 1, and label 3. At Merritt, Nicola valley, 17 passed, as follows: For certificate, 10, voucher 4, medallion 2, and label 1. At Ladysmith, Vancouver island, 20 passed, as follows: For certificate 15, voucher 3, and medallion 2. While it is by no means a new development to have men qualify themselves to render first aid in cases of emergency in the districts above-mentioned, nor in other mining districts in British Columbia, the addition of more to the list of those already qualified is at all times pleasing, the more so since it means the probable lessening of suffering and, in some instances, possible saving from death, where sudden illness, accident or other emergency shall require prompt action until skilled medical or surgical services shall be available.

**Increase in ore receipts**—The figures showing the quantity of ore received at the Consolidated Mining and Smelting Co.'s smeltery at Trail, West Kootenay, during seventeen weeks ended April 29 of the current year are satisfactory, since they indicate a substantial increase when compared with the receipts for the corresponding period of 1914, which was before war conditions had arisen to seriously disturb the markets for metals and otherwise interfere with the ordinary progress of mining and smelting operations. The respective totals were 141,293 tons to the end of April of this year, and 111,424 tons for the corresponding period of last year. The increase was, consequently, between 26 and 27 per cent. It should be pointed out, however, that there is not yet room for unmixed satisfaction, since the increase was not general; for instance, Ainsworth, Slocan, and Nelson divisions of West Kootenay, respectively, made a much smaller output of silver-lead ore, while there was also a decrease in, or rather an entire suspension of, shipment of copper ore from mines in Nelson division. The reduction in output of lead-bearing ores from the three divisions mentioned was offset to a considerable extent by a substantial increase in the quantity received from the Sullivan Group mine in East Kootenay. The larger increases were: From Rossland mines 37,694 tons, East Kootenay mines 7,343 tons and State of Washington mines 3,960 tons. The chief decreases were: From Nelson mines 7,801 tons, Slocan mines, 5,715 tons and Ainsworth mines 5,057 tons. As the largest producer of last year in Slocan division—the Standard silver-lead mine—is about to resume production, as are, also, several other mines in Slocan and Ainsworth divisions, it is unlikely that there will be so large a decrease in output of silver-lead ore from those divisions during the ensuing similar period of four months.

**The Granby Consolidated Co.** having got back to normal rate of production, with all eight of the blast furnaces in operation at its smeltery at Grand Forks, the mining situation is improved to that extent in

Phoenix camp. Published figures give the monthly totals of ore shipped from the company's mines at Phoenix to its smeltery at Grand Forks as follows: For January 42,211 tons, February 63,091 tons, March 69,948 tons, April 85,382 tons; total for four months 260,632 tons. The Jewel gold mine, in Greenwood division, is the only other present regular producer in the district, but its output is small in comparison with that of the Granby mines; still, since it gives regular employment at mine and stamp mill to about 30 men, its operations are a welcome addition to the industrial life of the Boundary. Occasional earload shipments of high grade ore are made from small properties around Greenwood, beside which prospecting is active in Franklin camp and neighboring parts of the country up the north fork of Kettle river, above Grand Forks.

#### Coast District.

**New copper mine.**—Another mine has been added to the list of copper producers in the Coast district of British Columbia, namely, the Rocher Debole mine, which recently made its first bulk shipment, consisting of about 450 tons of ore, consigned to the Granby Consolidated Co's smelting works at Anyox, Observatory inlet. This property is described at some length by Mr. John D. Galloway, assistant mineralogist, in Bulletin No. 4, Omineca Mining Division, issued a few weeks ago by the Provincial Department of Mines. It is situated in Juniper basin at the head of Juniper Creek, and is situated ten miles from Skeena Crossing, a flag station on the Grand Trunk Pacific railway ten miles westerly from New Hazelton. The property comprises six mineral claims on Rocher Debole mountain; it is owned by the Rocher Debole Mining Co. There are three main veins, in granodiorite; the highest vein contains copper-iron minerals, the middle and lowest veins galena and zinc. In August, 1913, the mine was leased to the Montana Continental Development Co., a Butte, Montana, organization. Under the terms of the lease, this company agreed to equip the mine with machinery, construct the aerial and surface tramways requisite for the transportation of ore to the railway, and develop the top vein by a crosscut adit, in return for the right to extract as much ore as possible during a two years' tenure of lease. The lessee company put in on Juniper creek, about five miles above Skeena Crossing, a small hydro-electric power plant and constructed a transmission line thence to the mine; installed a 6-drill Canadian Rand compressor; drove a crosscut adit about 500 ft. to the vein; constructed a surface tramway to the upper terminal of the aerial tramway near the summit of a ridge overlooking Skeena river, and built the aerial tramway, in two sections, nearly four miles down to orebins on a spur from the railway at Carnaby; erected mine buildings, and put in a portable sawmill driven by a 20-h. p. electric motor. The main vein is described as varying from 2 to 12 ft. in width and including a fairly regular shoot of from 1 to 4 ft. of ore, samples of which taken by Mr. Galloway ranged up to 1.20 oz. gold and 1.80 oz silver to the ton and from 9 to 13.3 per cent. copper.

Other properties on Rocher Debole mountain being worked are the Red Rose, which has ore ready for shipment, and the Great Ohio group.

**Silver-lead near Hazelton.**—Several silver-lead properties in the neighborhood of Hazelton are preparing to ship ore. The Silver Standard group, on Glen mountain, four miles east of Old Hazelton, last year shipped to Trail 736 tons of ore that contained approximately 200 oz. of gold, 122,000 oz. of silver, and 282,000 lb. of lead. Production was discontinued when the metal markets were disorganized by the outbreak

of war in Europe, but now that the ore can be disposed of it is intended to resume shipping to the smeltery. The American Boy is on Nine-mile mountain, eight miles from New Hazelton. Last year 48 tons of ore was sent to Trail to determine value in bulk. There occurs on the group of eight mineral claims a series of parallel veins on four of which development work has been done. Mr. Galloway states that the American Boy, like the Silver Standard, has a considerable quantity of ore that could be handled at a profit if concentrated before shipment. Freight and treatment charges were last season about \$23 a ton, exclusive of the cost of hauling down the hill to the railway at New Hazelton, so that under the conditions only high-grade ore could be shipped at a profit. Average assay returns from ore on the main dump from the shaft on No. 3 vein show a value of more than \$20 a ton, but of course, such ore may not at present be shipped crude; it should, however, be possible to effect a simple water-concentration that would result in a product running from \$150 to \$200 a ton. Another prospective shipper is the Silver Cup group of four claims, also situated on Nine-mile mountain, under lease to George and Roy Clothier who last season opened a body of good ore and have already commenced this season's work. Several veins have been found; half a dozen drifts have been run on the main vein at different elevations. A test shipment of 23 tons of selected ore contained about 140 oz. of silver to the ton. A sampling of 10 tons of this ore before shipment showed it to also contain lead 46.1 and zinc 12.4 per cent. There are as well in the country tributary to Hazelton other camps in which development of mineral claims has been undertaken, information concerning which is included in Bulletin No. 4, above-mentioned, which is obtainable gratis on application to the Department of Mines, Victoria.

#### DOMES MINES CO.

Pres. De Lamar said at the annual meeting of Dome Mines Co., Ltd. at Toronto: "We have been waiting to get the present mill to full capacity and to its full efficiency as to saving of values. For the last six months this has averaged between 20,000 and 23,000 tons per month, with a saving of 90 per cent. to 91 per cent. of values. Our general manager says that in May he will be able to mill 25,000 tons; next month he hopes to get up to 27,000 tons, and in 30 days thereafter to get up to full capacity, between 28,000 and 30,000 tons per month. He is saving 94 per cent. of values.

"As it was intention of directors to establish a dividend basis which we could continue to maintain, it was necessary to know what the mill would turn out. In 60 to 90 days from now we should be able to prove it, and then establish dividends. We are still working with a baby mill; and this mill has paid for present mining, milling and housing equipment, as the company had no working capital.

"The plan is to double the capacity of this mill within the same mill building, without loss of time, and with this completed and the mine well developed we shall be able to build a mill of much larger capacity, depending entirely on tonnage developed with the money now being contributed for new stock.

"We have an ore body of great length and width and fair values, and the old rule still holds good in mining—that when you cannot pay dividends from quality, you may from quantity, if the ore holds out, and my 40 years of mining experience, tell me it will hold out for very many years."

# MARKETS

## STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Company, Standard Bank Bldg., Toronto, Ontario.)

May 22, 1915.

### New York Curb.

	Bid.	Ask.
Alaska Gold .....	35.12½	35.37½
British Copper .....	.62½	.87½
Braden Copper .....	7.00	7.25
California Oil .....	281.00	283.00
Chino Copper .....	43.50	44.00
Giroux Copper .....	.50	1.50
Goldfield Cons .....	1.43½	1.50
Green Can .....	28.00	30.00
Granby .....	80.00	81.00
Inspiration Copper .....	29.00	29.25
International Nickel .....	132.00	136.00
Miami Copper .....	23.75	24.50
Nevada Copper .....	14.50	14.75
Ohio Oil .....	135.00	137.00
Ray Cons. Copper .....	23.00	23.25
Standard Oil of N. Y. ....	184.00	186.00
Standard Oil of N. J. ....	393.00	396.00
Standard Oil (old) .....	1300.00	....
Standard Oil (subs.) .....	900.00	....
Tonopah Mining .....	6.87½	7.12½
Tonopah Belmont .....	4.37½	4.62½
Tonopah Merger .....	.36	.40
Yukon Gold .....	41.50	41.62½

### Porcupine Stocks.

	Bid.	Ask.
Apex .....	.03¾	.037½
Dome Extension .....	.08½	.09
Dome Lake .....	.14	.14½
Dome Mines .....	14.00	14.30
Foley O'Brien .....	.25	.34
Hollinger .....	25.00	27.00
Jupiter .....	.10¼	.11
McIntyre .....	.42½	.43
Moneta .....	.05	.05½
Pearl Lake .....	.01	.01½
Porcupine Gold .....	.00⅞	.007½
Porcupine Imperial .....	.06¾	.07
Porcupine Crown .....	.83	.84
Preston East Dome .....	.02½	.03
Rea .....	....	.11
West Dome .....	.00¾	.04

### Cobalt Stocks.

	Bid.	Ask.
Bailey .....	.02⅞	.02¾
Beaver .....	.34	.35
Buffalo .....	.60	.90
Chambers Ferland .....	.17	.19
Coniagas .....	4.85	5.00
Crown Reserve .....	.78	.80
Foster .....	.03½	.04
Gifford .....	.02	.03
Gold Reef .....	.03½	.05
Gould .....	.00⅞	....
Great Northern .....	.02¾	.03
Hargraves .....	.01	.01½
Hudson Bay .....	20.00	21.50

Kerr Lake .....	4.75	5.00
La Rose .....	.56	.58
McKinley .....	.26	.29
Nipissing .....	5.70	5.85
Peterson Lake .....	.24½	.25½
Right of Way .....	.04½	.04¾
Rochester .....	....	.03⅞
Teck Hughes .....	.04¾	.05
Temiskaming .....	.35½	.35¾
Trethewey .....	.14¼	.19
Wettlaufer .....	.44¾	.05
Seneca Superior .....	1.20	1.25
Homestake .....	....	.21
York Ontario .....	....	.08¼

## SILVER PRICES.

May—	New York cents.	London pence.
8 .....	50	23 ⅞
10 .....	50 ⅞	23 ⅞
11 .....	50 ⅞	23 ⅞
12 .....	50 ⅞	23 ⅞
13 .....	50	23 ⅞
14 .....	50	23 ⅞
15 .....	50	23 11 16
17 .....	50	23 ⅞
18 .....	49 7 8	23 ⅞
19 .....	49 ¾	23 ½
20 .....	49 ¾	23 16 16
21 .....	49 ¾	23 16 16
22 .....	49 ¾	23 16 16
24 .....	49 ¾	Holiday
25 .....	49 7 8	23 ⅞

## TORONTO MARKETS.

May 26—(Quotations from Canada Metal Co., Toronto)—

- Spelter, 22 cents per lb.
- Lead, 5½ cents per lb.
- Tin, 45 cents per lb.
- Antimony, 40 cents per lb.
- Copper, casting, 21 cents per lb.
- Electrolytic, 21 cents per lb.
- Ingot brass, yellow 13c.; red, 15 cents per lb.

May 26—(Quotations from Elias Rogers Co., Toronto)—

- Coal, anthracite, \$7.50 per ton.
- Coal, bituminous, \$5.25 per ton.

## NEW YORK MARKETS.

- May 25—Connellsville coke (f.o.b. ovens)—
  - Furnace coke, prompt, \$1.50 to \$1.55 per ton.
  - Foundry coke, prompt, \$2.00 to \$2.40 per ton.
- May 25—Tin, straits, 38.00 cents.
- Copper, Prime Lake, 18.50 to 18.75 cents.
- Electrolytic Copper, 18.37½ to 18.62½ cents.
- Copper wire, base, 20.00 cents.
- Lead, 4.30 cents.
- Spelter, 18.75 to 19.25 cents.
- Sheet zinc (f.o.b. smelter), 19.50 cents.
- Aluminum, 25.00 to 26.00 cents.
- Nickel, 45.00 to 48.00 cents.
- Platinum, soft, \$40.00 per ounce.
- Platinum, hard, 10 per cent., \$42.00 per ounce.
- Bismuth, \$2.75 to \$3.00 per pound.
- Quicksilver, \$74.00 per 75-lb. flask.