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Editor
REGINALD E. HORE

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CIRCULATION.

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CONTENTS.

ENGLISH FOR ENGINEERING STUDENTS

It is not an uncommon thing for an engineer to express regret that in his student days he spent so little of his time in the study of English. Occasionally an engineer goes further and urges that something be done to provide for better training for the engineers of the future. Some who have had occasion to feel their deficiency keenly are heard to criticize severely the colleges which send them out under a serious handicap. A few make suggestions as to just what should be done at the colleges where they were trained.

In recognition of the lack of training in writing which the average mining engineer has had, the Michigan College of Mines in 1911 engaged an English instructor, Mr. J. D. Black, and offered a course in technical writing. An interesting account of the result of three years' work is given by Mr. Black in a recent paper. First, regarding the student's standpoint, he says:

"How is it at the College of Mines after three years of the work? I do not think that the courses are any less popular here than in other engineering schools in the country; in fact, I think they are more popular. And I am not claiming much popularity at that! Some of the students think that the courses are a nuisance; others say that the work is useless, that they don't seem to be getting anywhere with it. Both of these sorts let the work trouble them just enough to escape a condition. Others say that perhaps a course in technical writing could be given that would be well worth while. Still some faith left! The good students are usually willing to grant that what little of the stuff they get is well worth the trouble—and even wish there might be more of it, especially if it could be managed without additional work on their part.

"But giving to the opinion of these earnest students all the weight it deserves, I am still forced to admit that those who have had one or two years of technical writing are far from being as eager for it as were those who began it three years ago."

The reason for the decrease in popularity of the courses was the recognition by the students that there was no fundamental difference between "technical writing" as taught to mining engineers and "composition" as taught to general students. "They have found that learning to write well on technical subjects is the same old grind that composition always was. And a good many of them are taking engineering just because they didn't like to write compositions in high school!"

While the unwillingness of the average engineering student to write compositions has prevented the courses offered from obtaining great popularity, Mr. Black is able to report that good results are obtained.

"That the students at the College of Mines have improved under instruction, there is no doubt in my mind. I have proved by the exactest tests that can be applied that those finishing the second year course can write very appreciably better than those just entering College, if they try. They do not write examination papers much better—can you expect it when they are nearly always pressed for time? The compositions written by the second year men last April as the final examination for the course were, I believe, the best set of compositions ever written by any class at the College. Moreover, I will match them with similar sets written by sophomores in any college or university."

In Canada the teaching of English to mining students is quite a different problem from that presented in Michigan. Here the mining students receive their education in Universities where every facility for the teaching of English is available. Special instructors are not necessary for mining classes. All that need be done is to arrange between the University Departments for the desired instruction.

The question to be considered here is whether the requirements in English are now strict enough. Students acting on their own initiative can usually find opportunity for as extensive courses in English as they desire. But the average engineering student has an idea that good English, while desirable, is not very essential to his success. Is the student capable of judging? It would be better to assume that he is not, and insist on courses in English being taken.

COBALT SILVER MINING COMPANIES PLAN NEW WORK

Following on the reopening of the few producing mines shut down on account of the war now comes news of further activity. The Cobalt Lake and La Rose companies have adopted programs which call for vigorous exploration and development of their property.

Some time ago the Cobalt Lake Company prepared plans for the draining of the lake so that the known ore-bodies could be extracted and others searched for. Most of the property underlies the lake and the project involves large expenditure both for draining off the water and providing other companies with water and the town of Cobalt with a sewage system. In spite of the inability of the town to finance its share of the work at this time the company intends to go ahead.

The La Rose mine, one of the earliest discovered and one of the best at Cobalt, has for some time not been showing up well on development. The known ore-bodies have been almost completely extracted and little new ore has recently been found. The company has a very large cash surplus and is in a position to carry on extensive development work if desired. For some time it has been doubtful whether the mine would soon be closed down or a vigorous plan of exploration adopted. Acting on reports by Manager R. B. Watson and P. A. Robbins the directors have decided on the latter policy. This means that operations will be carried on that may easily lead to the discovery of more ore. Much will be learned that will be of use both to the company and to the owners of the surrounding properties. The structure in the vicinity of the La Rose merits close study. The possibility of discovering ore on the property is a fair one.

LORRAINE IRON DEPOSITS

The activity of the armies in Lorraine near the borders of France, Belgium, Luxemburg, and Germany draws attention to the fact that this region is a very large producer of iron ore. In all four countries the working of the iron deposits in this neighborhood is and has been for years an important and profitable industry.

The Lorraine iron ore district, easily the greatest in Europe, has a productive area of about 300,000 acres or approximately 470 square miles. Of the total there is in France 180,000 acres, in Germany 106,000 acres, in Luxemburg 9,000 acres, and in Belgium a few hundred acres now practically worked out. The ores, which are oolitic, occur as a group of sedimentary beds of varying thickness.

In the war of 1870 the Lorraine district was the scene of much fighting, as it is in this war. When the war was over France ceded to Germany practically all of the district in which iron ore outcropped. As remarked by Mr. E. C. Eckel in his recently published work on iron ores, "the war of 1870 was in reality an exchange of blood for iron in a way that the world has not appreciated."

After the war ore was developed at greater depth on French territory and the ore reserves in France are now known to be greater than those in Germany.

In the International Geological Congress report on iron ore resources of the world the Lorraine-Luxemburg region is credited with 5,600,000,000 tons. Of this 2,835,000,000 tons is in Germany, 3,000,000,000 tons in France, and 270,000,000 in Luxemburg.

It seems not improbable that the next report on iron ore resources will show those of Germany to have decreased about 2,835,000,000 tons and those of France to have increased a corresponding amount.

WAR AND OIL

Oil is a very valuable commodity in war as in peace. Considerable importance is therefore attached to probable changes in control of oil fields during the war. Fortunately it seems that Germany is to be the chief sufferer.

In the British Isles the oil shales of Scotland are the source of a very large annual production. This field is in no danger.

Great Britain's sources of supply across the seas are also available owing to the protection afforded by the Allies' fleet. The same is true of France's supply.

On the other hand Germany's sources of supply both by land and sea are being gradually cut off. Germany produces some oil; but depends largely on imports from other countries. The oil fields of Russia and Austria are ordinarily called upon to supply large quantities to Germany. Russia, of course, exports no oil to the enemy, and by the invasion of Galicia is depriving the enemy of the most important source in Austria—the Boryslaw-Tustanowice field.

Ordinarily Germany imported large quantities of oil from overseas. This supply has been completely cut off except for small quantities which reach Germany through neutral ports.

Germany depends largely on oil for her war machines, and it may be taken for granted that she had very large stocks on hand before the Kaiser launched his campaign for the mastership of Europe. However, the celerity with which the Allies have cut off the supply will cause no little embarrassment if the war is prolonged.

CORRESPONDENCE

KIRKLAND LAKE ORES.

To the Editor of The Canadian Mining Journal:

Sir,—I have read with interest the article by Mr. John A. Dawson in your issue of September 1st. I have had the opportunity of inspecting a great many samples of ore from the Tough-Oakes Mines, and have followed very carefully the analyses on the samples of car lots of the Tough-Oakes ore sampled at our works. The possibility that such tests are wrong may not be precluded, but a number of tests, all giving the same results, afford a reasonable check. Almost conclusive evidence is afforded by the agreement of reports from other chemists and petrographers. Without going into a description of the methods used I will say that up till the conclusion of our tests six months ago none of the samples of the shipments and none of the specimens examined contained any graphitic carbon. Molybdenum was present in all samples of the ore in greater or less extent and apparently proportional to the dark colored substance which Mr. Dawson calls graphite.

Notwithstanding this evidence I would be very much surprised if graphitic carbon were not found sometime or other; the nature of the veins is such as to lead one to expect this mineral.

The error into which Mr. Dawson has allowed himself to be drawn is quite easily seen, that of generalizing from insufficient data. It is not an uncommon thing for a chemist to take one sample, and from the analysis thereof to evolve his "system."

I take this opportunity of correcting Mr. Dawson for the reason that the presence of the metal molybdenum in the Tough-Oakes ores was first determined in our laboratories; and owing to the fact that all the analyses that have been published by the Tough-Oakes company have come from our own laboratories.

Incidentally I would take exception to the deduction which Mr. Dawson makes in the next to last paragraph of his article. He constructs the mineral sylvanite by taking all of the available gold, silver and tellurium present in the ore. Inasmuch as all samples examined by myself have contained gold, visible at least under the microscope, it seems that this is an unfair way of determining the presence of sylvanite or any other of the precious tellurides in these ores. It may not be said that there are no precious tellurides present, but after a great many experiments I have concluded that it is probable that hessite is the only one present in economic quantities. If the other minerals do occur they must do so under some microscopic form and in such an event I must confess to be at a loss to know how to settle the question finally.

Two tellurides have been determined definitely, namely, altaite and tetradymite. These two minerals are invariably in intimate association with the native gold, and occur in small veinlets, as individual crystals, or as cavity filling in the nuggets of gold. A remarkable fact with regard to the tellurides found in the cavities of the gold, is that they contain no trace of gold and only a small trace of silver. A similar example is given in the occurrence of a new mineral from Cobalt, presumably of the tetrahedrite group, identified in our laboratory. This has a probable formula of $Sb_2S_3.3\ (Cu_2S)\ 2FeS.$; has a bright metallic lustre resembling specular iron; H.=1.0 to 1.5; and gives a reddish brown streak on paper. Although this mineral is almost invariably found in cavities in the native silver in the Townsite and Nipissing ores, yet the specimens analyzed showed only a trace of silver. The meaning of this physical affinity and chemical antagonism will, no doubt, afford discussion for some one more capable of undertaking it than the writer.

Yours, etc.,

E. G. CAMPBELL.

Cobalt, Sept. 25, 1914.

OIL FIELDS OF EUROPE.

In the British shale oil fields of south-east Scotland about 3,000,000 tons of shale is raised annually, producing about 72,000,000 gallons of crude oil by destructive distillation in retorts. About 75 per cent. of this oil is converted into finished products, notably fuel oil, which is used very successfully by the British navy.

The oil fields of Germany produce 130,000 to 140,000 tons of crude oil per annum. Apart from this, large quantities of soft coal are distilled in Germany, and from the tar oil various products are obtained, including liquid fuel both for consumption under boilers and for operating Diesel, semi-Diesel, and other internal combustion engines. Germany imports about 1,200,000 tons of petroleum products per annum.

Austria has a large oil industry in the north-east part of Austria, known as Galicia. The Galician fields were producing immediately before the war at the rate of about 1,000,000 tons per annum. The Russians are advancing towards these fields from the eastward.

Roumania produces about 1,800,000 tons of crude oil per annum, much of which is very rich in benzine (gasoline, petrol or motor spirit). The mobilization of the Roumanian army has interfered with production.

Italy produces about 10,000 tons of crude oil per annum, including some of very light quality.

Russia produced last year 9,246,942 tons of crude oil. There are four principal producing districts, known as the Baku, Grosny, Maikop and Ural-Emba.

THE DAY

By Henry Chappell.

(The author of this poem is a railway porter at Bath, Eng. He is known to his comrades as the "Bath Railway Poet.")

You boasted the Day, and you toasted the Day,
And now the Day has come.
Blasphemer, braggart, and coward all,
Little you reck of the numbing ball,
The blasting shell, or the "white arm's" fall,
As they speed poor humans home.

You spied for the Day, you lied for the Day,
And woke the Day's red spleen.
Monster! who asked God's aid Divine,
Then strewed His seas with the ghastly mine;
Not all the waters of the Rhine
Can wash thy foul hands clean.

You dreamed for the Day, you schemed for the Day,
Watch how the Day will go.
Slayer of age and youth and prime
(Defenceless slain for never a crime)
Thou art steeped in blood as a hog in slime,
False friend and cowardly foe.

You have sown for the Day, you have grown for the Day;
Yours is the harvest red.
Can you hear the groans and the awful cries?
Can you see the heap of slain that lies,
And, sightless, turned to the flame-split skies
The glassy eyes of the dead?

You have wronged for the Day, you have longed for the Day
That lit the awful flame.
'Tis nothing to you that hill and plain
Yield sheaves of dead men amid the grain;
That widows mourn for their loved ones slain,
And mothers curse thy name.

But after the Day there's a price to pay
For the sleepers under the sod,
And He you have mocked for many a day—
Listen, and hear what He has to say:
"Vengeance is mine—I will repay."
What can you say to God?

SCHUMACHER.

It is stated by Mr. F. W. Schumacher, the owner of the Schumacher mine at Porcupine, that he intends to erect a mill on the property, so encouraged is he by the indications there.

The contractors are the only men who have been allowed to go recently from the property, and they had completed their work. Sinking has been stopped at present, but veins already found above the 300 ft. level will be developed, he states.

Further sinking to the 500 ft. level may be undertaken later.

JUPITER.

The secretary of the Jupiter Mines, Limited, announces that the McKinley-Darragh option, which was to expire on September 18, was extended for a further term of three months.

Development has been more favorable during the past two or three months than in the early part of the option period, but the McKinley-Darragh company did not feel that the results justified the exercising of their option at this time, and accordingly asked for an extension, which the Jupiter directors considered that in view of existing circumstances the interest of all considered will be best served by granting.

The extension calls for the continuation of operations in substantially the same manner as they have been heretofore carried by the McKinley-Darragh company. The terms of payment in the event of the exercise of the option remain unchanged. These terms include the payment of the existing bonds immediately upon the exercise of the option. The additional interest accruing on the bonds and the additional sum required to carry on the development are the price being paid by the McKinley-Darragh company for the extension. The McKinley-Darragh company has the right to exercise its option before the expiry of the three months if it so desires.

CALGARY OIL FIELD.

According to the Natural Gas and Oil Record interest in the Calgary oil field last week centred around the well of the United Oils Co. Aside from the favorable showings found there, the entire field was very quiet. The well has now reached a depth of 2,650 ft. The gas pressure is increasing, and there is every indication that a producing oil well will be brought in. There have been good showings of oil for the last two hundred feet. O. G. Devenish and other officials of the company who have been spending a great deal of time at the well for the last few days expect to bring in a real oil well.

Tubing in the Calgary Petroleum Products No. 1, the Dingman Discovery well, is being raised in the hope of getting better results. It is possible that the drill will be put back in that well and the immediate territory thoroughly tested. Drilling will be resumed at the No. 2 well of the same company within a few days.

The Acme now has a standard outfit on the way to the United property, where they will put down a well on a royalty basis.

Troubles between the Alberta Drilling Co., the contractors and the Dome Oil Co. have continued during the week, with the result that work on the well is closed down.

Word from Wetaskiwin, in the north, is to effect that the No. 2 well, now drilling, has reached a depth of 1,216 ft., and a heavy flow of gas has been encountered. The Ottawa Petroleum has let the contract for drilling a well on section 7, Township 32, Range 5, and the equipment is now all on the grounds. The Alberta Associated well on Section 7, Township 16, Range 2, has now reached a depth of 220 ft., and all equipment is on the ground for another well in the Rock Mountain House district. All casing is back in the hole at the Federal and they are again drilling and making good progress. Piedmont has awarded a contract and fully expects to be drilling within two weeks. Western Pacific has been under-reaming and putting in casing during the week. There is wet gas in this well. Wet gas has also been encountered in the No. 2 well of the Northwestern Pacific.

The Herron-Elder well (Alberta Petroleum Consolidated No. 2) has been straightened and drilling resumed. The gas flows increased at both the Alberta Petroleum No. 1 and the Prudential during the past week, and good progress has been made in drilling.

Taken all in all the Alberta field looks better to-day than ever before, and news of a real producer on the property of the United can be looked for at any moment.

MILITARISM vs. PATRIOTISM

By F. W. Gray.

Application has been made by some of the men of Sydney, Cape Breton, for permission to form a city regiment. Most people noticing this announcement would regard it as a natural and commendable action for Sydney men to take in this day of supreme effort. But the Sydney Trades and Labor Council have before them a resolution of protest against the formation of this mooted regiment because of the tendency it betrays to foster "the abuse of militarism."

No doubt the men who framed this resolution are excellent citizens and sincere in their convictions, but like many persons whose thinking is confused or superficial they mistake current shibboleths for verity, and they use specious phrases without analyzing their real inwardness. What does the word "militarism" imply? Certainly it is a misnomer in the sense in which it has been used, and apparently is still used, by a certain school of trade unionists if applied to home defence. The so-called Trades and Labor Congress is professedly an international body which has affiliations with the American Federation of Labor and such reactionary bodies as the United Mine Workers of America. The deprecation of home militias, for reasons which have been sufficiently obvious in Cape Breton, in Vancouver and in Colorado, is a plank in the political platform of the Trades and Labor Congress and its affiliations on the other side of the line, and this attitude has unfortunately clouded the thinking of many well-meaning men who, probably, if they thoroughly dissected their mental processes would find themselves to be patriots in the truest sense of that much misused word. All sane men denounce the abuse of militarism, and it is because of the widespread hatred of militarism among the British nation that the Empire is now engaged in what all thinking Britons reverently believe to be a righteous war against the desolating idea which finds its grimmest exemplification in the Prussian military system. We commend to the careful consideration of all trade unionists in Canada the following extracts from a resolution adopted by the Parliamentary Committee of the Trade Union Congress of Great Britain, after a two-days' conference. It proceeds:—

"The Parliamentary Committee are convinced that one important factor in the present European struggle has to be borne in mind so far as our own country is concerned—namely, that in the event of the voluntary system of military service failing the country in its time of need, the demand for a national system of compulsory military service will not only be made with redoubled vigor, but may prove to be so persistent and strong as to become irresistible. The prospect of having to face conscription, with its permanent and heavy burden upon the financial resources of the country, and its equally burdensome effect upon nearly the whole of its industries, should in itself stimulate the manhood of the nation to come forward in its defence, and thereby demonstrate to the world that a free people can rise to the supreme heights of a great sacrifice without the whip of conscription.

"Another factor to be remembered in this crisis of our nation's history, and most important of all so far as trade unionists and labor in general are concerned, is the fact that upon the result of this struggle in which this country is now engaged rests the preservation and maintenance of free and unfettered democratic government, which in its international relationships has in the past been recognized and must unquestionably in the future prove to be the best guarantee for the preservation of the peace of the world.

"The mere contemplation of the overbearing and brutal methods to which people have to submit under a government controlled by a military autocracy—living, as it were, continuously under the threat and shadow of war—should be sufficient to arouse the enthusiasm of the nation in resisting any attempt to impose similar conditions upon countries at present free from military despotism."

This is the studied opinion of the highest deliberative body of the representatives of labor in the very home of trade unionism—members of the Mother of Parliaments—and it may be conceded that Britons understand and practise the truest and completest democracy yet evolved.

A recent editorial of the Chicago Tribune, after reviewing the wonderful unanimity of the Empire in this struggle naively concludes that the British Empire "is a queer institution" and concludes by saying "in reality there is nothing queer about it. The undoubted truth of the matter is that the words 'British Empire' stand for the greatest republic the world has ever seen."

In Mr. Asquith's eloquent and burning speech recently delivered in the House of Commons he likened Belgium to Sparta and Athens and reminded the world of the marvellous defence of the Dutch Republics against the military autocracy of Charles V. of Spain. Mr. Asquith rightly upheld the British Empire as the age-long champion of the small nationality. Indeed, what does the British Empire consist of but a group of small independent nationalities, bound together by a common origin and common aims, and destined to a still closer union and a more glorious future than even its storied past?

But suppose the Empire, crushed by the heel of the Prussian Junker, and our quiet homes given to the flames as Louvain was, our wives and daughters subjected to nameless outrage as the women of Louvain were, our religious edifices and teachers treated as they were treated in Louvain, would Canadian trade unionists consider that Canadian troops were exponents of the "abuse of militarism"?

No, we will not do Canadian trade unionists the injustice of thinking that they will play any other part in this "crowded hour" of our Empire's life than the part of men who fight for the country of their fathers and the temples of their God. They will be found saying with Bret Harte:—

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

* * * * * *

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

MANY MEN ARE NEEDED.

Lord Kitchener, speaking in the House of Lords on August 25, as Secretary of State for War, said:

"While other countries engaged in this war have, under a system of compulsory service, brought their full resources of men into the field, we, under our national system, have not done so, and can therefore still point to a vast reserve drawn from the resources both of the Mother Country and of the British Dominion across the Seas. The response which has already been made by the great Dominions abundantly proves that we did not look in vain to these sources of military strength, and while India, Canada, Australia and New Zealand are all sending us powerful contingents, in this country the Territorials are replying with loyalty to the stern call of duty, which has come home to them with such exceptional force. Over seventy battalions have, with fine patriotism, already volunteered for service abroad, and when trained and organized in the larger formations will be able to take their places in the line. The 100,000 recruits for which, in the first place, it has been thought necessary to call have been already practically secured. This force will be trained and organized in divisions similar to those which are now serving on the Continent. Behind these we have our Reserves. The Special Reserve and the National Reserve have each their own part to play in the organization of our national defence.

"The Empires with whom we are at war have called to the Colors almost their entire male population. The principle we on our part shall observe is this: that while their maximum force undergoes a constant diminution, the reinforcement we prepare shall steadily and increasingly flow out, until we have an army in the field which, in numbers not less than in quality, will not be unworthy of the power and responsibilities of the British Empire. I cannot at this stage say what will be the limits of the forces required, or what measures may eventually become necessary to supply and maintain them. The scale of the Field Army which we are now calling into being is large, and may rise in the course of the next six or seven months to a total of 30 divisions continually maintained in the field. But if the war should be protracted, and if its fortunes should be varied or adverse, exertions and sacrifices beyond any which have been demanded will be required from the whole nation and Empire, and where they are required we are sure they will not be denied to the extreme needs of the State by Parliament or the people."

The Prime Minister in the House of Commons on August 27, in answer to a question, said:

"Most excellent service has been rendered by members of this House and by local political organizations in the work of giving information and arousing public attention to the necessity of raising recruits. I trust there will be no slackening of these patriotic efforts, but that they may be carried on upon an even more extended scale in future. My noble friend Lord Kitchener needs all the recruits he can obtain."

DOMINION STEEL.

The directors of the Dominion Steel Corporation have voted to defer action on the preferred dividend due Oct. 1. It was explained that any other course was out of the question, owing to the disturbed business conditions all over the world. The dividend is cumulative and will be paid as soon as business shows some indication of recovery.

COPPER.

Fairly large sales of electrolytic copper have been made to consumers at 12 cents, 30 days.

The last mail advices from Germany said that spot copper was bringing in the neighborhood of 16 cents per lb. as against the New York price of 12½ cents, showing how scarce the metal is over there.

THE GOLD POOL.

In perfecting plans for the $100,000,000 gold pool it has been decided that the Clearing Houses in various localities from which participation is expected shall have charge of the subscriptions in those localities. These Clearing House Associations will invite the co-operation of State banks and trust companies in their cities, these cities being central reserve and the reserve cities. The special committee of New York Clearing House is now preparing a letter which will be sent to the State banks and trust companies inviting their co-operation in same manner as in city note syndicate.

It is thus expected that participation in the pool will be the widest and greater than in any co-operative money movement in the history of American finance.

The Clearing Houses of the reserve and central reserve cities will co-operate with the special committee of the New York Clearing House and with the Forgan committee in plans for use of the money.

STEEL ORDERS RENEWED.

Pittsburg, Sept. 22.

One of the largest orders for export steel which has come to this country since the commencement of the European war has been secured from the Government of Queensland, Australia, by the Carnegie Steel Co.

The order is for 17,000 tons of steel rails, which will be manufactured by the Homestead plant. Arrangements have already been made for the delivery of the rails. The European war is directly responsible for the big Australian order coming to this country.

Several weeks ago Col. August Evans, a representative of the Queensland Government, came here, and after inspecting several of the local steel mills, placed a tentative order for the rails, and after several days had elapsed, however, the order was cancelled with the announcement that the rails were to be made in Europe.

During the latter part of last week James Grant, secretary to Col. Evans, arrived in this city and immediately opened negotiations with the Carnegie Company for the manufacture of the rails, the delivery of which was to be in accordance with arrangements temporarily with the European makers.

The above order should not be confused with the one for which the officials of the Dominion Steel Corporation are understood to be negotiating. It is a South African order, which it is hoped to secure for the Sydney plant.

It is understood the initial orders received from the British market as the result of the visit of an official there consists of 2,000 tons of nails and 2,000 tons of rods.

Just how the British market will develop for Canadian trade of that character remains a matter of conjecture.

A good deal of the trade which Canada might eventually get which formerly was supplied by Germany is, of course, cancelled by war conditions and this country will have to wait for the return of normal conditions before expecting large or profitable results.

GOLD MINING AT PORCUPINE AND KIRKLAND LAKE, ONTARIO

By Ben Hughes.

After six weeks' warfare it can be stated without fear of contradiction that the gold industry of the Province of Ontario has received a stimulus from the conditions that prevail. This relates, of course, solely to the mines that are in a position to ship bullion now, and though the mines do not actually receive more for the output, the smelters are making conditions of shipment and settlement and treatment much easier.

Those companies which are not yet producing, but have enough money on hand to proceed without borrowing, are continuing operations as before. The war has, however, shut down one or two prospects where development was being paid for by borrowing money. This has not been of material importance to the Porcupine camp, since there were very few gold prospects operating on money raised by stock subscription before the war started. In fact, two only have been affected: Foley O'Brien, where no effort has been made to rebuild since the plant was burnt down, and the Schumacher. Some men have been laid off at the Schumacher; but the owner has announced that a mill will shortly be constructed.

The war, however, has had a most grave and undesirable result in hindering the taking up and development of promising surface showings, of which there are many, from Swastika and Kirkland Lake to Hurricanaw. Under normal conditions there would have been quite a number of small outfits proving up properties under option at Kirkland Lake, Sesikinika and Porcupine. There can be no hope of better conditions for the prospector until the strain imposed by the war has been eased.

The Porcupine camp steadily gains in importance day by day. More than 2,000 tons of ore is treated daily in the various mills. The tonnage treated in the mills to-day is approximately as follows:

Mill.	Daily Tonnage Treated.
Dome	750
Hollinger	750
Porcupine Crown	125
McIntyre	300
Porcupine Vipond	80
Rea	40
Little Pet	15
	2,050

Within the next two months this tonnage will be added to considerably. The mill at the Dome Lake is being overhauled and will probably be able to treat from 80 to 100 tons a day before the end of October and the mill at the Vipond will soon handle 100 instead of 80 tons per day.

Hollinger.—The progress of the year has served to accentuate the prominence of the Hollinger's position in the camp. The yield from the big mine is limited by its power capacity. So far the demands of the mill have pushed the capacity of the power plant to the limit; but when the new compressor plant is running there should be no further difficulty in keeping ahead of the requirements and at the same time allow to the Acme the development that it certainly deserves. To-day so restricted is the power at the command of the Hollinger that outlying shafts have been shut down until the first big compressor is turned over and running. The situation has been rendered more acute since the Vipond resumed work, that company leasing their power to the big mine until operations were resumed.

It is expected that the first big compressor will be available early in October; the Fraser & Chalmers compressor has been shipped and is now in the high seas. The foundations are in and the building completed. A

Constructing Foundations for Addition to McIntyre Plant

second machine will be running shortly after the first.

At the Hollinger the sinking of a six compartment working shaft has been commenced. It will be pushed through to the 1,300 ft. level, levels being cut at the 425 and 800 ft. This working shaft will serve the Hollinger, the Acme and the Miller-Middleton. It is being sunk on Acme property.

To-day there are no less than 900 men on the Hollinger pay roll. Many of these are occupied in construction. It is, however, probable that the enlarged scheme of operations will necessitate a permanent force of 1,100 or 1,200 men.

Dome.—At the Dome Mr. Keading is effecting economies and raising the tonnage. There has been a considerable reduction in staff and the total force now number about 370 men. Economies are being worked out both in the mill and underground. For instance, by installing an ore bin at the crusher station and separating the fines from the coarser rock there, it is anticipated that in crushing and conveying the costs can be reduced from five to three cents a ton. Underground larger ore cars are used, and the shoots along the 1,200 ft. drifts widened, so that economy of time in filling the cars will be effected.

McIntyre.—The McIntyre is being examined for the Nipissing Mines Co. by Mr. Morton Webber, who has spent the last two years very largely in work of this character. If the option is taken up it will doubtless lead to further activity among the mines bordering on Pearl Lake. The Plenaurum has a section of the lake from which McIntyre territory could be worked to great advantage, and several of the principal shareholders hold large blocks of stocks in both companies.

Porcupine Pet.—Two small properties are shipping a little bullion. The Porcupine Pet has discovered a shoot of remarkably rich ore on the 50 ft. level, and the little Nissen stamp mill is running continuously.

Rea.—At the Rea the leasing company is making very good clean-ups from the treatment of ore from the shoot blocked out above the 200 ft. level by the old company. There are two drills on development work.

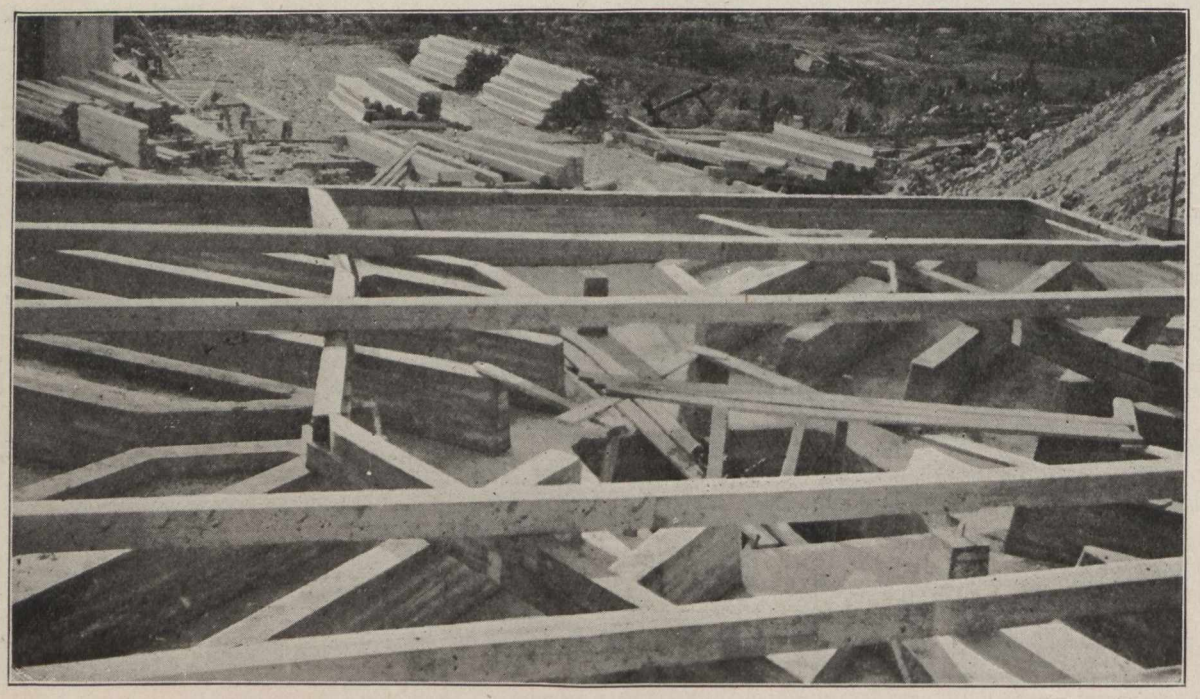
Teck-Hughes.—The Nipissing having a large cash surplus available, the option on the Teck-Hughes has not been affected by the war. Development so far has been quite successful. On the surface a vein has been discovered running parallel to the main lead. It is a promising one.

Tough-Oakes.—The Tough-Oakes is producing and shipping gold with the greatest expedition. All ore broken goes to the rock-house, where it is hand picked. All the high grade is shipped and the rest sent to the stock piles until a larger mill has been provided for its treatment. About 12 tons a day is being treated in the little mill. Construction of the large mill is being proceeded with.

PORCUPINE VIPOND MINES.

Under date of September 24, 1914, Henry H. Ward, president, sends the following letter to the shareholders of Porcupine Vipond Mines, Limited:

Since May 2, 1914, your manager, Mr. C. H. Poirier, has been so continuously engaged with the various details of the mill construction, purchase and installation of machinery, and preparation for working the mine, that I deemed it unwise to call upon him for any extended report, and have contented myself with making this general report from current data and information.



Foundation for Porcupine Vipond Cyanide Plant

Pursuant to the arrangements made as outlined in my letter of May 2, 1914, for the underwriting of 300,000 shares of treasury stock of your company, work was immediately begun on a cyanide extension to the plant. The extension wes designed by Mr. C. H. Poirier, manager of the property, advised by Mr. John B. Dorr, of the Dorr Cyanide Machinery Co.

The new building is a structure 60x130 ft., and is added directly to the original mill without material alteration of the latter. There are installed in the new building among other items the following:

Five 26x10 ft. wood tanks with Dorr standard thickeners; three 12x12 ft. wood tanks with Dorr standard agitators; two 20-frame Merrill precipitation presses, pumps, motors and accessory apparatus.

The ore is treated by crushing in cyanide solution, and thereafter by continuous decantation.

Mr. Poirier, in 1912, first recognized the adaptability of the continuous decantation process to Porcupine ores as permitting, with no sacrifice in regard to recovery, a considerable saving in the cost of construction and installation over the sliming and filter-pressing method then exclusively used in the district. Plans were drawn, but owing to conditions with which shareholders are acquainted, it was impossible to follow them out until recently. During this time, however, a company operating in the district has installed a continuous decantation plant which followed in a general line the flow sheet outlined by Mr. Poirier and which has proved to be extremely efficient in all respects.

Clearing of the ground, laying of foundations and construction of the mill building began in May, and the extension was completed about September 1st, on which date, after a preliminary test, the mill was put in operation, running about one-half capacity. On September 5th, the tanks were completely bedded and the first tailings passed out of the mill. The plant is operating satisfactorily in every respect, and will be brought up to full capacity during the present month. It is now on a basis of profitable operation. Exact figures cannot be given until normal conditions of full load are established.

While carrying on this program of mill construction and completing it absolutely according to the schedule laid out, Mr. Poirier made preparation for resuming working of the mine itself. Three raises were started for better ventilation and for more economical handling of ore. One of these has already been put through to the surface. A program for extension of development has been begun for the purpose of maintaining and, if practicable, increasing, the proved ore reserves.

Shareholders should be advised that the underwriting program outlined in my letter of May 2, was abandoned by reason of the July payment having been made only in part, and because subsequent payments were not made at all. However, the financial plan had provided a considerable margin, and in view of this, and through the company availing itself of other resources put at its disposal, including financial guarantee made by me personally, the extension of the plant was successfully completed, mining resumed, and the property put on an operating basis in spite of adverse financial conditions and the general disturbance of business due to the war in Europe. The company has had the advantage of a liberal attitude on the part of various corporations, firms and individuals with whom it has done business or employed by it.

We are fortunate in having been able to have delivered or to secure on contract a sufficient supply of cyanide, zinc dust and other necessary materials, principally imported from abroad, to insure the uninterrupted operation of the mill.

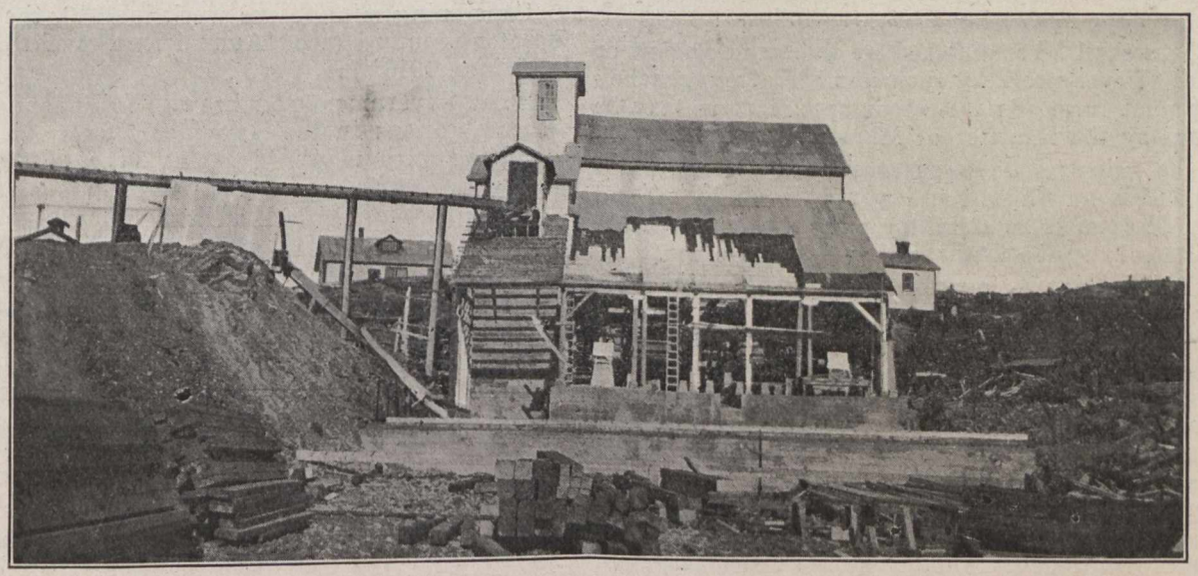
The plant is well covered by insurance.

A financial statement and general report will be made as soon as payments on various contracts are completed and matters are in such shape that they can be put before shareholders in a clear manner.

Mr. Poirier continues as manager of the property. The firm of Poillon & Poirier, mining engineers, composed of Messrs. H. A. Poillon and C. H. Poirier, have been retained as consulting engineers and have been of great service in that capacity.

Mr. H. W. Heine has served the company well as superintendent. He has frequently been in sole charge during Mr. Poirier's necessary absences.

Mr. Poirier has shown the greatest devotion to the company's interests, and this devotion with his high ability, combined in four months' time to bring to completion, at a reasonable cost, a large addition to the plant, which should prove economical and highly efficient in operation. This he has done in spite of many difficulties. He has spared himself in no way, and has always willingly undertaken to help the completion of this operation in any manner whatsoever, whether strictly within the requirements of his duties as manager or not.



Making Addition to Porcupine Vipond Mill

MINE RESCUE TRAINING IN BRITISH COLUMBIA

By E. Jacobs.

In August Mr. Thomas Graham, Chief Inspector of Mines, presented to eighteen men employed at the Jingle Pot coal mine, near Nanaimo, Vancouver Island, Provincial Government certificates of efficiency in mine-rescue work. The recipients of the certificates took their mine-rescue course at the Government training station at Nanaimo. There are now 161 men who have similarly qualified and obtained Government certificates, beside a considerable number who have successfully passed examination after training in one or other of the mine owners' rescue stations.

Late in 1912 Mr. W. J. Dick, of Ottawa, mining engineer to the Commission of Conservation, Canada, presented to the secretary of the commission a report on "Mine-Rescue Work in Canada," which report was afterward printed by the commission and widely distributed. At that time, as mentioned by Mr. Dick, British Columbia was the only one of the coal producing provinces of the Dominion requiring rescue apparatus to be kept at coal mines. The following is an excerpt from the detailed information given in Mr. Dick's notice of British Columbia in that report:

"The Coal Mines Regulation Act, 1911, makes provision for mine-rescue apparatus, as follows:

" 'There shall be established by the owner, agent or manager of every colliery such number of oxygen helmets or some form of mine-rescue apparatus as may be approved by the Minister of Mines.

" 'Such mine-rescue apparatus shall be contantly maintained in an efficient and workable condition, and shall in all cases be so stored or placed in or about the mine as to always be available for immediate use.

" 'The Lieutenant-Governor in Council may from time to time establish mine-rescue stations for the purpose of supplementing, in case of need, the colliery installations of mine-rescue apparatus, and also for the purpose of training holders of certificates of competency under this Act in the use of such mine-rescue apparatus as may be approved by the Minister of Mines; and it shall be incumbent on the owner, agent or manager of every operating mine to have all certificated officials who are physically fit, and not less than three per cent. of such number as the Chief Inspector of Mines may deem sufficient of the workmen, trained in the use of such established mine-rescue apparatus.

" 'Provided that in cases of emergency such stations shall be available for the use of any trained corps of mine-rescuers, duly qualified medical practitioners, or corps trained in the work of first aid to the injured, subject, always, to the order of an Inspector of Mines.'

"Although this Act has only been in force a little more than a year, the mine operators, as well as the Government, are doing all in their power to lessen the number of fatalities incident to mine explosions and mine fires in so far as this can be accomplished by trained men equipped with suitable breathing apparatus."

Mr. Dick further gives particulars of the training work necessary to obtain a certificate of competency at several of the collieries; also the forms for "Physician's Examination," and the "Mine-Rescue Training Record."

In the report for 1912 of the Chief Inspector of Mines, included in the "Annual Report of the Minister of Mines" (pp. 204-8), it is stated that much progress was made in mine-rescue work in 1912; mention was made of the Canadian Collieries (Dunsmuir) Ltd., having built commodious and well arranged stations at its Extension and Cumberland collieries, respectively; that the Provincial Government had built, and on November 1 opened, a station and had appointed an instructor; also that a site had been purchased at Nanaimo and erection of a station was in progress. Mr. Graham added:

"Much progress in training has been made by several of the local companies, some of whom issue diplomas to their employees who take a course of training.

"On May 10th last, the writer, on the invitation of the Western Fuel Co., had the honor and pleasure of presenting forty-one employees of that company with certificates of competency in mine-rescue work. This company has issued sixty-three certificates of competency since the opening of its station.

"In November last Inspector Strachan had the honor and pleasure of presenting fourteen employees of the Nicola Valley Coal and Coke Co. with certificates of competency earned at that company's station."

Concerning mine-rescue work in 1913, the Chief Inspector reported (see "Annual Report of the Minister of Mines, 1913"):

"The Government now has two fully equipped mine-rescue stations in the Province; these stations are equipped with mouth-breathing type of the Draeger apparatus. The equipment consists of sixteen two-hour apparatus, eight half-hour apparatus and four pulmotors. During the year twelve C. E. A. G. electric safety lamps were added to the equipment.

"Training was actively conducted most of the year at the Fernie (Crowsnest pass) station, with George O'Brien as instructor, and Government certificates of competency were issued to seventy-three persons from this station.

"The Nanaimo station was not taken over until late in the year and little work was done at it, but pending its completion, the instructor, J. D. Stewart, was sent to Merritt, and, through the courtesy of the Nicola Valley Coal and Coke Co., which granted the use of its station, Mr. Stewart, assisted by Frank Bond and Inspector of Mines Robert Strachan, instructed a class of twenty-nine men, each of whom was granted a certificate of competency. There were, therefore, 102 Government certificates of competency in mine-rescue work issued during the year. The equipment maintained by the operating companies was supplemented during the year by two-hour Draeger apparatus. For the use of 5,500 underground employees there are in the Province sixty-six sets of two-hour and twenty-six sets of half-hour apparatus, or one for every sixty persons."

It is of interest to note that the Chief Inspector of Mines and several of the mine inspectors under him are fully qualified for mine-rescue work, some of them having taken their training course at the United States training station at Seattle, Washington, prior to the establishment of stations in British Columbia; also that a number of mine officials and other holders of first class certificates of competency under the Coal Mines Regulation Act, are similarly qualified for mine-rescue work.

BRITISH COLUMBIA COPPER CO.

Boston.

British Columbia Copper Co. has closed down its smelter and ceased mining operations. Exploratory work continues, however, on part schedule.

The mine management advises that 10,000,000 tons of ore have been put into sight on Copper mountain. This ore averages about 1.85 per cent. copper and carries 72 cents per ton in gold and silver.

Actual construction work on the proposed new mill has not started. Its size has not been definitely determined, but with the blocking out of all the ore now in sight the initial capacity is expected to be at least 1,000 tons daily. Construction will be delayed.

KEEPING COPPER FROM THE ENEMY.

In answer to the statement in several newspapers that the Amalgamated Copper Co. had shipped to London its stocks of copper which were held in Rotterdam at the opening of the war, to put them out of reach of the Germans, T. Wolfson, vice-president of the United Metals Selling Co., says:

"The stocks of copper carried by this company in warehouse at Rotterdam at the beginning of the war were stored in a public warehouse, and were covered by warrants in the name of C. S. Henry & Co., a British corporation, which were in the possession of Henry & Co. The British Government formally notified Henry & Co. not to deliver the warrants, and upon instruction of the United Metals Selling Co. that they be delivered into neutral hands, the position of the British Government regarding them was disclosed.

"The warehouse in Rotterdam refused delivery of the copper except on presentation of the warrants and the British Government took possession of the warrants, paid for the copper represented by them and at its own cost and risk removed the copper from Rotterdam to London. The British Government put it absolutely out of the power of the United Metals Selling Co. to make any other disposition of the copper."

OPENING OF THE PANAMA CANAL.

It is an extraordinary commentary on the universal upheaval caused by the European war that the opening of the Panama canal on August 15 passed almost unnoticed. What should have been a brilliant ceremony, at which the warships of every European naval power would have assisted, was shorn of most of its display; no European nation participated, and the actual opening was carried out by the passage of the United States naval steamer Ancon, followed by a small squadron of American merchant vessels. On board the Ancon were Colonel Goethals, the celebrated United States engineer, who is Governor of the Canal, a staff of naval and military officers, and the President of Panama. The actual commercial effect of the opening is likely to be not a little obscured by the war.

COBALT FROM BELGIAN CONGO.

The great source of the German cobalt is from crude copper produced by the Union Miniere du Haut Katanga, in Belgian Congo, Africa, of which 8,064 tons was produced and shipped to Germany for refining during 1913. The crude copper obtained 2.8 to 3.25 per cent. of cobalt (some ran much higher in 1912), and if 3 per cent. were the average content of cobalt the total was about 242 tons of metallic cobalt. This makes a by-product comparatively easily saved in electrolytic refining.

COBALT SHIPMENTS.

Cobalt, Sept. 19.

Upon notice received from the British Admiralty normal insurance rates have been resumed on silver bullion and it is again being shipped. But as Nipissing is still shipping to New York only, a small proportion of the 108,000 oz. crossed the seas. Ore shipments continue normal.

This week the Right of Way shipped two cars from the old mine. One of these was part ore, part concentrates, the other was entirely of concentrates.

The ore shipments from the Cobalt camp for the week ending Sept. 18, were:

	High.	Low.	Total Lb.
Right of Way	123,130		123,130
City of Cobalt	87,750		87,750
Dom. Red'n		85,400	85,400
Cobalt Townsite ..	86,310		86,310
McKin.-Darragh ..	83,620		83,620
La Rose	84,140		84,140
	464,950	85,400	550,350

The bullion shipments for the week ending Sept. 18th, were:

	Bars.	Fine Oz.	Value.
Nipissing.....	87	100,445.66	$54,366.21
O'Brien.....	34	33,770.50	16,770.00
City of Cobalt...	6	4,603.00	2,532.00
Crown Reserve..	53	60,000.00	32,500.00
Townsite.....	6	4,983.00	2,740.00
	186	203,802.66	108,908.21

Cobalt, Sept. 26.

Over half a million oz. of silver bullion was shipped from the camp this week, the price ranging from 51½c. to 53c. an oz. By far the greater proportion of this bullion was destined for the English market. The Caribou Cobalt shipped through the Dominion Reduction Co., where its ore is being treated, to London. La Rose shipped through the Nipissing.

Eight mines shipped a normal tonnage of ore. The Right of Way despatched yet another car, and this property is making its final clean-up. The New Liskeard mine, the Casey, has resumed shipments, and the other English companies, the Cobalt Townsite and the Cobalt Lake, were also on the list. The Seneca-Superior was the only company to contribute more than one car of ore.

The ore shipments from the Cobalt camp for the week ending September 25, were:

	High.	Low.	Total Lb.
McKinley-Darragh	172,140	.....	173,140
Senenca Superior	62,060	.....	62,060
Dom. Reduction	.....	86,710	86,710
La Rose	80,740	.....	80,740
Cobalt Lake	64,150	.....	64,150
Right of Way	34,210	.....	34,210
Cobalt Townsite	83,910	.....	83,910
Casey Cobalt	65,096	.....	65,096
	563,306	86,710	650,016

The bullion shipments for week ending September 25 were as follows:

Nipissing.....	386	444,537.86	$234.099.39
La Rose	48	55,867.72	29,068.05
Caribou Cobalt	37	44,803.80	23,745.59
	471	545,208.58	$295,913.03

ELECTRICITY IN COAL MINES

By John Liston, General Electric Co.

The use of electricity in coal mining is not new, as it has been employed to a limited extent for many years. The rapid extension which has recently characterized its application is due to several causes, the more important of which can be briefly outlined as follows:

First, the improved efficiencies of modern electrical machinery in general, and the increasing use of alternating current with its greater flexibility in transmission over distances which are beyond the economical limit of direct current distribution.

Second, the specialization of the electrical manufacturing companies' engineers on the power requirements peculiar to coal mine operation.

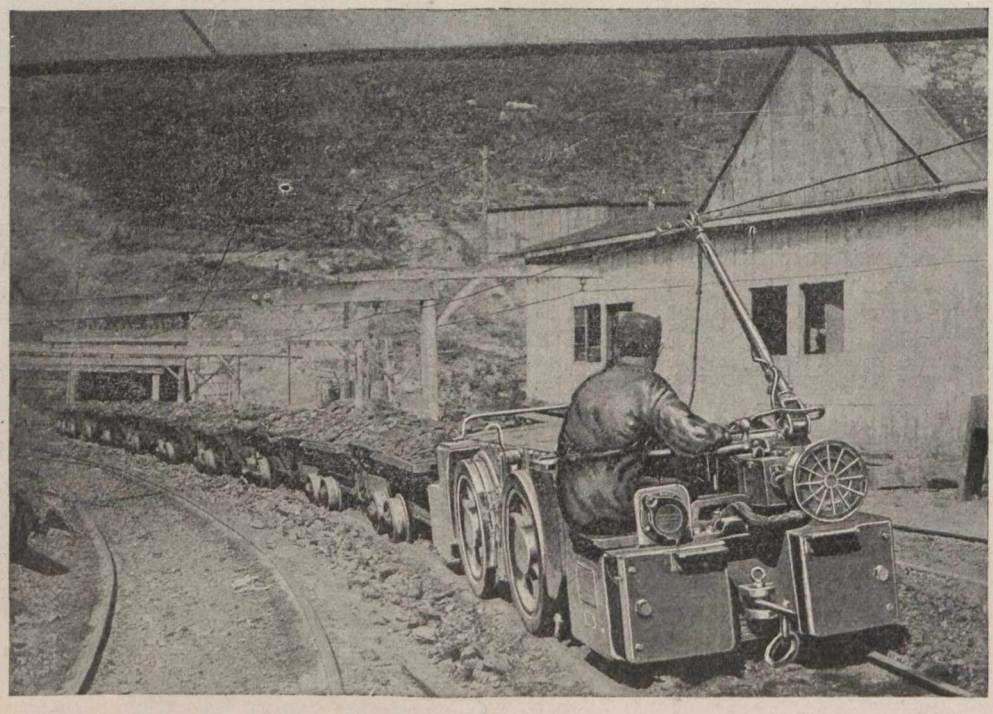
Third, the growing appreciation by the engineers of the mining companies of the advantages of electrical power and their active co-operation in the solution of the problems entailed by special conditions.

Fourth, the notable operating economies which have resulted in numerous installations utilizing electric power, even under the severest service conditions, and the attainment in practically every case of an increased output for a given power consumption.

In some cases, however, the engineers of the mining companies are not fully aware of the inherent economy of electric service and its practically universal applicability, and are, therefore, disinclined to supersede older equipment which, while not so economical in operation, has still proven its practical utility.

Mine Locomotives.

The superiority of the electric locomotive for mine haulage is largely due to the fact that in addition to its high efficiency, mechanical strength, dependability and simplicity of control, it is the most compact form of tractor available. This last characteristic is of the utmost importance in underground operations where the available headroom is usually limited and where the cost of increasing the height along a roadway—either by brushing the roof or taking up the bottom, would materially increase the cost of mining. Except in special cases it is obvious that steam locomotives cannot safely be used in the mines, and the compressed air type also has many limiting features. It can develop an average efficiency of only about 25 to 30 per cent.—is more cumbersome than the electric type, for a given capacity, and



Fifth, the necessity for the development of coal fields in which the geological conditions were such that the mines could not be economically operated by the older methods, and the continually increasing distances between the working faces and delivery points in mines already in operation which tended to render electric haulage practically imperative.

That the above causes are all given the practical consideration which their effect on operating costs so fully merits, is clearly demonstrated by the fact that in all recent coal mining developments of appreciable size electricity has been adopted as a source of applied power either wholly or in part.

In many of the older workings it has been found that true economy would sanction the scrapping of a large percentage of the steam power equipment and its replacement by a centrally located generating station.

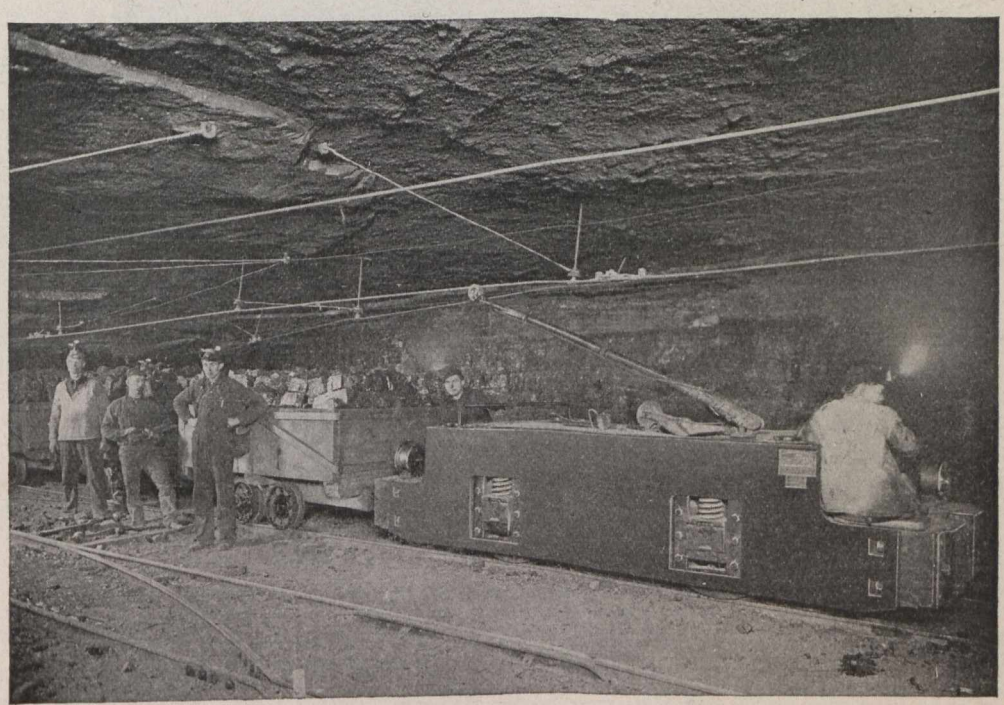
the necessary frequent re-charging of the storage tanks involves delays which diminish its serviceability. The distance which it can travel on one charge is limited.

In the development of the electric mine locomotive there has been a constant improvement in the structural details, as the arduous service conditions which are normally encountered in coal mine operation have become more fully understood by the designing engineers. Due to the compact and heavy structure necessitated by the tractive requirements and limited head room in which it must ordinarily be operated, the electric mine locomotive has from the first been unusually strong mechanically, and the earliest locomotive of this type built by the General Electric Co. is still in daily use after a constant service of 22 years. Three general forms are now commonly used, i.e., the straight haulage, the cable reel or gathering, and the combination or

crab type. The standard weights range from 3 to 25 tons and for low vein mines the total height of the smaller sizes does not exceed 27 inches. The economy obtained in the use of the straight haulage type for delivering trips to the shaft, slope, entry tipple or breaker in mines having reasonably long haulage is generally acknowledged, and units of this type are used in practically all mines where electric service is available.

For the main haulage in mines the mule or horse has been almost universally discarded where electric service could be obtained, inasmuch as a single locomotive can effectively displace a considerable number of animals, can travel faster, requires less head room, and can operate 24 hours a day if required. For gathering, however, animals are still used to some extent, as the question of their replacement in this service by gathering locomotives is governed by such a diversity of operating conditions that each installation must in effect be considered as a separate problem.

In some of the larger mines the question of comparative operating costs for each group of workings has been ignored, and cable reel locomotives used throughout for gathering, simply on account of their greater capacity, reliability and general convenience, and the resulting increased output has in every case fully justified the expenditure involved in the complete abolition of animal haulage.



The type of gathering locomotive developed by the General Electric Co. consists of a reel of large diameter driven through double reduction gearing by a small vertical series wound motor, the reel being supported by the motor frame and rotating on ball bearings. Friction is further reduced by also providing the armature shaft with ball bearings. This motor is connected directly across the line and is equipped with a permanent series resistance which protects it from a heavy rush of current when the locomotive is standing still.

A combined switch and fuse is also inserted in the circuit for protection against short circuits and for convenience in opening the circuit if desired, but is not involved in any way with the ordinary operation of the reel. The motor is so designed that it is of sufficient capacity to permit of its being installed for any length of time without overheating.

After the cable is attached to the trolley wire and locomotive moves forward, the unwinding of the cable causes the motor to act as a series generator, and the counter-torque thus developed produces sufficient tension on the cable to cause it to pay out evenly and drop along the roadbed without producing kinks. This counter-torque produces enough braking effect to instantly stop the reel when the forward movement of the locomotive ceases, and as soon as the locomotive starts back the motor action comes into play and the reel is rewound at a tension sufficient to obviate any possibility of the locomotive overrunning the cable. As the operation of the reel is entirely automatic, the motorman is free to devote his entire attention to the handling of the locomotive.

For haulage in gangways in which the grading for the roadbed is such as to prohibit the use of cable reel locomotives, the combination or crab type, equipped with a hoisting drum and steel cable in addition to the cable reel, is generally used, as it can be blocked in the entries of successive gangways and by means of the hoist can draw the loaded cars up the slopes and then deliver the trips to the main haulage tracks. On short slopes it does the work as rapidly and effectively as a permanent rope haul or hoist, with the added advantage of portability, and, as it can also perform the duties of both the straight haulage and cable reel types, it is often considered indispensable in mines where a limited number of locomotives can handle the entire output. Its "general utility" features have caused its adoption for all underground work in some of the largest mines in the anthracite fields where the irregular grades in numerous gangways render it especially valuable.

In collieries and mines where the breaker or tipple is located at a considerable distance from the entries or shafts, separate locomotives can be advantageously used for surface haulage, and as they are practically unrestricted in the matter of size, excepting in regard to the capacity of the breaker or tipple for handling the coal received, heavy locomotives—ranging from 10 to 25 tons, capable of delivering a large number of cars per

trip—are commonly used. The retention of steam locomotives for this work involves interruptions due to the necessary coaling and renewal of the boiler water, and renders impossible that continuity of service which is essential in order to obtain the most economical operation of the coal handling plant.

The standard modern mine locomotive motor equipment consists of two direct current units connected to the driving axles through a single reduction gear, although three motors are sometimes used with three pairs of driving wheels, in which case the centre pair are flangeless in order to permit the turning of curves of short radius. There are also a limited number of single motor locomotives still in use, although they are being very generally superseded by the two-motor type.

Mine Hoists.

For haulage in slope mines or in drift or shaft mines where the different levels are connected by slopes of considerable length, the locomotive cannot be used and recourse is had to various forms of rope haulage with permanent hoisting drums located either on the surface or in chambers underground. In particular instances the use of endless chain haul or conveyor belts or buckets may be advisable. Among the advantages claimed for electric hoists are:

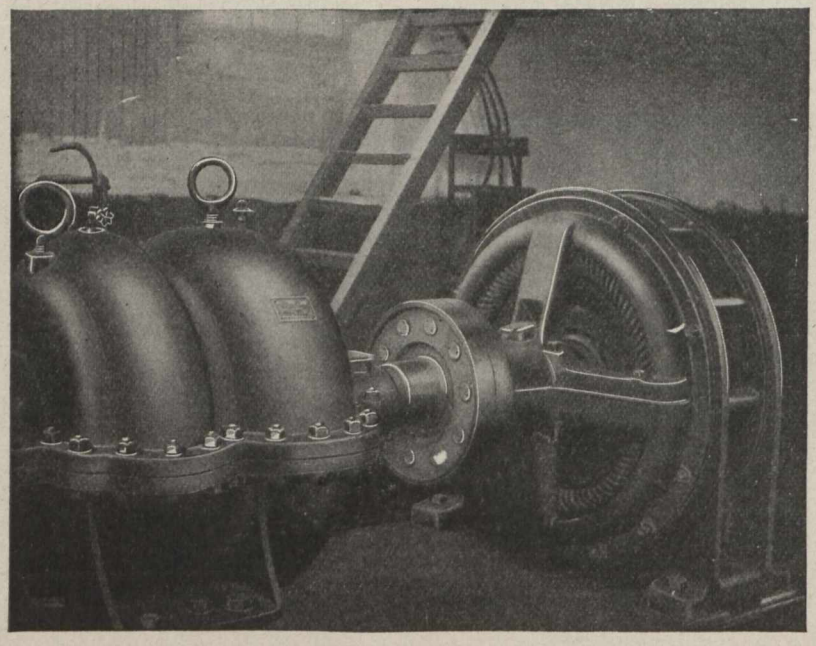
The power is uniformly applied throughout the operating cycle as there is no reciprocating motion or intervening connecting rods or cranks with their varying torque at different positions, and the power demand is limited to the time during which the hoist is in actual operation. This feature minimizes the amount of power consumed. Under space conditions it is possible to employ a system of regenerative braking, the weight of the descending carrier driving the motor as a generator, and thereby feeding back an appreciable amount of current into the distribution system.

The intermittent service of hoists involves a necessity for certain precautions in resuming the operation of steam hoists after they have been shut down which are entirely absent when the electric type is used. If water collects in the cylinder of a steam hoist it must be thoroughly drained before starting the hoist to avoid the danger of blowing out the cylinder head, and in cold weather this is frequently complicated by the formation of ice in both the cylinder and pipe line.

The power losses represented by the drop in voltage in the electric conductors is practically negligible for the distances usually in coal mine transmission when compared with the condensation losses in steam piping or the pressure losses in air lines over the same distances.

With steam hoists the exhaust steam practically prohibits any extended use underground, while the exhaust from the air operated type introduces a factor that may have an adverse effect on the mine ventilating system.

The motor driven hoist is the simplest and most compact form, inasmuch as the motor can usually be mounted on a common base with the hoisting drum and arranged to drive it directly through gears, thereby forming an entirely self-contained unit and effecting an economy in weight and in the amount of space required for its installation, which is often of appreciable importance when the hoists are located in the mine. Owing to the superior speed control of the electric type it has greater flexibility in operation and its extreme simplicity not only minimizes the cost of repairs, but obviates the necessity for the service of an engineer in running it, as the average worker is competent to receive the limited amount of instruction necessary and can be safely entrusted with its operation. Emergency demands on the ability of the operator are, as a rule, reduced by providing safety devices in the form of signal lamps, bells, or automatic cutouts, and for conditions such as those imposed by the use of motors for driving the type of water hoist commonly found in the anthracite fields, the hoisting equipment can be made entirely automatic in operation.



Electrically Operated Pump

Owing to the wider range of speed control which is obtained in hoists driven by direct current motors, this type is very largely used, but in many of the later installations polyphase induction motors having a resistance connected in the rotor have been applied to this service with entire success, and simple and thoroughly reliable controllers can readily be provided to secure the variations in speed required for coal mine hoisting.

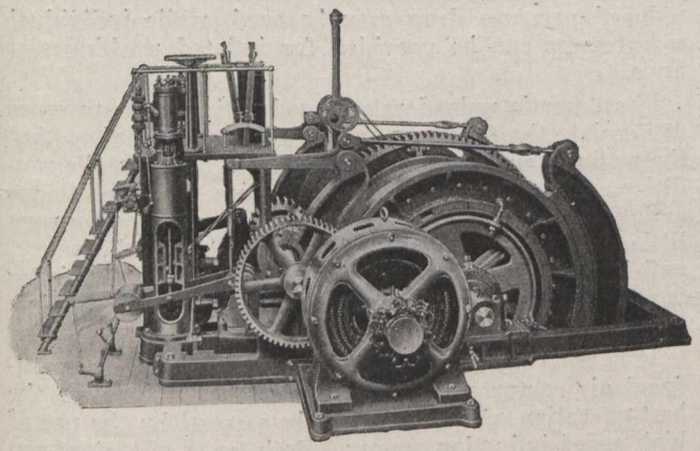
Mine Pumps.

The relative importance of the pumping equipment in different coal mines is dependent upon the geological conditions encountered. In many mines the service re-

quired constitutes a comparatively negligible demand on the power station, owing to the possession of natural drainage facilities, with a resulting limitation of the pumping units to those required for boiler supply, fire protection, and a few dip pumps operating at low heads.

On the other hand, a large percentage of the mines situated below local water levels are absolutely dependent for continuous operation on the efficacy of their pumps or water hoists, and the cost of their operation has a vital influence on the obtainable margin of profit. The importance of this factor can be fully appreciated when it is realized that in many mines more than ten tons of water have to be elevated to the surface for every ton of coal mined. In addition to this, the pumping outfit must ordinarily have sufficient reserve capacity to cope with excessive demands due to floods, having their source either on the surface or in water bearing ground which is likely to be encountered in extending the workings.

Two facts have contributed to simplify the problem of the main pumping units in coal mines. First, the recent remarkable improvement in the efficiencies of multi-stage centrifugal pumps, which were formerly only applicable to comparatively low head service, but



Electrically Operated Hoist

are now successfully delivering water from sumps located more than one thousand feet below the surface; the best results being obtained when they are driven by motors which are direct connected, thereby avoiding the friction losses of gear drive, the high speeds which are characteristic alike of the electric motor and the centrifugal pump rendering it a simple matter to design a very effective combined unit. Second, the feasibility of providing existing pumps or water hoists, originally designed for steam operation, with motor drive which at once greatly reduces the amount of power required and the expense of attendance necessary, and can safely be made automatic in operation, if desired.

Where motors are geared to reciprocating pumps their use insures the direct application of a larger percentage of the initial power developed than other methods, and many pumping sets of this class are still employed, although the centrifugal type is usually adopted for new installations.

The pumping units of a representative "wet" coal mine can be roughly divided into four classes, i.e., sinking pumps, used in development work, in sumps or for emptying flooded mines; main sump pumps, permanently installed in the mines; auxiliary pumps feeding into a central sump; and portable pumps for temporary service or removing small amounts of water from depressions beyond the reach of the stationary auxiliary pumps, or for fire fighting. There is also a fifth class which, however, is common to all power station service, and includes those units which provide for boiler feed and general water supply.

The motor-driven sinking pump must, of necessity, be capable of maintaining good efficiencies under fluctuating heads, and in some instances must be capable of operating when entirely submerged. When used in slopes, it is generally mounted on rails or a car to facilitate the movement necessitated by following the receding water level, but if it is serving a shaft it is either mounted on a float so that it will always operate at the surface of the water, or is supported by chains or cables so as to permit of the necessary adjustment. In all cases the power is supplied by flexible cables of sufficient length to meet all variations of the operating level, and as they occupy but little space they leave the shaft or slope practically free from any encumbrances, and as provision need only be made for the discharge pipe and the electrical conductors, they can usually be run in one of the hoisting compartments. Induction motors should preferably be used for sinking pumps, especially if they are liable to be submerged, as this type, due to its simple construction and the absence of moving electric contacts, need not ordinarily be enclosed, but the factor of safety is very greatly increased by using an enclosed motor with waste packed bearings, the use of stuffing-boxes not being essential.

In sinking pumps the load increases inversely as the head against which the pumps are delivering water and, as a rule, the limits can be approximately predetermined and the motors so designed that from the start the efficiency increases with the increasing head. Both alternating and direct current motors with either horizontal or vertical shafts can be readily adapted to all forms of sinking pumps, the type of motor selected depending upon the service required and the character of the electrical energy available.

The main sump pumps are usually of large capacity, and their energy requirements often constitute a large percentage of the generating station output. Where the sump is of sufficient size to store the water normally collected during the day, the cost of this demand on the generating equipment may be minimized by running these pumps at night, in this way tending to equalize the power station load and permit the operation of a mine or colliery with a much smaller capacity in generators than would be required if these large pumping sets were run as a day load.

The adoption of the centrifugal type of sump pump in coal mines is due not only to the improved efficiencies of the modern multi-stage form, but also to the ability of the centrifugal type to handle liquids containing a considerable percentage of solid matter in suspension more successfully than reciprocating pumps. Moreover, its design and practically uniform load when serving sumps permits direct drive by means of high speed motors, preferably of the constant speed polyphase induction type where alternating current is obtainable. As single pumps capable of delivering water to the surface from any depth required in coal mining, at one lift, can now be run with greater economy, both as to first cost, and power consumption, than a number of units of low head and equal capacity, the once common practice of raising the water to the surface in successive lifts to sumps located at different levels has been practically abandoned.

For draining portions of the mine which are below the level of the sumps, a number of comparatively small pumps are ordinarily required, and as the difference in

the water levels is not usually great these pumps are, as a rule, standardized for the maximum head against which they will have to operate. This seldom exceeds 300 feet and in some mines is as low as 15 feet. Owing to their relatively large number and scattered location, these pumps are usually driven by direct current motors and operate from the locomotive feeder wires, although they are sometimes served by cables run into the mine through a centrally located bore hole. They are frequently semi-portable, so as to facilitate their movement or replacement to meet the varying requirements developed by the constantly changing conditions incident to coal mining. Like the main pumps, they normally operate without attendance except for occasional inspection, cleaning and lubrication, and can be equipped with automatic control, if required.

Perhaps the best demonstration of the superior flexibility of electrical operation in coal mines is found in the portable pumping set, which can be lowered down the shaft or slope and rapidly hauled to any portion of the mine by a locomotive and immediately put into service by connecting the suction pipe, unreeling the discharge hose and connecting the motor leads to the locomotive feeder wires. The equipment varies in details, but not in essentials at different mines, and consists of a centrifugal or plunger pump direct connected or geared to a direct current motor provided with a simple drum controller. There is also a suction pipe with a strainer end and a discharge pipe or hose reel, and if the set is intended for fire service, the necessary fire fighting auxiliaries are included. The complete outfit is compactly mounted on a truck having the same wheel gauge as the mine locomotives. It constitutes a valuable adjunct to the ordinary pumping equipment, as it can be used in all emergencies to replace any pump of approximately the same capacity which may be shut down for repairs or other reasons, and for intermittent dip pumping roadways where the expense of drainage grading would not be justified and a permanent pumping set would not be economical, owing to the short and irregular periods of operation.

Ventilating Fans and Air Compressors.

Uninterrupted service is the primary requisite of a coal mine ventilation system. The imminence of the hazard to the workers underground involved in a failure of the supply of fresh air being, of course, dependent on the character and formation of the mine.

Mechanical ventilation by means of rotary blower or exhaust fans which give a positive and fully controllable supply of air is almost universal in coal mines, the furnace system being used only in small isolated mines, or as a temporary arrangement in some of the larger ones, while the water fall or trompe ventilator or the steam jet or water jet methods are rarely resorted to. In driving ventilating fans with electric motors it is customary to couple the motor and fan shafts together and avoid the use of belting, as the nature of the load is such that with high speed fans direct drive minimizes the power requirements and economizes space.

Where large slow speed fans are changed over from steam to electric drive the retention of belting is often necessary, due to the difference between the speeds of the fan and the motor, but with both forms of electric drive the reliability of the service is increased, attendance cost reduced, and better speed control assured, while the installation of the fan itself is not influenced by the location of the power house. Where remote control is desirable, as in the case of fans situated at a considerable distance from the central or substations, it can be accomplished with remote control switches and any interruption of the service indicated promptly by connection alarm lights or bells in the motor circuit.

For mines using induction motors for other work, the question of adopting synchronous motors for driving the fans should be carefully considered, especially if the induction motor load is such as to seriously affect the power-factor of the generating and distribution systems, as by utilizing synchronous motors of higher rating than is actually required for driving the fans, their excess capacity may be devoted to correcting lagging power-factor by supplying leading current to the distribution system. This will frequently obviate the necessity for providing unloaded synchronous condensers to counteract the influence which underloaded induction motors and transformers have on the power-factor, and consequently the effective capacity of both generators and conductors.

When compressed air machinery is required in coal mines, electric drive renders it possible to locate the compressors with a view solely to securing the best air service irrespective of the location of the prime movers, in contradistinction to the necessary limitations of steam-driven air compressors. The motor operated units may be installed in distant substations or in the mines, and as a result short pipe lines with a correspondingly reduced pressure drop may be used, while individual compressors can be provided for isolated working sections.

If automatic unloaders are used with the compressors to regulate the pressure, and by-passes provided so that the motor is enabled to start at very light loads, the conditions are most favorable to the use of synchronous motors on slow speed reciprocating compressors, as very little overload capacity is then required in the motor, and it may be designed as in the case of those driving ventilating fans to compensate for conditions of low power-factor.

It is not usually advisable to drive high speed centrifugal air compressors with synchronous motors, as the best operation of this type can be secured by the use of high speed induction motors. Both types of motors can ordinarily be direct connected to the compressor shaft, but belting is of necessity sometimes retained in changing over from steam to electric drive.

Rock and Coal Crushers.

When motors were first applied to the centrifugal type of rock and coal crushers it was considered advisable to retain belt drive, due to the onerous starting conditions, excessive vibration and the possibility of the severe operating requirements resulting in stalling or injuring the motor. Familiarity with the use of electric motors, however, induced many of the engineers of the mining companies to attempt direct drive and both alternating and direct current motors are now successfully applied in this manner, being connected to the crusher shaft through flexible couplings.

When driving these crushers with engines it was necessary to utilize belting in order to obtain the required speed, and space economy was attained by installing the engine close to the crusher and reducing the belt-slip caused by the short arc of contact by interposing idlers. This was accomplished at a sacrifice in the power applied in useful work and the cost of belting renewals was excessive, amounting in some cases to approximately $100 per month for a single crusher. It is manifest that direct motor drive not only eliminates this expense, but reduces the amount of space necessary, while at the same time applying a greater percentage of the power in useful work.

The efficiency of motor drive for coal crushers as measured by the output in crushed coal for a given motor capacity was recently demonstrated by an exhaustive test conducted for the United States Coal and Coke Co., at Gary, W. Va.

A 200 h.p. General Electric induction motor was direct connected to a crusher having a normal output of 200 tons per hour, which, during the test, delivered 262 tons of crushed coal per hour without exceeding the guaranteed temperature rise in the motor. Owing to the heavy starting torque and severe intermittent overloads to which a motor must necessarily be subjected in this service, the polyphase induction type should be used when alternating current is available. If direct current motors are used with either rock or coal crushers, they should be enclosed to avoid commutator trouble from abrasive or conductive dust; reference to the accompanying illustrations of coal crushers driven by induction motors will show that this type need not ordinarily be enclosed.

While the above references have considered only the centrifugal type of crusher the electric motor can be adapted to any form of coal breaker, disintegrator, roll crusher or pulverizer, and where their operation calls for relatively slow speeds standard back geared motors can generally be applied.

Breakers and Tipples.

The earliest attempt at individual motor drive was made with direct current enclosed motors, and was only partially successful, as the intense vibration inseparable from breaker operation tended to cause commutator troubles.

In those breakers where induction motors were used, the simplicity of the rotor and the absence of moving electrical contacts resulted in a practically complete immunity from motor troubles, and the breakers were supplied with current from a central generating station; no local reserve power plant being required.

For driving tipples individual motors have heretofore been more generally used than in breakers, and the typical modern steel tipple is usually equipped with separate motors for the conveyors, picking tables, screens, crushers, etc., although in some cases they are driven in groups by one or more large motors.

Where long conveyors or scraper lines are used the power waste inherent in rope transmission may be reduced by using a centrally located motor or individual motors for separate sections. If extensions to the system are made, as in the case of conveyor lines to culm or refuse piles, the additions may be made without interfering with the operation of the original equipment, by providing a separate motor for each new section.

Coal Cutters.

The typical modern coal cutter shown herewith is mounted on a self-propelling truck and all its movements in loading upon or unloading from the truck, and during the process of mining, are made under its own power without hand labor. The motive power is supplied by a specially designed, enclosed, direct current shunt wound, vertical shaft motor provided with a simple rheostatic controller and wound for operating at the voltages commonly used for mine locomotives, so that current can ordinarily be supplied by the generator equipment provided for haulage, and as the mining machines are usually in service at night their use does not as a rule call for any increase in the generator capacity.

The first generators in the older developments were direct current units provided for lighting and locomotive haulage, and were usually belt connected to existing engines, direct connected sets being adopted for additions to the original outfit. Engine driven alternators were eventually added as the transmission distances increased beyond the economical range of direct current, but many isolated mines are still equipped for direct current service only. The increasing use of alternating current motors and the high combined efficiencies of high speed turbine driven alternators led to the choice of high pressure turbines as prime movers for most of the new power plants, or else mixed pressure or low pressure turbines were adopted to supplement the engine equipment as they could ordinarily be operated with the exhaust steam of the engines already installed and in this way added greatly to the generator capacity of the power station without requiring extra boiler capacity.

Comparatively high transmission voltages are now commonly used in this industry and most of the recent substations are constructed and equipped in accordance with the most advanced engineering practice, while on the other hand many mining plants illustrate in their miscellaneous electrical equipment the successive stages in the advance of electric manufacture during the past twenty years.

U. S. RADIUM PRODUCTION.

The U. S. production of carnotite bearing ores during 1913 was the largest to date, and amounted to about 2,269 short tons of dry ore, which contained about 81,990 lb. of uranium oxide, equivalent to 34.8 tons (31,560 kilograms) of metallic uranium. Rutherford has estimated that the quantity of radium in equilibrium with uranium is equivalent to about one grain of radium to 3,000 kilograms or uranium, and workers in the U. S. Bureau of Mines have estimated that the uranium in carnotite is accompanied by about 90 per cent of the radium required for equilibrium. On the supposition that these figures are approximately correct and that 90 per cent. of the radium present is recoverable, then the ores produced contained 8.5 grams of recoverable metallic radium, equivalent to 15.9 grams of hydrous radium bromide, valued, at $120,000 a gram of metallic radium, at $1,020,000.

In the United States uranium minerals were produced in commercial quantities during 1913 only in Colorado and southeastern Utah, and the quantity produced in Colorado was much in excess of the Utah output. The great bulk of the uranium mineral was carnotite, but a small tonnage of pitchblende ore was taken from the Belcher and Calhound mines, near Central City, Gilpin county, Colo. Only a few pounds were sold, and this was apparently for specimens or experimental use. Fifty dry tons of low grade material, carrying 1.49 per cent. uranium oxide, was shipped from the Kirk mine, which lies adjacent to the Calhoun and Belcher mines. This material had been mined in a previous year and had been picked over for pitchblende several times. It was too lean to ship under ordinary circumstances, but was bought by a French firm for experimental treatment.

KERR LAKE.

Kerr Lake Mining Co. during the year ending August 31, made a profit of $620,786. There was produced 1,828,424 oz. of silver at a cost of 24.86 cents per oz. The company's surplus August 31 was $961,094. The manager estimates ore reserves at 5,698,700 oz. and expects his estimate to prove a low one.

SOME MEMBERS OF THE STEFANSSON EXPEDITION.

Included in news published recently in daily newspapers relative to the rescued Karluk party, which last month reached Nome, Alaska ,and three men who died on Wrangel Island, there was mention made of the death of George Stewart Malloch, geologist. The late Mr. Malloch was one of several members of the Geological Survey of Canada who joined the Stefansson Arctic expedition. He had been on the staff of the Survey seven or eight years. The field work seasons of 1906-7-8 he spent in coal areas on the eastern slopes of the Rocky mountains, Alberta. In 1909 he was engaged in reconnaissance work along the line of the Grand Trunk Pacific Railway, on the upper Fraser river, between Fort George and Tete Jaune Cache, British Columbia. In 1910 he was with Mr. R. G. McConnell in Portland Canal district, B.C., of which he made a topographical survey, while Mr. McConnell and an assistant did the geology of the region covered. In 1911 he examined a portion of the Groundhog coal basin at the head of the Skeena river, north of Hazelton, B.C., a district which at that time was attracting much public attention. In 1912 he continued his reconnaissance of the Groundhog basin, determining the southern, eastern and northern boundaries of this coal area. A long report on that field, as well as his report on the metalliferous deposits in the vicinity of Hazelton, was included in the Geological Survey Summary Report for 1912. Having volunteered for geological work in the Arctic regions as a member of the Stefansson expedition, he was in Victoria in June of 1913, on his way north, as it has now proved, never to return. He was a much valued member of the Geological Survey staff, and his untimely death is much deplored. His age was about 30 years. He was a son of Dr. Malloch, of Hamilton, Ontario, and a graduate of Queen's University, Kingston. His name appears in the directory of the graduates of the School of Mining, Kingston, as "B.A., 1902, B.Sc., mineralogy and geology." He was also a member, ex officio, of the Canadian Mining Institute.

Information has been received concerning other members of the Stefansson party, these having been at work on or in the neighborhood of the Mackenzie River delta. A despatch to the New York Times, published several weeks ago, included news of three members of the Geological Survey, namely, Kenneth G. Chipman, J. R. Cox and J. J. O'Neill, as follows:

"Kenneth G. Chipman, chief topographer, and Dr. J. J. O'Neill, geologist, are now working in the west branch of Mackenzie delta, and will survey the branch in a launch as soon as the river opens. John R. Cox, topographer, will survey the east branch of the delta.

"Chipman and Cox have completed a survey from the Alaskan boundary to the Mackenzie, and O'Neill and Cox have surveyed a large part of Herschel island.

"All the members of the expedition are in good health and prospects of accomplishing some work next year are good."

The despatch was from Rudolph M. Anderson, of the Canadian Arctic Expedition, and was dated from Escape Reef, West Edge of the Mackenzie Delta, May 16, via Athabasca, Alberta, May 31.

A short time ago Mr. G. G. Aitken, Chief Geographer, Lands Department, Victoria, B.C., received a letter from Mr. Chipman, in which was given much information about the work that he had been engaged in up to the time of writing. Some accompanying notes, dated Fort McPherson, N.W.T., July 7, 1914, were as under:

"On March 16 Cox and I left Collinson point, and went to Herschel island. There we separated, he mapping the Firth river and then spending the spring on the coast line, while I went directly to Iglukitaktak, in the Mackenzie delta, where I waited for open water. This came on June 4, and I spent the rest of the month mapping in the delta, arriving here on July 1 to meet the steamer with our mail and freight. Cox got in here on the 3rd. The steamer is now daily expected. I do not think I ever before in my life looked forward to anything as anxiously as I now do to whatever that steamer has for us. It is more than a year since I was with you in Victoria, and I have frequently, especially during the last month, thought of the pleasant times I enjoyed there."

While Mr. O'Neill's previous geological work in recent years was done in the provinces of Quebec and Ontario, Messrs. Chipman and Cox were for several field seasons employed in the Canadian West. On June 26, 1908, Mr. Chipman arrived in Victoria from Ottawa with Mr. Chas. H. Clapp, whose assistant he was, to commence a geological and topographical survey of the southern portion of Vancouver island, which important work was begun on July 1 and continued well into the autumn. In the 1909 field season he assisted Mr. R. H. Chipman, who in that year commenced the preparation of topographic map of Vancouver island. In 1910, when this work was continued, Mr. Chipman had charge of the party which began the survey of the Sooke sheet, and in 1911 he spent the season in mapping the Cowichan Lake sheet. The field season of 1912 he was engaged on the Windermere map area, and in his brief published report mentioned that district as "scenically one of the most beautiful in Canada, each year receiving more attention from mountaineer and tourist, and, with the completion of the automobile road across the main range of the Rockies from Banff to Windermere, will be one of our most attractive mountain resorts." He, too, was in Victoria last year en route to the north with the Stefansson party.

Mr. Cox was one of the assistants of the Chief Topographer of the Geological Survey, Mr. W. H. Boyd, in the Slocan and Boundary districts in 1910, and in the Blairmore-Frank district, Alberta, in 1911, while in 1912 he was with Mr. Chipman in the Windermere district, B. C.

FIRE PROOF ROOFING.

In the city of Hot Springs, Ark., a disastrous fire recently swept through several blocks of the residential section, consuming everything before it except four houses covered with asbestos roofing. A strong wind —almost a gale—carried burning embers and shingles hundreds of feet; and although the roofs of these houses were at times covered with flaming shingles and sparks they did not ignite. In fact, the fire in this direction was entirely checked, showing that an efficient fireproof roofing is not only of immense value to the building it actually covers, but is also a preventive of large conflagrations.

ROCK DISTURBANCES THEORY OF PETROLEUM EMANATIONS vs THE ANTICLINAL OR STRUCTURAL THEORY OF PETROLEUM ACCUMULATIONS

By Eugene Coste.

Although some of the observers who first paid especial attention to the occurrences of oil and gas in the strata (such as Hunt in 1859, Andrews in 1861, Winchell in 1865, Mendelejeff in 1876, Hofer in 1876, Minshall in 1881, and I. C. White in 1883) seem to have been impressed with the fact that oil and gas deposits were connected with the disturbances in the rocks caused by their upheaval, yet, with the exception of Mendelejeff, and possibly Andrews, these observers do not appear to have understood what is really the one essential factor in the occurrence of oil and gas in the strata: viz., the faulting, uplifting, fracturing, fissuring, and jointing always accompanying even slight rock disturbances, and in certain districts (petroliferous provinces) allowing solfataric hydrocarbon emanations to force their way up from the interior and to reach and impregnate the porous portions of sediments subjected to the disturbances. Instead of this simple explanation to account for the observed connection between petroleum deposits and rock disturbances, most of the observers mentioned above, and many others who have followed them on the same lines since, have entirely reversed the problem. To them, instead of the dissemination of gases from fissures into the sediments, it presented the accumulation and concentration, according to anticlinal or other geologic structures, of oil and gas originally present throughout the whole mass of the strata where they were produced by the decomposition or distillation of organic remains.

Whether this important problem involves accumulation from sources within the oil-bearing strata themselves, or infiltration and dissemination from outside sources, may be easily determined if all preconceived ideas are put aside and the established facts only are considered.

Physical Facts.

Sedimentary strata are composed of alternate beds of shales, sandstones, and limestones, most of which are sufficiently close-grained to have retained from the time of their deposition enough water, held in their minute pores by capillary action, to fill all the spaces between their grains and render them entirely impervious to other fluids. Shales or consolidated clays form the bulk of the sediments and are especially fine-grained saturated impervious rocks, but many beds of sandstone or limestone are also quite impervious. Carll, Lesley, White, and Orton have often referred in their reports to the wonderful impermeability of the sedimentary strata of the oil regions. A sufficient proof is the very strong natural gas pressures always recorded in the gas and oil deposits, and the great differences in the pressure of the gas of different sands tapped at various depths in the same well, or in nearby wells in the same pool or field. These strong pressures and wide differences in pressure have been noted in thousands of wells drilled in the 10,000 or 12,000 ft. of sedimentary strata along the Appalachian oil belt, for instance, from New York State through Pennsylvania, West Virginia, Ohio, and Kentucky to Tennessee.

In order to explain the retention of this gas under strong pressures (up to 1,500 lb. per square inch in some cases) in so many thousands of separate spots and at depths sometimes as shallow as 100 ft. and varying from that to 4,000 ft., we must certainly conclude that the sedimentaries forming the substrata of this vast region and ranging through many geological ages are remarkably impervious. It is for this reason alone that the petroleum deposits have not escaped to the surface, and have been preserved in a multitude of separate pockets, pools, or fields, with different pressures, though often quite close to one another and always comparatively near the surface. Yet without an iota of evidence we are asked to admit the reverse of what we see everywhere to be the case; and we are told by the advocates of the anticlinal theory that these impervious rocks which confine the gas and oil in their present reservoirs are themselves the source from which these substances were obtained. If it is impossible for the natural gas, notwithstanding its strong pressure, to traverse the 100 ft.—or the 3,000 or 4,000 ft. at the most—which separate it from the surface, it is still more clearly impossible that it could have accumulated, according to the anticlinal theory, by traveling miles through the same surrounding rocks to its present reservoirs, from supposed minute organic sources distributed throughout the very same impervious sediments.

Again, if, as required by the anticlinal theory of oil and gas accumulation from within the sediments themselves, these products could circulate freely through the minute pores and mass of the shales, such a movement could and would have commenced immediately after the deposition of the sediments, while they were still lying flat and undisturbed. It is entirely superfluous to assert that the upward movements of the petroleums in the sediments were started by a slight folding of the rocks, either in the form of an anticline or any other form, "by which the oil, gas and water may have been separated out and the oil concentrated in one locality." The supposed organic petroleum products if they could move freely through the sediments, whether from the action of gravity, hydraulic pressure, or any other cause, would certainly start up toward the surface as soon as formed; they would never stop until reaching it; and therefore there would be no oil or gas at all found in the sediments to-day. In the Californian fields, Madill, Wheeler and other fields in Oklahoma, the Athabasca region of Canada, and many others, the productive sands are in unconformable formations, and sometimes right above the unconformities. To suppose that in these cases the petroleum in the lower bed of the Cretaceous, for instance (Dakota sandstone in Canada, or Trinity sandstone at Madill), is derived from the unconformable Paleozoic rocks underneath, is to ignore the long lapse of time between Paleozoic and Cretaceous times, which was certainly sufficient to exhaust out of the Paleozoic into the air, long before the deposition of the Cretaceous beds, all petroluem products formed from the decomposition of Paleozoic organic remains. If several unconformable formations (and in California there are at least three or four marked unconformities between different productive

(A paper presented at New York Meeting A.I.M.E., 1914.)

sands) contain petroleums in the same district and none at all in other districts with the very same sequence of formations, it must be due to some source for the petroleums outside of all these sediments, and to some infiltration, at a period more recent than the youngest productive formation, from a source beneath the oldest.

In all cases, therefore, the anticlinal theory of petroleum accumulations from sources within the sediments themselves fails to explain how the petroleums could possibly enter the porous portions of the sands, and remain there, and not continue their migration to the surface. On the contrary, solfataric petroleum emanations, through the agency of rock disturbances and fissuring, may enter and be retained in a patch of porous sands entirely surrounded by impervious rocks and there separate their component hydrocarbons and associated gases and vapors more or less according to gravity, the gas working its way to the higher parts of the porous sands, the water, if any, remaining in the lower parts, and the oil floating on the water, between it and the gas. In dry sands, such as the deep sands of Pennsylvania and West Virginia, the oil will naturally work down more or less to the lower part of the porous portions impregnated and will often be found in synclines. That part of the anticlinal theory which provides for a certain amount of separation of the water and of the different petroleums once they have reached a porous reservoir, is, of course, true. But even this has been much exaggerated; since the sand reservoirs in the oil and gas fields are very irregularly porous, and far from forming ideal tanks like a bottle or a room. Many impervious streaks or patches of various forms are found in the very heart of their porous portions, and they are seldom continuously porous over large areas. During the periods of disturbance there was also much fissuring and jointing; and, under the strong pressures of the gas always present in the petroleum emanations, these irregular tanks could not be filled up in the theoretical manner mentioned above. Every day, in the drilling of wells this theoretical arrangement of gas first, in the higher portions of the reservoirs, then oil and then water, is entirely reversed. Every day dry holes or oil wells, or salt-water wells are "drilled in" on the top of the anticlines while large gas wells are obtained away down on the slopes or at the bottom of synclines. On the other hand, many anticlines are barren of petroleums, although these anticlines are developed in sedimentary formations where every requisite condition demanded by the anticlinal thory is absolutely fulfilled; namely, fossiliferous strata; porous arched reservoirs; impervious covers; and water in the porous rocks; but where the essential factor is missing, namely, the rock disturbance producing the necessary fissure through which the solfataric hydrocarbon emanations could force their way up to the porous reservoirs.

The structure of many an oil or gas field has no resemblance to an anticlinal structure. A. Beeby Thompson in a paper read before the Institution of Mining and Metallurgy of London, England, in which he reviews the relationship of structure to the occurrence of petroleum, graphically illustrates by many good sections the great diversity of oil and gas field structures and thus plainly demonstrates the reverse of what he advances in the text: namely, that oil and gas fields are generally connected with anticlines and that "an anticlinal structure favors the accumulation of oil" and "played a most important part in the formation of oil fields." Indeed, a number of prolific and prominent oil fields are shown by Mr. Thompson's diagrams to exist in strata presenting structural conditions entirely different from anticlines. Other instances and examples to show that oil and gas fields are found under all sorts of structural conditions have been often furnished by other writers in their studies of the different oil fields of the world, especially of America. It has been found necessary really to transform the anticlinal theory by expanding it into a structural theory including all sorts of other forms. This structural theory was elaborated by F. G. Clapp in his papers in Economic Geology (vol. v, No. 6, Sept., 1910, pp. 503 to 521, and vol. vii, No. 4, June, 1912, pp. 364 to 381). What the author principally proves from his classification of oil and gas fields is really petroleum deposits are not dependent on or controlled by any kind of structure whatever. Such deposits are found, according to this classification: (1) on strong anticlines standing alone; (2) on well-defined alternating anticlines and synclines; (3) on monoclines with change in rate of dip; (4) on structural terraces; (5) on broad geanticlinal folds; (6) on bulged anticlinals; (7) in saline domes; (8) around volcanic rocks; (9) along sealed faults; (10) sealed in by asphaltic deposits; (11) at contact of sedimentary and crystalline rocks; (12) in joint cracks of sedimentary rocks; and (13) in crystalline rocks. To these classes of deposits may be added the following: (14) on gentle slopes or monoclines without any change in the rate of dip, as the Welland field, Ontario, the Madill field in Oklahoma, etc.; (15) in vertical veins cutting across the strata such as the gilsonite veins in Utah, the albertite vein in New Brunswick, Canada, and the grahamite vein near Cairo, West Va.; (16) in quicksilver and other metallic veins; (17) in and along volcanic or igneous dikes; (18) in meteorites; (19) in the volcanic emanations of to-day; and (20) in synclines.

With so many different classes of petroleum deposits, it is clear that the structure in itself is not the controlling factor and that too much weight has been attached to the form of folding of the sediments surrounding the petroleum deposits. In order to make the anticlinal theory fit everywhere unwarranted new names have been given and supernatural properties have been attributed to certain structures (such as "arrested anticlines" and "quaquaversal domes") which in no possible way could of themselves affect the oil or gas accumulations.

Even along the Appalachian oil belt, which is supposed to give many typical examples of anticlinal structures, it is well known that the oil and gas fields are really in the bottom of a deep geo-syncline between the Cincinnati anticline and the Appalachian uplift. These so-called anticlines, on which the oil and gas fields have been developed in that region, are mere wrinkles of small amplitude in the bottom of that deep geo-syncline. The height of each wrinkle is only a few hundred feet at the most, and therefore (if the sands were continuously porous, and the strata in general were as permeable as the anticlinal theory requires to explain the accumulation of the large quantities of petroleums obtained), the oil and the gas would not have stopped on or near the summit of arch of these wrinkles of porous sands, but, if the covers of these sands were impervious, would have traveled along the sands from one arch to the other and gradually up the western or the southern slope of the geo-syncline until reaching the surface at the outcrops of the sands in Ohio, or northern Pennsylvania and New York State. Many differences in pressure have been noted between the gas found on one of the wrinkles and that in the same sand on the adjoining one. The few hundred feet of water in the syncline between these

two wrinkles could not possibly prevent the gas from traveling from one to the other and equalizing that pressure, and, as I have said above, could not possibly prevent the gas from getting out up the slopes of the geosyncline to the outcrops.

In the Gulf oil fields of Louisiana and Texas, it is still more clearly evident that the particular shape or structure of the salines or mounds was not a factor in the accumulation of oil from the surrounding sediments. These salines cover indeed such small areas that it is only a stretch of the imagination to suppose that the enormous quantities of oil obtained from under them could possibly be derived from the strata affected by what has been called the "quaquaversal doming" under the salines. Moreover, this doming does not extend to the Tertiary or Cretaceous clays and sands surrounding the salines or mounds; and therefore this particular structure could not be a determining factor of oil accumulations from the surrounding sediments. On the contrary, it is well established that the sediments under the salines have been replaced by masses of salt, limestone, dolomite, silica, sulphur, and gypsum, of secondary origin from solutions moving vertically and carrying hot oils, hot water, and hydrocarbon and sulphur gases, and that these products did not extend horizontally into the impervious sediments surrounding the chimney-like channels under the salines; also, that these salines are distributed along lines of deep faults which were evidently the first channels for emanations of the hydrocarbons and other vapors and waters, before they finally came out to, or near, the surface through the chimneys under the salines. What has structure to do with occurrences of oils in deposits of this kind, which are clearly due to the rock disturbance under the salines, and to hot gasaqueous emanations coming up from below? This explains the fact that oil in large quantities is "struck" at many different levels under the salines, and none is struck, outside of the salines, in the surrounding sediments.

That these are solfataric volcanic emanations is made plain by the occurrences of oil a little further south, along the same coastal plain, in Mexico. There one can actually observe numerous volcanic necks of olivine basalt, scattered at wide intervals, and also distributed along fault lines similar to the lines connecting the salines of Texas and Louisiana; and these volcanic necks are surrounded by large seepages of asphalt and the very prolific oil fields of this region are all developed in close proximity, around these volcanic rocks. F. G. Clapp in a paper in Economic Geology (vol. vii, No. 4, June, 1912) says with regard to this class of oil deposits in Mexico:

"In close proximity to the basaltic upheavals, the Tamasopo limestone and overlying formations have been domed upward, forming pockets or places of change in rate of dip at the base of the upheavals and surrounding them, where large deposits of oil have accumulated."

It is known, however, that these Mexican lava cores form really vertical pipes, which may be said to have drilled themselves upward through undisturbed and almost horizontal strata of shales, limestones, and sandstones, and Mr. Clapp himself admits that in his hypothetical cross-section of one of the Mexican oil-fields. The supposed action of the doming referred to by Mr. Clapp would therefore have been so infinitesimal as to be entirely negligible in considering the accumulations of oil out of the surrounding sediments. According to Mr. Clapp's theory the Cretaceous sediments surrounding the lava cones of Mexico tenaciously held back in their pores, during long ages, enormous quantities of petroleum products, until such time as the volcanic peaks and needles pierced through them in late Tertiary times. In doing so the volcanic cores tilted only very slightly the sediments immediately surrounding them. It would be impossible for this slight tilting of very small portions of the whole mass of the strata of this region to effect the immediate release from these sediments of the enormous quantities of oil supposed to have been so firmly held by them during long periods; and it can only be concluded that the effect of structure in this case at least has evidently been much overdrawn. Why should so much be demanded from poor impotent structure alone, when it is manifest that these Mexican petroleum deposits are directly connected with vulcanism, and due to solfataric volcanic emanations accompanying the upheavals of the basaltic cones?

Many other instances to show that structure is not a determining factor in the migration and accumulation of oil in the California fields may be found in the reports of Arnold, Anderson and Johnson. These authors summed up their conclusions as follows:

"This migratory faculty may be ascribed entirely to the presence of the associated gas which would cause the oil to fill every crevice offering a point of escape or a point of lodgment."

"The condition of the rocks is the chief factor that controls the matter of where the oil is stored most abundantly"

In California, "many of the 'oil sands' so called, are not true sands, but zones of fractured shale or flint offering interspaces in which the oil can gather."

"Large accumulations in anticlines may be accounted for primarily by the cavities offered by the strata along upward folds, and secondarily by the presence of less pervious beds arching over such folds and affording favorable conditions for the confinement of oil and gas tending to escape."

If to these conclusions is added the consideration of the many strong faults and disturbances always plainly in evidence in the fields of California, and also the consideration of the fact that in these fields a number of unconformable formations, from and including the crystalline gneisses to the Quaternary, are productive of oil, it will be readily understood that the migration of oil is effected vertically along fissures and from a source beneath the crystalline gneisses instead of horizontally and more or less under the determining influence of the structure.

The same conclusion has been reached by Washburne in the Florence field of Colorado: viz., that geologic structure has had little or no influence on the movement or the accumulation of oil which is present mostly in open fissures in a zone of shales 2,500 ft. thick, at the bottom of a syncline.

Geologic Facts.

Simple and well-known geological conditions and considerations prove just as conclusively that the occurrences of oil and gas in the strata can only be attributed to a process of infiltration, dissemination, and impregnation of the porous portions of the sediments from deep solfataric volcanic sources. As I have already on several occasions* presented in detail a number of facts and

*Natural Gas in Ontario, Journal of the Canadian Mining Institute, vol. iii., pp. 68 to 89 (1900). The Volcanic Origin of Natural Gas and Petroleum, Journal of the Canadian Mining Institute, vol. vi., pp. 73 to 123 (1903). Petroleum and Coals, Journal of the Canadian Mining Institute, vol. xii., pp. 273 to 301 (1909). The Volcanic Origin of Oil, Trans., xxxv., 288 to 297 (1904). Fallacies in the Theory of the Organic Origin of Petroleum, Transactions of the Institution of Mining and Metallurgy, vol. xxi., pp. 91 to 192 (1911-12).

arguments in support of these views, I will here only recapitulate the principal points as briefly as possible:

1. In the solfataric volcanic phenomena enormous quantities of hydrocarbon gases and vapors are constantly thrown out in the air in all the volcanic districts of the world. See my previous papers and Dr. G. F. Becker, Bulletin No. 401, U. S. Geological Survey, for short reviews of this evidence, which, however, will be found at length in the writings of the eminent geologists and chemists who have made special original studies on this subject, notably, Elie de Beaumont, Humboldt, De Lapparent, Suess, Fouque, Le Blanc, Silvestri, Stocklassa, Brun, Charles Sainte-Claire Deville, Lacroix, Gauthier, Tschermak, Janssen, Libbey and Sokolow. A. Gauthier, for instance, has shown not only that hydrocarbons and other combustible gases are to be found in the lavas or volcanic rocks of to-day, or associated with these rocks in their eruptions, but that enormous quantities of these combustible gases are contained also in ancient igneous rocks, and that by simply warming these rocks to a moderate red heat he could extract from them at least 100 times their volume of mixture of combustible gases and water vapor.

After giving the details of his experiments and analyses he says:

"Putting aside the reactions pertaining in the melted portion of the interior of the globe if we consider what happens when certain already crystallized masses of the crust are reheated to red heat on account of their sinking internally, or because lateral pressures of different parts of the crust cause an uplift of the melted rocks from the interior along the points of minimum resistance.. When these rocks already solidified once are thus reheated by the incandescent masses it will be seen that they will be bound to give off by all possible vents the gases and vapors produced in the experiments just cited and recorded. From these, as we have seen, one liter of granite gave (at 1,000 deg. and calculated only for this temperature) about 20 liters of various gases and 89 liters of water vapor, that is to say, more than one hundred times its volume of gases. One can understand from this the great explosive force due to these reactions, and that it is not at all necessary to admit the hypothesis of the penetration of superficial or meteoric waters down to the igneous masses as a necessary condition to the production of volcanic phenomena. . . . One will understand that to explain the origin of the water in volcanoes the nature of the gases emanated and the violence of the eruptive phenomena, that it is sufficient for the deep crystalline strata to be reheated only a few hundred degrees, and the emanation of volcanic gases with their composition (combustible gases) and their formidable pressures, will be the necessary result of this reheating."

Dr. Albert Brun in his Researches sur l'Exhalaison Volcanique gives many interesting analyses of the gases found in volcanic rocks, and given off at volcanic or explosive temperatures, that is to say, above 600 deg. or 800 deg. C., which he recognizes as the only true volcanic gases. These analyses show that hydrocarbons are frequent in volcanic rocks all over the earth and that they are sometimes quite abundant. For instance, in an obsidian from the Plomb du Cantal, France:

"The analysis showed that the vapor which is distilled is slightly ammoniacal and carries much bitumen. Heated in the vacuum its fused, vitreous residue is perfectly black with carbon. Moreover, there is enough bitumen present to form on the cold parts of the apparatus oily striations. These oils are soluble in chloroform, with a brown fluorescence, and are combustible with a clear flame."

Many other analyses of lava, obsidian, and other volcanic rocks are stated by Dr. Brun to have given from traces of hydrocarbon to quantities even more abundant than in the instance cited above, and out of 67 analyses 38, or 57 per cent., gave hydrocarbons. The volcanic rocks containing the petroleums were from widely distributed localities, such as Mt. Erebus (antarctic), Armenia, Abyssinia, Java, Japan, Peru, Tamanfaya, Canaries, Iceland, Milo, Vesuvius, Stromboli, Etna, Arran Islands, Scotland, Sweden, Germany, Hungary, Italy and France.

In view of these and other evidences, no geologist can to-day deny that petroleums are now proved to be abundantly produced in the phenomena of vulcanism, whether recent or ancient.

2. There are no geological phenomena of to-day or of ages past in which, through organic agencies, petroleums—that is to say, the mixtures of hydrocarbons known as petroleums—are being produced, or are known to have been produced. The gradual decomposition of entombed vegetable organic matter in nature to-day, and during the past geological ages, is and has been accomplished in the sedimentary strata at low temperatures and has resulted in the formation of peat, lignite, coal, and anthracite; that is to say, in the formation of oxygenated fixed carbon compounds very different from petroleums. If these "coals" had been distilled it might be argued that "petroleums" were thus formed, but it is, of course, well known that as a general rule they have not been distilled; the necessary heat to bring about distillation was never attained in the unaltered sedimentary strata. At any rate, it is a matter of geological record that the "coals" are found everywhere in the sediments in the undistilled state and not as coke, and that coal and petroleum deposits have no genetic connection of any sort one with the other.

It is equally a matter of geological record that the soft tissues of animal organic matter were not finally entombed in the sediments, where they have left absolutely no trace of their former existence, as demonstrated by the billions of fossils in our paleontological museums and collections, and in the impervious rocks everywhere, without the slightest trace of any carbon compound to be found in them. The former animal organic matter of what is to-day the fossil animal world evidently decomposed fully, or otherwise disappeared entirely, before the final entombment of the hard part of the animal; and therefore no petroleums could possibly be formed from it.

It is insufficient to argue, against such evidence to the contrary, that petroleums must have an organic derivation, because the large petroleum deposits are always found "associated" with sedimentary strata and fossiliferous rocks. This word "associated" is very vague. It takes more than the presence of water in a cave or in a porous rock to prove that that water originated there. Are not volcanic rocks themselves thus "associated" with sedimentary strata—often in successive horizontal flows or laccolitic intrusions interbedded with sediments, or in veins and masses cutting across sediments? Are not the solid petroleums thus found in irregular veins or masses cutting across the sediments? Are not the liquid or gaseous petroleum deposits themselves local and irregular impregnated spots of the porous sediments, not at all in sheets like coal beds? In some districts

(petroliferous provinces) they occur in many sands throughout all the sequence of the sediments from the earliest Cambrian to the latest Quaternary, entirely irrespective of the fossiliferous beds, and mostly in sharp sands without fossils—sometimes above great thicknesses of shale strata, sometimes below all shales, as, for instance, the petroleums in the Trenton limestone of Ohio and Indiana, while in other districts the same entire series of sediments is absolutely barren of petroleums.

It is also insufficient to say that because volcanic rocks are not everywhere to be seen in the petroliferous districts a solfataric volcanic origin cannot be attributed to the petroleums. As I have already quoted several times in other papers, De Launay in his Science of Geology remarks:

"The dislocations of the earth are more and more observed to have taken place not alone in mountainous regions but even in regions of plains." . . .

"All the regions of the earth, probably without exceptions, have been subjected to dynamic movements to which are connected igneous manifestations of internal origin."

These disturbances furnished the necessary fissuring of certain belts of strata, whether much disturbed and uplifted, as in California, Roumania, and Galicia, or sometimes lying still comparatively flat and apparently undisturbed, as along the Appalachian belt in Pennsylvania and West Virginia. In all cases, however, the imperviousness of the bulk of the strata, especially the shales, and the fact that these readily caved in and sealed the fissures, prevented the petroleums from entirely escaping to the surface. Through this fissuring of the strata the pent-up solfataric hydrocarbon emanations came up from the interior, losing some of their pressure as they forced their way up through the fine minute fissuring and the imperfectly porous sands. Hence the differences of pressures recorded in the different sands of the same field and the higher pressures recorded in all fields as the petroleums are found in deeper and deeper sands. Hence the fact that in every field or district, not one but a number of different sands belonging to a number of different geological formations, sometimes unconformable, are impregnated with the petroleums in irregular spots, here and there, along the structural lines in the neighboring districts are absolutely barren.

The distribution of the Mexican and of the Texas and Louisiana oil fields along lines of fault has already been referred to, as well as the evident connection of the oil of these fields with vulcanism.

Similarly the oil fields of California belong to much disturbed and fractured belts bordering the Coast Range on each side for many miles. There also the migratory ascent of the hydrocarbons through faults and fissures is most plainly attested by numerous asphalt veins, and by tar and gas springs. That these faults and disturbances, constantly referred to in the reports of Arnold and Anderson, have brought up the hydrocarbon emanations from below the crystalline gneisses and granite is evidenced by the fact that in Placerita canyon, 5 miles east of Newhall, Los Angeles county, a very light oil (between 50° and 60° B.) is produced from crystalline gneisses which overlie the San Gabriel granite. Above these crystalline rocks, the oil is found in California to be stored in the porous reservoir-rocks, or in the seams and joints of any and all the strata affected by these profound disturbances in a geological column of some 26,000 ft. of Cretaceous, Tertiary, Fernando, and Quaternary sediments, those of each period lying unconformably on the next lower, and the lowest unconformably on the crystalline rocks. It cannot be imagined that the petroleums contained in any one of these rock series can have originated from organic remains in the underlying unconformable series, since they would have been lost at the surface, if they had migrated at all, during the long intervals marked by the unconformities, unless a still more improbable process be imagined; namely, that in each case the organic remains accommodatingly waited until the end of the long period marked by the unconformity, before beginning to be decomposed and transformed into petroleums, and to migrate upward. There is only one possible explanation: solfataric volcanic emanations of hydrocarbons coming up from below the crystalline rocks along the fault lines and in the zones of disturbance, at repeated periods of dynamic movements of the Coast Range. Some of these movements must have been very recent to explain the oil in the gravels of the Quaternary and the large seepages often found at the surface.

If the other oil districts of America are considered broadly it will be seen that the Appalachian fields, the Northwestern Ohio and Western Ontario fields, the Illinois fields and some of the Indiana fields, and the Mid-Continent fields, all show linear distribution of their petroleum deposits more or less parallel to the Appalachian uplift, except some of the Oklahoma pools, which follow the direction of the Arbuckle or Wichita Mountain uplifts. Along these oil belts the numerous petroleum-bearing rocks do not represent fixed geological horizons—the oil and gas rising from various beds of different ages; and outside of these oil belts, structurally favorable folds are barren of petroleums in the same geological horizons.

Following the Appalachian oil belts, for instance, from Tennessee and West Virginia through Pennsylvania to New York State, the petroleums are found in lower and lower rocks in the geological scale, until they are found right on the top of the Archaean in the Potsdam sandstone. The Archaean, therefore, or the igneous magma below it, must be the final source. It would be puerile indeed to assume one hundred different sources of this belt, since it must then be assumed also that every member of the sedimentary series separating two oil-bearing sands is the impervious cover, and cannot therefore be considered as the source, of the petroleums in the sand below; and since it has to be admitted, after all, that the Archaean rocks, or the igneous magma below the Potsdam, is one at least of the sources.

This peculiar occurrence of the petroleum deposits in the sedimentary strata of all ages, yet in certain districts only, along zones of tectonic structural disturbances of these strata, where they align themselves in "petroliferous provinces," as do the metals in "metallogenetic provinces," is exemplified not only in North America but all over the earth. In Russia the petroleum deposits follow the Caucasus uplift from the Tamansk peninsula in the northwest to the Apcheron peninsula in the southeast for a distance of 750 miles. In Galicia and Roumania they follow the Carpathian range and turn with it in a grand sweep of more than 500 miles from a northwest to southeast direction in Galicia to an east-and-west one in Roumania. The same association of naphtha to a dislocated zone along the Krudestan chain in Persia, has been well described by J. de Morgan. The Tertiary tectonic and igneous "girdles" around the Pacific and the Caribbean sea are followed by an immense Tertiary "petroliferous province," of which the oil fields of California, Alaska,

Japan, Borneo, Sumatra, Java, New Zealand, Peru, Colombia, Venezuela, Trinidad, Mexico, and Texas are salient points.

The constant recurrence of hydrocarbons in volcanic and igneous rocks, volcanic emanations, metallic and other veins, meteorites, comets and other stellar bodies, clearly demonstrates that petroleums are inorganic. The hydrocarbon emanations sometimes follow closely the volcanic lava, as in the Mexican and other oil fields, but they need not be, and often are not, accompanied to the surface by volcanic rocks. They must, notwithstanding, everywhere be held to be of a solfataric volcanic nature, as shown by their peculiar position along the tectonic structural disturbances, and because, moreover, they could not originate in the mass of the impervious sediments, and could only travel through these by means of faults or fissures from deep sources. Besides, with their associated salt and sulphur they are identical with solfataric volcanic vapors emanating from all the volcanic districts of the earth, and are absolutely unlike anything else in nature known to be in the active process of formation at the present time. Like volcanic vapors these hydrocarbons are always found under high pressures, often giving rise to violent explosions and sudden outbursts in enormous quantities, after earthquake shocks, and along disturbed dynamic lines; and, like volcanic vapor, they are also found at times to be still hot and associated with hot waters.

RESUSCITATION FROM MINE GASES AND SHOCK

The U. S. Bureau of Mines as the result of careful investigation recommends the following procedure in rendering first aid to those in need of artificial respiration:

In case of gassing, remove the victim at once from gaseous atmosphere. Carry him quickly to fresh air and immediately give manual artificial respiration. Do not stop to loosen clothing. Every moment of delay is serious.

In case of electric shock, break electric current instantly. Free the patient from the current with a single quick motion, using any dry non-conductor, such as clothing, rope or board, to move patient or wire. Beware of using any metal or moist material. Meantime have every effort made to shut off current.

Attend instantly to the victim's breathing. If the victim is not breathing, he should be given manual artificial respiration at once.

If the patient is breathing slowly and regularly, do not give artificial respiration, but let nature restore breathing unaided.

In gas cases, give oxygen. If the patient has been gassed, give him pure oxygen, with manual artificial respiration.

The oxygen may be given through a breathing bag from a cylinder having a reducing valve, with connecting tubes and face mask, and with an inspiratory and an expiratory valve, of which the latter communicates directly with the atmosphere.

No mechanical artificial resuscitating device should be used unless one operated by hand that has no suction effect on the lungs.

Use the Schaefer or prone pressure method of artificial respiration. Begin at once. A moment's delay is serious.

Continue the artificial respiration. If necessary, continue two hours or longer without interruption until natural breathing is restored. If natural breathing stops after being restored use artificial respiration again.

Do not give the patient any liquid by mouth until he is fully conscious.

Give him fresh air, but keep his body warm.

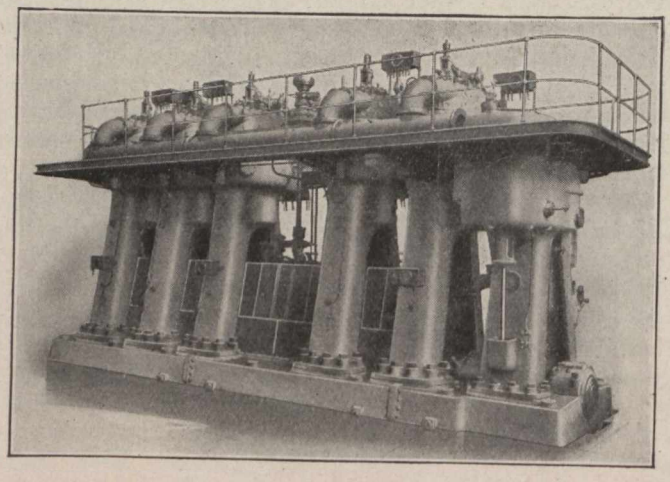
Send for the nearest doctor as soon as accident is discovered.

GALICIAN OILFIELDS.

At the time of the outbreak of war, the daily output of the Boryslaw-Tustanowice field in Galicia is stated to have been about 3,000 tons daily, and it is now estimated that the present production cannot be more than 50 per cent. of that amount. Of the men operating in the field, about 60 per cent. were liable for active service, but only about half of these, says the Petroleum World, have been called up, as the Austrian Government wishes to maintain a constant supply of oil for the needs of the railway transport service, the Austro-Hungarian Government and the German Navy. It is pointed out an advance of the Russians from the eastward past Lemberg would very probably cut off the principal Galician field of Boryslaw-Tustanowice from being a source of oil supply to the Austrian and German Governments. Germany imports at the rate of 1,200,000 tons of oil per annum, and, considering that all the sources of supply, except Austria, are closed to Germany, it will be realized how important it is to the latter country that Austria should be able to transport oil and products across the Austro-German frontier.

FIRST LARGE DIESEL ENGINE FOR UNITED STATES.

The accompanying photograph illustrates one of two 1,250 h.p. (sea level) Carels type Diesel engines, built for Phelps-Dodge & Co., for the central power plant of the Burro Mountain Copper Co., Tyrone, New Mexico. The plant is situated at an elevation of 6,700 feet, at which height the normal power developed will be



1,000 h.p. Each engine is direct connected to an 815 K.V.A.G.E. 60 cycle, three phase alternator. One engine is now ready for operation, the other practically erected in the power plant.

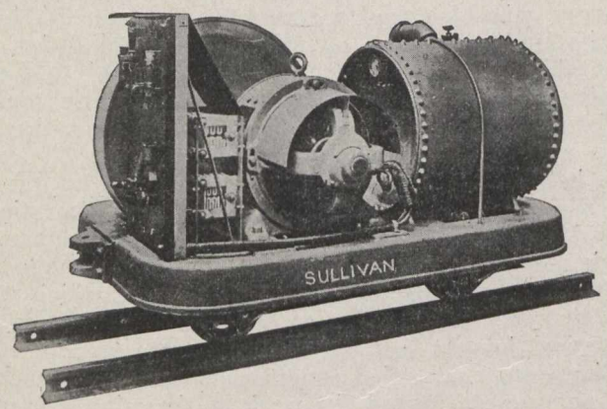
These are the first large Diesel engines to be installed in America. They are the Carels type, two cycle engines, with five power cylinders. At the right is the scavenging air cylinder, driven directly from the main crank shaft.

These engines were built by Usines Carels Freres, of Ghent, Belgium.

A PORTABLE MOTOR OPERATED COMPRESSOR.

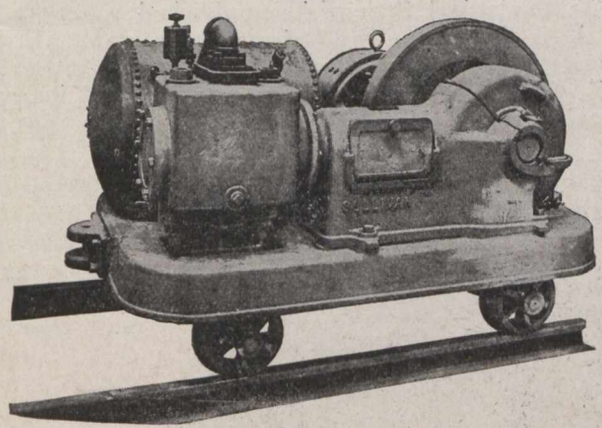
The small motor driven air compressor illustrated herewith is exceedingly useful in mines, industrial plants, etc., for supplying air for rock drills, hammer drills, pneumatic tools, coal pick machines and post punchers.

The complete unit is mounted on a truck of any desired wheel gauge and comprises a 15 h.p. Westinghouse electric motor, the air compressor, a storage tank and a motor starting rheostat.



The motor is of the damp proof type and will operate successfully in the wettest portions of the mine. It is supplied for either alternating or direct current.

The receiver is made of plate steel and is tested to withstand 100 pounds air pressure. With it are furnished a pop safety valve, pressure gauge, and blow off or drain cock.



The construction of the air compressor is very substantial. The bearings are all adjustable and removable. The cylinder is lubricated by a light feed air cylinder lubricator and the crank shaft and crosshead by the splash system. An unloading device on the air inlet valves saves energy when the demand for air is less than the output of the machine.

This compressor is manufactured by the Sullivan Machinery Co., Chicago.

PERSONAL AND GENERAL

Mr. B. B. Hood, formerly mill superintendent at the Moose Mountain mine, is now at Chrome, New Jersey.

The Pittsburg meeting of the American Institute of Mining Engineers will be held at the Hotel Schenley, October 8, 9 and 10, 1914.

Mr. H. C. Hoover has accepted the temporary chairmanship of Camp Bird, Ltd., and the Santa Gertrudis Co. Mr. R. J. Frecheville has resigned his position as director of the companies and assumes the chairmanship of the technical committee. Messrs. F. A. Govett and F. H. Hamilton have joined the boards of both companies, and Messrs. Norman Craig and George de Pass have joined the Santa Gertrudis and Camp Bird boards, respectively.

Mr. Geo. P. Schubert has been appointed assistant professor of mining and civil engineering at the Michigan College of Mines.

Mr. Morton Webber is at Porcupine examining the McIntyre mine.

The Sixth International Congress of Mining, Metallurgy and Geology, to have been held in London, July, 1915, has been indefinitely postponed.

Professor E. S. Moore, M.A., Ph.D., professor of geology and mineralogy at the Pennsylvania State College, is on a visit to Australia.

Mr. T. Walter Beam has returned to Denver, Colorado, after having been at Hedley, Similkameen, B.C., for some time, supervising exploration with the diamond drill of mining property situated near Hedley and held by the New York Syndicate No. 2, which includes leading shareholders in the Hedley Gold Mining Co.

Mr. W. M. Brewer, of Victoria, B.C., after having investigated mining conditions in Skeena district, visited Graham island of the Queen Charlotte group. He will report to the British Columbia Department of Mines on both parts of the Province, in which he has been engaged for several months.

Mr. Frederick K. Brunton, for about two years assistant superintendent at the British Columbia Copper Co.'s smelting works at Greenwood, Boundary district, recently left that place for Anaconda, Montana. He is a son of Mr. D. W. Brunton, of Denver, Colorado.

Mr. George A. Clothier, for some time superintendent of the mining property of the Indian Mines, Ltd., in Portland Canal mining division, British Columbia, is now engaged, with a brother, in operating under lease a silver-lead mine near Hazelton, Omineca mining division.

Mr. Newton W. Emmens, of Vancouver, has returned to the Coast after having spent the summer in the neighborhood of Fish river and the adjacent Lardeau country, obtaining information for a report to the British Columbia Department of Mines.

Capt. A. Fournier, of Kaslo, B.C., until recently manager for the French company that owned the Cork mine and concentrating mill on the south fork of Kaslo creek, has left British Columbia for France, to rejoin his regiment and take part in the European war.

Mr. Fletcher T. Hamshaw, formerly manager for the Pittsburg-British Gold Co., operating a placer gold mine on McKee creek, Atlin, B.C., has this season been working about one hundred men on the James claims on Bonanza creek and Little Eldorado, in the Chisana (Shushanna) gold field, Alaska.

Mr. F. August Heinze has been in British Columbia several weeks. He is interested in mineral claims in Franklin camp, Boundary district, and in a large area of land which is part of the grant made by the British Columbia Government some years ago to the Columbia & Western Railway, from Trail westward through the Boundary country.

Mr. Frederic Keffer is back in Greenwood, B.C., after having been at Clifton Springs, New York, and other places in the United States.

Lieut.-Col. R. G. Edwards Leckie, of Vancouver, B.C., accompanied one of the volunteer regiments of that city to Valcartier, Quebec, en route to Europe to take part in the war on the Continent.

Mr. Lionel E. Hill, superintendent of the Le Roi No. 2 Co.'s Josie group of mines, returned to Rossland, British Columbia, about the middle of September after having been away on a visit to Japan. He has since proceeded to Valcartier, Quebec, to join the engineers who form part of the Canadian contingent going to the European war. Before leaving Rossland he was entertained by local friends and presented with a small souvenir in the shape of a gold-handled pocket knife engraved with his initials and the words, "From the Rossland Mess."

Mr. M. E. Purcell, of Rossland, superintendent of the Consolidated Mining and Smelting Co.'s Centre Star group of mines, is actively promoting the St. John Ambulance Association first aid movement among metal miners.

Hon. Wm. Templeman, formerly Dominion Minister of Mines, has been ill in one of the hospitals in Victoria, B.C.

Major J. E. Leckie, one of several mining engineers who have enlisted for service abroad, was injured at Valcartier camp by being thrown from his horse when it slipped in the mud. It is reported that the injuries are not of a serious nature.

OBITUARY.

Henry Bratnober, who died at Livermore, California, on September 12, was some years ago considerably interested in the Le Roi Mining Co., of Rossland, B.C.

CANADIAN GENERAL ELECTRIC CO.'S CORPS.

The accompanying photograph shows the corps of engineers raised by the Canadian General Electric Co. for service during the war. The corps has been recruited from the several staffs, and will be maintained by the company until the war is over. This action is worthy of much praise.

The members are: Capt. Ritchie, A. T. McLean, W. S. Johnson, J. S. Dunlop, G. Hillier, C. Henry, George Monaghan, A. Hardie, J. C. Munro, C. C. Rous, P. Foster, E. Crockford, H. S. McKean, A. J. Palmer, R. W. Nurse, H. Galvin, R. Bethune, H. Bestard, H. S. Elliott, Charles Stewart, W. J. Swanger, F. G. Jackson, H. Williams, E. S. Shill, C. Pink.

IN INDIA.

Germany made the same mistake about India as it did about Ireland, and everybody who counts on India to be false to Britain will come a cropper."

In these words his Highness the Aga Khan, the recognized temporal leader over sixty millions of Indian Mohammedans, summed up the Indian Empire's status in the world's war.

The Khan has offered to place his personal services and resources at the disposal of the Government, and has volunteered to serve himself as a private in any regiment of infantry in the Indian expeditionary force.

LA ROSE.

Montreal, Sept.22.

At the meeting of the La Rose board recently, when the regular dividend of 2 per cent. was declared, the directors listened to a lengthy report from Manager Watson, who also read a report by Manager Robbins of the Hollinger mine, on the future possibilities of profitable operations. Both reports advised that extensive explorations and development be carried on.

For some time there have been rumors that the La Rose would suspend operations and disperse the surplus held in the treasury, but it was stated by one of the directors that it was now most likely operations would be continued and further extensive development work done. When the dividend checks are mailed a copy of the reports will accompany them, which will explain fully the position at the mine and the course of action thought best by the directorate.

The present unsettled condition of the silver market has not as yet affected the work at the mine. Everything is going along as usual, and just as soon as enough silver is mined to warrant a shipment being made, it will be sent to London to be held for spot sale.

It is stated that the dividend just declared was not earned, but is being paid out of surplus.

THE ARCHEAN GEOLOGY OF RAINY LAKE.

The Geological Survey has published a report by Dr. A. C. Lawson on the Rainy Lake region. In the eighties Dr. Lawson, then a young geologist on the staff of the Geological Survey, was engaged in a reconnaissance in this region, and his reports on the district became classical. At that time the district was difficult of access and covered with primeval forest, so that geological work was carried on under great difficulties, and only a reconnaissance was possible. In the interval of time that has elapsed, a vast amount of detailed work has been carried on by the United States Geological Survey and the various state surveys to the south of the International Boundary line that has added largely to the knowledge of the Pre-Cambrian. It was felt that it would be of great interest and value to have Dr. Lawson revisit his old field, and study it under the more favorable condition now prevailing.

The principal object is to present Dr. Lawson's position and his mature opinions based on his re-examination and more detailed study of the district.

SPECIAL CORRESPONDENCE

BRITISH COLUMBIA

With the exception of the Boundary district, where there does not appear to be any prospect of an early resumption of copper mining and smelting operations, the outlook for metalliferous mining in the Province is somewhat brighter, though there does not seem to be much change so far as concerns interior coal mines. Ore receipts at Trail show a fairly high total for the last fortnight, namely 16,574 tons, of which, however, the greater part—12,130 tons—was from Rossland mines. East Kootenay's proportion was 2,362 tons, nearly all of lead ore from the Consolidated Co.'s Sullivan group mine. Production in Ainsworth, Slocan and Nelson divisions is much decreased, yet a larger number of mines is being operated, chiefly doing development work, than might have been expected under present unfavorable conditions.

News from the Cariboo placer-gold field is generally satisfactory, a cool and rainy summer having kept up a good supply of water for hydraulicking purposes, with resultant benefit to the mine operators of that district. Similarly, satisfactory news has come from the Atlin gold field, where there continues to be much activity on a number of gold bearing streams.

Little news is available concerning what is being done at the copper mines of the Britannia, Granby Consolidated and Tacoma Steel Co., the last-mentioned being owner of the Marble Bay mine on Texada island, but all are being worked. The development of ore at considerable depth in the mine of the Portland Canal Tunnels, Ltd., near Stewart, Portland Canal, is regarded as promising to be of much importance. If present indications of the occurrence of ore in commercial quantity be borne out by later developments, there may be expected to come about, as soon as industrial matters resume their normal condition, a marked change in that camp, since much more deep-level development will, no doubt, be undertaken.

Statistics of gold bullion receipts at the Dominion Assay Office, Vancouver, show a decided increase for the current fiscal year as compared with those for the corresponding months of 1913. For the month of August, 1914, approximate, the figures are 22,500 oz. of bullion, valued at $311,000, as compared with 12,000 oz., valued at $161,000, for August, 1913. For the expired five months—April-August—of the present fiscal year, the totals are 103,000 oz., valued at $1,385,000, against 35,700 oz., valued at $529,300, for the corresponding period of 1913.

West Kootenay.

Ainsworth.—During the two weeks ended September 10, ore receipts at Trail from Ainsworth mines were smaller than in August. They were 232 tons from the Bluebell, 152 tons from the Maestro, and 38 tons from the Utica. Neither the Highland nor the No. 1 mine appeared on the list during the first part of the month.

Slocan.—On the whole, there is an improvement in mining conditions in the Slocan mining division. The Rambler-Cariboo mine and mill did not long remain inoperative. Both are again active, and shipment of ore has been resumed, though only on a small scale. Announcement has been made that the Wonderful has been leased. In the Cody neighborhood, both the Surprise and Noble Five are being worked, though neither is sending out ore. Several lessees are working in the Reco, where there is reported to be another good showing of ore opened. A little high grade silver ore is being brought out from the Mountain Con, which is situated at a high elevation and in the mountains beyond Cody. The lessees of the Idaho-Alamo property are getting ore ready for shipment whenever conditions shall admit of its being sent out.

In Silverton camp, the Standard is giving employment to a number of men who are doing deadwork, but no ore is being stoped nor is the concentrating mill running. A quantity of zinc concentrate that had accumulated is being sent to a zinc smeltery in the United States. The Silverton Mines, Ltd., is operating both mine and concentrating mill, the former comprising the Hewitt-Lorna Doone group.

Nelson.—Ore from the Molly Gibson mine, in this division, has been arriving at Trail; in August 158 tons was received, and during the week ended Sept. 10, 147 tons. Work is being done on the Pingree property, on Forty-nine creek, distant from Nelson about a dozen miles. Mr. F. E. Pearce is now superintendent here, and he has opened some promising showings of ore.

In the Sheep Creek and Salmo parts of the district shipment of lead ore has been stopped for the time being. The Queen gold mine and 20 stamp mill have not been affected by the generally unfavorable conditions, for these are being continued in operation. A recently published report is to the effect that a shortage of water for power purposes has necessitated closing for a while the Motherlode Sheep Creek Mining Co.'s gold-saving mill.

Boundary and Similkameen.

The last report published of the Jewel gold mine, in Long Lake camp, eight miles from Greenwood, was to the effect that operations were continuing to be profitable, and that ore was being mined up to the crushing capacity of the 15 stamp mill running there.

The Hedley Gold Mining Co.'s 40 stamp mill at Hedley, Similkameen, is being operated as usual. It is stated that this company, scenting possible trouble ahead, before the European war cut off supplies, purchased sufficient cyanide to meet its needs for a considerable time, so that its progress is not being interfered with by any shortage of mill supplies. The directors declared the customary dividend of three per cent. and bonus of two per cent., the total of profit thus distributed on September 30 having been $60,000.

Coast.

The collection of British Columbia minerals that has been made by officials of the Canadian Government Exhibition Commission is described as being a very good one—generally representative, and the specimens carefully selected, so that this Province should have as comprehensive a display included in Canada's mineral exhibit at the Panama-Pacific Exposition next year as the Provinces of Quebec and Ontario, which have long been well represented in the Dominion mineral collection for exhibition purposes. Mr. W. D. Dalglish, who is in charge of the mineral section, after having spent several months in British Columbia, is about to proceed to San Francisco, to there prepare for next year's big exposition. Mr. Wm. Thomlinson, who has been very assiduous in his endeavors to secure the best samples of ores and other minerals obtainable in the parts of the Province assigned to his charge as mineral collector, will remain in British Columbia to attend to forwarding to San Francisco all the minerals gathered in the Province for display in California. Both men have been thorough in their work of collecting specimens of minerals, and the result will doubtless eventually be of much advantage to the mining industry of the Province.

Portland Canal Tunnels, Ltd.—Supplementary to the information relative to the recent important developments in the deep-level adit that this company has driven, included in the last mining news contributed to the Journal from British Columbia, is the following: On September 4 Mr. W. J. Elmendorf, the company's general manager, telegraphed to the secretary at Victoria that the adit was "twenty-five feet into the green vein and still looking very well. Two feet practically solid ore and four feet mixed ore passed through. All intervening ground well mineralized; probably more ore ahead." On September 5, he telegraphed: "Assays yesterday on galena ore 38 oz. silver. Still in vein with some ore in face." Under date September 8 he wrote that the adit was then in 3,642 ft. Part of his report follows: "The face of the tunnel has never been out of ore since my last letter. I do not mean to give the idea that we have been driving across a vein in a solid ore body, or even that it is all milling ore. Much of it is, however, and several streaks from two to ten inches wide are solid sulphides. The proportion of lead in the ore as we approach the footwall of the vein seems to increase, and I believe that the gold content is bettering also. Our last assays showed on September 6 as under.

	Gold.	Silver.
Average of 1 ft. of ore, half quartz....	$4.80	8.7 oz.
Picked galena	3.20	27.4 oz.
Average 6 in. streak, some waste	12.00	14.8 oz.
Average 1 in. streak, iron and zinc..	0.60	2.7 oz.
Muck on Sept. 5.	1.20	2.8 oz.

"As the face has been advanced far enough to allow us conveniently to get at the first of the ore we cut, I shall properly sample as much as possible before sending my next letter. I am sending down to you samples of ore from the face of yesterday and to-day. You will see that the samples assayed, as above, were not assayed for lead, but we can see the galena in the ore. Samples 1, 2, and 3 reported to-day would go 8, 75 and 15 per cent. lead, respectively. It is not necessary to actually determine the lead contents unless we are shipping ore. We are not yet across the vein, which is at least 43 ft. wide, but a little slate showing yesterday and to-day indicates that we may be nearing the footwall. Another good seam of ore is showing in the face of the adit as I write. I do not wish anyone to be unduly enthusiastic, but can say in all earnestness that the ore body we have opened, and are still opening, is one of great possibilities, and may make a mine for us here. (Note—Last month the depth was stated to be about 2 000 ft. That was incorrect—it may be only about 1,200 ft.)

COBALT AND GOWGANDA

Generally conditions have very much improved during the past two weeks. Satisfactory temporary arrangements have been made with the smelters, and the output from the mines and mills shipping ore and concentrates is normal. For a time the passage of the Atlantic was deemed too hazardous for such valuable contraband as silver, but latterly the Admiralty has notified that the passage of the high seas is clear, and the express companies have taken bullion again at slightly over normal risks.

Kerr Lake has resumed operations with a full crew of between 150 and 175 men. The Drummond Fraction is also working once more; the Beaver is running its mill, but not working underground. The report that the Casey would again put on full force appears to have been premature.

Cobalt Lake.—It is officially stated that the Cobalt Lake Mining Co. will proceed with the draining of the lake. The company had decided after the opening of the war that in view of the financial conditions this important development would have to be laid over until times were more propitious; but recently word has been received from London that the original plans would be adhered to and the draining would commence at once. The Cobalt Town Council notified the company that owing to the fact that there was not sufficient money in the treasury and that it was impossible to sell bonds, the town could not carry out the sewage disposal work rendered necessary by the draining of the lake. The company is understood to be willing to undertake this work and charge it up to the town for payment later.

Nipissing.—The production of $112,905 at the Nipissing last month was made up almost equally of high and low grade ore, $100,899 being credited to high grade and $112,066 to low grade.

That no less than 540 ft. of ore has been developed on vein 98 of the Nipissing is shown in the last report. The vein has been completely developed by a drift and raises from that distance. Three raises have shown the ore shoot to have a height of 65 ft. above the level, and a fourth raise gives a height of 80 ft.

While the vein was being prepared for stope timbers a calcite vein which showed no values at the level has been found to contain ore above the level, and developments to date show one to two inches of ore assaying 1,500 oz. to the ton.

A fifth level is being developed at shaft 73. A winze is being sunk on the centre of the main ore shoot until the Keewatin formation is encountered.

At the 90 ft. level of 64 a drift is being run to the east in order to get under the good ore shoot at the 300 ft. level. The drift to the west has been pushed almost to the boundary.

The "Little Silver" development is proving more remunerative than at first anticipated. The vein assays 2.500 oz. over a width of two inches. Some stoping is being done on vein 122.

NOVA SCOTIA

Dominion Coal Outputs.

The output of the Dominion Coal Co.'s collieries in the Glace Bay district for the month of September will be in the neighborhood of 350.000 tons, compared with 407,000 tons in September, 1913. The Springhill mines will produce about 35,000 tons against 29,000 tons in September last.

The total production to the end of September compares approximately with last year's figures, as under:

	9 mos. ending Sept., 1913.	9 mos. ending Sept., 1914.
Springhill mines	286,000 tons	306,000 tons
Glace Bay mines	3,527,000 tons	3,350,000 tons
Total.	3,318,000 tons	3,656 000 tons
Decrease.		157,000 tons

'Under all the circumstances the decrease in production is less than might reasonably have been anticipated.

The Springhill mines have done particularly well, having increased production by 20,000 tons in the year to date when compared with last year. The workmen at Springhill are to be congratulated on having such steady and continuous employment under the prevailing trade conditions. In this respect the

Springhill mines are at the present time unique among the mainland collieries of Nova Scotia.

Pit-timber supplies.—One effect of the war upon the coal mining industry in Great Britain has been to restrict very severely the importation of pit timber into Great Britain. The supply comes chiefly, or almost altogether, from the countries surrounding the Baltic. Trade papers in Great Britain report an increase of 50 per cent. in the price of pit props, and an interesting sequel has been enquiries in Canada for pit-timber supplies, made through the British Trade Commissioner.

So far as Nova Scotia itself is concerned the available pit timber is not more than sufficient for the needs of the local coal mines, but New Brunswick and Quebec should be able to furnish pit props and timber in sufficient quantities.

Apropos of this question it is interesting to note that an investigation is at the present time on foot under the joint auspices of the Dominion Forestry Department and the Mining Faculty of McGill University, having for its object the collection of information regarding the life and use of pit timber in Nova Scotia, and the possible economies through proper selection of timbers and the use of preservatives. Up to now practically nothing has been done in Nova Scotia in the way of treating pit timber as a preventative against decay and decay-causing fungoid growths. Reference has been previously made in this correspondence to the findings of the reconnaissance of survey of Nova Scotia forests, carried out under the direction of Dean Fernow some few years ago, which showed that Nova Scotia was really but poorly provided with valuable timber, and pleaded for some centralized and intelligent system of tree-planting and fire-guards. European enquiries now develop the significant fact that Nova Scotia possesses barely sufficient timber for her own requirements, notwithstanding that large tracts of Nova Scotia are of such a character as to be of no value for any purpose but that of timber raising. The problem is one that will have to be tackled by the Provincial Government, because no single individual or group of individuals can undertake the work hoping for private profit. The length of years needed to produce saleable lumber, or even such small lumber as pit props, from seedlings, is too long for private enterprise. Even large corporations have to pay dividends, and the shareholders of to-day cannot be made to see the advisability of expending present revenue for the prospective benefit of the shareholders of fifty years to come.

ELECTRICAL EQUIPMENT OF OIL WELLS.

A bulletin issued by Canadian General Electric Co., Limited, describes electrical equipment of a large number of wells and gives tables of actual comparative operating costs for a considerable range of conditions showing excellent results obtained.

A shallow oil find has been reported on the Moses Laforet farm concession 8, Sandwich East township, in Essex County. Laforet drilled through 60 ft. of surface and 50 ft. of rock, first striking gas and then water with a small proportion of oil, about an inch of oil showing on top of a pail of water. John Robinson, a neighbor, struck a small gas flow three years ago, which he is still using for household purposes; but oil was not previously encountered.

CYANIDE PRODUCTION IN UNITED STATES.

"Before sodium cyanide—the commercial product which is now used in gold and silver mining the world over—was placed on the free list, 90 to 95 per cent. of the consumption in America was supplied by domestic production," says F. W. Braun, of the Braun corporation, who is an authority on the conditions which govern its production and consumption.

"Following the removal of the tariff, the reverse became the case—90 to 95 per cent. has been imported, principally from Germany.

The largest plant, although partially dismantled and operated at about one-tenth of its capacity is still in existence. Before the tariff was removed, the United States produced 16,000,000 to 18,000,000 pounds a year, of which the large plant located at Perth Amboy, N.J., yielded 14,000,000 pounds. The owners will probably find it advisable under present conditions to resume operations, provided they can be assured of some protection in the future against foreign importations.

GRANBY.

Operations of the Anyox property of Granby continue satisfactory, according to official reports. Many of the difficulties encountered just after starting the smelter have been overcome. Part of the time the full battery of three furnaces has been operating and as the need for alterations arose one of the stacks has been temporarily shut down. The management had counted on the Midas mine in Alaska being in position to start production during mid-summer, but delays in deliveries of material and the unsatisfactory metal market conditions have made this impossible. It is probable, however, that operations on a limited scale will be commenced late in October or early in November.

THE MANUFACTURE OF COKE IN THE UNITED STATES.

According to Edward W. Parker in a bulletin published by the U. S. Geological Survey the cause of conservation has been as signally and materially advanced during the last few years in the manufacture of coke, through the development of retort-oven practice, as has been evinced in any branch of mining and its collateral industries. The new era in coke making in the United States had its modest beginning in 1893 in the construction at Syracuse, N.Y., of 12 Semet-Solvay by-product retort ovens which were operated in connection with the chemical works of the Solvay Process Co. Progress at first was slow, for among furnace men a strong prejudice existed against the product of the retort oven which lacked certain physical characteristics, particularly the silvery luster and musical "ring" of the beehive coke, to which for many years they had been accustomed. It required a decade for the young rival of beehive coke to establish a firm hold, for, although production increased each year from the time the first plant was constructed, by 1902, the total quantity of retort coke produced was less than 1,400,000 tons, whereas in the same period the production of beehive coke had increased nearly 15,000,000 tons.

The second by-product coking plant to be erected in the United States was one of 60 Otto-Hoffmann (now known as "United-Otto") ovens built for the Cambria Iron Co., at Johnstown, Pa., in 1895, and it was the

enlargement of this plant to 160 ovens in 1899 that probably exercised a considerable influence in convincing furnace men that the luster and ring of beehive coke were not essential qualities in the manufacture of iron.

During the last two or three years the progress in the manufacture of by-product coke has been marked, not only in the number of ovens built and under construction but in the size and capacity of the ovens themselves. The original Semet-Solvay ovens at Syracuse, N.Y., were 30 feet long, 16 inches wide at one end, 17 inches wide at the other, and 5 feet 8 inches high. They had a charging capacity of 4.4 short tons of coal. The original Otto-Hoffmann ovens at Johnstown were 33 ft. 6 in. long, 6 ft. high, and 17 to 21 in. wide, with a charging capacity of 5.5 tons. Many of the retort ovens constructed at the present time are over 36 ft. long and nearly 12 ft. high but without much additional width, and they have a charging capacity of from 12 to 16 tons.

The number of retort ovens in the United States in 1902, the end of the first decade in the era of by-product coke manufacture, was 1,663; in 1912, at the end of the second decade, there were 5,211 such ovens, and in 1913 they numbered 5,688. The increase in the number of retort ovens from 1912 to 1913 was 477, whereas the total number of ovens increased 420, from 102,230 to 102,650. As will be shown later, however, many thousands of the beehive ovens were idle in 1913, more than half of them probably for the whole time, whereas all but 157 of the completed retort ovens were in operation. There were 1,321 new ovens building at the close of 1913, of which 504 were of the by-product type. The output of the by-product ovens in 1913 represented 27.5 per cent. of the total coke production of the United States. In 1912 it represented a little more than 25 per cent., and in 1911 22.1 per cent.

The evolution in coke making is not only in the steady substitution of the retort oven, and its recovery of the valuable contents of the coal other than coke, for the wasteful beehive; it means also the shifting of the coke-making industry from the vicinity of the mines to the centers of manufacture and population, where the gas may be utilized and the other by-products disposed of at a profit. The extent to which this shifting of the coke-making industry has already taken place is evinced by the statistics of production in West Virginia where there are few coke consuming enterprises. From the time the industry was first started in that State the larger part of the product has been shipped to furnaces in other States. The production of coke in West Virginia in 1913 showed an insignificant gain over 1912, and the industry has not only shown no progress during the last 10 years but has materially declined. The quantity of West Virginia coal used in the manufacture of coke, however, has materially increased, but the ovens at which the coal is used are at points in other States, and most of them are of the by-product or retort type. Returns to the U. S. Survey for 1913 show that the quantity of West Virginia coal made into coke outside of the State in that year was 7,546,674 tons, or nearly twice as much as the coal made into coke at ovens within the State. Another evidence of this marked change is that of the 17,826 ovens in West Virginia in 1913, 9,129 were idle the entire year and many others for a portion of the year.

In spite of the progress made in the last few years in the manufacture of coke in by-product ovens the United States is still much behind some European countries in this regard. In Germany and Belgium the retort oven is the only one used, the beehive having been discarded years ago. One of the reasons for the somewhat tardy development in the United States is peculiar, being nothing less than the well-grounded apprehension as to the early exhaustion of the Connellsville coal. Because of the limited span of life yet remaining to the Connellsville region, the owners and operators in that district have not felt disposed to throw away the capital already invested in the beehive ovens that have made the Connellsville district notorious and the coke famous.

THE ORIGIN OF COAL.

According to David White and Reinhardt Thiessen in a bulletin published by the U. S. Geological Survey the fact is almost universally accepted that beds of coal represent accumulations of vegetal matter in varying stages of preservation, with, as a rule, very small proportions of the remains of animal life. Mingled with the organic substances are different inorganic mineral sediments, which, together with the mineral matter originally contained in the plants themselves, constitute the "ash" of coal. The examination of coal shows that the kinds of ingredient plants range all the way from algæ and fungi to large trees of various orders, and that these in turn vary in their own groups according to the depth and the nature of the water in which they grew and according to the other conditions of growth, such as moisture, temperature, soil, light, climate, and the competition of individuals. The species or kinds of plants and the numbers of each kind also differ greatly among themselves, not only during any one geologic period because of the changes of environment, but also from one geologic period to another, and it will be remembered that well-developed coal has been found in the strata of every period since the Silurian.

Most geologists now agree that coal is transformed peat. True there is wide difference of opinion as to how the transformation has been accomplished and even as to whether coal started as such peat as is now found. Some writers insist that the higher grade coal, in its process of development, never passed through geologic stages of existence as peat, lignite, etc., but these writers are relatively few. At all events there is scarcely anyone who does not admit that some peat has been converted to coal in the normal geologic processes. In the following pages the term "peat" is used in its broad sense, to include lowland swamp and salt-marsh or estuarine peats, as well as inland-bog peats. Ordinary or typical coal beds were formed from plant remains in vast lowland or coastal swamps and deltas.

The plant materials composing coal differ both in kind and in degree of preservation, or, rather, of decomposition, for it will be recalled that all the organisms forming the deposit undergo more or less decay, the extent of which depends on climate, water table, and other conditions of deposition, just as in the peat swamps of the present day. The rate and the extent of the decay are controlled largely by the oxygen supply, which is chiefly affected by the rate of plant growth, temperature, the exposure to the air, the drainage, and so forth. Obviously the growth of the peat accumulation requires that the rate of contribution of the plant material shall, on the whole, exceed the rate of decay, the putrefaction being finally smothered by exclusion of oxygen from the buried debris or stopped by the influence of the toxic products of decay accumulating beneath the surface of the bog.

The process must take place beneath a water cover, preferably stagnant, or in the presence of sufficient moisture to prevent the vegetal matter from forming merely vegetable mold or humus. In some cases all of the tender and delicate structures have disappeared, leaving only the most indestructible debris, such as the grains or lumps of resin left by the completely decayed wood of certain conifers, fragments of hard and resistant cuticles, tough and oily seed coats, and gummy spore envelopes. On the other hand, much of the accumulated material may have decayed relatively little, and the vegetal mass composing the main substance of the coal may consist largely of wood, or, rarely, it may contain tender and delicate tissues of miscellaneous types, including fungi and possibly even algæ.

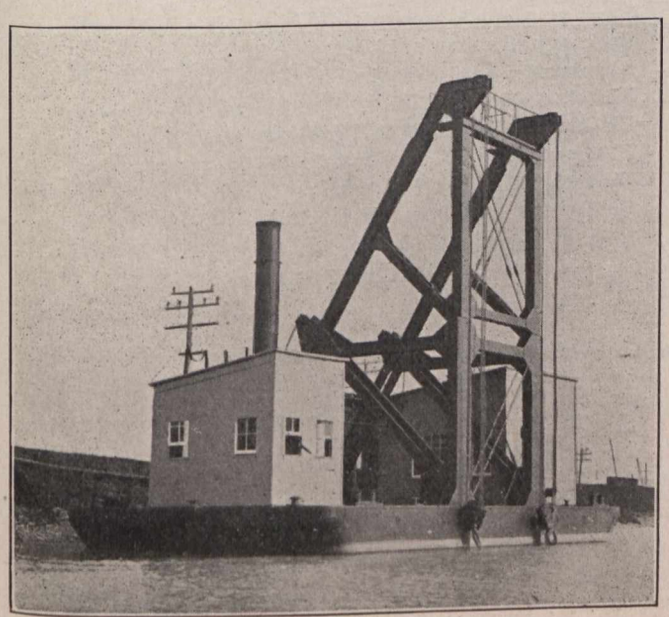
NIPISSING.

Nipissing Mines Co. has declared regular quarterly dividend of 5% payable October 20 to stock of record, September 30. Books close September 30 and re-open October 19. This dividend coincides with the payment made three months ago when the extra of 2½% was omitted. At that time property conditions for a time were not up to normal, and it was decided to eliminate the extra payment. That it was a temporary mine condition, however, was demonstrated by an improvement in earnings which almost immediately set in. The company's cash position during the past quarter has improved slightly. The statement follows:—

	Sept. 8.	June 8.
Cash	$730,149	$865,318
Bullion	126,949	250,140
Ore in transit and on hand	507,831	210,412
Total	$1,364,929	$1,325,870

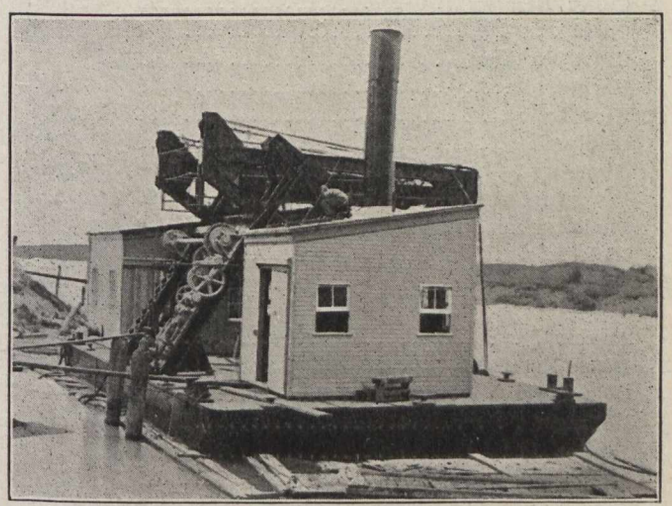
LOCK GATE LIFTER FOR TRENT CANAL.

The accompanying illustrations show the steel pontoon lock gate lifter that was recently built for the Department of Railways and Canals, for service on the Trent canal, by M. Beatty & Sons, Ltd., of Welland. It was designed and built to lift and place into position the lock gates, and its capacity of 50 tons and clearance of 37 ft. above the deck, will enable it to step any of the mitred gates throughout the entire length of the Trent canal. It has a structural steel collapsible derrick, mounted on a steel pontoon, with separate steam engines for each operation.



Gate Lifter with Derrick Raised

The derrick is built of structural steel in two units. When in working position the derrick is erect as shown in cut No. 1. In transporting the lifter from one lock to another, the upper part of the derrick is lowered



Gate Lifter with Upper Part of Derrick Lowered

where necessary, as per illustration No. 2, which allows of its passage under overhead bridges along the canal. The operation of raising and lowering the derrick is performed by a 6 by 6 double cylinder engine mounted on one of the back legs.

The pontoon is kept on an even keel by two movable ballast cars under deck.

SETTLEMENT OF COLORADO STRIKE.

Washington, Sept. 15.

President Wilson was notified to-day that the United Mine Workers of America had accepted the tentative basis for the settlement of the Colorado strike submitted by the President last week. The terms accepted by the miners, and also placed before the Colorado operators by President Wilson provide, in brief, as follows:

A three-year truce.

The appointment of a grievance committee by the President.

Open-shop conditions.

Re-employment of strikers not found guilty of crime during the strike.

Withdrawal of the Federal troops.

In a letter to the President, the executive officers of the Mine Workers said their acceptance was, of course, conditioned upon action by the convention of the Colorado branch of the organization now meeting at Trinidad.

The heads of the mine companies involved have notified the President that they are carefully considering the matter.

MARKETS

QUOTATIONS, SEPTEMBER 23.

Cobalts—

	Asked.	Bid.
Bailey	¾	½
Beaver Consolidated	..	20
Buffalo	..	75
C.-Fer	15	11
City of Cobalt	..	30
Cobalt Lake	45	37
Crown Reserve	1.15	1.08
Gould	1	½
Great Northern	4½	4
Hargraves	2	..
Kerr Lake	..	4.25
La Rose	..	78
Nipissing	5.50	5.15
Peterson Lake	23¼	..
Timiskaming	9	8½
Wettlaufer	..	5

Porcupines—

	Asked.	Bid.
Apex	2	½
Dome Extension	5¼	..
Gold Reserve	..	1
Hollinger	18.00	17.00
Jupiter	4½	..
McIntyre	29¾	27
Pearl Lake	2¼	..
Porcupine Cobalt	80	..
Porcupine V.	17¼	..
P. E. D.	1¼	¾
Rea M.	..	10
Teck-H.	7⅛	7

TRANSACTIONS, SEPTEMBER 23.

	Open.	High.	Low.	Close.	Sales.
Bailey	⅝	..	..	⅝	500
Beaver Consolidated	20½	..	..	20½	500
Dome	6.50	..	..	6.50	75
Hollinger	17.00	..	..	17.00	5
Porcupine Vipond	17	..	..	17	300
Timiskaming	8½	..	..	8½	500

STANDARD EXCHANGE.

Toronto, Sept. 22.

The Standard Mining Exchange decided yesterday to retain its minimum list, which means that no mining stocks may be offered on the Exchange for a less amount than fixed by the committee when the exchange re-opened on August 24.

The minimum scale fixed by the Exchange, and below which no sales are permitted, is as follows:—

Cobalts—

Beaver	.17
Buffalo	.75
Chambers-Ferland	.10
Canadian	.05
City of Cobalt	.30
Cobalt Lake	.30
Coniagas	6.00
Crown Reserve	1.00
Great Northern	.04
Hudson Bay	30.00
Kerr Lake	4.00
La Rose	.70
McKinley-Darragh	.40
Nipissing	4.75
Peterson Lake	.23
Seneca Superior	2.00
Timiskaming	.07
Trethewey	.12
Wettlaufer	.04½
York, Ont.	.07

Porcupines—

Dome Extension	.05
Dome Lake	.30
Dome Mines	6.50
Foley O'Brien	.20
Hollinger	16.00
Homestake M. F.	.20
Jupiter	.04
McIntyre	.27
Pearl Lake	.02
Porcupine Crown	.75
Porcupine Peterson	.25
Porcupine Vipond	.17
Rea Consolidated	.10
Teck Hughes	.07
West Dome	.05

TORONTO MARKETS.

Sept. 23.—(Quotations from Canada Metal Co., Toronto)—
Spelter, 6c. per lb.
Lead, 5c. per lb.
Tin, 38c. per lb.
Antimony, 6c. per lb.
Copper, casting, 13½c. per lb.
Electrolytic, 13½c. per lb.
Ingot brass, yellow, 10c. per lb.; red, 12c. per lb.

Sept. 23.—Coal—(Quotations from Elias Rogers & Co., Toronto)—
Anthracite, $7.75 per ton.
Bituminous, lump, $5.25 per ton.

GENERAL MARKETS.

Sept. 21—Connellsville coke (f.o.b. ovens).
Furnace coke, prompt, $1.70 to $1.75 per ton.
Foundry coke, prompt, $2.25 to $2.35 per ton.

Sept. 21.—Tin, straits, 32.00c.
Copper, Prime Lake, 12.25 to 12.37½c.
Electrolytic copper, 11.87½ to 12.00c.
Copper wire, base, 13.25 to 13.50c.
Lead, 3.80 to 3.90c.
Spelter, 5.30 to 5.40c.
Sheet zinc (f.o.b. smelter), 8.50c.
Antimony, Cookson's, 11.00c.
Aluminum, 18.50 to 19.00c.
Nickel, 40.00 to 45.00c.
Platinum, soft, $48.00 to $50.00 per oz.
Platinum, hard, 10%, $52.00 to $54.00 per oz.
Bismuth, $2.75 to $3.00 per lb.
Quicksilver, $75.00 per 75-lb. flask.

SILVER PRICES.

	New York, cents.	London, pence.
September—		
12	55	..
14	54⅛	24⅝
15	52⅝	23 15/16
16	53⅜	24¼
17	52⅝	24
18	51¾	23 13/16
19	51½	23⅝
21	51½	23⅝
22	52½	24⅛
23	53	24¼
24	53	24¼