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CANADIAN MINING JOURNAL

VOL. XXXVI TORONTO No. 10

ON and after June 1st, the offices of the Canadian Mining Journal will be in the New Purman Building, 263-5 Adelaide Street, West.

Increase in our printing business makes it necessary for us to have additional machinery and more room. In our new quarters we will be exceptionally well equipped.

The Canadian Mining Journal, 2nd Floor, 44-46 Lombard St., Toronto, Ont.

Synopsis of Coal Mining Regulations

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

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

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

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

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

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

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

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

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

THE CANADIAN MINING JOURNAL

VOL. XXXVI. TORONTO, May 15, 1915. No. 10

The Canadian Mining Journal

With which is incorporated the

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Editor
REGINALD E. HORE

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CIRCULATION.

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

CONTENTS.

GERMAN WARFARE

For some time Germany has been regarded as an outlaw among the nations. It is becoming more and more evident that the term outlaw is scarcely applicable. The Kinsale jury has diagnosed the case.

The dastardly treatment of the Belgians, the raids on unfortified towns, the use of asphyxiating gases in direct violation of accepted rules of warfare, the murder of passengers on an unarmed ship; these are crimes that Germany cannot hope to live down in this generation, nor in the next. Germany has gone on record for all time as the nation of murderers.

In characteristic German, the murderers claim that they issued warnings of the premeditated crime, and that therefore the crime is excusable. And this is the nation from which we have been drawing teachers for our colleges!

We are not greatly surprised that the Germans tried to sink the Lusitania. We would not be surprised if they should attempt more such murders. That they succeeded in their attack was the only surprise. The British navy must have been very busily occupied elsewhere.

One result of the crime will be that citizens of the United States will recognize more clearly that the Germany of to-day is the foe of mankind. Americans were not slow to see the significance of the German crimes in Belgium. They will, by the loss of their fellow-countrymen on the Lusitania, appreciate that the Allies' cause is theirs also.

In Canadians the news of the sinking of the Lusitania and the loss of so many innocent lives has aroused a feeling of repulsion towards anything German. It is not mere hatred of an enemy; but a feeling of loathing, such as one has for a common murderer. Even of the Prussians we expected something more noble than this. That the soldiers despised even the civilians of their own country was commonly believed; but that they would murder unarmed Belgian citizens, butcher wounded soldiers and sink passenger ships without warning is a revelation. There is but one way to treat these criminals. An overwhelming force must be provided. Every citizen of the Empire must assist in the task of punishing the murderers of babes.

THE CANADIAN MINING INSTITUTE

In a letter to the secretary of the Canadian Mining Institute, Mr. B. Neilly, of Cobalt, refers to differences of opinion as to the character of the Institute. He asks whether it is a technical society or an association

to further the interests of the Canadian Mining Industry. The question is readily answered by the following extract from the Charter:

"Whereas the persons hereinafter named have, by their petition, represented that an association known as the Canadian Mining Institute has been founded by the said persons, and others, for the following purposes, namely:

"First, to promote the arts and sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications. Second, the establishment of a central reference library and a headquarters for the purpose of this organization. Third, to take concerted action upon such matters as affect the mining and metallurgical industries of the Dominion of Canada. Fourth, to encourage and promote these industries by all lawful and honorable means. And whereas the said persons have prayed that it be enacted as hereinafter set forth, and it is expedient to grant the prayer of the said petition: Therefore Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:

"1. John E. Hardman, George M. Dawson, William A. Carlyle, Charles Fergie, John Blue, B. T. A. Bell, A. W. Stevenson, James McArthur, Archibald Blue, William Hamilton Merritt, F. T. Snyder, Henry S. Poole, Wilbur L. Libbey, Robert G. Leckie, Clarence H. Dimock, Geo. E. Drummond, Geo. R. Smith, J. Obalski, John J. Penhale, R. G. McConnell, Frank C. Loring, John B. Hobson and William Blakemore, together with such persons as hereafter become members of the Institute are hereby incorporated under the name of 'The Canadian Mining Institute,' hereinafter called the 'Institute,' for the purposes set forth in the preamble."

The first two by-laws as to membership are:

"1. Members shall be persons actually engaged in the direction and operation of mining and metallurgical works, mining engineers, geologists, metallurgists, chemists and such other persons as the Council may decide are eligible through connection with mining affairs.

"2. Associate members shall be persons directly or indirectly associated with or interested in the business of mining, but not included under Sec. 1. Associate members shall be entitled to vote, but may not hold office."

The charter and by-laws make it clear that the Canadian Mining Institute was not intended to be, and it is not, merely a technical society. The Institute has a far larger purpose to serve.

ASPHYXIATING GASES IN WARFARE

It seems a waste of time to indulge in further recrimination of the Germans because of their inhuman mode of warfare. We are now resigned to the inevitable proverb: "What can one expect from a pig but a grunt?" But the latest barbarism, that of the use of asphyxiating gases, chlorine and bromide, is of particular interest to miners, because the Germans seem to have used oxygen breathing apparatus in their deadly work. Roland Hill's despatch to the Montreal Star, of the 26th April, says: "Front ranks opened up close to our (Canadian) trenches, and hand-grenade men, with special breathing apparatus, broke through with gas bombs."

The British Government despatched Dr. J. S. Haldane, whose name every miner knows from his exhaustive researches into mine gases and their effects on the human organism, and his experiments on oxygen breathing apparatus—to report on the nature and effects of the gases used by the Germans. Dr. Haldane states men who breathed these gases died of acute bronchitis caused by inhalation of an irritant gas, probably chlorine or bromide. Chlorine gas is heavy and would cling close to the ground. No man is better qualified to recommend counter-measures than Dr. Haldane, and we can rest assured that the resources of science are not all in the hands of our enemies.

It may not be generally known that oxygen breathing apparatus is part of the equipment of the German Zeppelins, and will enable the aviator to breathe with ease at heights which would render breathing impossible or very difficult to the unaided human organism. Every German submarine is equipped with breathing apparatus, which gives the occupants an additional lease of life in case the air inside the submarine for any reason becomes irrespirable. The same apparatus also enables men to escape from a submerged submarine, through the manhole provided for this purpose, and reach the surface of the water.

Oxygen breathing apparatus have been used by the French in gathering decomposed bodies on the battlefield.

It may be confidently expected that the British authorities will speedily evolve some form of respirator which will nullify the devilish devices of our unscrupulous foes. There are several large manufacturers in Great Britain capable of meeting this new requirement quickly.

One of the German newspapers falsely states the British have used asphyxiating gases, and suggests that German scientists with their greater chemical knowledge would probably produce a more effective weapon. It is apparently a favorite trick of the Germans to accuse their opponents falsely of the use of some unlawful device of destruction, so as to minimize their own venality when they themselves commence to use it. But it may be remarked that the production of deleterious

gases is a game that two can play, and if the Germans are prepared to unlock all the destructive forces of nature remorselessly, they may meet some unpleasant surprises in return.—F. W. G.

McIntyre Porcupine Mines, Limited, will have a new interest for mining men now that Col. A. M. Hay, Sir H. M. Pellatt, W. J. Sheppard, J. B. Tudhope and J. P. Bickell are on the board of directors. These men are all Canadians who have been successful in many business enterprises, and who have the confidence of the public. Col. Hay is especially well known to mining men, being one of the most highly respected members of the Canadian Mining Institute.

The copper market continues to furnish sensations. The demand seems to grow as the price advances. Ordinary brands are finding a ready market at 19 cents per pound, and special brands of Michigan copper are in demand at 23 cents.

Dr. Waldemar Lindgren states that 100,000,000 pounds of tin, equivalent to about $40,000,000, is needed annually in the United States and is imported. This splendid market for tin should be kept constantly in mind by prospectors. It is not at all unlikely that there are tin deposits in Canada.

After June 1 the office of the Canadian Mining Journal will be in the new Purman building, 263-265 Adelaide street west. Call and see us in our new home.

The Cobalt branch of the Canadian Mining Institute has arranged for an excursion to Porcupine May 17-20. A number of mines and mills will be visited, and a meeting to hear methods described will be held on Tuesday evening. A committee, composed of Porcupine mine managers, will have charge of the program.

POTASH DEPOSITS IN SPAIN.

Particular interest attaches to the proposed Spanish potash law, in view of the fact that the American Agricultural Chemical Company said in its recently published annual report:

"Within the past year an important discovery of potash salts has been made in Spain, and through the opportune presence of your chairman in that country at the time the Spanish Government's examination of these deposits had been completed, your company has acquired from the Spanish Government some large concessions in the territory examined.

"These properties are now being surveyed, under the direction of an eminent Spanish mining expert, preparatory to boring them for potash. These deposits appear to be in every way similar to those of Germany, and, so far as reported upon, they are richer in quality and lie at a considerably less depth than the German deposits.

"It appears, therefore, as if Germany's potash monopoly might be broken, and your company placed in a position to obtain its potash from Spain in the near future."

OFF KINSALE

By B. F. Griffin, in Boston News Bureau.

"Only the baby's cap floating showed where more than a score sank."—News item.

An admiral, bearded, ponderous, grim,
At his desk with charts bespread,
And some four thousand miles from him
A babe in a trundle bed,—

How could they meet and when and where
And their alien paths collide?
Go ask yon mist-loved headland there
Long brooding above the tide,

With candy-stick lighthouse capped red-white
And girt with the fishers' sail,
That the Dane kings saw and Armada fight,—
Ask the Old Head of Kinsale!

In sight of the rude, warm fisher cot
At foot of the watching cliff,
Only a little white cap afloat
O'er grave of a foundered skiff.

More souls—two thousand,—various wrapped
With flesh and with circumstance,
Were in yon steel-gilt-plush cage trapped,—
Two-thirds had never a chance!

But what of number or of weight
In souls or in gold or steel?
To the rocking babe 'twere equal fate
Had his cradle been the keel!

An admiral, bearded, ponderous, grim,
At his desk with charts bespread,
And some four hundred miles from him
A babe in an ocean bed!

CORRESPONDENCE

STIMULATION OF PROSPECTING.

To the Editor of the Canadian Mining Journal:

Sir,—As I have for nearly twenty years followed the occupation of prospecting, I am, of course, interested in any suggested attempts to stimulate prospecting.

By a prospector I mean a man whose occupation is searching for minerals, expecting, as a reward for his labor, to mine and dispose of minerals found, or to sell his rights to others. In either case, security of title, character and value of ore and nearness to a market are the most important points to be considered. It therefore follows that it is unprofitable to prospect too far from where transportation facilities are available or in course of being provided. While Canada is today fairly well supplied with railroads, the mineral bearing areas through which these railways run are also pretty well staked into mining claims, but not developed, nor even properly prospected.

Old camps, mills and other mining machinery, evidence of the operations of J. Rufus Wallingford and Blackie Daw, are to be found; but no work is being done. Dead and all but deserted mining camps, of which mementoes in the form of mining shares are to be found in nearly every home in the United States, Canada and Europe, are not good advertisements, nor inducements for further investments in any new mining ventures, be they ever so legitimate.

As a result, the prospector is obliged to go far afield where discoveries are of doubtful value.

As conditions are to-day the prospector is idle, for his occupation is no longer profitable. As a matter of fact, he is claim poor.

At the same time, we find that Ontario and other Canadian mining companies are investing their surplus capital in mining industries in the United States, Mexico and Central America. Surely they would rather invest and operate in their own country, were conditions as favorable at home as they are abroad.

Then what is the matter with the conditions at home?

First. Terms, as usually asked, by owner or owners of mining claims, are considered by mining companies, looking for investments, as prohibitive.

Second. Ownership and title, as applied to defunct mining companies' properties, are too obscure.

Third. Too far from railway or other transportation facilities to make operation profitable.

As a remedy I would suggest that a sufficient tax be imposed on all leased or patented mining claims, on which a required amount of work had not been performed during the year, so as to make it unprofitable to hold mining lands without attempting to do mining. And in default of work being done or tax paid, the ground should become open for prospecting and staking. Such a law would open large areas of mining lands near to transportation; would also stimulate mining and prospecting, and curtail, if not eliminate, the operations of the wild catter and his brood. Then by the time that the mineral resources that may be in the unexplored North of Canada were needed, the Geological Survey Department would have that country surveyed and maps would be available to guide the prospector and miner. This would help eliminate the gamble ever present in prospecting and mining.

I am fully aware that to suggest that owners of leased or patented claims be required to do work or pay a tax, is about equal to disturbing a hornets' nest. But the mining companies who make a profit of mining and are employers of large numbers of men, are paying taxes, and the prospectors, up to the time of securing a lease or patent, are required to do so much work yearly or lose their claims. Then why should those who hold mining land without doing any work not be required to pay for that privilege?

The prosperity of the mining industry, as well as the Canadian people, is not measured by the amount of mineral land disposed of to individuals or companies, but by the number of people who are employed by that industry and the amount of metal recovered.

If the present system is continued Canada will, in the course of a few years, be in the same position as the United States is to-day, having no new country to prospect and explore.

In the meantime isolated mines, scattered over the country, fighting for their lives against an ever increasing cost of operation, are continually asking the Government for aid in providing the necessary facilities of transportation. Gowganda is a typical example of such a case. Of the thousands of claims leased, only three properties are working. A few leased claims are still owned by the original locators, but the majority are in the hands of bankrupt stock companies and speculators, who have no notion of ever doing any active mining or allowing the development of their properties by others who may wish to do it, before first securing a substantial cash payment. And the attitude adopted by the officials of the Bureau of Mines towards those who have attempted to prospect and locate lapsed mining claims, is not calculated to stimulate prospecting on any of the several hundred claims posted in the Recorder's office as cancelled for the lack of performance of work.

Under those conditions new discoveries of mineral can hardly be expected to be made. As a result, the camp is slowly dying for the lack of opportunity to make good.

As those conditions are more or less general throughout Canada, is it then any wonder that the mining men from the Atlantic to the Pacific are asking: What is the matter with and what can be done to stimulate prospecting?

Suggestions have been made that prospecting parties be sent out by the Government and that we establish State batteries. These would, at best, give only local and temporary relief, as only in some respects are all mining camps alike. All camps are hampered in their progress by idle claims. Every camp needs cheap power, in order to carry on mining. As idle claims are, more or less, a result of lack of cheap power, Government aid by supplying cheap power would go a long way towards relieving the situation and would be self-supporting.

The Ontario Government possess the opportunity to demonstrate the practicability of my suggestion, without any financial risks being involved, by erecting at the Indian chutes on the Montreal river at Elk Lake, a Hydro-Electric power plant for the purpose of supplying electric power to Gowganda mines. If not found profitable to the Government the power could be used for the electrification of the T. and N. O. Ry.

Yours, etc.,

L. HEDLUND.

Gowganda, May 10th, 1915.

SHOULD ONTARIO HAVE GOVERNMENT BATTERIES?

Mr. T. A. Rickard writing editorially in the April 17 issue of Mining Press on the article by Mr. Geo. R. Rogers, "Should Ontario have Government Batteries," April *Canadian Mining Journal*, says:—

We have some personal knowledge of the Government-owned plants in Western Australia, and can say that on the whole they have been a decided success. They have been the means of stimulating mining and prospecting in many remote districts where no plant for recovering gold was available, and in localities where the freight to a custom-mill is prohibitive. Even when a group of small properties contains good ore, the collective owners cannot afford to erect a plant, and so in time are forced to close. Then the Government steps in and provides the means whereby the gold is extracted at reasonable cost. Discontent is not unusual among miners who have not received the yield they expected, but who ever heard of a prospector who did not over-estimate the value of his ore? In Western Australia there are 37 stamp-mills and cyanide-plants operated by the State. These cost £332,378, and have treated for small mine-owners a total of 960,989 tons of gold ore yielding £4,109,321 and 64,920 tons of tin ore producing £80,835. It is certain that without these Government mills most of this metal would never have been recovered. The effort has stimulated mining and prospecting. One objection to the system does exist: the miners often extract the richest ore in their claims and then abandon them, whereas if the men had their own plants they might develop their properties.

MINERAL DEPOSITS NORTH OF SAULT STE. MARIE, ONT.

By Charles H. O'Connor.

The Algoma Central Railway in its tortuous route from Sault Ste. Marie to the little town of Hearst, some three hundred miles north, on the Grand Trunk Pacific, passes through one of the most picturesque parts of Ontario. For the first two hundred miles the country is rugged and broken, with hills and valleys and innumerable lakes and streams. It is clothed with virgin forests of spruce, pine, balsam, birch, poplar and maple. The scenery along this section of the railway is entrancing. A distant view of the limpid waters of Lake Superior; the rugged scenery of the famous "Horse Shoe Bend"; the dizzy heights of the Montreal river bridge with the falls thundering two hundred feet below; the misty grandeur of the Agawa canyon; and the exquisite beauty of Bridal-veil Falls are silent witnesses of the lavishness with which nature has painted this wonderful country.

The forest abounds with game, moose, red deer, caribou, bear, partridge, ducks and geese. In the lakes and mountain streams there are brook trout, lake trout, black bass, maskinonge, pickerel and white fish in abundance. Small fruits such as strawberries, raspberries and blueberries are very plentiful. The Algoma Central Railway Company has erected a number of cottages at various points along the line for the accommodation of tourists and hunters. These cottages are rented by the week, or for the season at a nominal fee.

North of the Height of Land the country is considerably flatter, and there are fewer rock outcrops. Here the land is slightly rolling and somewhat similar to the prairies of Western Canada. The timber is mostly spruce, while the soil is clay loam covered in many places with a few inches of rich black earth.

Gold at Wawa Lake.—Back in the spring of 1897 gold was discovered at Wawa lake in the Michipicoten district. An extract from a report by the late Prof. A. B. Willmott, sums it up as follows:

"In pursuance of instructions from the Director of the Bureau of Mines, I left Toronto on September 10th, 1898, to make a geological examination of the Michipicoten mining division.

"For some time a little prospecting had been going on in the Michipicoten district, but no valuable discoveries had been made. During the early summer an Indian named Thaddy showed specimens of quartz carrying free gold at Missinabie. For a consideration he pointed out, to James Dickinson, of North Bay, the situation of the vein on Wawa Lake. Samples were obtained, and rich assays were the result. On the first report parties hurried into the district from Sault Ste. Marie and were successful in locating other veins carrying free gold. Their glowing reports were the foundation of most sensational articles in Canadian and American journals, many referring to the district as another Klondike. Men began to arrive from all quarters of the continent, and even women came into the district as prospectors.

"Many prospectors, utterly unfit for their duties, unused to bush life, unable to canoe, often not knowing quartz when they found it, were induced to go into the district by the glowing accounts. It is not surprising that many quickly left. Unfortunately they told their friends that there was no gold in the country, when they should have said that they failed to find nuggets which could be shoveled into bags without the prospectors being forced to get out of their canoes.

"The excitement, however, brought other classes of men, some of them old prospectors, and others with experience of bush life. Many of these made finds, and still more of them were convinced that the district was well worth prospecting."

In a later report Mr. Willmott says in part:

"The Mackey claim (which was originally the Dickinson claim), situated one and one half miles south of Wawa city in Wawa lake, was discovered by an Indian named Thaddy. A sample composed of small fragments taken at random from many points on the vein yielded in my laboratory $65.50 to the ton in gold. Eleven assays made for Mr. Mackey ran from $13 to $145 to the ton. The veins vary from one to four feet in width and have been stripped for six hundred feet."

Several years later the Bureau of Mines Report, 1906, summarized the district as follows:

"The Michipicoten region first attracted attention in 1897 as a gold mining district, hundreds of locations being taken up in the next two or three years to the north of Wawa lake. On many of these, gold specimens of a very promising kind were found, but none of the prospects discovered can be said to have developed into mines, except the Grace, which was worked for some time, apparently at a profit, by the Lake Superior Power Co."

Grace mine.—Thus the first real mining "boom" in Algoma district was created. Of the hundreds of claims staked the great majority were abandoned on account of the scarcity of fuel, lack of capital and adequate machinery to work them. The Grace mine was operated for several years by the Lake Superior Power Company, during which time the main shaft was sunk to a depth of some three hundred feet. A few gold bricks were sent to the banks at Sault Ste. Marie; but during a financial stringency in 1905 the mine was closed down. It changed hands several times until it finally became the property of the Le Page Mining Co. The vein at the three hundred foot level is four and one half ft. in width and shows free gold. The mill was run spasmodically by the Le Page Co., and "clean-ups" aggregating $30,000 were made. The property is now under option and no doubt active operations will recommence at a very early date. The Michipicoten district was discovered at a very unfortunate time. Money was scarce and it was almost impossible to interest capital in Ontario gold. The surface showings are good and the Grace mine has proven that the values hold with depth, so it is reasonable to suppose that the Michipicoten gold fields will yet come into their own.

Helen iron mine.—About the time of the Michipicoten gold boom, the late Ben Boyer, while prospecting in the district for gold, discovered the Helen iron deposit, and Mr. Alois Goetz, of Sault Ste. Marie, Michigan, staked the Josephine and other iron properties.

The Helen mine was purchased from Mr. Boyer by the late Mr. E. V. Clergue and later turned over to the

Lake Superior Corporation. This property is too well known to require a detailed description here; but it is interesting to note that up to date over 1,500,000 tons of hematite ore has been mined, the largest portion of which was shipped to Sault Ste. Marie, where it was converted into steel rails for the various great railway systems of Canada.

Josephine iron mine.—At the Josephine, which is about ten miles north of and on the same range as the Helen, some 500,000 tons of good hematite ore has been proven up. On both the Josephine and Helen there are immense deposits of siderite (carbonate of iron) which have not as yet been mined.

The Magpie iron mine is located about twenty miles north of the Helen. This property was acquired by the Lake Superior Corporation from Messrs. Blackendon, Burke and Gibson in the summer of 1910. In July of the following year a railway branch was completed connecting it with the Michipicoten Division of the Algoma Central Railway. The ore is a siderite and magnetite and it is necessary to roast it to eliminate the sulphur and carbonic acid contents before it is smelted. A roasting plant with a daily capacity of one thousand tons and costing in the neighborhood of one million dollars has been constructed for this purpose. The operation of this plant was looked upon by many as an experiment and was watched with keen interest by engineers throughout the country. It must be gratifying to the officials of the Lake Superior Corporation to know that it has proven an unqualified success, and that their expectations have been more than realized in regard to the low cost of production and the excellent quality of ore thus produced. Over twelve million tons of ore have been proven up. The mine is operated electrically from power developed at Steep Hill Falls on the Magpie river.

Iron Mountain, which is perhaps the most gigantic magnetic iron deposit yet discovered in Ontario, is situated at Mile 182 on the Algoma Central Railway and some four or five miles south of the main line of the Canadian Pacific Railway. It was located by Mr. Harry Dreaney, of Toronto. In describing its discovery Mr. Dreaney says:

"In the summer of 1910 my attention was drawn to this district by some samples of very rich gold ore brought to Toronto by Messrs. O'Connor and McFadden of the Soo. I interested some friends with myself in investigating the find and during the time of proving up the gold, I personally sent prospectors over the surrounding country. The iron was among samples of highly mineralized quartz which the men brought in for inspection. I made a trip for investigation and found that the iron outcrop appeared to be of some extent. Strange to say I could not keep my men on it, as after I had ordered them to leave all the quartz veins alone and follow up the iron, I found on my return that they had abandoned it and gone off again developing the quartz veins. The 'lure' of the gold was strong on them. They had to be impressed that the iron had more attraction for me than the gold. But after they became acquainted with its possibilities they were quite efficient in tracing out the deposit by the strike and the magnetic readings of the dip needle. Judge John McKay had prospectors in the field about this time and staked some claims on the west end of the range."

The deposit has been traced for a distance of ten miles, and it varies in width from forty to one hundred and forty feet. It has been purchased under contract from Mr. Dreaney by the International Steel Co., Ltd., who purpose installing a concentrating plant at a cost of approximately one million dollars. Power to operate the plant has been arranged for and will be transmitted to the property from a developed power within the district.

The ore consists of alternate bands of high and low grade iron intermixed more or less with silica. The average percentage of iron is low, being probably 35 and 40 per cent., but the ore is practically free from phosphorus, sulphur and titanium.

In discussing the low grade iron deposits of this district the late Mr. E. A. Sjostedt, who was consulting metallurgical engineer for the Lake Superior Corporation at that time, says:

"The great economy in using high grade and pure furnace material, even when high in cost per ton, instead of a medium grade ore obtainable at a low cost, is being more and more realized by progressive blast furnace managers. The saving consists not only in a much more than proportional yield of pig iron and a much more than corresponding low fuel consumption per ton of pig iron produced, (owing to the purity and porosity and the higher oxidation of the iron in the briquettes which make them easily reduced), but also in the production of a first-class iron, which causes no trouble during its different stages of conversion and produces a high grade steel at a minimum cost. This latter advantage is not yet sufficiently appreciated in this country, but has long been recognized in Sweden where quality steel has proven the saving of the iron and steel industries in spite of the high cost of blast furnace fuel. A great many plants for the concentration of low grade iron ores (especially silicious magnetite) have therefore lately been installed in Europe and among them concentrating and briquetting plants in Sydstvanger district in Northern Norway. The ore is very similar in structure and composition to the ore of this district, averaging about 37.5% iron and 44% silica and is low in phosphorus, sulphur and titanium. By means of the Grondal method it yields a concentrate which averages about 67% iron, .006% phosphorus and .008 sulphur. Owing to the excellent results that have been obtained in the furnaces in Germany and England when using these imported Swedish concentrates, English and German capital have been freely available in Sweden and Norway for the installation of concentrating and briquetting plants at the Swedish and Norwegian mines. However, there is no need of going to Europe for seeing such plants in operation, as several Grondal plants have now been erected in the United States among which I lately visited that of the Pennslyvania Steel Co. at Lebanon, Pa., where 600 tons of ore are concentrated and nodulized daily. The results from this class of furnace material have here been exceptionally encouraging: General Manager Lee telling me that this company has lately erected a 1,200 ton plant in Cuba and that he expects to double his own plant, and looks forward to the time when he would need to use nothing but concentrates, as his records show that with concentrates alone he has been able to double his furnace output and decrease his furnace consumption 50 per cent. as compared with the old records when using the roasted Cornwall ores. The ordinary fuel saving and increase in blast furnace output, even when using high grade natural ores, amounts to 20 per cent.

This is the class of ore on which the future steel industries of Canada and perhaps of America must de-

pend. Over 75 per cent. of the iron ore used in Ontario blast furnaces comes from the United States, but with the rapid development of our immense deposits the time will shortly come when our steel industries will not only be supplied with ore mined exclusively in Canada, but we will also have an abundant supply for export.

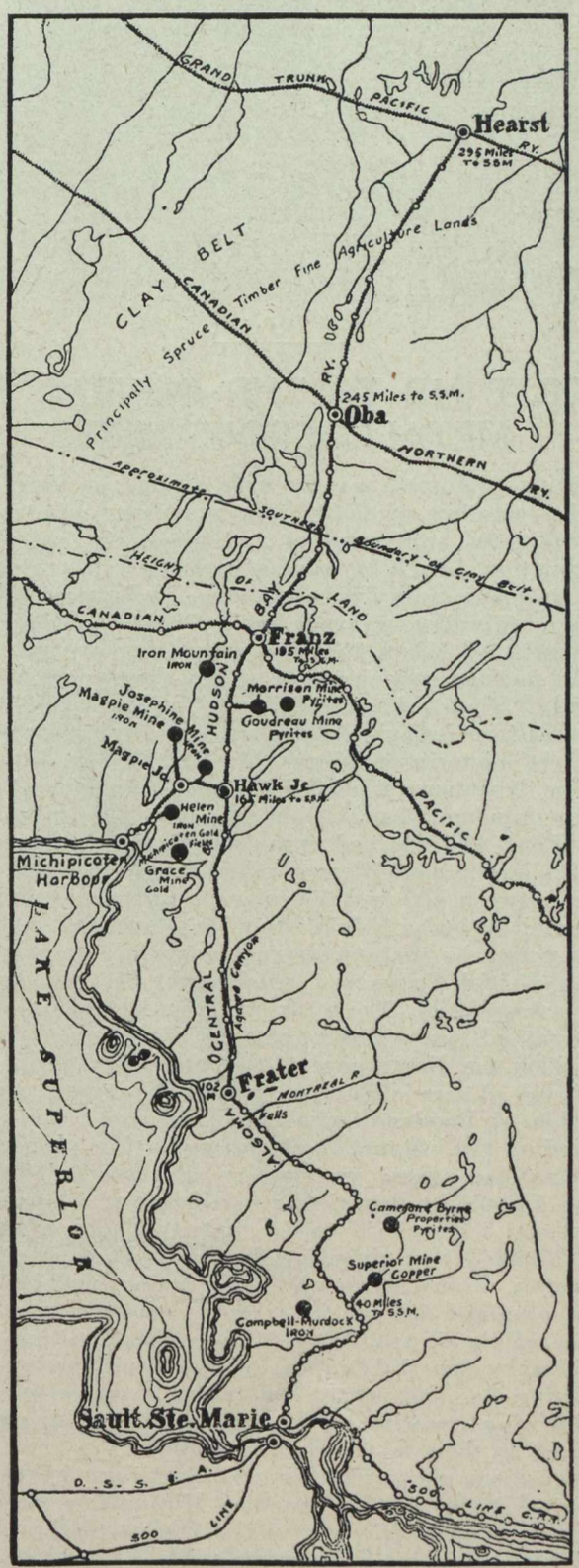
Goudreau pyrite mine.—At Goudreau lake, some two miles East of Goudreau station on the Algoma Central Railway, the Madoc Mining Company, a subsidiary company to the General Chemical Company of New York, N.Y., have for the past two years been engaged in diamond drilling an iron pyrites property which they have under lease from the Lake Superior Corporation. An immense body of ore has been proven up and with the completion of a railway spur which is now under construction to connect it with the Algoma Central active mining operations will commence. This ore is mined exclusively for its sulphur contents and is used extensively for the production of sulphuric acid. Some 50,000 tons of ore will be gotten out this summer from this property and shipped to the company's refinery for treatment. A large number of men will probably be employed.

Prospects—In addition to the above mentioned mines there are a number of prospects which are well worthy of mention. Among them being the Campbell-Murdock iron properties, five miles West of Wabos siding, where it has been estimated that there are upwards of eight million tons of magnetic iron ore; the Morrison and Wilcox properties which adjoin the Goudreau and on which there are large deposits of iron pyrites; and the Cameron and Byrne pyrites properties six miles East of Mile Sixty where an exposure of several thousand ft. of 40 per cent. ore has been uncovered.

The country, except in the vicinity of the railways and along the principal rivers and lakes, has only been roughly prospected. With a systematic examination there is every possibility that numerous other valuable mineral discoveries will be made.

Timber—Extensive lumbering operations have been going on in this district for several years and while large portions of this territory—especially in close proximity to the railways and large streams—have been cut over, still there are vast areas which have not as yet been touched. The Lake Superior Paper Co. are perhaps the largest operators. Thousands of cords of spruce are required to keep their large mechanical and chemical pulp mills at Sault Ste Marie going continuously. This plant has a capacity of over two hundred tons of pulp per day and as it takes approximately one and one half cords of wood to make one ton of mechanical and chemical pulp, nearly one hundred thousands cords of spruce are used annually. The cutting of this timber gives employment to hundreds of men during the winter months at the company's various lumber camps throughout the district. Last winter some thirty thousand cords of pulp wood were purchased by a large American concern from the settlers and jobbers in the vicinity of Hearst and shipped by rail to the paper mills at Appleton, Wisconsin. Together with the operations of the above mentioned companies and several other smaller companies the total output of pulp wood for the winter of 1914 and 1915 will exceed two hundred and fifty thousand cords. Of this exceedingly large amount, one hundred thousand cords is for domestic use and the balance of one hundred and fifty thousand cords for export to the United States.

There are also several large concerns who are cutting pine timber almost exclusively. During the spring "drive" thousands of pieces of this timber are floated down the rivers and streams tributary to Lakes Superior and Huron and find their way eventually to various saw mills, where they are cut up into board lumber and



Sketch Map of District North of Sault Ste. Marie, Ont.

dimension timbers for the markets of the world. Many cords of hardwood are also cut, some of which are used in the manufacture of charcoal and the balance for fuel.

With the exhaustion of the timber supply in other localities the importance of these vast resources cannot be underestimated. The industry is practically in its infancy as yet, and as it grows, it will not only attract other new industries, which will give employment to a correspondingly greater number of men, but will also net the Province and incidentally the people of the district many thousands of dollars.

Water power—Exclusive of the forty-four thousand horse-power, which is Canada's share of the immense power flowing over the St. Mary's rapids at Sault Ste Marie, there is more than one hundred thousand horse-power in the numerous falls on the Michipicoten River and Steep Hill Falls on the Magpie River, none of which powers are being utilized. The energy is available when required and will prove a valuable asset in the development of the country.

FIRST AID TO THE INJURED AT METALLIFEROUS MINES

British Columbia was the first province in Canada to make statutory provision for compulsory mine-rescue training and equipment at coal mines, its Coal Mines Regulation Act, 1911, having included this protection for its coal-mine workers employed underground. Last year a beginning was made by the British Columbia Department of Mines to induce men employed in and about metalliferous mines to attend classes for instruction in "First Aid to the Injured," and at a meeting of the Western Branch of the Canadian Mining Institute, held in Victoria on March 11, Mr. Dudley Mitchell, of the departmental staff, informed those present that during nine months since his appointment as instructor in "First Aid" he had organized classes at a number of the larger metalliferous mines in the province and that between 400 and 500 men had attended and received instruction chiefly from duly qualified medical men acting as surgeon-instructors under the auspices of the British Columbia Council of the St. John Ambulance Association. The work had been in some measure interrupted by the closing of some of the mines, consequent on the disturbance of the metal markets by the outbreak of war in Europe, but in some mining camps, notably at Rossland, numbers of men had continued attending the instruction classes and a fair proportion of them had passed examination and obtained the St. John Ambulance Association certificate of competency to render "First Aid to the Injured." In addition, Mr. Mitchell had given instruction in the use of the pulmotor, which automatic resuscitating machine has been obtained for use in cases of emergency at the mines of the Consolidated Mining and Smelting Co., the Granby Consolidated Co., the Britannia Mining and Smelting Co., and others, not taking into account the coal-mining companies also provided with this useful adjunct to their mine-rescue apparatus.

At various meetings during the last three years the Western Branch of the Canadian Mining Institute has had papers and addresses on the subject of First Aid and, too, has given demonstrations of the use of the pulmotor. Gradually there has come about an increasing recognition of the necessity for making provision for rendering "First Aid to the Injured" to other workers than those employed in coal mines, the latter having already been benefitted by an enactment requiring that certain of the mine officials shall have obtained a "First Aid" certificate of competency. In this direction the efforts of the Chief Inspector of Mines to secure for the metalliferous miners, as well as the coal miners, as much protection as possible against unnecessarily serious results from accidents or sudden attacks of sickness until skilled medical or surgical services shall be available, have been supplemented to an important extent by the enactment recently by the Legislative Assembly of British Columbia of "An Act for the Protection of Workmen Engaged in Industrial Operations," submitted to the Provincial Legislature by the representative of a constituency on Vancouver island in which there are operating coal mines. The bill makes provision for various classes of workmen beside miners, but its effect in the cases of numerous metalliferous mines was fully recognized when it was under discussion. The act is as follows:

1. This Act may be cited as the "Ambulance Act, 1915."

2. Every employer of labor directly or indirectly operating any mine, camp, construction-work, or industry employing more than thirty persons, and being situated more than six miles from the office of a medical practitioner, shall at all times maintain in or about such industry or works at least one person possessing a certificate of competency to render first aid to the injured, and shall also provide a good and sufficient ambulance box or boxes.

3. The Secretary of the Provincial Board of Health shall determine the qualifications necessary to obtain a certificate of competency to render first aid to the injured, and any duly qualified medical practitioner may issue certificates in accordance therewith.

4. Any employer of labor directly or indirectly operating any industry or works subject to the provisions of section 2 of this Act shall forward to the Provincial Secretary the name of the person qualified to render first aid, and the number of his certificate of competency, and any employer directly or indirectly operating for more than six days without such competent person shall, upon summary conviction, be liable to a penalty not exceeding fifty dollars, and, in default of payment of such, to imprisonment for a period of not more than three months.

5. Any incompetent person presuming to possess a certificate in accordance with the provisions of this Act shall, upon summary conviction, be liable to a penalty not exceeding fifty dollars, and, in default of payment of such, to imprisonment for a period of not more than three months.

6. This Act shall not apply to coal-mines operating under the "Coal-mines Regulation Act."

7. This Act shall come into effect on the first day of January, 1916.

W. F. FERRIER HONORED BY UNIVERSITY OF ALBERTA.

At the annual convocation of the University of Alberta, in Edmonton, on April 28th, the degree of D. Sc., (Honoris Causa) was conferred on W. F. Ferrier, B. Sc., F.G.S., mining engineer and geologist, of Toronto Mr. Ferrier was for nine years an officer of the Geological Survey of Canada, and is well known as a mineral collector. He has spent many ardent years on field work in Western Canada and the United States. He has also made extensive donations to the museum collections at the University of Alberta, and has assisted in building up the Geological Museum equipment.

PROSPECTING BITUMINOUS SAND IN ALBERTA*

By S. C. Ells.

The necessity of carefully and systematically prospecting any area of bituminous sand as a preliminary to actual development is, of course, obvious, and until this has been done it is impossible to definitely express an intelligent opinion regarding the value of a deposit. Incidentally, it may be noted that a certain degree of danger attends such work. During warm weather, large and small masses of bituminous sand flake off and fall from exposed faces. After rains, heavy slides of loosened material are frequent along the more precipitous outcrops. The following are among the more important conditions to be considered.

Overburden.

Even a casual consideration of the measurements of sections will indicate the importance that will attach to this feature, since everywhere in Northern Alberta the bituminous sand is overlaid to some extent. In certain cases, gravels and clays, in others, stratified sandstones, shales and occasional thin quartzites constitute the overburden; while, in many instances, low grade bituminous sand must also be classed as overburden, and removed as such. Moreover, contour maps of small areas in the vicinity of eleven of the more promising outcrops indicate wide variation in surface elevations, often within narrow limits.

Types of Machines, etc.—Types of machines for proving depth and character of overburden are well known, and require little comment. A simple churn drill that is being used extensively in connection with prospecting work on the iron ranges of Minnesota, is, however, here briefly referred to. Such a drill is found to be satisfactory in determining depth of overburden when the material consists of sand, gravel and clays. As illustrated in Fig. 1, the three members of the head frame, which is 30 to 40 ft. high, consist of two squared legs about 5 in. by 6 in., and a heavy ladder; the latter being of service in connection with necessary work about the upper part of the rig. Light poles, spiked to the ladder and legs, carry plank scaffolding. A 1¼ in. hemp rope supports the casing, drill, etc., also operates the 250 lb. hammer used in driving the casing. This rope runs over an 18

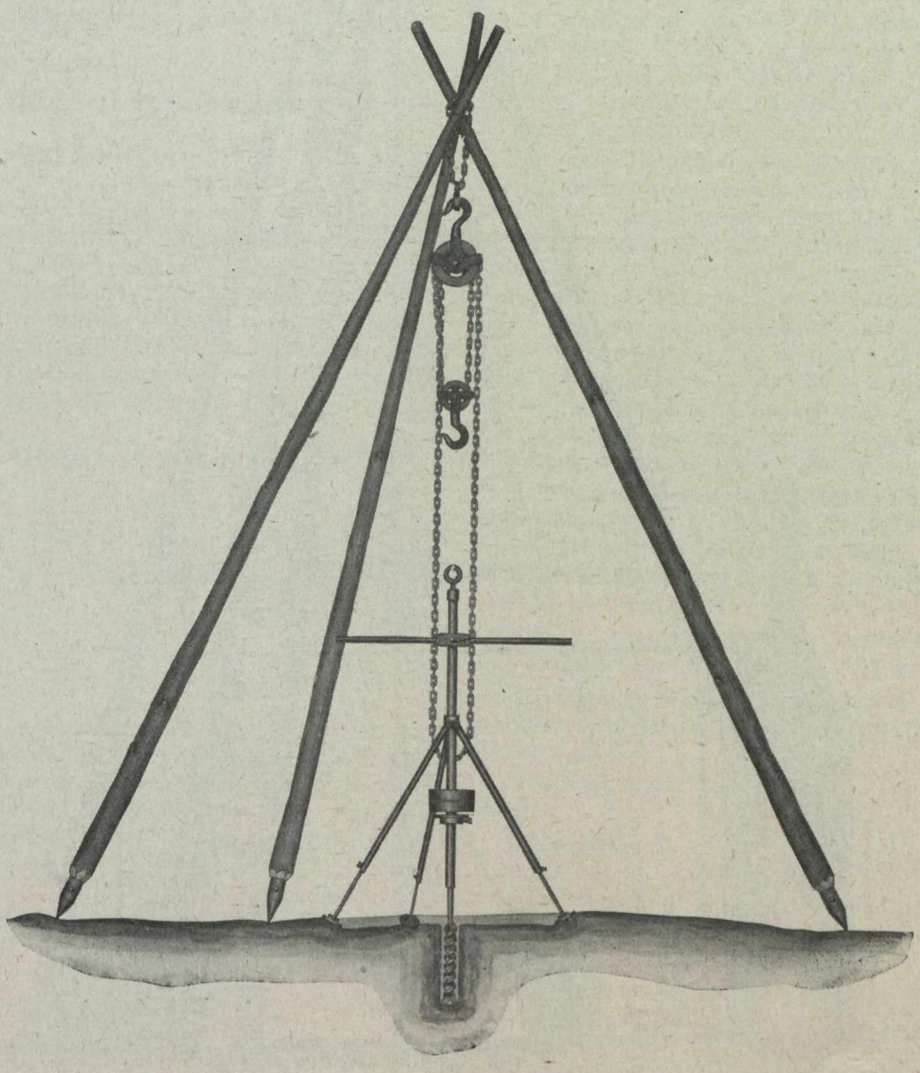


Fig. 1.—Arrangement of Auger for Boring Bituminous Sand.

*Extract from a report on the bituminous sands of Northern Alberta, Mines Branch, Ottawa, 1915.)

in. sheave placed in the upper end of the ladder, and from thence passes around a capstan as shown in Fig. 1. In driving the casing, or in operating the drill, an attendant checks or loosens the rope, and thus controls the height and frequency of the drop of the hammer.

The casing used is 3 in. heavy wrought iron, lengths being usually about 20 ft. Wash rods of 1¼ in. wrought iron are passed down through the casing, and carry a bitt at the lower end. In driving the casing a T coupling is usually screwed to the upper end in order to prevent damage by the hammer. By means of a 6 ft. bar clamped about the casing, a slow turning movement is given, which tends to prevent binding.

In commencing a hole, the casing is first driven down until it no longer sinks easily. Water is then pumped down through the wash rod, and passes out through small holes in the faces of the bitt. This water mixes with the material churned up by the bitt, and, rising through the casing, overflows at the casing head. Here the material from the hole is either wasted or run into settling boxes, for further examination. It may be noted that in soft ground, such as sand, a bitt is not required, the water merely flowing through the lower open end of the wash rod. Usually the casing is easily driven after the wash rod. In tough clay, however, it is often desirable to first spring the hole with 60 per cent. dyna-

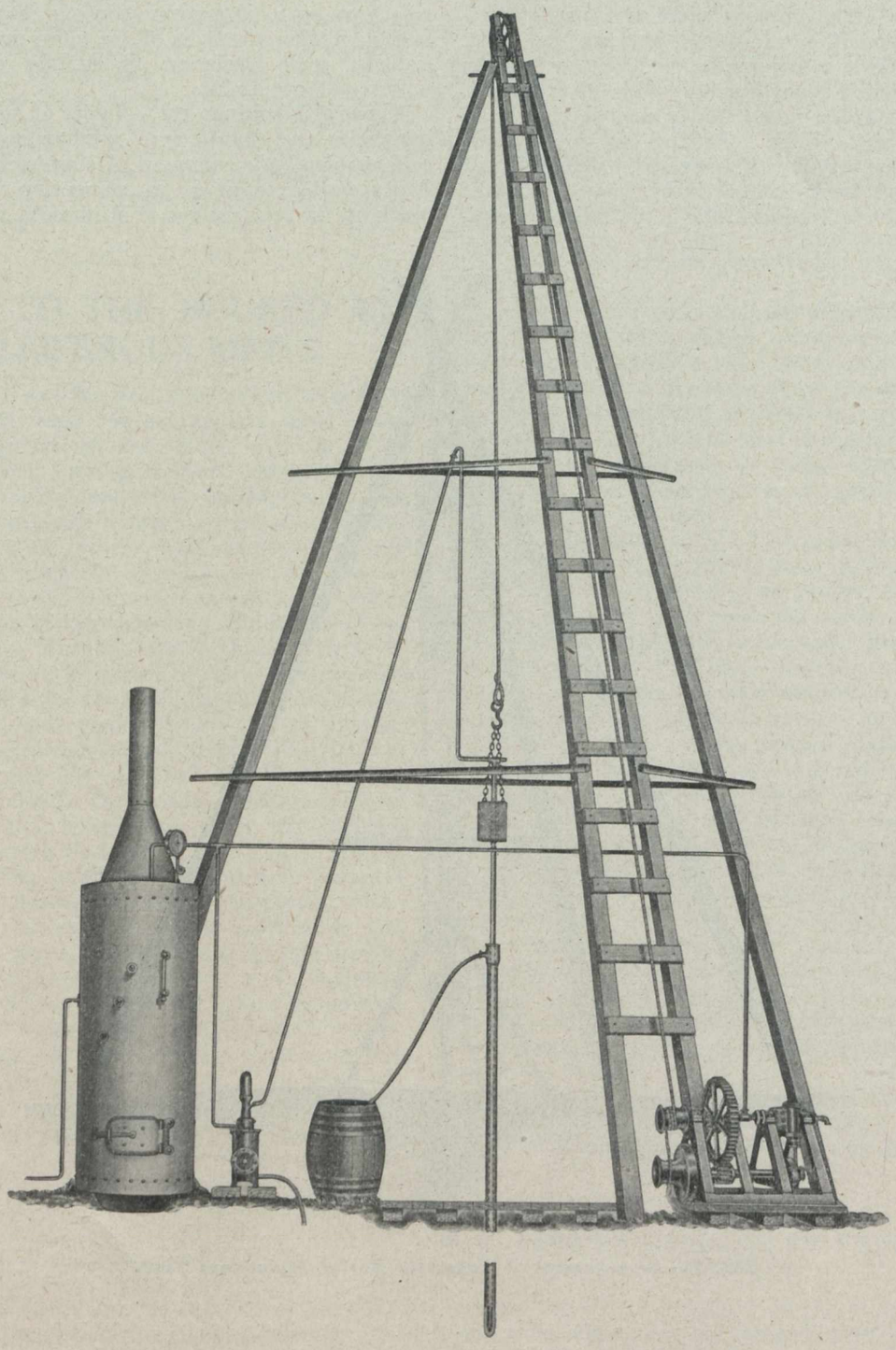


Fig. 2.—Typical Example of "Churn" Drill.

mite. Boulders when encountered are also shattered by the use of dynamite, rods and casing first being drawn up a sufficient distance. After passing through the overburden, holes may be continued, in the case of bituminous sand, by means of an auger, or other suitable appliance.

A rig such as the above can be operated by two men, though a crew of three will get better results. In favorable ground 30 to 50 ft. of hole per day can be driven.

A 10 h.p. engine similar to that shown in Fig. 1, weighs about 1,400 lb., and a 20 h.p. boiler about 3,000 lb. These are easily capable of sinking and casing holes to a depth of 150 ft. Moving with stone boat and wagon, and setting up, need, therefore, present no serious difficulty. The total cost of boiler, engine, pump, pipe, tools, etc., should not exceed $1,200. Such equipment may usually be purchased second hand at a somewhat lower cost.

Variation in Thickness of Bituminous Sand.

Owing to the general uniformity of elevation of underlying limestones, and to the undisturbed condition of much of the overlying strata, when present, the thickness of bituminous sand in any deposit within a reasonably limited area will probably be fairly uniform. The outcrops are, however, often partially concealed by drift and talus piles, which will necessitate extensive excavation before accurate measurements can be made. Frequently a portion of a bed extends below water level, in which case boring must also be resorted to.

Variation in Quality of Bituminous Sand.

Variation in per cent. of bituminous content, grading of mineral aggregate, percentages of sulphur, etc., will be met with, often within narrow, horizontal and vertical limits. Such features can only be determined by systematic sampling to the full depth of the deposit to be excavated. Two methods may be adopted, each of which will be found applicable under different conditions.

1. In sampling an exposed face, it is probable that the best results can usually be had by blasting out a vertical section. Care should be taken that such a section exposes bituminous sand in place, for, especially under heavy overburden, the effects of slips may extend several feet into the banks. Such slips are not always easy to detect, since disturbed bituminous sand, even under its own weight, will resolidify in such a manner as to leave no surface indication of any disturbance. In one instance the writer exposed a section 65 ft. high, by excavating the whole face to a depth of 5 to 8 ft. Although at first the material appeared to be in place, it was afterwards considered to be all a part of one large slip.

In connection with excavation such as the above, holes are most easily sunk by means of a special auger. The shank of this auger is 7/8 in. steel, the auger itself being 2 in. in diameter, with seven turns to the foot. The cutting edges are drawn to a chisel edge, 2½ in. diameter, and nearly at right angles to the stem. The boring rods for holes up to 20 ft. deep are of 1 in. steel, and 10 or 12 ft. lengths jointed by means of sleeve couplings, have been found convenient. In order to secure a downward pressure, circular movable weights, slotted at the side, are supported by a collar, held in place by set screws. The brake handles, 2 or 4 in number, may be held in place either by a chuck or simply by a set screw. If a set screw is used, the drilling rods must, of course, be flattened at intervals. A light adjustable tripod and collar is suggested, since considerable care is required in holding the rods at any desired angle. In order to prevent the points of the tripod from sinking into the soft bituminous sand during warm weather, thin, flat, circular metal plates may be used as indicated. In boring, it is found necessary to lift the auger at frequent intervals, in order to clear the hole. A block, suspended from a triangle of rough iron-shod poles, is therefore, suggested for this purpose. A circular leather collar, loosely fitted about the auger shaft, will prevent dirt and borings from entering the hole when the auger is lifted. A suggested arrangement for such a rig is indicated in Fig. 2. Difficulty is often experienced in boring, especially in passing through the richer beds, and all parts should be made to stand a total pressure on the brake handles of 600 lb. The occasional use of small quantities of distillate in the hole is often essential in order to "cut" the bitumen and prevent the auger sticking. Boulders or hard stratum are passed through by using a churn drill.

Whenever possible, it is obviously desirable that the bottom of the hole reach bed rock or other hard stratum. Before loading, the holes should be sprung, half a pound of 60 per cent. dynamite being used to every 25 lb. of black powder subsequently charged. Near the city of Santa Cruz, Cal., the City Street Improvement Company operates an extensive quarry in bituminous sandstone, somewhat similar to much of the material of the McMurray district. At this quarry the holes, after springing, are usually loaded with 175 lb. of black powder, a charge that will throw from the face from 280 to 300 tons of bituminous sandstone.

2. In prospecting at points where overburden is heavy, some type of light drill may be used to reach the upper limit of the bituminous sand. Beyond this, a rig similar to that shown in Fig. 2 should be used, but with the greater depth heavier rods will be required.

Finally, the following list includes the more important articles that will be required by the prospector:

Excavating tools, etc.—Shovels (long and short handles), mattocks, pick axes (extra strong), crowbars, sledges (8 lb.).

Drilling tools, etc.—Augers, drill steel, portable forge.

Exposives, etc.—Black powder, 40 per cent. to 60 per cent. dynamite, caps, fuse, battery for firing.

Miscellaneous tools, as: stilson, pipe, nut, chain and monkey wrenches, stocks and dies, cold chisels, pincers and pipe tongs, files.

Equipment for rough carpenter work, as: brace and bitts, hammers and nails, chisel, saws, axes, grindstone.

Miscellaneous: rope, spare set screws, gasoline, friction top sample cans, with capacity of about 20 cubic in. Carrying boxes for all small tools and for sample cans.

INTERNATIONAL NICKEL DIVIDEND.

International Nickel has declared a dividend of 5 per cent. on the common stock payable June 1, to stock of record May 14. Previous dividends for the fiscal year ended March 31, were at the rate of 2½ per cent. quarterly, and as this is the last dividend out of the earnings for the year ended March 31, the total payment on the common stock for that fiscal year was 12½ per cent.

METALLURGICAL PRACTICE IN THE WITWATERSRAND DISTRICT, SOUTH AFRICA

By F. L. Bosqui, Johannesburg, Transvaal

(Continued from Last Issue.)

This brings me to the subject of the Nissen or single unit stamp, 16 of which have just been installed at the Modderfontein B. mill as a result of most favorable trials conducted at the City Deep in 1911. These trials incontestably demonstrated certain points of superiority of this type of stamp, showing, for example, that pound for pound of dropping weight, the Nissen stamp crushed about 30 per cent. more rock per day and had an increased efficiency of 35 per cent. over the ordinary stamp of equal weight.

The better results obtained appeared to be due to the elimination of the admittedly weak mechanical features of the older design. The serious defect of the conventional 5 stamp arrangement is that it is impossible to adjust and distribute the feed properly. It is obvious that in the multiple box all the stamps are not doing the same amount of useful work. The complex and mutually opposing currents set up within the mortar box make uniformity of feed impossible. The uncrushed ore is not distributed evenly over the dies, so that coarser pieces are not always most suitably arranged under the falling stamp. This difficulty in controlling feed is undoubtedly largely responsible for broken stems and shoe necks, and the uneven wear on dies. Another serious defect of the multiple principle is that with the long screen and the turmoil of pulp set up within the box, there is no positive discharge of the crushed ore when reduced to the desired size, and only that material adjacent to the screen can be discharged. Another obvious mechanical defect of the 5-stamp principle is that different sections of the mortar casting are subjected to continuous and rapid blows, which produce a rocking tendency, eventually loosening foundation bolts. These, if kept tight to insure rigidity, will stretch and eventually break.

The distinct advantages of the single stamp principle may be summed up briefly as follows:

1. Owing to the mortar being circular, the screen can be extended around the stamp for the greater part of the circumference of the mortar, so that it is equally distant from the stamp throughout its full length. The screen is therefore always at right angles to the direct splash of the pulp, in the most advantageous position.

2. At each blow of the stamp the pulp is forced radially against the screen, so that all particles sufficiently reduced are discharged. Owing to the mortar box being circular, each time the stamp is raised all the material in the mortar flushes to the centre, to be struck by the falling stamp. It follows, therefore, that the uncrushed ore is automatically returned to the crushing zone, so that the best conditions of feed are maintained.

3. The blow being always received in the vertical axis of the box, the mortar remains rigid on its foundation. This is noticeable in the case of the Nissen stamps at the City Deep, where, after three years of use, the box is apparently as rigid on its base as on the day it was fixed in position.

4. One of the important features of the Nissen box is that it can be cast with a minimum likelihood of shrinkage strains, which are so destructive to ordinary 5-stamp mortars. The foundation bolts give no trouble, not being subject to undue strains.

5. Another advantage of the unit principle is the more continuous operation and flexibility of the entire plant, as each stamp can be put out of commission independently.

6. An interesting feature of this type of stamp is the comparatively even and flat wear of the dies, which results from the return wash of the ore to the centre of the mortar with each stroke of the stamp, and from the increased number of rotations of the stamp due to wider cam and tappet faces.

The only objection seriously urged against the single stamp unit in South Africa is the initial cost of erection, as compared with the Californian. On the assumption that the single stamp installation required a longer mill building than a Californian for a corresponding tonnage, we should require longer bins, greater fall for launders, increased depth of pump pit and higher pump lift. But this objection is practically nullified by experience at Modderfontein B., where tonnages of 14.25 and 29 tons from Californian 1,650-lb. stamps and Nissen 2,000-lb. stamps respectively, both using 0.27 in. aperture screen (9 mesh), indicate a negligible difference in length of mill required. It is true that 2,000 lb. stamps in multiple arrangement have recorded duties as high as 20 tons; but assuming that 1,650 lb. is the economic mechanical limit for stamps arranged in series of five, the chief objection to the Nissen stamp may be regarded as unimportant. On the basis of the above data, 50 1,650 lb. Californian stamps would crush 713 tons per day; the same tonnage can be crushed by 24 Nissen stamps. The former would require a mill building 117 ft. long, if arranged in single line; the latter, 133 ft. Even if we compare the room taken up by the two types of stamp of equal weight, the disadvantage of increased length of building for single stamps in this case would be easily offset by improved efficiency.

Amalgamation.

The recovery of gold on amalgamated plates is still a very important department in Rand reduction plants, in spite of its gradual restriction in some cases to a relatively small amalgamating area, and the tentative proposals made from time to time to eliminate it altogether. It would simplify metallurgy enormously, both from a technical and metallurgical point of view, if the cyanide process could be depended upon to extract all the gold from Rand ores. In America, in recent installations, amalgamation is omitted. In these cases, however, the gold is found either (1) so finely divided, though free, that its dissolution by cyanide is sufficiently rapid and complete, or (2) it does not exist in amalgamable form. On the Rand, where we find recoveries by amalgamation as high as 70 per

cent., the greater portion of the coarse gold, variable in quantity at different mines, is only economically recoverable on plates; and there is, therefore, no likelihood of this step in treatment ever being dispensed with.

Many factors have influenced and changed amalgamation practice on the Rand. In the early days "inside amalgamation" was carried on in the spacious and specially designed mortar boxes provided with plates; but high mercury losses, the impossibility of obtaining a reliable screen sample, the inconvenience of cleaning up, and the necessity of modifying the design of mortar box to a narrower and more efficient type for crushing purposes, were the causes of the gradual abandonment of this practice. Apron battery plates are still retained in many mills, one to each battery of 5 stamps, and are of the conventional type, the average size being 5 by 12 ft., inclined to a maximum of about 1½ in. to the foot. When tube milling was introduced, making coarser crushing possible, supplementary plates were placed after the tube mills, to offset the reduced recovery from the battery plates, and to recover the gold released in the tube mills. A shaking movement was imparted to these plates, similar to that of a concentrating table, by means of hardwood springs, and an eccentric driven from a countershaft. As many as seven of these plates, 5 by 12 ft., were placed below each tube mill, set at a grade of about 10 per cent. The shaking movement was considered necessary to insure a good distribution and flow of pulp; but as tube mills became more efficient and numerous it was found that a stationary table, set at 18 per cent. grade, was quite as effective; and in many mills the tube mill plates were changed from shaking to stationary.

The practice at present is as follows: Amalgamation with and without battery plates; classification of stamp mill pulp in tube mill cones, the underflow of these going to tube mills and thence over tube mill plates; the overflow going either (1) direct to the cyanide plant, (2) to a separate set of amalgamating plates, or (3) to join the main pulp stream leaving the tube mills. It will be seen that in (1) and (2) only the tube milled pulp is amalgamated on the secondary plates, while in case (3) all the pulp passes over these plates.

This difference in practice is affected by a number of considerations. We find the Consolidated Goldfields using only three stationary plates to a tube mill, after re-classifying the overflow from the tube mill cones and by passing a considerable amount of pulp without secondary amalgamation; while the Rand mines, in their newer plants, use six tube mill plates, and bypass little or no pulp. Undoubtedly the former method is the simpler; there is less capital expenditure for plant and buildings, less capital held over in the form of amalgam, and reduced operating expense. But experience on the Rand would seem to show that it is impracticable to fix any definite limit for plate area. By restricting this area to narrow limits an increased burden of extraction is thrown on the cyanide plant, involving an irregular realization from a considerable portion of the total gold extracted, which is undesirable where the maintenance of a uniform and easily available yield is of so much importance from the point of view of mine administration. But apart from this consideration, variations in ore, as regards grade, coarse-gold content and general composition, certainly affect amalgamation; and as these factors cannot be depended upon to remain constant from month to month even for the same mine, I am of the opinion that the radical reduction in plate area recently advocated can be regarded as safely applicable only in special cases. The amalgamating facilities at Modderfontein B. may be considered a mean between the two extremes; here there are no battery plates, but 30 stationary 5 by 12 ft. tube mill plates, or a total of 1,800 sq. ft., with capacity of 39 tons of ore per plate per day. Trials have been made at this plant with a view to reducing the number of plates, but the appearance of free gold in the sand residue during these trials, and during periods when the 30 plates were overcrowded by a sudden increase of tonnage, led to the conclusion that in this instance at least any reduction of plate area would be inadvisable.

The details of amalgamation do not differ essentially from practice in other parts of the world, which has been described in a number of text books. The plates are periodically "dressed" by brushing up the accumulations of concentrate, or "black sand," with adherent amalgam, followed by the usual sprinkling with mercury and vigorous rubbing to produce the necessary uniformity and softness of surface. The operation of "scraping" is carried out once a day, usually in the morning, by means of steel scrapers, which remove the bulk of the gold accumulated during the previous 24 hours. To prevent an excessive accumulation of gold on plates, "steaming" is resorted to at varying intervals, the usual practice being to steam one-third of the plates every month, so that all plates obtain this treatment about four times a year. The procedure is to place a tight wooden cover over the plate and introduce steam until the amalgam is sufficiently softened by the heat. The plate is then scraped until only enough amalgam remains to insure a good surface. All accumulations of amalgam and "black-sand" are treated either in a grinding pan or amalgam barrel, the latter being preferred. Grinding with steel balls is carried on for about 2 hours. The contents of the barrel are then run slowly off into a *batea*, where further amalgamation takes place, the residual slimed black sand overflowing to suitable boxes, where it is retained for further treatment. All amalgam from mercury traps, launders, etc., is similarly treated. The resultant product from the grinding barrel and *batea*, when the bulk of the gold has been separated from it in the first operation, is subsequently treated in a small tube mill, whence the outflow is allowed to pass over an amalgamated plate. To recover the major part of the residual gold not saved in these two operations, the slime thus produced is treated either in separate tanks by prolonged leaching, or in a small air agitating vat, followed by decantation. By this means extractions of over 95 per cent. are obtained from this product. The tailing is sometimes discharged into the slime plant and mixed with a current slime charge.

Tube Milling.

The determination of the exact scope of the tube mills in crushing ore, and the conditions under which it would work most effectively, was not arrived at until some time after its introduction. The application of the diaphragm cone, which made possible a uniform feed of easily controllable moisture, and the introduction of heavy stamps, which permitted coarse crushing within the wide range necessary for fixing, by trial, the economic scope of the tube mill, were important factors in the development of this important auxiliary to crushing, whose value and limitations are now pretty well understood.

The obvious desideratum in distributing the work

of crushing was to ascertain the economic point of separation between stamp milling and tube milling in the production of a final product sufficiently fine to yield the maximum net profit. To determine this point of economic balance has been no simple undertaking, but has entailed a vast amount of practical investigation.

The cost of tube milling had an important bearing on this problem. The first step toward reducing operating expense was in the substitution of selected pieces of banket ore for grinding purposes, in place of the imported pebble. Then it became apparent that a tube mill worked more efficiently on coarse than on fine pulp; and the opinions of metallurgists finally converged to the now generally accepted view that the product of a 9-mesh battery screen (0.272 in. aperture) is about the economic limit of size for tube mill feed on the Rand, in producing a final product most suitable for cyaniding. Beyond this point, except in special cases, the tube mill encroaches on the domain of the stamp.

This point having been satisfactorily settled, it remained to determine the proper ratio of tube mills to stamps. At present this ratio is extremely variable, dependent upon many factors. But in new mills, the usual allowance is based upon the result of extensive trials in which all the leading groups have participated. In recent practice, the tendency has been to increase the ratio of tubes to one 22 ft. 6 in. by 5 ft. 6 in. tube mill to ten 2,000 lb. stamps, or one tube mill to 200 to 250 tons per day of 9-mesh product. At Modderfontein B. the ratio, when the sixth tube mill shall have been erected, will be one of the latter to 264 tons per day of 9-mesh battery product. At the proposed new mill the ratio will be one tube mill to seven Nissen stamps, or one mill to 203 tons of 9-mesh product per day. Latter-day practice aims at the production of certain screen grades in the various stages of reduction, which will give the most suitable final products for sand and slime treatment. The following gradings are fairly representative of the work being done at a modern plant using efficient classification and vacuum filtration:

	+60 (0.01 in.)	+90	−90 (0.006 in.)	−200 (0.0025 in.)
	p.c.	p.c.	p.c.	p.c.
Entering tube mill—				
Main circuit	85.81	8.08	6.11	....
Concentrate return..	58.30	30.87	10.83	....
Leaving tube mill—				
Main circuit	18.74	23.58	57.68	....
Concentrate return..	10.59	31.52	57.89	....
Final pulp before slime Separation.	1.40	13.87	84.73	....
Sand (39 per cent. of total ore)	9.28	38.76	40.94	11.02
Slime (61 per cent. of total ore)	....	....	10.00	90.00

(Over the period represented by above gradings, the extraction by cyanide was 93.7 per cent.).

We now come to a consideration of the more important improvements in the details of tube milling, as locally evolved. In reviewing the progress of this branch of reduction since the general adoption of tube mills by the gold mines of the Rand in 1904 to 1905, it must be confessed that divergence from the practice and design followed in the initial stages has been significant. Up to a few years ago the 22 ft. by 5 ft. 6 in. tube mill, standardized on these fields, remained almost unchallenged; and in the opinion of many, the change since introduced to greater diameter and less length has still to be justified by practical comparative tests. Modifications in methods of introducing the pulp, quantity of feed, percentage of moisture, crushing load, speed of rotation, and in methods of lining have naturally resulted as experience matured, and have all been subjects of considerable controversy here and elsewhere.

The principle of peripheral discharge, abandoned at the inception of local tube milling by reason of excessive wear on liners, went uninvestigated for many years, although the probability of its return to favor was predicted by prominent metallurgists at the time. That there was justification for this assumption has been shown recently, for as the result of trials carried out on a working scale and only lately completed at the City Deep, Ltd., a gain in crushing efficiency has been completely proved when using scoop elevators, fitted at the discharge end of the mill and passing the pulp out through the trunnion in the ordinary way.

A great deal of theoretical work has been done by various investigators in attempting to arrive at a method of comparing the crushing efficiency, or work done, by stamps and tube mills. So far, however, the production of sand of—90 grade remains the only practical standard of comparison which has been generally adopted. As the result of exchange of ideas and experience, the points of difference in local practice have gradually been brought into line, until to-day the procedure—speaking generally—may be considered uniform for standard tube mills using the ordinary central discharge.

In feed devices, the Schmitt spiral lift is now universally adopted at the more recent plants. This appliance is particularly suitable for taking the usual free underflow from the thickening cone, and can handle without difficulty the large tonnage of broken quartz necessary to maintain the load. In tonnage of dry solids fed and percentage of moisture, practice seems to have settled down to a range of 250 to 400 tons per 24 hours, depending upon the coarseness of pulp fed, with a moisture of from 32 to 40 per cent., the latter factor varying directly as the tonnage fed, within the above limits. Local considerations, however, such as physical difference in the ore itself, the occurrence and accessibility of the gold, make it necessary to modify the procedure slightly between mine and mine. Concerning speed of rotation, as the result of tests carried out locally, the tendency has been to reduce the speed to 28 rev. p. minute from the 32 to 33 considered the desideratum a few years ago, giving an average peripheral speed, using an Osborne liner, of about 400 ft. per minute.

In regard to liners, although it has been universally recognized that these have a supremely important bearing on the crushing efficiency obtainable in tube milling, the opinions of the highest authorities the world over have been at variance as to both material and design. As far as the former is concerned, owing to the extremely abrasive nature of the ore dealt with on the Rand, practice elsewhere has had little to do with shaping the final opinion now held here, as to what is considered most suitable. Beginning with shaped silex blocks, imported with the mills, shortly afterward replaced with local chert, through various stages of composite liners, composed of cement and iron, we find the majority of tube mills on the Rand to-day using the Osborne bar liner, the standard design consisting of tapered steel bars of 4 by 1¼ in. to ¾ in. section, set longitudinally, the thick edge being held in position against the shell of the mill by wedging with flat bar iron 2½

to 3 in. wide by ½ to ¾ in. thick. This has proved superior to all other liners in efficiency and longevity, the extra work accomplished being greatly in excess of the increase in power consumed. Moreover, the average variation in the internal diameter of the liner during its life is much less than with either the silex or the composite-block type, which start with a thickness of 6 in. or over.

Undoubtedly the most interesting and practical development of latter-day tube milling is to be found in the results of experiments previously referred to, which had, as their original object, the investigation of the principle of peripheral discharge. The effect of obtaining such a discharge by means of a scoop or elevator is to change the nearly horizontal line of pulp level, determined by the diameters of inlet and outlet, to a sloping line from the inlet to the lowest point in the circumference of the opposite end. Thus the mill, with the same feed and pebble load, is working on a considerably smaller pulp load, with the result that a comparatively greater grinding surface is effectively exposed, resulting, as might be expected, in an increase of production of −90 product as well as of horse power consumed. In carrying out these trials, a standard 22 ft. by 5 ft. 6 in. mill was employed, fitted with a scoop discharge, in which the radius of the lift circle could be varied. These trials were conducted in two stages: In the first, the scoop was given a maximum lift, in this case about 28 in. radius. In this series, the power consumption, wastage of pebble load, influence of feed, crushing and mechanical efficiency, were investigated. (C.E.=production of −90 in tons per mill. M. E. $= \frac{-90}{\text{h.p.}}$). In the second series, the radius of the lift circle was gradually reduced, and a comparison made with the previous results. In both trials the screening used in the stamp mill was 64 to 100 meshes to the square inch. The conclusions deducible were as follows:

1. That when maintaining the pebble load at the centre mark with feeds ranging from 250 to 400 tons per 24 hours, a 25 per cent. increase in crushing efficiency could be obtained, but with proportionately increased power consumption.

2. That within certain limits of feed, the weight of the pebble load can be decreased by 25 per cent. without affecting the crushing efficiency, with about a 10 per cent. decrease in power consumption, the mechanical efficiency showing a corresponding increase.

3. That the wear on the crushing load is increased 300 to 400 per cent.

4. That by decreasing the effective radius of the scoop from the maximum possible (about 29 in. in a 5 ft. 6 in. mill) to the ordinary trunnion discharge, a steady decrease in crushing efficiency is accompanied by a proportionate decrease in power consumption.

Considerable additional wear of liner would naturally result when running under these conditions; the ratio of the increase, however, was not determinable during the trials. Apart from the obvious fact that there is a considerable saving in head, it remains to be proved whether the lowering of the pulp level in the tube mill is best done by using an elevating scoop or by passing the pulp through openings in the periphery, as originally practised by Davidson. Locally, the former system has an overwhelming advantage, owing to the serious alteration to existing plants that would be necessitated by the latter. With the use of the pulp elevator, or scoop, the enormously increased pebble feed would have to be faced, amounting to 25 tons per mill per day. This would necessitate proper additional provision being made for sorting, conveying and feeding, which would mean a practically insurmountable difficulty in existing plants. On the other hand, the effective radius of the elevator can be reduced at will, any increase in crushing efficiency between normal and 25 per cent. being obtainable.

An interesting innovation in the design of recent plants, first introduced at the East Rand Proprietary, is the arrangement shown in Figures 3 and 5, Plate V, wherein the tube mills are placed below ground level, thus permitting flow of pulp by gravity from stamps to tube mill cones, and saving the excessive wear on pumps. This is desirable even though it entails a subsequent higher lift of finer pulp, more suitable for pump elevation.

The latest design of tube mill used by the Rand Mines (Fig. 4) includes a ball chamber interposed between the main crushing section of the mill and the outflow trunnion. This chamber is provided with a cast-iron step lining bolted to the shell, and the grinding medium used is 10 lb. steel balls, of which about 20 are required. The object of these balls is to reduce the small spent pebbles which are being continually rejected by the mill. The usual practice is to remove these from the pulp by means of a trommel fixed to the discharge trunnion, and periodically convey them to the stamp battery. The ball chamber is very effective in doing away with this nuisance, and has not been found to reduce the grinding efficiency of the mill, owing evidently to the additional work done by the balls, nor do the balls wear out unduly.

(To be continued.)

MR. SCHWAB, UNDER PRESSURE.

No man of metal amounts to anything until he has been under pressure. Charles M. Schwab has received relatively as much hammering as a Bethlehem Steel armor plate for a warship.

Samuel Untermyer has fought Charles M. Schwab upon more than one occasion. The only way Untermyer could square the account was to retire each time and buy some more Bethlehem Steel for the bottom of his strong box for his grandchildren.

Ten years ago, in the Evening Mail building, Charles M. Schwab was on the witness stand before the legal guns of Samuel Untermyer.

"Are you the man behind the gun?" said the lawyer of iron nerve to the man of steel construction. There was no answer.

"Are you the real thing in Bethlehem Steel?" And still there was no answer.

"Do you understand the English language?" snapped forth the limb of the law.

Straight as a gun barrel came the answer:

"I do when I hear it."

Then came the plain question:

"Do you hold the controlling interest in Bethlehem Steel?"

And straight and clear came the answer:

"I do."—Boston News Bureau.

CASEY-SENECA.

S. Harry Worth, president of the Seneca-Superior, and R. F. Segsworth, treasurer of the same company, have taken an option on a block of treasury stock of the Casey-Seneca Silver Mines, Limited, a company recently formed by Mr. Herbert Murray, of Haileybury, to hold the title to his claim adjoining the Casey mine in Harris Township. The funds necessary to prospect the property are being raised by private subscription.

METHOD FOR THE DETERMINATION OF GOLD AND SILVER IN CYANIDE SOLUTIONS*

By L. W. Bahney.

Many methods for the determination of gold or silver, or both, in cyanide solutions have been published, which with care in manipulation, and modification in some cases, will give results that are satisfactory. It is possible to classify or group these methods as follows:

1. Evaporating the solution in a porcelain or agateware dish containing litharge (1), or in a "boat" made of lead foil.

2. Forming a lead sponge containing the precious metals by means of zinc shavings (2), zinc dust (3), or a piece of aluminum (4).

3. Decomposing the cyanide solution with an acid and precipitating the precious metals by the use of one or a combination of some of the following: Copper sulphate (5), sodium sulphite (6), hydrogen sulphide (7), cement copper (8).

4. Precipitating the silver by zinc dust held in a Gooch crucible and determination with a standard solution of sulphocyanate (9).

5. Electrolysis (10).

6. Colorimetry (11).

Eliminating group 4 because of its applicability to silver solutions only; group 5, because of the time and apparatus required; and group 6, because of the skill required, and the difficulty of maintaining the standards; which method of the remaining groups will give accurate results in the shortest time?

In the Hammond Laboratory of the Sheffield Scientific School, where many ores are tested for treatment by the cyanide process, the resulting solutions will cover a wide range, when their contents of base metal compounds are considered, and it is in the laboratory work just as much as in mill work that a reliable method that will not require too much time is needed. This is especially important in teaching.

What criticism I have to make has been brought about by doing what every operator does—trying the various methods to find the one that will give "good results."

Group 1 requires too much time; a large hot-plate surface if many determinations are to be made; scraping of the dishes clean to remove all particles; breaking up the mass; fluxing and fusing in a crucible. Evaporating in a lead boat is uncertain, because some lead foil may be quite thin and perhaps pitted, so that the solution will leak through as the evaporation proceeds and the cyanide solution becomes concentrated.

Group 2 includes the method suggested by Alfred Chiddy and others that are modifications of it.

The idea of the formation of a lead sponge to contain the gold and silver as suggested by Chiddy is a clever one, and it appealed to every one having anything to do with cyanide solution. To be able to remove from the dish a small sponge of lead that could be cupeled was a great advancement in the work. It is difficult to get good results if it is followed as printed (2), so that its modification as suggested by Stines, Magneau, Holt and others is a natural outcome. Any of the methods of this group that will give a sponge of closely cohering lead, containing all the gold and silver, in a reasonable time, is a "good one"; but when the sponge breaks into small pieces they must be collected in some manner and filtration is the next step.

When the lead has been collected on a filter paper it then becomes necessary to scorify or dry the paper and reduce it in a crucible with the necessary fluxes.

It has seemed to me that it is right here that an opportunity exists for a new method, either for the formation of a good sponge or to save the broken sponge formed by any of the other methods, and at the same time eliminate scorification.

Group 3 includes all those methods that permit the use of a large quantity of solution and from which the precious metals may be precipitated as mentioned above. Whether it is necessary to use so large a quantity, aside from experimental work perhaps, I shall leave to the individual operator. My own objections to this group are: The quantity of solution involved; the time required; and the necessity of filtration and scorification.

In order to present this new method clearly I have numbered each successive step in making the determination and have included the photograph to show apparatus, etc.

I. Procedure of New Method.

1. Into a 250 c.c. beaker (No. 2 low form) pour 5 assay tons (146 c.c.) of cyanide solution.

2. Add 20 c.c. of a 20 per cent. solution of lead acetate.

3. Add 15 c.c. of concentrated hydrochloric acid.

4. Place a ¼ in. rod of zinc in the beaker.

5. Place the beaker on a hot plate—bumping does no harm if it will not break the beaker by raising it off the plate.

6. As soon as the solution boils, leave it so for 5 minutes; then remove from hot plate.

7. Fill with cold water; then decant about half and again fill with cold water.

8. Twist the zinc rod quickly between the finger and thumb and draw it out of the sponge.

9. If any small particles of lead are left adhering to the rod at about where the top of the solution touched it, draw the sponge up the side of the beaker with a glass rod.

10. Touch the zinc rod to the sponge to free the particles.

11. Wash the sponge three or four times with cold water to remove zinc chloride.

12. Press it against the side of the beaker with a glass rod to remove the water.

13. Decant the water and wash again.

14. Place the dewatered sponge on a piece of sheet lead 2 in. square, then fold it. It is now ready for cupellation.

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2. Alfred Chiddy: Engineering and Mining Journal, vol. lxxv, No. 13, p. 473 (Mar. 28, 1903).
3. W. Magenau: Mining and Scientific Press, vol. xcii, No. 15, p. 259 (Apr. 14, 1906).
N. Stines: vol. xcii, No. 17, p. 278 (Apr. 28, 1906).
H. L. Durant: Proceedings of the Chemical, Metallurgical and Mining Society of South Africa, vol. iii, pp. 105 to 111 (1902-03).
4. T. P. Holt: Mining and Scientific Press, vol. c, No. 24, p. 863 (June 11, 1910).
5. A. Whitby: Proceedings of the Chemical, Metallurgical and Mining Society of South Africa, vol. iii, p. 6 (1902-03).
6. J. E. Clennel: Cyanide Handbook, p. 443 (1910).
7. Henry Watson: Engineering and Mining Journal, vol. lxvi, No. 26, p. 753 (Dec. 24, 1898).
8. Albert Arents: Trans., xxxiv, p. 184 (1904).
9. G. H. Clevenger: Engineering and Mining Journal, vol. xcv, No. 18, p. 892 (May 3, 1913).
10. Miller: Proceedings of the Chemical, Metallurgical and Mining Society of South Africa, May 16, 1905.
11. James Moir: Proceedings of the Chemical, Metallurgical and Mining Society of South Africa, vol. iv, p. 298 (1903-04).
A. Prester: Proceedings of the Chemical, Metallurgical and Mining Society of South Africa, vol. iv, p. 385 (1903-04).

*A paper published in the Bulletin of the American Institute of Mining Engineers, February, 1915.

II. Procedure When the Sponge Breaks.

When the sponge breaks into large pieces it is possible to unite them by pressing together with a glass rod. If there are many small particles it may not be possible to unite them by pressing together. Then this method is suggested:

15. Fit a 2 in. funnel into a filtering flask.
16. Cut a piece of sheet lead 3 in. square; fold as you would a filter paper.
17. Cut off the corners; then open it to fit the funnel.
18. Place about 5 g. of test lead in the lead cone and push it down with the finger, then smooth out the folds and creases so that it will fit well.
19. Lift it from the funnel and prick seven or eight holes in the apex or point by means of a pin, then put it back in the funnel.
20. Complete 9 and 10; then start the filter pump.
21. Tip the beaker and draw most of the lead sponge into the lead cone by means of a glass rod (without a rubber tip).
22. Pour the remainder of the solution in the cone, rinse beaker and wash contents of cone three or four times.
23. Tamp the lead down with the flat knob of a glass rod.
24. Stop suction, remove cone from funnel and fold it carefully. It is now ready for cupellation.
25. Draw a hot cupel to the front of the muffle and place the cone in it. When the water has been driven out, push the cupel into a hotter part of the muffle and finish the cupellation in the regular manner.

IV. Notes and Comment.

The generation of hydrogen along the zinc rod is sufficiently active to prevent the adherence of the lead. A strip of aluminum does not work so well.

The method has been used in the assay of a number of solutions containing a variety of base metal compounds and in each case the sponge remained whole. With solutions from cobalt ores that contain much silver the sponge is apt to break.

The amount of time as given in the table will vary with the heat of the hot plate—those given are averages.

In order to keep the weight of the lead to be cupelled down to a minimum, thin sheet lead should be used.

A cone as described in 16 and 17 will correspond to a filter paper 7½ cm. in diameter and, made of heavy sheet lead, will weigh about 7 g.

The pin holes should always be as near the point as possible.

A screen analysis of the test lead used in developing this method is as follows: + 30, 7.0 per cent.; + 60, 28.6; + 100, 23.2; — 100, 41.2 per cent.

It is quite possible to have a cone manufactured as are bottle caps. This would lessen the weight about 50 per cent.

V. Scorifying the Precipitate.

The following method may be used for scorifying the precipitate obtained by any of the methods of group 4:

26. Collect the precipitate in a 9 cm. filter paper; wash it down into the point.
27. Make a cone from a disk of sheet lead 3½ or 4 in. in diameter.
28. Punch 10 or 12 holes at the point.
29. Fold the filter paper into a small wad and place it in the point of the cone.
30. Pour on top of the paper 10 g. of test lead.
31. Fold the lead cone so as to include its contents and place it in a glazed scorifier at the mouth of the muffle.
32. When the paper has become dry and begins to char, the gases will burn as they come from the pin holes. As soon as the flame ceases place the scorifier in a hotter part of the muffle. The lead cone will hold the paper firmly while it is burning; so there is no danger of its unfolding and scattering the precipitate.

COPPER.

One of the largest copper producers tells the Boston News Bureau:

"We made a very large sale Wednesday—millions of pounds—at 19 cents, and this price has been bid us for deliveries extending so late in the year that we have declined the sale."

Another very large seller says:

"The companies for which we sell are more than 100 days sold ahead, and we are daily taking contracts at 19 cents per pound for electrolytic."

The heavy sales of copper booked by producers during April by no means covered requirements of manufacturers in the United States handling war orders and those abroad working on similar orders. Inquiries now in the market call for many millions of pounds to be delivered further ahead than most producers care to sell.

One of the most important inquiries in the market this week for the account of a foreign government, understood to be Russia, called for 15,000 tons of copper, 10,000 tons of spelter and 5,000 tons of aluminum. Deliveries were desired during the next six months. Among copper people who had been visited in this connection the opinion was expressed to the Boston News Bureau that while the tonnages would doubtless be secured, it might be necessary to do considerable "shopping," particularly for the spelter.

Another buyer wants a large amount of copper to be delivered from November to May, 1916. This likewise, is for export.

Some of the producers have refused to book copper beyond September. Others have gone into the first half of 1916. The demand for copper has been genuinely large, all producers admit and the price advance to 19 cents a pound for electrolytic has been fully warranted by trade conditions.

The Granby Consolidated Co. again has in operation all of the eight blast furnaces at its copper-smelting works at Grand Forks, B.C. Smelting was suspended there last August, shortly after war was declared between Great Britain and Germany; two furnaces were blown in toward the end of the year, and others were added until, on April 19, the full battery was running once more.

The steel plant of the International High Speed Steel Company, at Rockaway, N.J., is now rapidly nearing completion, and it is expected that it will be in full operation by the latter part of June. The product will be confined to the highest qualities of tool steels, alloy steels, high speed steels of all shapes and sizes, solid octagon and cruciform, and hollow hexagon and round rock drill steels, for which the company has already achieved an enviable reputation in its famous "Bulldog" brand.

CANADA COPPER CORPORATION, LIMITED, ANNUAL REPORT, 1914

The first annual report of the Canada Copper Corporation, Ltd., which has mining properties in British Columbia and its head office in New York City, has been issued. Under date of April 16, 1915, the chairman, Mr. Newman Erb, reported as follows:

Report of Chairman.

"This company was organized in March, 1914, with an authorized capital of $5,000,000 divided into 1,000,000 shares of $5 par value. As of December 31, 1914, there were outstanding 600,200 shares, leaving unissued 339,800 shares, 200,000 of which are held for conversion of debentures.

"At the time of the organization of the company, there were authorized 1,000,000 six per cent. convertible debentures, of which there were outstanding as of December 31, 1914, $600,000. The remaining $400,000 of debentures and 199,800 shares of stock may be issued for future requirements.

"Under the plan of organization, stockholders of the British Columbia Copper Co., Ltd., were invited to subscribe to the debentures of your company, and at the same time to exchange their shares for shares of the Canada Copper Corporation. There were so exchanged 444,952 shares of British Columbia Copper Co. stock, now owned by your company, and the balance of 155,048 shares and $155,048 par value of debentures were taken over by the underwriters.

"There has been loaned to the British Columbia Copper Co., Ltd., to December 31, 1914, $340,000 against that company's notes, secured by a first mortgage, which funds have been expended for the purchase and development of the properties under option.

Report of General Manager.

"The actual production period at the mines and smeltery was confined to eight months of the year, the plant having been shut down shortly after the outbreak of the European war in August.

"The ore shipments from the mines were as follows:

Mines.	Tons.
Mother Lode, Boundary, B.C.	178,049
Queen Victoria, Nelson, B.C.	7,920
Napoleon, Washington	5,332
Lone Star, Washington	1,988
Total	193,289

"**Mother Lode Mine**—In the month of May, it became possible to ship two classes of ore from this mine, one class coming from the glory-hole section and the other from the new orebody in the south end of the property. Below are given average assays and analyses of the ore before separation was effected. A representing four months' shipments; B the 'mine-run' ore after it was separated; and C the ore coming from the south end of mine:

Class.	Quantity Tons.	Gold Oz.	Silver Oz.	Copper Per Cent.
A	102,536	0.0275	0.149	0.862
B	69,703	0.0363	0.178	0.868
C	5,810	0.0950	0.167	0.396

	Silica. P. C.	Iron. P. C.	Lime. P. C.	Sulphur. P. C.
A	34.65	15.36	20.01	2.37
B	31.30	17.85	18.75	3.37
C	21.20	28.60	11.95	13.20

"Numerous rock falls occurred during the year, due to the heavy blast set off in September, 1913. The waste rock became mixed with the ore and was to a large extent removed by hand-picking from a conveyor belt. More than 25 per cent. of the material hoisted through the shaft was put over the dump as waste. While this maintained the grade, it raised the costs correspondingly.

"Diamond drilling disclosed the presence of a new orebody in the southern end of the Mother Lode claim, and extending into the Primrose claim, also one of the company's properties. Two levels, the 200-ft. and the 300-ft., were extended and driven under this ore, connections were made between levels, and stoping was begun as quickly as possible. No attempt was made to block out ore.

"Raises were started from the 200-ft. level, north, to tap an orebody known to exist in the northern end of the glory-hole. Aside from this, the usual drifts, crosscuts, and raises were put in to facilitate the extraction of the ore broken down by large blasts. The distances driven were as under:

	Ft.
Drifts and crosscuts	1,175.5
Raises	1,420.3
Diamond drill holes	4,852.0

"Costs.—The cost of placing the ore on the railway cars at the mine was $0.8548 a ton. This is higher than usual; it is in part accounted for in that all construction work was charged to operating expense, and by the following special items:

	Ton Ore	Ft.
Ore sorting	$0.0455	
Development	0.0870	$5.968
Diamond drilling	0.0648	2.378

"Ore Reserves.—The figures given are estimates and not the result of actual measurements of orebodies. The mine is in such condition that it is not possible to measure broken ore in the mine-chutes and in the glory-hole. The new orebody in the south end of the property was not opened to expose quantity, but to furnish an immediate ore supply to the smeltery. It is more than likely that a greater amount of ore than that given in the estimate will be taken from this part of the mine. However, future work will determine this.

"Near the shaft and under the hoist are pillars and arches of good ore, which may be extracted if the hoist be moved to the opposite side of the shaft. The cost of making this move is estimated to fall within $3,000. In the northern end of the glory-hole are two bodies of good ore which can be reached by raises from the 200-ft. level. The broken and shattered material in the glory-hole may be extracted, provided the hanging wall does not cave in. Should this happen, a new set of raises from one of the lower levels might still recover a large portion of this material. The following is an estimate of ore available under favorable conditions:

	Tons.
In mine chutes	15,000
In north end of glory-hole	75,000
In glory-hole section	100,000
Arches and pillars below hoist	65,000
New orebody, south end	60,000
Total	315,000

Prospecting by diamond drills has failed to disclose an extension, in any direction, of the main Mother Lode orebody. The new discovery in the southern end of the property seems to be a separate orebody. It has a general dip to the northeast, and crosscuts from the 300-ft. level would determine its extent at that depth.

"**Napoleon Mine.**—This mine was closed in May, there not having been any farther call for its ore for the Greenwood smeltery. The ore shipped during five months amounted to 5,332 tons; its average grade was gold .0547 oz., and silver 0.0807 oz. to the ton, copper 0.204 per cent., silica 20.3 per cent., iron 35.3 per cent., lime 5.3 per cent., sulphur 17.7 per cent. Mining, freight, and general expense amounted to $2.8575 a ton at Greenwood smeltery.

"The remaining available ore is estimated at 33,000 tons and consists of floors of stopes.

"**Queen Victoria Mine**—Work was suspended at this property in March. The price of copper having steadily declined and the grade of the ore become so low, it could not be shipped to Greenwood at a profit. The costs were $3 a ton f.o.b. cars at the smeltery; the grade of the ore was as follows: Gold, trace; silver, 0.36 oz. to the ton; copper, 1.268 per cent.; silica, 36.8 per cent.; iron, 14.17 per cent.; lime, 24.75 per cent.; sulphur, 2.07 per cent. Shipments of ore totalled 7,920 tons.

"**Lone Star Mine.**—The work carried on at this property was largely exploratory. Operations were suspended entirely in May. Some ore was extracted and sent to the smeltery at Greenwood and a small amount of milling ore was delivered to the experimental mill at Boundary Falls, B.C., for testing purposes. The smelting ore shipped amounted to 1,988 tons; it was of the following grade: Gold, 0.03 oz., and silver 0.225 oz. to the ton; copper, 2.423 per cent. The milling ore yielded 16.22 tons of table concentrate which gave the following assay: Gold, 0.17 oz., and silver 0.62 oz. to the ton; copper, 10.65 per cent; silica, 24 per cent. Experiments show that this ore could be treated by wet concentration on tables, afterward passing the middling and tailing, after regrinding, through a flotation unit. The tables yielded about 35 per cent. of the entire metal value in the form of concentrate. The flotation tests were made with a laboratory 'slide machine,' and were not commercial, but it is safe to say that practically the same results can be obtained in milling on a large scale.

"The ore reserves consist of two separate orebodies, containing together about 175,000 tons of ore of the following grade: Gold, 0.03 oz. and silver 0.2 oz. to the ton; copper, 1.70 per cent.

"**Eureka Group.**—This property is situated a few miles from Nelson, B.C. It was held under option by the company. Developments did not warrant the payment of the purchase price, and the option was relinquished in July.

"**L. H. Group.**—This is another property, worked under option to purchase, which did not come up to expectations, and, as no reasonable concession could be obtained from the owners, the option was allowed to lapse early in the year.

"**Wellington Camp.**—The Butte claim was taken under option and some surface exploration, in the way of shallow pits and shafts, was done. The results did not warrant the expenditure, therefore the option was forfeited in April.

"**Emma Mine.**—The company owns a three-quarter interest in this property, which has been idle since a fire destroyed its headworks in 1912. The ore is high in oxidized iron and contains copper and gold. The quantity of ore is estimated at about 65,000 tons.

"**Smelting Operations.**—The smeltery was not operated to full capacity, due to shortage of custom ore. This, in connection with the low price of copper, early in the year made it apparent that it was a question of very little time before operations must cease entirely. The furnaces were blown out on August 23 and the plant cleaned up as far as practicable.

"The total quantity of ore smelted from January 1 to August 23 was 299,928 tons, consisting of British Columbia Copper Co.'s ores 193,512 tons, and custom ores 106,416 tons.

"The amount of converter slag made and smelted was 5,129 tons; it contained 1,627 tons of custom ore and 466 tons of clay.

"The amount of coke used was 41,026 tons. This represented 13.52 per cent. of the entire charge fed to the furnaces.

"The time of actual operation was 450 furnace days. The total amount of charge smelted ex-coke was 303,430 tons, or amount of charge smelted per furnace day 674 tons.

"The average grade of matte was 39.7 per cent. copper. The blast furnace slag contained 0.251 per cent. copper, 0.0039 oz. gold, and 0.07 oz. silver a ton. The average analysis was: Silica, 41.9 per cent.; iron, 18 per cent.; lime, 22 per cent. The recoveries, based on blister copper returns, slag losses, and metals tied up in process, showed as follows: Gold, 101.39 per cent.; silver, 75.48 per cent.; copper, 77.27 per cent. The production of metals was: Copper (fine), 4,116,190 lb.; gold, 14,442.28 oz.; silver, 63,501.27 oz.

"**Copper Mountain.**—At this camp, which is situated approximately 130 miles west of Greenwood, and 14 miles by wagon road, south of Princeton, Similkameen, B.C., the company has been carrying on a campaign of prospecting and development by diamond drilling and trenching. The ore occurring here consists of a mineralized grano-diorite, which has been intruded by quartz-porphyry dikes. The latter comprise a rather intricate system. Considerable work was done during the year to determine the location of these dikes, thereby avoiding drilling non-mineralized ground.

"Until August there were four drills in operation, and an average of 91 men employed daily. Since that time the working force has been reduced to an average of 28 men a day, with one diamond drill still being operated.

"Systematic trenching has been done to the extent of 18,315 ft. for the year. Owing to heavy overburden, some of the trenches reached a depth of 35 ft. The amount of diamond drilling for the year was 28,134 ft.

"Ore Estimates.—The ore developed to date is computed from diamond drill holes, trenches, pits, and underground work such as shafts and drifts. A classification has been made as to the situation of the several orebodies, some of them following a more or less regular northwesterly-southeasterly course, while others are scattered. The latter are designated 'outlying orebodies.' A further distinction is made as to ore occurrence, namely, that which is 'reasonably assured'

and 'probable' ore. The latter consists of sections adjacent to or between orebodies of known depth and value, and under good surface showings; or favorable situations which have been partly proved by one or more ore-bearing diamond drill holes.

"Our engineers estimate the amount of 'reasonably assured' ore at 4,523,763 tons, of the following grade: Copper 1.82 per cent., gold 0.013 oz., and silver 0.24 oz. a ton. In addition, there is estimated to be in this same section 1,675,000 tons of 'probable' ore of a similar grade. The 'outlying' orebodies show 'reasonably assured' ore to the amount of 405,170 tons, containing 1.54 per cent. copper, and 0.013 oz. gold and 0.14 oz. silver to the ton. The probable ore in this section is estimated at 345,000 tons of a similar grade."

Balance Sheet, Canada Copper Corporation, Ltd.

The Balance Sheet, as at December 31, 1914, shows the following Liabilities and Assets:

—Liabilities—		
Capital stock (authorized, $5,000,000) issued		$3,001,000.00
Debentures (authorized $1,000,000), issued		600,000.00
		$3,601,000.00
—Assets—		
Investment, British Columbia Copper Co., stock		$3,000,000.00
Notes receivable, secured by mortgage		340,000.00
Interest accrued on notes		8,216.67
Mining property		9,394.73
Incorporation, legal and general expense	$53,271.30	
Debenture coupon No. 1	18,000.00	
	$71,271.30	
Less interest received	8,988.98	
		62,282.32
Cash on hand		181,106.28
		$3,601,000.00

BRITISH COLUMBIA COPPER CO., LIMITED

Under date April 15, 1915, the directors of the British Columbia Copper Co., Ltd., have submitted to the shareholders their report, together with the certified Balance Sheet and Profit and Loss account, for the year 1914. The report follows:

On account of the unsettled condition of the copper market, incident to business disturbances in the latter half of the fiscal year, the company's smeltery at Greenwood, Boundary district, and operations at the mines from which the ore supply had been drawn, were suspended last August, but the development and exploration at Copper mountain, Similkameen, were continued in a restricted way in order to conserve your company's resources.

The ore shipments from the company's mines tributary to the smeltery at Greenwood, were as under:

	Tons.
Mother Lode mine, near Greenwood	178,049
Queen Victoria mine, near Nelson	7,920
Napoleon mine, State of Washington	5,332
Lone Star mine, State of Washington	1,988
Total	193,289

The more important work done was in the further exploration and development of the properties acquired and under option on Copper mountain, where to the end of the fiscal year there has been disclosed 6,200,000 tons of reasonably assured and probable ore of an average grade of 1.82 per cent. copper, and in addition to this, there is some 750,000 tons of ore of a lower grade, namely, 1.54 per cent. copper.

The company expects to, in the coming fiscal year, continue work, but on a larger and more aggressive scale, hoping thereby to add materially to the ore reserves already disclosed.

It is intended, when the work shall have made further progress, to arrange for the permanent improvements and equipment for treating these ores.

There are options outstanding on eleven mineral claims at an aggregate cost of $188,000 and payments have been made on these options totalling $52,545.84. There were twelve other claims under option, but the result of prospecting having proved unsatisfactory those options were permitted to lapse. There has been expended upon development during the fiscal year $183,203.96.

As shown in the balance sheet herewith, this company has borrowed from the Canada Copper Corporation, Ltd., $340,000, to December 31, 1914.

The company's engineers recently made a preliminary valuation of the company's mining and smelting properties and the value shown in the balance sheet is based on their report. The amount written off for property in the Boundary district and the Lone Star and Napoleon properties in the State of Washington, including the stock and bonds of the New Dominion Copper Co., Ltd., is $1,781,095.20, leaving the present book value of $1,377,431.22. The Copper Mountain properties are shown on the books at a present valuation of $2,022,568.78, making a total of $3,400,000, as shown in the balance sheet.

The above-mentioned transaction has reduced the balance as shown in Profit and Loss account December 31, 1913, by approximately $500,000, leaving balance to Surplus account, December 31, 1914, of $23,530.45.

The management is again indebted to the intelligent co-operation of its operating force under unusually adverse conditions.

Profit and Loss Account.

Operating disbursements—		
Mining, smelting, freight, refining and selling charges, general office and administration expenses, maintenance and fixed charges and expenses incurred during the time the plant was closed		$788,684.64
Custom ore purchased		162,434.84
		$951,119.48
Proceeds of metal shipments		$899,851.17
Miscellaneous earnings		11,503.76
Balance, being loss for the year		39,764.55
		$951,119.48

Balance Sheet.

—Liabilities—	
Capital Stock— Authorized $3,000,000 in 600,000 shares of $5 each; issued, 596,709 shares, less 5,000 shares in treasury; 591,709 shares of $5 each	$2,958,545.00

Accounts payable		146,704.54
Loans and advances from banks		58,794.04
Canada Copper Corporation—		
Amount advanced on mortgage	$340,000.00	
Accrued interest thereon	8,160.00	
		348,160.00
Reserve for sundry liabilities	$500.00	
Reserve for employers' liability	5,016.76	
		5,516.76
Surplus		23,530.45
		$3,541,250.79

—Assets—

Properties, equipment, shares and bonds in other companies, etc.	$3,400,000.00
Metals and smeltery products, supplies, etc.	112,801.23
Prepaid insurance and taxes	4,693.00
Sundry debtors	6,567.19
Cash on hand and in banks	17,189.37
	$3,541,250.79

CANADIAN COLLIERIES (DUNSMUIR), LIMITED

At the annual meeting of the Canadian Collieries (Dunsmuir), Limited, held in London on March 19, the affairs of the company were fully discussed, and resolutions were unanimously adopted waiving the default the company had made on September 1, 1914, and March 1, 1915, in payment of interest on its bonds. This waiver covers a period of three years, that is, until March 1, 1918, or, as the resolutions put it, "to the half-yearly date for payment of interest upon the bonds occurring next before the expiration of one year from the formal conclusion of peace between Great Britain, on the one hand, and Germany and Austria, on the other hand (whichever period may be the longer.) Then the bond interest shall be payable only as and when and to the extent that the net profits of the company as certified by the auditors of the company for the time being are sufficient to pay the same, any arrears of such interest being nevertheless carried forward and paid out of the net profits of any subsequent year."

The reasons for this and other modifications of the trust deed of August 6, 1910, securing the 5 per cent. first mortgage gold bonds of the company were fully explained at the meeting. As the chairman pointed out, there were the following alternatives open to the bondholders: First, they could put in a receiver; second, they could commence the foreclosure of their mortgage, and third, they could waive the defaults and extend the time for payment of the bond interest. The last-mentioned alternative was unanimously adopted, and to that end the meeting appointed a committee of five of the bondholders, and in this committee was vested a voting trust giving it entire control over the administration and management of the company. The five members are: Messrs. Stanley Carr Boulter, Robert Henry Benson, David Augustus Bevan, John Ashley Mullens, Jr., and Ernest Guy Ridpath.

The full report of the meeting includes many interesting features. Mr. W. E. Rundle, general manager of the National Trust Co., Ltd., the trustees for the bondholders, presided at the meeting. During the discussion he stated that "Sir William Mackenzie (of Mackenzie & Mann, of Toronto, at the head of the Canadian Northern and Canadian Northern Pacific Railways), is not now a director of the National Trust Co., but Messrs. E. R. Wood and F. H. Phippen are directors. He added that out of 22 directors of the National Trust Co., there were but two who were also directors of the Canadian Collieries Co., and he gave assurance that those two had not at any time attempted to influence the mind of the trustees with regard to anything arising out of the trusteeship; also, that the national Trust Company had ably administered this trusteeship. So far as the National Trust Co. is concerned, the chairman stated that it has not any interest in the Canadian Collieries Co. save as trustee; nor does it own a dollar's worth of bonds or stock in the Collieries Co., nor any stock in the Canadian Northern Railway.

Mr. H. S. Fleming, the chairman of the executive committee of the Canadian Collieries Co., who had journeyed from Vancouver Island, British Columbia, to attend the meeting, explained at length the causes leading to the present condition of the company. After reviewing the two years' strike of the miners, he referred to the trade depression, and in this connection said: "To show you the very direct effect which this has had on the position of the company, I may tell you that during last winter the total consumption of domestic coal in the city of Vancouver was barely one-half of what it had been two years before. This, of course, affected all the coal mining companies on the British Columbia coast, but the Collieries Co. most, for the reason that it is the largest. The use of coal for industrial and public purposes had been similarly cut down. Then, the war disorganized shipping and there was and is little demand for supplying ships' bunkers with coal. In addition there was the increased use of fuel oil." He added, however, that owing to large orders received from San Francisco and elsewhere during August and September of 1914, the company in those months earned net profits of $46,000 and $54,000 respectively, but in October and November following the net profits were only $1,300 and $1,100. He said, further: "But I think the August and September results show that, given even a moderately good market for the coal, the company's mines are capable of earning very substantial profits, and that the money put into the property has not been wasted. And, I believe, the market is bound to come sooner or later. The war will not last for ever, nor will the depression of trade. The Pacific coast will begin to grow again in population and industry." Replying to a question regarding the serious shrinkage in the profits between the time the mines were worked by the Dunsmuir interests and the date of the statement of accounts presented, Mr. Fleming said that the operating earnings in the year ended June 30, 1911, were $665,000 from the mines, or $728,000 from all sources; in the next year they were $546,000 from the mines, or $751,000 from all sources. Then in the next year there was the strike, which practically stopped operations at the mines for a short time and made it difficult to produce coal. In regard to the money subscribed, $3,500,000 of this had gone into improvements to the mines and property generally. A very considerable amount of the money subscribed had to be taken as working capital, owing to the Dunsmuirs not having delivered to the company all the assets that were expected would be received,

but a decision as to these was now being obtained from the Privy Council of Great Britain. No directors of the company receive any salary, except two local directors, who are each paid $500. Many other questions were answered and then the resolutions submitted were adopted, as already stated.

The following notes relative to the property of the Canadian Collieries (Dunsmuir), Limited, on Vancouver island, British Columbia, may be of interest:

About the middle of 1910 those who organized the company acquired from the Wellington Colliery Co. the mines, coal lands, coke ovens, shipping docks and bunkers and other property connected with the carrying on of the coal mining and shipping business of Hon. James Dunsmuir and his associates, who had operated under the name of the Wellington Colliery Co. There are two collieries, each with its own separate shipping dock and appliances, railway between mines and dock, etc.

The Union colliery, near Cumberland, about 65 miles north of Nanaimo, in Comox district, is the more important of the two collieries. In 1910 there were operated Nos. 4 and 7 slopes and Nos. 5 and 6 shafts. In 1911 important changes were inaugurated, these including commencing to develop a hydro-electric power, so as to substitute electricity for steam at the several mines, the construction of a new tipple at No. 7 mine, relaying the track of the 12-mile standard gauge railway from the mines to Union bay with 80 lb. steel, and the substitution of 50 ton for 25 ton cars for conveyance of coal to the shipping bunkers, and sinking a new shaft (No. 8) at a place about one mile north of No. 7 mine. These several improvements were well advanced in 1912, but in September of that year labor troubles were experienced. Construction work was continued in 1913, the hydro-electric power system was completed and electric power replaced steam at all but No. 6 of the company's mines in the Comox field, all the mechanical shops and the coal washing plant at Union bay were also supplied with electric power and light, the development of No. 8 mine was continued, and the railway extended to it, while a small town of miners' cottages was constructed near the mine, and generally preparations were made for considerably increasing the output of the mines as soon as there should be the requisite demand for the coal. Meanwhile, production of coal was continued notwithstanding the continued opposition of the United Mine Workers of America. In 1914 the extensive scheme of development and improvement and extension of mining, handling and transportation facilities was practically completed, while the strike was "called of," all the workmen required having been available.

The Extension colliery, situated less than 10 miles southwest of Nanaimo, comprises Nos. 1, 2 and 3 mines, all worked from what is known as the No. 1 tunnel, and No. 4 mine, worked by a shaft. About the middle of September, 1912, a strike of the miners necessitated the closing of these mines. The following spring work was resumed with fewer miners than formerly; later the strikers burned the surface buildings and destroyed the electric locomotives and the coal cars, so production of coal was stopped for a while. In 1914 work was being continued, and conditions were gradually improved until things were back to normal.

The shipping dock and bunkers for the Extension mines are at Ladysmith, with which there is standard-gauge railway connection, as well as with the railway between Victoria and Nanaimo.

The company's beehive-type coke ovens are at Union bay, but no coke has been made there since 1910. Last year there were negotiations with the object of resuming coke-making, to supply coke to a coast copper smeltery, but these were not successfully concluded.

The following table will serve to show what the output of coal has been for the last five years, and the number of employees for four years:

Year.	Coal mined long tons.	No. of Employees Under-ground.	Above-ground.	Total.
Comox Colliery—				
1910	518,426	1,172	416	1,588
1911	437,335	996	263	1,259
1912	475,803	766	217	983
1913	508,095	786	223	1,009
1914 (estimated)	403,980	Not yet published.		
Extension Colliery—				
1910	390,482	737	194	931
1911	331,576	714	167	881
1912	265,766	698	164	862
1913	57,855	135	64	199
1914 (estimated)	129,934	Not yet published.		

The mines at both collieries were in condition for a much larger production than was made, and there were more miners obtainable than work could be found for, but the demand for coal was insufficient to admit of either colliery working anything like full time.

THE CONDENSATION OF GASOLINE FROM NATURAL GAS.

The condensation of gasoline from natural gas is the title of Bulletin 88, just issued by the Bureau of Mines, George A. Burrell, Frank M. Seibert and G. G. Oberfell, authors.

This report treats of a method of preventing some of the waste of the natural gas incidental to oil mining. This method, the condensation of gasoline from natural gas, offers to the oil operator and others a profitable means of utilizing some of the oil-well gas now being wasted. The most desired constituent of crude oil is obtained, the production of oil is not hindered, and the gas, after the extraction of gasoline, can be returned to the leased area to drive pumps or into pipe lines for uses to which natural gas is ordinarily put, generally with its fuel value lessened only in a slight degree.

The authors say: "Gas may be found in a sand and separate from oil. It may be found in more than one sand separate from the oil, or the gas sand may be just above and in contact with the oil sand. A given sand may produce oil and gas in one place and in another part of a territory gas only.

"Gas may come from the same sand as the oil itself. It is this manner of occurrence of gas and oil that the authors desire to emphasize, for under these conditions the gas is frequently mixed with enough of the gasoline constituents of the oil to warrant the erection of a plant for the purpose of condensing the gasoline.

"The gas usually finds its way to the atmosphere through the space between the casing of the well and the tubing inserted for the removal of the oil. This gas is the so-called 'casing head gas.' At the beginning of an oil flow, when the flow is natural, a large quantity of gas escapes to the air through the same tubing as the oil. Where the gas finds its exit to the atmosphere apart from the oil at the casing head, it is a simple matter to make pipe connections between the casing head and any desired point where the gas is to be utilized. This is frequently done when the supply of

casing-head gas is sufficient to warrant its utilization, but frequently, when the supply exceeds the small demands of the lease, the excess is wasted.

"When a well is first drilled, the quantity of gas escaping with the oil from the tubing is frequently enormous, being 10,000,000 to 15,000,000 ft. or more at times. This gas is wasted; the flow in time diminishes.

"When gas comes with the oil in the flow pipe, the two are often separated by means of a gas trap. The oil, entering the top of a drum, settles to the bottom and is withdrawn, and the gas flows off at the top. Many of the plants in California utilize gas that flows with the oil for condensing gasoline. One gasoline plant in the Cushing field, Oklahoma, also uses trap gas. A new type of trap for saving gas from gushers and separating the gasoline is described in this report.

"Oil wells that have passed the flowing stage and are being pumped may still continue to give off much gas at the casing head. The quantity may vary from little or nothing at some wells to 500,000 cubic ft. or more at others. When enough of the gas is available, it is used for pumping on the lease, the excess being wasted. A steam pumping engine of 50 horse-power requires about 25,000 cubic feet of gas for 10 hours' operation. From 12 to 15 cubic feet of natural gas is needed per horse-power hour for gas engines that are used on leases for pumping oil wells. If there is not enough of the gas available for working pumps, it is all allowed to go to waste, or perhaps some is used for heating and lighting a few scattered houses on the lease.

"The efficient utilization of the wasting casing-head gas ordinarily is a difficult problem. The many miles of pipe that would have to be laid to transport it from a field would usually be an unwarranted expense. However, some towns, among which may be mentioned Warren, Pa., and Sistersville, W. Va., are lighted and heated largely with casing-head gas.

"In general, however, the oil man considers casing-head gas as waste gas and its escape necessary in oil-well operations, to permit the maximum flow of oil into the well from the surrounding strata."

The bulletin also treats of the effect of drilling neighboring wells; the effect of formation of waxy sediment; the history of the making of gasoline from natural gas; the chemistry of natural gas, and many other matters of interest along these lines.

NICKEL ALLOYS.

In a paper presented at the Annual General Meeting of the Institute of Metals, London, March 19, 1915, A. A. Read and R. H. Greaves gave the results of a careful study of nickel-aluminium and copper-nickel-aluminum alloys.

Nickel-Aluminium—The influence of nickel on aluminium bears considerable resemblance to that of copper, in that it increases the yield point and tensile strength with the simultaneous diminution of elongation and reduction of area. It increases specific gravit, hardness and rate of corrosion in both fresh and sea-water, and decreases electrical conductivity and resistance to alternating stress. The present work dealing with alloys containing up to 5½ per cent. of nickel provides data for the following comparison between the effects of nickel and of copper on aluminium.

The effect on the microstructure is similar.

Specific gravities are equal for the same amounts of copper or nickel.

Increases in the yield point and tensile strength of rolled rods due to nickel is not so great as that produced by an equal quantity of copper, though the elongations are the same in both cases.

In the case of chill castings, the elongation of the nickel alloy is higher than that of the corresponding copper alloy, while there is practically no difference in tensile strength.

Malleability (hot and cold) is reduced more by copper than by nickel.

Ductility as measured by wire drawing is less for nickel-aluminium than for the alloy with an equal amount of copper.

Nickel-aluminium alloys have a high resistance to alternating stress.

In the case both of nickel and of copper alloys, the quenched material is almost identical in properties with the annealed.

The mechanical properties of copper-aluminium alloys reach a maximum at about 4 per cent. of copper. A similar maximum had not been reached at 5½ per cent. of nickel.

Corrosion of nickel-aluminium alloys both in fresh and sea-water is less than that of copper-aluminium alloys.

Copper-Nickel-Aluminium—The presence of copper and nickel together in aluminium leads to the formation of a triple eutectic, and the resulting alloys bear some resemblance to copper-aluminium alloys whose percentage of copper is equal to the total percentage of copper and nickel. None of the ternary alloys examined in the form of rolled rods showed as high a tensile strength as the 4 per cent. copper-aluminium, while in the cast state, the replacement of more than 2 per cent. of nickel by copper is of no advantage. This proportion of copper also gives the best elongation in chill castings. As in the case of nickel-aluminium alloys, the quenched material shows the same properties as the annealed. For any series of alloys in which the proportions of nickel and copper vary while their total percentage remains the same the specific gravities are constant:

The more malleable alloys are those in which nickel predominates, the binary nickel-aluminium alloys being the most malleable.

The more ductile alloys are those in which copper predominates, the binary copper-aluminium alloy being the most ductile.

The alongation of the hot rolled material is independent of the relative proportion of copper and nickel.

The corrosion is least when only nickel is present and greatest for the ternary alloys. In all cases, the corrosion is more marked as the total percentage of copper and nickel increases.

The behaviour of the material in the tensil tests was carefully followed up to a stress beyond the yield point: and various methods of defining the position of this point in these light alloys is discussed.

Among many other instances of the practical helpfulness of the mining fraternity in Canada is that of miners employed at the No. 1 mine, Ainsworth, British Columbia. About thirty of the mine staff and working force, together contributed $100 last month, this amount to provide two beds at the Cliveden hospital for wounded Canadians in England. The donation is the more worthy of mention for the reason that only a few weeks ago work was resumed at the mine after three months' inactivity.

GASOLINE FROM "SYNTHETIC" CRUDE OIL*

By Walter O. Snelling.

In the course of some experiments more than five years ago, made for a totally different purpose than the investigation of the oil used, I placed a small quantity of a transparent yellow lubricating oil in a bomb-like vessel and heated it to a relatively high temperature. At the end of the experiment I removed the oil from the vessel and was amazed to find that instead of bearing any resemblance to the oil which I had put in, it now had the appearance of ordinary crude oil. The green color by reflected light and the rich red-brown by transmitted light were so unmistakable as to at once lead to further investigation. I subjected the material to fractional distillation, and the surprise which I experienced at the appearance of the oil, changed to amazement when I found that it yielded, on distillation, 15 per cent. of gasoline and 30 per cent. of burning oil, and that its constitution resembled crude oil quite as much as did its appearance. Further, the gasoline and kerosene distillates which it yielded were of a clear water-white color, entirely without treatment with acid or alkali, and were entirely free from the odor familiar in "cracked" petroleum distillates.

The result of this experiment was quite too remarkable to be credited without further confirmation, and I at once filled the vessel with some of the same oil that I had used before, and again heated to about the same temperature that I had previously used, and for the same period of time. Upon opening the vessel and removing the contents I found, not the material resembling crude oil that I had obtained before, but apparently only the same oil that I had put in, somewhat darkened in color, but nevertheless far different in appearance from the material obtained in the previous experiment.

Evidently some condition existed in the first experiment that had not existed in the second test, and here began a series of tests in which I sought by the change of one variable after another to arrive at the identical conditions which must have existed in the first experiment. Only the fact that the bottle of heavy oil used in the first test was still in its place, and the further fact that I had no crude oil among the materials at hand when I began the experiment—only these facts kept me from believing that I had indeed made some mistake, and that crude oil had in some manner found access to my apparatus.

After many fruitless experiments I learned a fact which should have been obvious to me from the first, but which, in the surprise due to the unlooked-for result obtained, had quite passed out of my mind. In my first test, the vessel which I used had contained but a little oil (about one-fourth of the volume of the vessel only), and in all of the other experiments I had filled the vessel three-fourths full or more, in the effort to obtain as much of a yield as possible.

I repeated the first experiment, using the vessel but one-fourth full, and heating to about the same temperature, and for the same time as I had done in the other experiments. The result was once more the greenish liquid so familiar to anyone who has lived in the oil field, and its fractionation again gave 15 per cent. of gasoline, 30 per cent. of burning oil, etc.

Apparently some remarkable change must come about in the hydrocarbon molecules, when a hydrocarbon body is heated in a still approximately only one-fourth full of oil, that does not occur when the same hydrocarbon is heated under similar conditions, except that a greater proportion of the volume of the still or retort is filled with oil. With grave doubts and fears, I placed in my retort some kerosene. If this water-white material, after treatment, should come out green in color by reflected light, and red by transmitted light, then indeed I would be convinced that I was dealing with a true transformation into crude oil. The experiment ended, I poured out from the vessel a liquid which resembled Pennsylvania crude oil so perfectly that when I placed a bottle of the new product by the side of a bottle of the real crude, it was hardly possible to say which was which, by appearance alone. I next melted some paraffin and placed it in the vessel, and after heating under the prescribed conditions, I poured out a thin fluid, suggesting crude oil in every way, and which on distillation gave somewhat over 15 per cent. of a water-white gasoline, free from "cracked" odor, and other distillates in about the same relationship as in ordinary crude oil.

One after another I tried putting all natural hydrocarbons available to me through this process. Vaseline, rod wax gas oil, fuel oil, and B. S.—all these went into my treating vessel, one after the other. They all yielded materials similar in appearance, odor and composition. From any of these materials I obtained a synthetic crude oil containing about 15 per cent. of gasoline, and other distillates in about the same order as are found in typical crude oils.

After many experiments had shown me the exact conditions of temperature, pressure, and filling volume of my treating vessel which were necessary to success, I fondly imagined that my troubles were over. I did not for a moment think that human nature would involve greater difficulties than had even the control of natural conditions. Full of enthusiasm, I described the results of my experiments to an oil man, without of course describing the exact process, on which I had not yet applied for patent. He listened to me carefully and kindly, but his look of utter unbelief and incredulity was a trifle galling, to one whose life work had been devoted to scientific investigations. Had I been a promoter, selling stock in a gold mine located at Hackensack, or in a diamond mine on the outskirts of Brooklyn, I could hardly have met with less encouragement, or more entire disbelief.

To-day, when processes for increasing the yield of gasoline are being worked on by many investigators and when such lines of work are being encouraged and lavishly supported by a number of oil companies, and are being paid for in many cases with sums far greater than any probable returns, it may be hard for you to realize that only five years ago the shortest cut to suspicion and doubt, from your friends in the oil business, was even to suggest gently in ordinary conversation that perhaps by some method it might be possible to increase materially the ordinary yield of high-grade gasoline from crude oil. I tried it a few times, picking out the most kindly and genial of my friends in the oil-refining line. They would look, first pityingly and then suspiciously, and would say: "But after you have gotten out the gasoline that is present in crude oil, how do you think that you are going to get any more? Don't you

*Extracts from a paper presented informally at the New York meeting Feb. 1915 of the American Institute of Mining Engineers.

understand that when you have gotten it all out why you have gotten it all? What is left is kerosene, gas oil, or what-not. But it is not gasoline."

Only once did I venture mildly to protest. I suggested that possibly, since hydrocarbons were all compounds of hydrogen and carbon, it might be possible to rearrange the atoms in the molecule so as to obtain more gasoline. This view met with some recognition, and I was told that what I was talking about was called "cracking" and that it was thoroughly understood by oil men, and that, furthermore, "there was nothing in it" as far as making anything saleable as gasoline, as the product would invariably be of bad color, and of an extremely offensive odor.

Slowly I came to realize that the oil industry was not yet ready for any new views as wholly different from the preconceived ideas as these experiments made necessary. So I would go back, for comfort, to the water-white gasoline of 70° Be. which I had made from paraffin and from kerosene, from gas oil and from fuel oil and from rod wax, and patiently wait for the day when my friends in the oil business would realize that there were a few insignificant things about oil which they did not yet know. For their attitude I could hardly blame them, after all, when I remembered my own doubt when I had seen the results of my first experiments. They had not seen them, and therefore if they doubted, I could at least understand their position, and I am hardly prepared to say that I should have been less doubting than they were, had the positions been reversed.

This paper makes public for the first time the results of my experiments, and in presenting it I wish to express my indebtedness to John T. Milliken, of St. Louis, Mo., President of the Milliken Refining Co. He was the first oil man whom I met who was willing to believe that research could really add materially to the oil man's knowledge. He has generously supported the experiments which I am now reporting, and has supplied the financial help which alone has made this paper possible to-day.

Very careful studies made in my laboratory have now proved that when a hydrocarbon body such as gas oil, for example, is heated in a vessel which is filled to more than one-tenth of its volume with such oil, but such filling is less than one-half of the total volume of such vessel and if then the vessel is so heated that a pressure of say 800 lb. per square inch exists within the vessel, a very remarkable and fundamental change occurs in the hydrocarbon filling such vessel. It is as though the carbon and hydrogen atoms were free to rearrange themselves, and that such rearrangement goes on until a more or less definite mixture of hydrocarbons remains in the vessel. When the vessel is less than one-tenth filled with oil considerable "cracking" seems to take place and the product is quite inferior. When the vessel is much more than one-half filled with oil the reaction seems to fail almost wholly, the amount of light products produced being very small. But when the conditions within the vessel, as to amount of filling, and temperature applied, are as indicated above, the carbon and hydrogen atoms of the hydrocarbon seem to rearrange themselves to form crude oil and natural gas.

In this rearrangement, not only are low-boiling compounds produced from those of higher boiling point, but even the reverse action takes place. In several tests I have obtained from petroleum products of medium boiling point synthetic crude oils which contained high-boiling ends, whose boiling point was considerably higher than that of any of the constituents present in the original oil used. Apparently the entire process depends upon certain equilibrium reactions, in which constituents of different boiling point tend to be present in a certain very definite ratio, provided the space relationship within the treating vessel is of the proper order. Solid paraffin of course contains no constituents that are liquid or gaseous at ordinary temperatures, but upon treatment by this process even this solid paraffin is resolved into synthetic crude oil and natural gas, and the percentage of products of each definite boiling point appear to be in a definite condition of equilibrium. If instead of starting with paraffin we go to the other extreme, and start with kerosene which is entirely free from heavy ends, we will obtain a synthetic crude oil which is much lighter in gravity than that produced from paraffin, but which nevertheless contains high-boiling constituents whose boiling point exceeds by many degrees the boiling point of the heaviest product present in the untreated kerosene. Thus it will be seen that while this process is primarily one in which heavy hydrocarbons give crude oils containing light distillates (this being the main trend of the reaction), yet the process is so essentially one dependent upon equilibrium that if high-boiling constituents are absent, or present in very small amount, the equilibrium will not be satisfied until additional amounts of these high-boiling constituents have been produced as the result of the reaction which is going on.

A residual pressure, after cooling, always exists, due to the natural gas formed in the process, and the amount of this natural gas, like the amount of gasoline in the synthetic crude oil, seems to be very constant no matter what hydrocarbon is taken. It is of course evident to the chemist that natural gas and gasoline contain a greater percentage of hydrogen than do heavier oils, and it is very interesting to note that when the charge which is placed within my treating vessel contains a hydrocarbon deficient in hydrogen, the formation of saturated gasoline goes on just the same, and the synthetic crude oil produced carries a "mud" consisting of the carbon which in the rearrangement has failed to find hydrogen. The gasoline produced from materials even highly deficient in hydrogen is quite normal in color, and does not appear to be in any way like the "cracked" products which are produced by the thermolysis of oil vapors, etc.

It is of course evident that if putting any hydrocarbon through the process described makes it into a crude oil, it ought to be possible to take any hydrocarbon and first convert it into crude oil by the process described, then remove the gasoline, for example, or any other constituent, from this crude oil by distillation, and then to subject the residue to a repetition of the process. I have done this many times, and have converted paraffin and other petroleum products almost wholly into gasoline and natural gas. I have obtained from paraffin about 70 per cent. of water-white gasoline, the remaining 30 per cent. representing the natural gas formed by the repeated action of the process, and some free carbon. From fuel oil, gas oil, vaseline, and similar materials, I have obtained from 50 to 70 per cent. of water-white gasoline, and samples of this gasoline, even after standing for a year or two, do not discolor, nor acquire an offensive or "cracked" odor. I wish to particularly note that this gasoline, even when produced, was not treated in any way, and has never come in contact with either acid, alkali, fuller's earth, bone black, or other related materials. In brief, the process which I have described produced, from practically any hydrocarbon, a material which resembles natural crude oil, and which gives a gasoline which appears equal in

quality and appearance to gasoline produced from natural crude. Both the crude oil produced by my process and the gasoline produced from its distillation possess an odor which is somewhat different from the odor of natural crude oil and ordinary gasoline. This odor, while peculiar and distinctive, is not in the slightest like the odor of "cracked" products, and it is in fact a slightly milder and sweeter odor than that of ordinary oil products. Upon mixing my synthetic crude oil, or the gasoline produced from it, with certain muds and clays, it seems to be altered, and the odor changes and becomes much more like that due to ordinary crude oil. Personally I am of the belief that crude oil in nature has in some cases been produced by some process related to that which I have here described, the effect of the high temperature which I use for a short time having in earth history been produced by very much lower temperatures acting through geological ages. I believe the condition which in my retort is represented by about three-fourths open space, in nature has had its equivalent in the open space in the sand or other porous rock which has been the repository of the oil, and I believe that natural gas, which is so commonly associated with petroleum deposits, has had a related origin in nature to that which it has in the process worked out in my laboratory experiments.

The study of the genesis of petroleum is so involved that I do not wish these suggestions to be taken in any way as other than ideas which have forced themselves on my mind after noting the very considerable similarity in appearance and constitution which exists in most of the petroleums of the world (except where a porous cover or other well-recognized conditions have allowed the more volatile materials to vaporize, or well known oxidation or other phenomenon to take place), and it seems more than likely to me that any process which in the laboratory will produce materials of such similar appearance and composition from raw products of the most diverse nature, must surely have some connection with the conditions which in geological time have similarly produced, from starting out products of many different kinds, a material possessing such well-marked and easily recognized characteristics as petroleum.

These experiments which I have described have been wholly of a laboratory nature, and much work remains to be done in the application of the principles which have been discovered to commercial work on a large scale. While it may seem to many that the pressures and temperatures employed are so high as to preclude the possibilities of commercial work, yet I do not think that is the case. Processes have been developed abroad, during the past few years, in which ammonia is made synthetically by reactions requiring both higher pressures and higher temperatures than those which are made use of in my present work. As these ammonia researches have gone on from their laboratory inception to their commercial development upon a very extensive and successful scale, I believe the present process will find similar development comparatively easy. The conditions necessary for successful commercial work are already well known, and involve no engineering features which American ingenuity cannot easily provide, and it is my hope that this process will be soon developed to the point where it will fulfill commercially the remarkable promise that it now seems to offer.

C. & H. DECLARES $15 DIVIDEND.

The quarterly dividend rate of the Calumet and Hecla Mining Co. was increased recently from $5 to $15 a share, the largest quarterly disbursement since 1913.

THE GERMAN PIRATES

As Americans See Them.

New York Times editorially says: From our department of state there must go to the imperial government at Berlin a demand that the Germans shall no longer make war like savages drunk with blood, that they shall cease to seek the attainment of their ends by the assassination of non-combatants and neutrals. In the history of wars there is no single deed comparable in its inhumanity and its horror to the destruction, without warning, by German torpedoes of the great steamship Lusitania, with more than 1,800 souls on board, and among them more than 100 Americans. Our demand must be made, and it will be heeded, unless Germany in her madness would have it understood that she is at war with the whole civilized world. We have learned much about Germany since the war began, much that has shocked the world's sense of humanity, but this frightful deed was held to be within the domain of the incredible until it was perpetrated. It transcends in atrocity anything our government could have apprehended at the time it issued its warning.

Now, as a necessary sequence of our note of Feb. 10, there must be a further communication to the German government, and it must be something more than a protest. We must demand that Germany shall not continue to make war on us. We may present the demand with reasonable confidence that Germany will pay heed to it. The Germans cannot advance their cause by forcing the world to perceive and admit that they are a people apart, that they are bent upon making war by methods and practices which civilized nations have long since renounced and condemned, and by exhibiting a degree of brutality which is commonly associated with madness. It is not to be believed that either the German government or the German people are wholly mad, and the notice we are compelled to take of the destruction of the Lusitania will, we hope, serve to recall them to sense and reason.

The New York Herald says: Undoubtedly hundreds of Americans have been sent swirling to eternity by the German pirates.

Henceforth is international anarchy to be the controlling factor in marine warfare? Henceforth is piracy on the high seas to be recognized and go unprotested and unpunished? Henceforth is the wanton murder of neutrals and non-combatant passengers to be treated as regrettable incidents and go at that?

It is for the neutral countries, and above all for the United States, to answer these questions. It is a time of gravity in American history unmatched since the Civil War. This cold-blooded, premeditated outrage on colossal scale will cause such a blinding white light of indignation throughout the neutral portion of the world, unhappily growing smaller and smaller, that there cannot conceivably be in Washington any thought of turning back from the note to Germany sent Feb. 10.

The Boston Post says editorially: The sinking of the British liner Lusitania by the torpedo of a German submarine yesterday, with terrible loss of life, is the worst crime against civilization and humanity that the modern world has ever known. It is a reversion to barbarism that will set the whole world, save perhaps the little world of its perpetrators, aflame with horror and indignation.

If she (Germany) wished to set every country on earth, save her Teutonic-Hungarian ally, against her,

she could have taken no better means. If she desires to be a hissing in the mouths of self-respecting nations, she is triumphant in her shame.

The Germans will cry, of course, that they had warned Americans not to sail on the Lusitania. That warning was in itself an insolent striking at Great Britain over the head of the government of the United States. It was as inadequate as it was impudent, and was not in any sense a substitute for the warning at the time of attack, which respectable warfare—and there can be such—has hitherto granted to noncombatants on the sea. The court of human opinion will find no palliation for this indefensible outrage.

The New York World says editorially: The circumstances and the consequences of the destruction of the Lusitania by a German submarine call for all the self-restraint and self-possession that the American people can command.

Morally, the sinking of the Lusitania was no worse than the sinking of the Falaba.

The whole German submarine policy in its campaign, not against British ships of war, but against merchantmen on the high seas, is a revival of piracy—piracy organized, systematized and nationalized. It is piracy against neutrals as well as against enemies. One day it is a British passenger ship that is torpedoed. Another day it is an American merchant ship flying the American flag which is destroyed without a word of warning. And still another day it is a defenceless Swedish or a Norwegian or a Dutch ship that is blown from the face of the waters by a German torpedo.

Modern history affords no other such example of a great nation running amuck and calling it military necessity.

The New York Tribune says editorially: No voice will be raised, no effort will be made, to force the hand, to hasten the action, of the President of the United States. But neither he nor any other official in our government can mistake the temper in which their fellow citizens will wait. They will wait with the casualty list in their hands. The nation which remembered the sailors of the Maine will not forget the civilians of the Lusitania.

The American says: The sinking of the Lusitania, with her heavy freightage of peaceful travelers, including hundreds of women and children was not an act of war; it was a deed of wholesale murder.

The Sun says: It is proper to keep clearly in mind the fact that the undersea attack on the Lusitania is of less importance to us as an event involving international relations than the recent sinking of the Falaba. That is, if it shall happily prove true, that all the American passengers who sailed a week ago to-day on the great Cunarder escaped with their lives. If, on the contrary, any American citizen died in consequence of the torpedoing of the Lusitania the incident is in the class with the Falaba, and technically possesses neither more nor less significance than that affair.

Yet, when all this has been said, the fact remains that no episode of the war has startled and aroused public opinion in this country in a greater degree. That it was premeditated we know, that it was reckless of innocent non-combatant lives we are sure and "dastardly" is the word on millions of American lips this morning.

The New York branch of the Jeffrey Manufacturing Co., has been moved from 77 Warren street to 50 Dey street, adjoining the Hudson Terminal.

PERSONAL AND GENERAL

Mr. W. M. Archibald, of Trail, B.C., one of the Consolidated Mining and Smelting Co.'s engineers, was in Spokane, Washington, last month.

Mr. J. W. Boyle, of Dawson, Yukon Territory, was in Victoria, B.C., in April, conferring with the military authorities there relative to the mounted gun section raised by him in the Yukon for service in the European war.

Mr. Ed. Dedolph, who was engaged in 1913 and 1914 in connection with the electric zinc smelting experiments carried on at McGill University, Montreal, and at Nelson, B.C., has arranged to open an assay office at Kaslo, B.C.

Mr. C. W. Drysdale, of the Geological Survey of Canada, is expected to spend the field-work season of 1915 in British Columbia, probably in the Lillooet district.

Mr. S. S. Fowler, of Riondel, Kootenay lake, B.C., general manager for the New Canadian Metal Co., visited Calgary, Alberta, last month.

Mr. Oscar Lachmund, general manager for the Upper Canada Corporation and the British Columbia Copper and New Dominion Copper Co.'s, has returned to Greenwood, B.C., from a business trip to New York City.

Mr. Douglas Lay, for several years superintendent of the Van-Roi silver-lead mine and concentrating mill in Slocan district, British Columbia, is on a visit to Walkerton, Ont.

Mr. Ralph C. Nowland, of San Francisco, Cal., field engineer for the exploration department of D. C. Jackling and associates, in the early part of April spent two or three days in Franklin camp, Boundary district of British Columbia, looking over mining properties there. He was accompanied by Mr. Fred M. Wells, of Vancouver, B.C.

Mr. Noble W. Pirrie, assayer, of Vancouver, B.C., left that city on April 23 to take up a commission as a lieutenant of artillery, for active service in Europe.

Mr. Alexander Sharp, of Vancouver, B.C., mining engineer to Mr. P. Burns and associates, was recently in Spokane and other places in northeastern Washington, on mining business.

Capt. B. Tamblyn, who was in Nelson district, British Columbia, early in April, has been investigating mining conditions and properties in that part of West Kootenay.

Mr. Gwynn G. Gibbins, of the Huronia Belt Co. staff, sailed on the Adriatic to join the Royal Engineers.

Mr. G. B. Wilson, manager for the company owning the marble quarries at Marblehead, north of Kootenay lake, B.C., has returned to the quarries from a business visit to the United States.

Col. A. M. Hay has been elected president of McIntyre Porcupine Mines, Ltd. Other newly elected directors of McIntyre are Sir Henry Pellatt, W. J. Sheppard, J. B. Tudhope, J. P. Bickell and J. R. Muerling.

Thomas Cantley, vice-president and general manager of Nova Scotia Steel, is on his way to Petrograd on business for the company.

Mr. C. A. Foster has returned to Haileybury from London.

Mr. Geo. R. Rogers, of Toronto, is at Gowganda.

OBITUARY

Henry Edward Croasdaile, who died at his ranch, Crawford bay, an arm of Kootenay lake, British Columbia, on April 14, was well known in the Kootenay district, he having been for some years actively engaged in developing the Silver King mine, on Toad mountain, a few miles south of the city of Nelson. The Nelson "Daily News" states that he was of Irish parentage, and was in his sixty-ninth year when he died. He was an ex-lieutenant of the Royal Navy; for some years was engaged in ranching in the far western States; later he was a stockbroker in Victoria, whence he went to Nelson in 1893. Immediately after his arrival in the chief town of Kootenay he took an active part in its business affairs, and as the years passed he became prominent in the commercial, industrial, and social life of Nelson. In company with Messrs. Winslow Hall and John McDonald, Mr. Croasdaile went to London in 1894 and promoted the company which was, in 1895, organized as The Hall Mines, Ltd., to acquire and operate the Silver King group. An aerial tramway four and one-half miles in length with a difference of 4,500 ft. in altitude of terminals, was constructed from the mine down to the smeltery site at Nelson. The first furnace of the smeltery, with a capacity of 160 tons a day, was blown in during 1896. The following year a furnace having an average capacity of 240 tons a day was built, and a reverberatory plant was added. In 1900, more capital being required for projected extensive development operations, the company was reorganized as The Hall Mining and Smelting Co., Ltd. In 1902, the known orebodies in the Silver King mine having been exhausted, and the supply of copper ore consequently becoming very small, the larger furnace was adapted to the requirements of lead smelting, and thereafter the smelting done was chiefly of custom ores. Meanwhile Mr. Croasdaile had retired from the management of the company. Mr. Croasdaile was connected with other mining undertakings, among them those of the B. C. Exploration Co., of which he was general manager. For some years after his withdrawal from mine management Mr. Croasdaile was in England, where he carried on a brokerage business, which he continued after he returned to Nelson. Following the loss of his only son about four years ago, and of his wife two years later, Mr. Croasdaile went to live on his ranch at Crawford bay with his sister and daughter, both of whom survive him. His body was interred at Nelson on April 16.

Joseph Foy.—The body of the late Joseph Foy, mine manager for the Pacific Coast Coal Mines, Ltd., was recovered about the end of April, and was buried at Nanaimo, Vancouver island, B.C., on May 1. Deceased was one of nineteen men who were drowned when the company's Fiddick mine was flooded by the breaking through of water from an adjoining abandoned mine on February 9, last. Mr. Foy sacrificed his life by going down the slope and endeavoring to save some of the miners caught by the rush of water in the workings lower down. He was a native of Whitehaven, Cumberland, England, and was 48 years of age. On arriving in British Columbia six years ago, he entered the service of the Pacific Coast Coal Mines, Ltd., first having charge of the development of the company's new mine at Suquash, in the northern part of Vancouver island, and afterward as overman supervising the work of sinking the shafts at the company's Morden mine near South Wellington. In 1913 he became manager at the Fiddick mine at South Wellington. He leaves a widow and eight children.

SPECIAL CORRESPONDENCE

NOVA SCOTIA

The production of the Dominion Coal Company for the first four months of the year compares with 1914 approximately as follows:

	1914 Tons	1915 Tons
Glace Bay mines	1,396,000	1,195,000
Springhill mines	133,000	134,000
	1,529,000	1,329,000

These figures show a decrease of approximately 200,000 tons, or less than half of one month's full output spread over four months. This is a fair showing in war time.

The first steamer for the St. Lawrence left on the 30th April. Last year the first steamer left Sydney for Montreal on the 25th April, but did not reach destination until the 5th of May, because of the unusually heavy ice conditions.

Prospects for the summer months are quite promising. Charter steamers will probably be slow in delivering because of the attractive freight rates now prevailing, and the general scarcity of suitable vessels caused by the requisitioning of ships by the Admiralty. It is expected that the level of last year's shipments will be maintained during the coming summer.

Stocks of coal at the mines are much smaller than they were last year. Some of the coal companies have not put any coal into banks during the past winter, and other companies have reduced the size of their banks. Requirements of coal for steel-making purposes will probably exceed the requirements of last summer, and so far as it is safe to forecast the future, indications are that the coal trade may experience a limited revival during the next six months.

The new benzol and toluol plant of the Dominion Steel Company is in operation, and a considerable quantity of benzol has already been made. Toluol is now being produced. It is understood the nitration of the toluol is to be undertaken by the Canadian Explosives Co. at their Ste. Anne plant. Officials of the Steel Company express themselves enthusiastically over the results of the benzol plant, which they claim has eclipsed the records of other plants in the United States.

Acadia Coal Co.—Success has attended the recovery operations at the Allan shaft of the Acadia Coal Co. The recovery operations were undertaken in a very deliberate manner, with much forethought and planning. It is understood that use was made of breathing apparatus, principally for advance work, and the construction of air stoppings. The work of the apparatus men was merely supplementary to the main recovery operations, of course, but has proved a useful example of the true function of these devices, and of what can be done when they are used with judgment and as part of a previously developed plan of operation.

Miners at the Front.—In common with practically all the coal mining districts in the Empire, the mining districts of Nova Scotia have contributed at least their full proportion of recruits to Britain's armies. Springhill, Nova Scotia, was always a live centre of military interest, and has for many years maintained an enthusiastic militia unit. The number of men who have gone from Springhill to the front has made an appreciable difference in the number of men available for work at the collieries. The Sydney coal field contributed very largely to the 17th Field Battery, which is now doing excellent work in France, and within the past few days a detachment of seventy recruits left the town of Glace Bay as a draft for the Second Contingent.

Practically the whole of these men were miners or in some way connected with the mining industry.

In a recent speech made by the Prime Minister of Great Britain at Newcastle-on-Tyne, Mr. Asquith stated that 217,000 miners had enlisted, "fifty per cent. of the miners of military age." This is a record of which the coal miner may well be proud. When the tale of this war comes to be written, it will be found that the miner has played his part well, which is exactly what those who know the miner in his daily walk and conversation would expect.

COBALT, GOWGANDA AND SOUTH LORRAIN

Since the war commenced there has been so little activity in the silver fields of Northern Ontario outside a radius of a few miles round Cobalt that it might almost be said that interest was dead apart from the working mines inside a very narrow circle. The exceptions are, of course, the Miller-Lake O'Brien at Gowganda, and the Casey to the north-east of New Liskeard.

The past month has seen more stir in the outer camps than for several years past.

Gowganda—Up the Montreal river the Miller-Lake O'Brien company has resumed operations on the usual scale after being obliged to seriously curtail production for some months owing to the dry summer, power being from hydro-electric installation. In addition a company has decided to commence preliminary operations on a group of claims known as the Homestead on Wigwam lake. There are quite good veins on the surface and it has been resolved that they shall have a chance. In Elk Lake two or three companies or syndicates are doing more or less desultory work on claims.

In South Lorrain it is reported that the Wettlaufer may start up again soon. The Currie is still being worked by the Pittsburg Lorrain and cross-cutting from the shaft on the Talon claims is continued. There is also a report that the old Bellellen may be opened up again.

Casey.—The most important and definite step to develop new territory will be made through the Casey Seneca company which has taken over the Murray claims. This property corners the old mine workings of the Casey, and is directly south of the new shaft where such good results have recently been obtained. The difficulty with the development of claims in this vicinity is that there is such a very heavy clay overburden. But now that the Casey is finding such good ore near the Murray line the chances in sinking a shaft blindly in the clay are less than when there was no development within two claims.

An option on a block of stock of the new company has been taken by Messrs. Harry Worth, president of the Seneca Superior Silver Mines, and R. F. Segsworth, treasurer of the same company. The new claim is guaranteed vigorous and effective prospecting and the results to this section of the Cobalt field may easily be of some importance. In the same section the Casey Mountain mining company has also resumed work with a small gang of men. It is known that there is a large conglomerate area here, but it could never be prospected by reason of the lack of outcrops and the very heavy overburdens.

Silver Leaf.—Excellent results have been obtained on the Silver Leaf in the winze 40 feet below the 75-ft. level. The winze was put down on ore. About 30 ft. down the ore became lean and a drift was run at 40 ft. Another vein about an inch wide of good ore soon came into the face and this was followed. In a few rounds there also appeared in a corner of the drift the best vein that has been found on the Leaf since it came under the lease of the Crown Reserve mining company. All the ore is being dumped down to the 200-ft. level of the Silver Leaf and trammed through the Crown Reserve rock house. High grade is sacked here. Low grade goes over the aerial tramway to the Dominion Reduction company. This will probably be altered if good developments continue, and a new shaft will be sunk on the Silver Leaf to facilitate the transportation of ore.

The Right of Way is being operated again. So far operations have been quite successful. Before power was available some hand steel work was carried out which put in sight some high grade ore, and already between six and eight tons have been sacked. In addition a contract has been made with the Northern Customs concentrator to send 30 tons a day for treatment. It is understood that the grade of milling ore being treated is quite satisfactory. In addition a new vein of high grade has been discovered in one of the walls of the old workings.

The Princess mine is under lease to Mr. Sidney Smith of Haileybury, who has commenced work with one drill on the 55-ft. level. The lease is on a royalty basis. The La Rose company shut down the Princess some months ago, it being understood that not enough ore was in sight to warrant further work except on a very restricted scale.

La Rose—A good grade of milling ore is being treated at the Northern Customs concentrator from the University mine. This ore is being taken from a point near the old workings. The La Rose is conducting quite extensive development work at this old mine.

Cobalt Lake is rapidly being drained, it being estimated, that it is going down at the rate of a foot a day. The lake had an average depth of 40 ft. last fall before the rock cut at the end of the lake lowered it six feet. It was estimated to contain 300 million gallons of water. The discharge pipe is running at about half bore into Mill creek.

King Edward—Work has started on the old King Edward under the direction of the York Ontario mining company.

Casey-Cobalt.—Very good results have recently been obtained at the Casey Cobalt mine from the new shaft on the east claim. It is understood that three veins, small, but of good grade ore, have been cut and are now being drifted upon.

The O'Brien mine development in the diabase is exciting much interest in the Cobalt camp. During last year, of the 1,200,000 ozs. produced two thirds came from the diabase. No. 6 shaft, which is in the diabase, is 300 ft. deep, and a winze has been sunk another 200 ft., about 1,000 ft. south and east from the shaft. As shoots of high grade ore are found, the better grade is handpicked out and the remainder is taken to the mill in electric locomotives on the surface. The heads at the mill from the diabase ore exclusive of the high grade ore run about twenty ounces. The coarse metallics are taken out of the ore by metallic traps at the end of the tube mills before the product goes to the cyanide tanks.

KIRKLAND LAKE AND PORCUPINE

Sesikinika—Good reports are beginning to come in from prospectors working claims in various portions of the gold belt near the height of land. Near Sesikinika lake some small veins of quartz rich in gold have been uncovered on the Hughes properties adjoining the townsite. These quartz veins are distributed over an area of four feet and the orebody has been traced for 500 ft. Some test pits are now being put down on them.

In Deloro township some discovery of good ore has been made on the Pike Lake company claims, and this is encouraging further prospecting of claims in this section of the Porcupine field.

The Dome Lake mine and mill closed down at the end of the month. It is known that the interruption of operations is only temporary, but for some time past the results of the mill runs have not been more than paying running expenses. The directorate felt that it was necessary to make some readjustments before the property could be run at a profit, and in the meanwhile determined to close down the mine and mill.

McIntyre—A complete change of directorate was made at the annual meeting of the McIntyre whereby a majority of Canadians was elected to the board.

Tough Oakes—Development on the 300-ft. level of the Tough Oakes mine has been very satisfactory of late. The drift at this level has been pushed for 300 ft. and there is good ore in the face. The drift is now entirely in the red porphyry. Two-thirds of the ore going to the mill is coming from the dump and the other third from development work. The mill is making excellent practice although some mechanical adjustments will have to be made.

The Rea mine has closed down, with the exception of the completion of some diamond drilling on the 300-ft. level. During all the time the Mines Leasing company had this property they ran a ten stamp mill with such good results that they were enabled to pay a 5 per cent. dividend. All the ore in sight has now been mined out and development work not leading to the expectation that further ore would be found it has been determined to close down both mill and mine.

Several test pits have been put down from the surface on other veins on the Rea, but they failed to disclose anything of importance.

Vipond—As a means of exploration a diamond drill is being used on the Vipond at the 300-ft. level from the west face. The vein at this point has made a turn, and it is considered more economical to endeavor to locate the extension with the diamond drill than to follow it in the drift.

A winze is being sunk from the 300-ft. level to the 400-ft. The ball mill, which should have been delivered some time ago, has now been installed and will raise the capacity of the plant considerably.

Production at the Vipond for the first three months amounted to $77,000. The total costs are now running $5 a ton, leaving a handsome profit on operations.

The St. Paul claims in Bartlett township are being worked. A shaft is being sunk by the owners of the claims, it is stated with satisfactory results.

The Huronian Belt Co. has decided to start up the North Thompson again. A contract has been let for the sinking of a three compartment working shaft to a depth of 300 ft. The present shaft is down to the 100-ft. level, but considerable work has been prosecuted from this level.

BRITISH COLUMBIA

Placer Gold Mining.—As the time for a resumption of placer gold mining for the 1915 season is at hand, interest is taken in the outlook for a water supply for hydraulicking and other sluicing operations. In Cariboo district the snowfall was light last winter, so that hopes for a gravel washing season of average length are now based on the expectation of a rainy summer following a dry late winter and early spring season. No information is available concerning the winter's snowfall in the Atlin field or other parts of Cassiar district, but there is general confidence that if there be sufficient water to allow of operations being continued throughout the possible running time, say a season of 180 days, the output from Atlin streams will be larger in 1915 than during several years past.

"Mining and Scientific Press," San Francisco, recently published an interesting article giving much valuable detail relative to hydraulic mining in the Atlin field. The writer of the article, Mr. A. D. Hughes. says: "The information given covers the operations of the North Columbia Gold Mining Co. during four seasons, 1910-1913, both inclusive. The work was carried on under the management of Mr. J. M. Ruffner. I was present during the whole of this period, and during three years acted as superintendent. The data given are therefore authentic and represent the result of observations at all stages of the work and under all the conditions obtaining."

Only brief excerpts from Mr. Hughes' long account may here be made. First, as to the length of the working season, he says: "During the four years considered there was but little variation in the dates of starting preliminary work, namely April 18, or that for commencing sluicing, May 10, and closing down, November 10." After describing the water supply system, Mr. Hughes states that: "The work was conducted from two separate pits, one on the south side of Pine creek opposite the town of Discovery, and the other about half-a-mile up stream on the north side. The water for both pits was taken from the main ditch, which is on the south side. There was about five feet of water above the sill of the gates at Surprise lake (which has an area of about 18 square miles), and with the constant supply coming from tributary creeks a steady flow of about 10,000 miner's inches of water was reasonably certain." As to operations: "As soon as the weather conditions permitted, 20 men were started to work in No. 2 pit. Usually there was one of the main pipe-lines to be moved. This made a new pressure box or penstock necessary.....At this plant the pressure boxes were built as close to the ditch as possible, usually about 30 ft. The flume was made 5 ft. wide and about 6 ft. deep. The pressure box dimensions were 8 x 16 ft. inside and 12 ft. deep. The sides of the box and flume were brought well above the water level of the ditch, so that they required less attention.....Two main pipe-lines were used, each about 1,500 ft. long, consisting of 30, 28 and 26-in. pipe to the main Y's at the pit. They consisted of 12 and 14-gauge slip-joint riveted pipe.....From the

main Y's the pipe was reduced to smaller sizes to run to the monitors. This pipe was of 14 and 16-gauge, mostly 16 and 18-in. diam. Eight monitors were in use five No. 6 machines, 15-in. intake and 6-in. nozzles, and three No. 5 machines, 11-in. intake and 5-in. nozzles. Each machine was equipped with a deflector, and each pipe-line with a gate. Nearly all the monitors were ball-bearing machines. Four machines were operated on each of the main lines." Concerning the gold recovered, Mr. Hughes says: "The gold was fairly coarse and was easily saved. Quicksilver was used in the riffles at all times. In cleaning up, about 75 per cent. of the gold was recovered in the first 35 ft. of the sluice. About 10 per cent. of the gold was recovered from the bedrock immediately around the head of the sluice; that is, within a radius of 40 ft. Tests proved that it did not pay to retard the work to clean the remainder of the bedrock by hand." The actual operating time is given as 154 days per season in Pit No. 1, with 4,500 miner's inches of water used per day, and 283,300 cu. yd. of gravel worked per season; average depth of ground 60 ft. 6 in.; average total cost per season, $34,192.30; average cost per cu. yd. 12.07c. The corresponding figures for Pit No. 2 are: Actual operating time 141 days per season; water used, 4,250 miner's inches per day; 178,580 cu. yd. of gravel worked per season; average depth of ground, 16 ft. 4 in.; average total cost per season, $35,743.46; average cost per cu. yd., 20.01c. No information is given as to the value of the gold recovered, but some idea is obtainable from figures given in the Annual Report of the Minister of Mines for 1912, in which Mr. Ruffner is quoted as having stated that the average recovery from 197,600 cu. yd. of gravel washed in Pit No. 2 during the 1912 season was 36.7c. a cu. yd. Allowing a similar average value for the four years under notice, the result would be an average recovery per season of $65,538 at a cost of $35,743. If a similar recovery per cu. yd. has been made in Pit No. 1, the result would be an average yearly recovery of $103,971 at a cost of $34,192. These figures, however, are merely surmises, not verified returns.

It is noteworthy that Mr. Hughes, resident in the district and presumably in a position to make a fair estimate, places the total value of the gold recovered yearly at $350,000 "during the time mentioned." If it be meant that during the four years under notice that was the average value per year, it is evident that the amounts on official record are very conservative, for they are shown in the Annual Reports as follows: For 1910, $275,000; for 1911, $225,000; for 1912, $290,000; for 1913, $315,000.

East Kootenay.

Sullivan Group.—Ore shipments from this lead-silver mine to the Consolidated Mining and Smelting Co.'s smelting works at Trail continue to be made on a much larger scale than at the corresponding period of 1914. For the first sixteen weeks, to April 22 inclusive, of the current year the total quantity of ore received at Trail from this mine was 13,099 tons. That for the corresponding period of 1914 was 5,287 tons, with 238 tons from the St. Eugene, also situated in Fort Steele mining division of East Kootenay, but not on this year's shipping list.

Placer gold mining will soon be again under way on several gold-bearing streams in Fort Steele division—on Wild Horse and Perry creeks in particular. While the yearly output of placer-gold is not large, there are still a few men who engage in placer-mining in this division every year. There is little new to chronicle relative to coal mining, except that the Crow's Nest Pass Coal Co. is having a somewhat better demand for coke now that all the furnaces at the Granby Consolidated Co.'s copper smeltery at Grand Forks, Boundary district, are in blast once more.

West Kootenay.

Ainsworth.—Four mines shipped ore to Trail during recent weeks, namely the Early Bird, No. 1, Retallack & Co.'s Whitewater group, and Utica. Of the total for four weeks ended April 22, 380 tons, the No. 1 shipped 275 tons, and the others one car load each.

The annual general meeting of the Utica Mines, Ltd., was held at Kaslo, Kootenay lake, on April 15. From a published account of the meeting it is learned that Mr. Geo. H. Aylard, general manager for the Standard Silver-Lead Mining Co., was elected president, and Mr. Chas. F. Caldwell, of Kaslo, vice-president; the other directors are: Mr. J. D. Chalin, St. Catharines, Ontario; Mr. W. M. Archibald, of the mining engineering staff of the Consolidated Mining and Smelting Co., of Canada, Ltd., Trail; Mr. W. O. Miller, of Nelson, district divisional superintendent for the Canadian Pacific Railway Co., and Dr. Gilbert Hartin, also of Nelson. The "Kootenaian" states that: "The new directorate is regarded as a strong one. The report of operations for the past year showed that during the latter part of 1914, owing to war conditions and the low prices received for metals contained in ore shipped, no profit had been earned, but that during the first quarter of 1915 operations had been profitable.....The company is now practically out of debt, having due from ore sold about sufficient money to offset current liabilities. The manager's report indicated that the mine is looking well, and the future is regarded by the directors as being promising."

Slocan.—Production of silver-lead ore in any considerable quantity has not yet been resumed judging by receipts at Trail from this division, the figures for four weeks having been as follows: From the Rambler-Cariboo mine, 198 tons; Hewitt-Lorna Doone, 46 tons, and Wonderful, 42 tons. However, zinc concentrate is being made at two mills, the Ivanhoe mill, near Sandon, running largely on ore from the Surprise mine, and the mill of the Silverton Mines, Ltd., treating Hewitt-Lorna Doone ore. It is reported that the Slocan Star mill will shortly be again operated, but no definite information has been made public relative to the Standard mill, at Silverton.

Several of the smaller mining properties in Slocan division are again being worked, so that the position is improving generally in this part of West Kootenay district.

A shipment of 6,000 tons of zinc ore from Australia to be smelted in the Southern Kansas and Oklahoma smelters has been passed through Kansas City custom house.

The big shipment from Australia comes as a result of the war in Europe which has closed most of the big European smelters.

The Broken Hill district in Australia, from which the shipment of 6,000 tons has come, produces about 400,000 tons of zinc a year. It has largely been shipped to Europe to be smelted. The 6,000-ton shipment of ore, it is expected, is the forerunner of other shipments to the smelters in the Kansas City district.

MARKETS

NEW YORK MARKETS.

May 7.—Connellsville coke (f.o.b. ovens)—
Furnace coke, prompt, $1.55 to $1.65 per ton.
Foundry coke, prompt, $2.00 to $2.50 per ton.
May 7.—Tin straits, 39.25 cents.
Copper, Prime Lake, 18.87½ to 19.12½ cents.
Electrolytic copper, 18.62½ to 18.87½ cents.
Copper wire, 20.00 cents.
Lead, 4.20 cents.
Spelter, 13.65 to 13.75 cents.
Sheet zinc (f.o.b. smelter), 17.50 cents.
Aluminum, 19.50 to 19.75 cents.
Nickel, 42.00 to 45.00 cents.
Platinum, soft, $40.00 per ounce.
Platinum, hard, $42.00 per ounce.
Bismuth, $2.75 to $3.00 per pound.
Quicksilver, $74.00 per 75-lb. flask.

SILVER PRICES.

	New York cents.	London pence.
April—		
24.	50⅝	23⅞
26.	50¾	23 15/16
27.	50½	23 13/16
28.	50⅝	23⅞
29.	50⅝	23⅞
30.	50½	23 13/16
May—		
1.	50½	23 13/16
3.	50¼	23 11/16
4.	50⅛	23⅝
5.	50	23 9/16
6.	50	23 9/16
7.	50	23½

TORONTO MARKETS.

May 7.—(Quotations from Canada Metal Co., Toronto)—
Spelter, 15½ cents per lb.
Lead, 5½ cents per lb.
Tin, 51 cents per lb.
Antimony, 40 cents per lb.
Copper, casting, 20½ cents per lb.
Electrolytic, 21 cents per lb.
Ingot brass, yellow, 13 cents; red, 15 cents per lb.
May 7.—(Quotations from Elias Rogers Co., Toronto)—
Coal, anthracite, $7.50 per ton.
Coal, bituminous, $5.25 per ton.

STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.)

New York Curb Stocks.

	May 7, 1915. Bid.	Ask
Alaska Gold	.36	.36¼
British Copper	.00¾	.01
Braden Copper	.08	.08⅛
California Oil	296.00	299.00
Chino Copper	.46½	.47
Giroux Copper	.01	.02
Green Can.	.30	.32
Granby.	.86	.86¾
Miami Copper	.25⅞	.26⅛
Nevada Copper	.15	.15¼
Ohio Oil	140.00	142.00
Ray Cons. Copper	.24½	.24¾
Standard Oil of N. Y.	185.00	187.00
Standard Oil of N. J.	406.00	409.00
Standard Oil (old)	1325.00	.....
Standard Oil (subs)	915.00	.....
Tonopah Mining	.07⅛	.07⅜
Tonopah Belmont	.09¼	.09⅜
Tonopah Merger	.36	.37
Inspiration Copper	.31⅝	.31⅞
Goldfield Cons.	.01½	.01 9/16
Yukon Gold	.02¾	.03
International Nickel	...	145.00

Porcupine Stocks.

	Bid.	Ask
Apex.	.03¾	.04
Dome Extension	.09¾	.10
Dome Lake	.16	.17
Dome Mines	12.25	13.00
Foley O'Brien	.30	.33
Hollinger.	25.20	26.00
Jupiter.	.12¼	.12½
McIntyre.	.50	.52½
Moneta.	...	.05½
Pearl Lake	.01	.01⅝
Porcupine Gold	.00½	.00⅞
Imperial.	.07	.07½
Preston East Dome	.02½	.03
West Dome	.04¼	.04⅝
Porcupine Crown	.80	.83
Teck Hughes	.04	.05
York, Ont.	.07	.08½

Cobalt Stocks.

	Bid.	Ask
Bailey.	.02½	.02¾
Beaver.	.35½	.36
Buffalo.	.55	.75
Chambers Ferland	.18	.22
Crown Reserve	.85	.89
Foster.	.03¼	.05
Gifford.	.02	.02¾
Gould.	.00⅛	...
Great Northern	.02½	.03½
Hargraves.	.01	.01½
Hudson Bay	19.00	...
Kerr Lake	4.85	5.10
La Rose	.50	.60
McKinley.	.29	.30
Nipissing.	6.05	6.13
Peterson Lake	.22½	.23
Right of Way	.04	.04½
Leaf.	.03	.03¼
Temiskaming.	.35½	.36
Trethewey.	.14	.16
Wettlaufer.	.03½	.05
Seneca Superior	1.00	1.35

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

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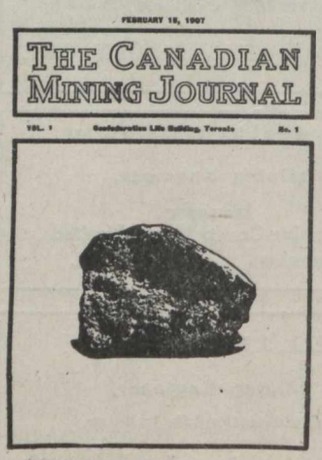

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Most of the older reports are out of print, but they may usually be found in public libraries, libraries of the Canadian Mining Institute, etc.

REPORTS RECENTLY ISSUED:

CANADA
Summary Report of the Geological Survey for the year 1913.
NEW BRUNSWICK and NOVA SCOTIA
Memoir 20. Gold fields of Nova Scotia, by W. Malcolm.
Memoir 60. Arisaig-Antigonish District, Nova Scotia, by M. Y. Williams.
Memoir 41. The "Fern Ledges" Carboniferous flora of St. John, New Brunswick, by Marie C. Stopes.
QUEBEC
Museum Bulletin No. 3. The Anticosti Island faunas, by W. H. Twenhofel.
Memoir 39. Kewagama Lake Map-Area, Quebec, by M. E. Wilson.
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Museum Bulletin No. 5. A Beatricea-like Organism from the Middle Devonian, by Percy E. Raymond.
Memoir 40. The Archaean Geology of Rainy Lake Re-studied, by Andrew C. Lawson.
Museum Bulletin No. 8. The Huronian Formations of Timiskaming Region, Canada, by W. H. Collins.
NORTH-WEST PROVINCES
Memoir 47. Clay and Shale Deposits of the Western Provinces, Part 3, by Heinrich Ries.
Memoir 53. Coal Fields of Manitoba, Saskatchewan, Alberta and Eastern British Columbia (Revised Edition) by D. B. Dowling.
Museum Bulletin No. 4. The Crowsnest Volcanics, by J. D. MacKenzie.
Memoir 61. Moose Mountain District, Southern Alberta (Second Edition), by D. D. Cairnes.
BRITISH COLUMBIA
Memoir 32. Portions of Portland Canal and Skeena Mining Divisions, Skeena District, B.C., by R. G. McConnell.
Memoir 51. Geology of the Nanaimo Map-Area, by C. H. Clapp.
Memoir 55. Geology of Field Map-Area, B. C., and Alberta, by John A. Allan.
YUKON AND NORTH-WEST TERRITORIES
Memoir 31. Wheaton District, Yukon Territory, by D. D. Cairnes.

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

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon. Letters and samples that are of a Departmental nature, addressed to the Director, may be Mailed O.H.M.S. free of postage.

Communications should be addressed to THE DIRECTOR, GEOLOGICAL SURVEY, OTTAWA.

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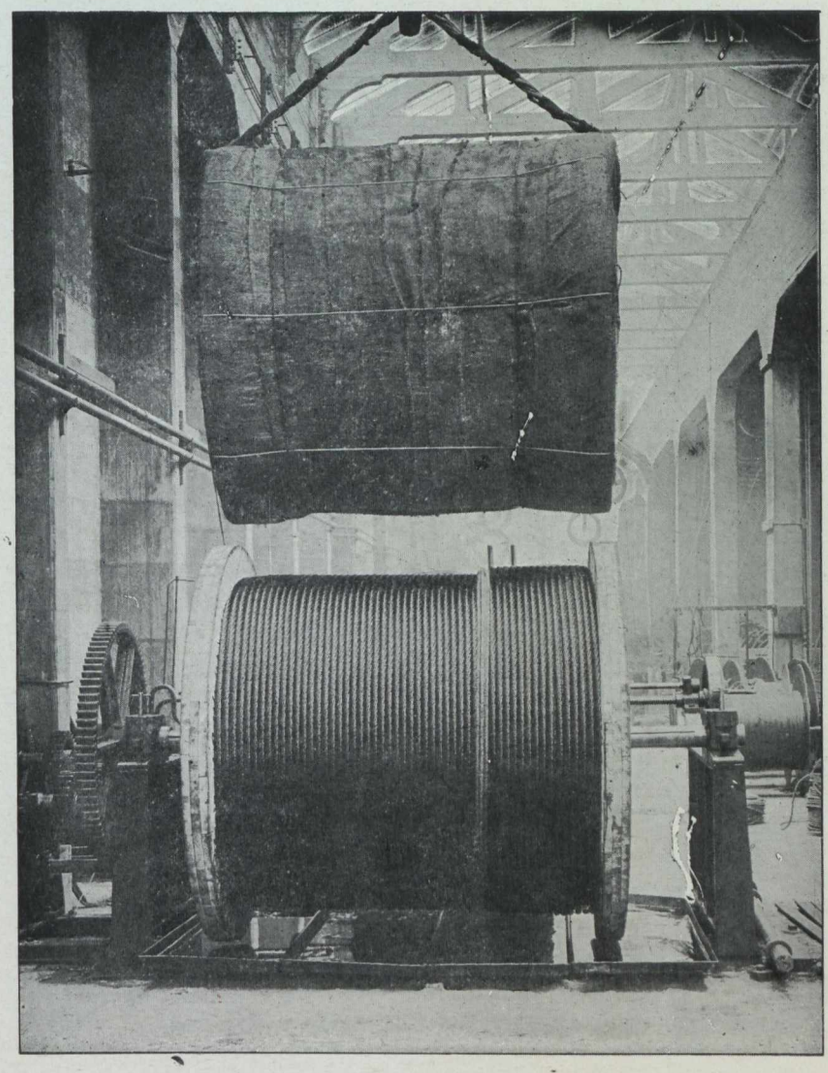

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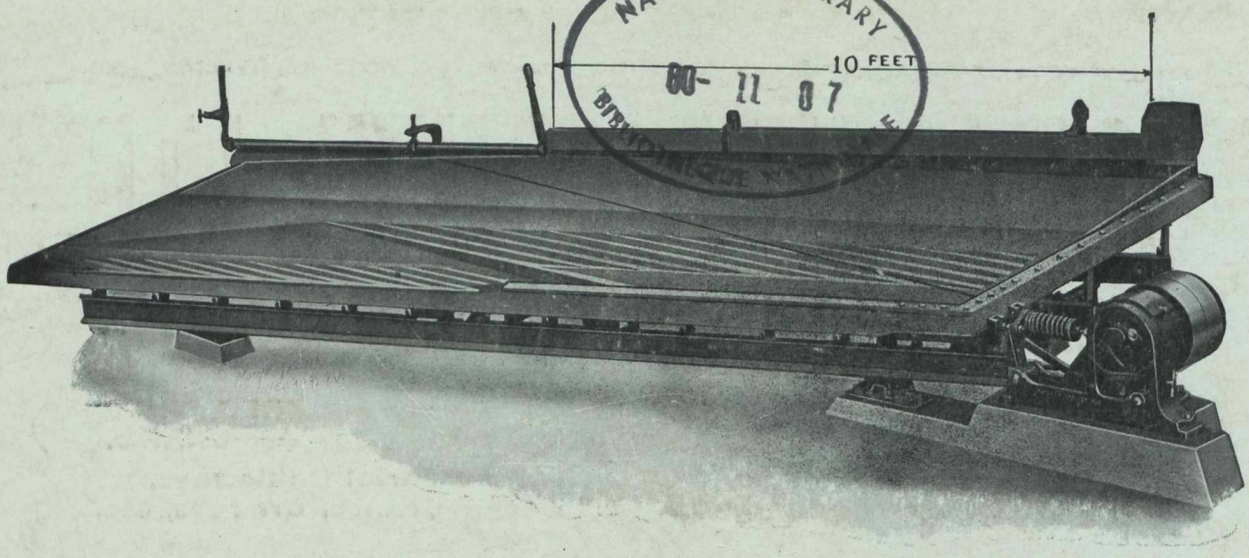

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