THE CANADIAN MINING JOURNAL

VOL. XXXII. TORONTO, July 15, 1911 No. 14

The Canadian Mining Journal

With which is incorporated the
"CANADIAN MINING REVIEW"
Devoted to Mining, Metallurgy and Allied Industries in Canada

Published fortnightly by the

MINES PUBLISHING CO., LIMITED

Head Office - - - 17-21-23 Manning Arcade Annex, Toronto
Branch Offices - Montreal, Halifax, Victoria, and London, Eng.
London Office - - - Walter R. Skinner, 11-12 Clement's Lane, London, E.C.

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

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

CIRCULATION.

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

CONTENTS.

MINING AND THE COST OF LIVING.

Of late years the scales have been removed from the eyes of the consumer. Publicists, through our most effective magazines, have made it plentifully plain that all of us pay more than we should for the necessaries of life and industry. The wide movement of reform that is spreading over America is manifested chiefly in the public exposure of the intricate iniquities of trusts, and in official investigations that sometimes bring results and sometimes do not. But reform, vaguely perhaps, and only rarely crystallized into definitive acts, is nevertheless pervading the atmosphere, not only in America but pretty well over the civilized world.

From South Africa, where the mining and farming communities feel most keenly the unbalanced incidence of taxation, there comes word of evidence given before the Industries and Commerce Commission. The witnesses examined were representatives of the consumers' organization. Let us glance for a moment at their asseverations.

Whilst the peculiar and pressing need of South Africa is a larger population of whites, yet the same injurious fiscal and industrial conditions obtain there as in Canada. As illustration, here is an excerpt from evidence taken: "No tariff can increase the total amount of work for white men in South Africa, but it may, and probably will, diminish it. . . The miner and the farmer have to carry the burden of protection. They subsidize protected industries, which in many cases means subsidizing the Kaffir and the coloured man who do not even purchase the articles they produce." The point is developed that only when the white man is enabled to live in decency and comfort at the lowest possible cost will he attain his fullest effectiveness.

Amongst the positive suggestions made, several bear upon bounties and subsidies. It is urged that customs duties be levied for revenue purposes only, and apply mainly to luxuries; that railways be run at cost and deficits of branch lines be paid out of general revenue; that coal, raw materials, and food supplies be carried at minimum rates; that harbour deficits be met out of general revenue; and that temporary bounties be granted to industries dependent upon raw material, provided there is reasonable ground for believing that they can shortly survive without the bounties. In short, a general downward revision of duties and railway rates is requested, along with a judicious trying-out of a temporary system of bounties. One strong point made refers to the fact that the local Johannes-

burg manufacturer is amply protected by the cost of laying down foreign goods in that city. He needs no tariff wall. It is shown also that the man with a family to support bears a burden of taxation out of all proportion to that borne by the bachelor. "It would be difficult," continues the evidence, "to conceive a more foolish and iniquitous system of taxation for a new country in need of white population."

The parallel between Canada and South Africa holds in a general sense. In detail, the circumstances of the two Dominions are widely divergent. The mining industry of the Rand is highly organized. Costs are so closely controlled that the immediate effect of extraordinary charges can be readily traced. The large gold mines are placed upon an industrial basis. Reserves are estimated more exactly than is possible in less favoured regions, and expenditure is carefully governed by engineering factors. Briefly, South Africa is pre-eminently a mining region. In agriculture and in manufacturing it has made but slight progress.

In contrast, Canada's chief industry is agriculture. But Canada also has large lumbering, mining, manufacturing, and fishing interests. Directly and indirectly Canadian manufacturers are enormously subsidized. Tariffs, bonuses, special subsidies, and a score of equally expensive devices aid the manufacturer. The consumer pays for all. Naturally the agriculturist, the lumberman, and the miner are bled.

The Johannesburg Daily Mail quotes from Mr. J. J. Harpell's book, "Canadian National Economy," a paragraph tracing the decline of Canada's gold output to the increased cost of living. Whilst we admit freely that in a country like South Africa, where gold mining has attained a degree of solidarity, any addition to living expenses will react at once upon the industry, we contend that Canadian gold mining has never reached the stage where the cost of living has become a serious factor. The impression that the Yukon, for instance, would still be producing on its old scale had it not been for inflated costs is entirely beside the point. Every new Canadian mining camp goes through a period of high prices; and each camp must ultimately be worked by large corporations on its own merits.

We do not deny that the cost of living is a problem in mining as in all other activities. But it does not become a problem in precious metal mining until certain other elements have had full play. The Yukon is thriving and probably will continue to thrive. Deserted gold mines are being re-opened in Nova Scotia and Ontario. If the cost of living was prohibitory ten years ago it is certainly much more so now. Yet never has there been more activity than at present. The volume of output is principally a function of the generosity of nature.

THE FLOODING OF THE PORT HOOD COLLIERY

From the accounts available at the time of writing there seems to be no doubt that the Port Hood Colliery has been inundated by water from the ocean entering through a break in the submarine cover. Sufficient particulars are, however, not as yet available to enable an opinion to be formed as to the cause of the inundation and the possibility of the cause having been preventable.

The Port Hood colliery has had many vicissitudes, and it has probably never made any money for its owners. The first attempt to mine coal at Port Hood was made in 1865 by the Cape Breton Mining Company, who drove a slope from the crop of the six feet seam; but operations were suspended in 1867.

The Port Hood mine at the present time has a main slope extending 2,800 feet from the surface at an angle of 27 degrees. The company operating is the Port Hood and Richmond Coal & Railway Company, and for some time past the bondholders have been in possession, and have made a very determined effort to make the mine pay. A new compressor was recently installed and coal-cutting machines were put to work underground. One difficulty of coal mining on the Inverness shore is the lack of suitable shipping ports, and the long drift-ice season, requiring the banking of large quantities of coal in the winter, which in its turn means the tying up of large sums of capital. During the summer the men worked irregularly, preferring to find employment on a breakwater which the Government have been constructing for many years to preserve the harbour of Port Hood. The unfortunate flooding of the mine will prove a ruinous blow to the town of Port Hood, and is greatly to be regretted.

The Inverness coalfield seems to have been particularly unfortunate, both in its financial aspects and its natural features. There can be little doubt that the detached basins of Chimney Corner, Broad Cove, Mabou, and Port Hood are all remnants of one great coalfield, which has been split up by folds of the strata and afterwards denuded, until nothing is left but the bare tips of the coal basins at the shore. Some of the seams have without doubt disappeared under the waters of the Atlantic; others are visible at low tide only, and all the time the sea is encroaching on what is left. In 1871 Mr. Richard Brown expressed the opinion that "immediate steps should be taken by the Government to ascertain the exact situation and economic value of every seam of coal in Inverness; because, owing to the rapid wearing away of the cliffs on a coast exposed to the heavy surf of the Gulf during the prevalent northwest winds, and to the combined action of severe frosts and rapid thaws, all vestiges of these valuable coal-seams will soon be entirely obliterated. In proof of this view it need only be stated that Seal Island, composed of carboniferous strata, which, beyond all doubt, was once connected with the mainland, is now separated from it by a channel two miles in width, the intervening land having been entirely swept away by the waves. It is evident, therefore, that a belt of coast, at least two

miles wide, has disappeared, effacing the outcrops of many valuable seams of coal. If this process be repeated to the extent of only one mile more, it is equally evident that all the outcrops now visible will be washed away, leaving 'not a wreck behind.' If correct plans are made, showing the position of every seam, at a future time, when all traces of them have disappeared, they may be reached by cross-cuts driven from the bottom of shafts sunk upon the adjacent shore, and worked under the sea."

It is comparatively recently that the Mabou mine, which lies some six miles to the northward of Port Hood, was flooded from the sea, and it is improbable that this mine will be re-opened. The Government of Nova Scotia can hardly err in taking whatever steps they deem necessary to prevent the flooding of the accessible portions of these submarine areas, because it may well be that such occurrences may render it impossible ever to mine the coal-seams that lie further out to sea.

Doubtless, the unfortunate accident at Port Hood will add something to our knowledge of the mining of submarine coal, and some useful deductions may be made for future guidance when more definite information is available. It may not be generally known that by far the greater portion of Nova Scotia's coal seams are submarine, and it is difficult to exaggerate the importance of their conservation, since they constitute the main source of the Provincial revenue. They also constitute the best guarantee for the future industrial development of the Maritime Provinces and eastern Canada in general.

SALARIES.

Not once, but many times, have we urged upon the powers that be the policy of paying higher salaries to the officers of the Federal Department of Mines.

In the last annual Summary Report, Mr. R. W. Brock, Director of the Geological Survey, puts the case strongly. In part, he writes thus: "The salaries paid to technical officers are too low. . . . More will have to be done if the Survey is to attract and retain the type of man that is needed to secure good results. . . . The first requirement is the man; the facilities for work are of only secondary importance."

Mr. Brock then proceeds to show that the system of gradual promotion is inimical to the Survey's best interests. The lowest salaries paid to technical officers are attractive only to young graduates who have a reputation to make. Such men are engaged by corporations at the very time that their services are becoming of value to the Survey. The loss to the Survey, which is forced to begin all over again with raw material, is serious.

Another problem presents itself when experienced geologists are attached to the staff. These men can be held only by giving them the highest salaries paid by the Survey. Manifestly this is unfair to the older officers whose salaries increase slowly from year to year, and who have not yet reached the highest division.

Mr. Brock does not suggest any alternative for the present system, the imperfections of which need no demonstration. He confines himself to asserting that larger salaries are needed if the Survey is to retain its dignity and its usefulness.

We are inclined to believe that the solution of the difficulty lies in the hands of the Director, in part at least. Naturally he will be helpless without larger support from the Government. But there are matters of internal economy that call for immediate change. For instance it is a patent absurdity to apply to the Survey the same graduated classification of officers as is applied to clerical departments of the civil service. The Survey officers are essentially technical. If classification be necessary at all, it should be as simple as possible. Merit and special qualifications should count more, and long service less.

Incidentally, the anomalous and unseemly "time-book" should be consigned to the scrap-basket. In view of the fact that the Survey staff is composed of reputable professional men, and is not a miscellaneous assortment of irresponsible clerks, the idea of forcing each officer to record his goings and comings is futile in the extreme.

It seems but fair to say that the Survey's claims will be listened to with more favour as soon as it has been placed upon a professional and not a clerical basis.

FAME.

What is fame? The answer is easy. A capable press agent can bring you a surfeit of fame — if only you point a cheque-book at him. And no one has been luckier in his press agent than Mr. John Hays Hammond, "Special Representative of the President of the United States of America" at the Coronation.

In an anonymous appreciation of Mr. Hammond that was published in the London Daily Mail lately, it is stated, metaphorically and hyperbolically, of course, that Mr. Hammond "can smell a gold mine a thousand miles away." There follows mention of the passionate yearning of the Czar of all the Russias to meet the man who could exercise, with so much benefit to his nation, his olfactory upon undiscovered mineral riches.

But, as the effusive scribe points out, Mr. Hammond has forsworn mining and is to devote the remainder of his time and energy, not to mention his acute sense of smell, to the cause of international peace. So eloquent is the admiring agent that a brooding feeling of security immediately descends upon us.

* * * *

What it costs in mere money to reach the heights that Mr. Hammond has reached, we can only guess. But there remains no doubt that he is famous and will remain famous. He stands unique, alone, the man with

the largest salary in the world, the man who has capitalized his proboscis from the Rand to Mexico, and from Siberia to Cobalt, where lies a mine called Nipissing.

MILLING IN COBALT.

That there is excellent milling being carried on in Cobalt is indicated by Mr. A. P. Globe's paper on another page. Mr. Globe is mill superintendent of the McKinley-Darragh. His knowledge is first-hand, and what he writes is keenly interesting.

An extraction of more than 90 per cent. on ore such as is put through the McKinley-Darragh mill is creditable indeed. The extraction of silver from a 43-ounce ore at the McKinley-Darragh is 90.55 per cent. The tailings contain only 4.1 ounces per ton. Costs, also, are kept low. The mill is equipped to treat 60 tons of ore per 24 hours. The milling cost per ton of ore milled is $1.30. The cost per ounce of silver recovered is three cents.

We note with approval that steps have been taken to install a hand-picking section, with the object of reducing the value of the ore that goes to the stamps.

In the swirl of other mining excitements the steady development of Cobalt has been lost to view. In the staid, progressive Cobalt of to-day it is hard to recognize any trace of the blustering mining camp of four years ago. But nothing is more worth following than the ever growing efficiency of a mining camp that has cut its eye-teeth, and is in the hands of competent technical men. Whilst our metaphors may be mixed, we wish to draw attention to the fact that Cobalt has reason to be proud of her mining and milling practice.

THE INTERNATIONAL GEOLOGICAL CONGRESS

Coal is to be the chief topic of discussion at the twelfth session of the International Geological Congress to be held in Toronto next summer. The Eleventh Congress discussed the iron ore resources of the world, and published the results in monumental volumes. Logical sequence suggests that coal be the next subject of enquiry.

Already there has been distributed a circular outlining the campaign that is under way. Concise reports are being obtained from all mining countries touching both worked and unworked deposits. Actual, probable, and possible reserves are to be estimated, and complete forms are provided to assist in classifying scientifically each particular fuel and in determining its commercial value.

It is most urgently requested that each and every mining official do his best to aid in this world-wide stock-taking. The information thus gained will do much to forward the saner use of our most important mineral commodity.

EDITORIAL NOTES.

French capitalists are putting money into Newfoundland oil lands. Submarine claims between Parson's Pond and St. Paul's Bay have been taken up.

In the volume on Porcupine published by the CANADIAN MINING JOURNAL, acknowledgment was omitted of the courtesy of Mr. A. C. Goudie in supplying tracings of the township maps.

The CANADIAN MINING JOURNAL is always anxious to receive notices of the movements of mining engineers. Brief items will be welcomed. It is good business for engineers to keep the mining public posted as to changes of address and absences from headquarters.

The representatives of the coal miners' unions in New Zealand have been requested by the British Admiralty to undertake to supply the navy at any time required, whether a strike exists or not. The reply of the unions was indefinite. They refused to bind themselves, but agreed to give due consideration to specific applications.

During the calendar year 1910, the Buffalo mine milled 41,484 tons of ore, averaging 36.07 ounces silver, a total of 1,496,255 ounces. The mill recovery was 80.07 per cent. The cyanide plant treated 11,700 tons of slime from the mill, containing 13.06 ounces of silver per ton, or 152,783 ounces in all. The recovery here was 103,321 ounces, or 67.62 per cent The total recovery by mill and cyanide was 1,301,396 ounces, or 86.98 per cent.

The extraordinary altruism of the larger breed of capitalist was never better demonstrated than by a recent utterance of Mr. Daniel Guggenheim. On leaving New York, Mr. Guggenheim delivered himself of a remarkable statement in which he expressed the fear that copper prices may soon become abnormally high. He dreads a "runaway price," and urges an organized community of copper interests so that prices may be kept at a decently low level. To Mr. Guggenheim we award the prize!

The Rev. Dr. Gordon ("Ralph Connor"), chairman of the Board of Conciliation that is attempting to patch up the dispute between operators and employees in southern Alberta and Crow's Nest Pass, showed singularly little discernment in his request that both sides send in a statement of their grievances and of the concessions that they were willing to make. It is the chairman's business to collect, sift, and weigh the evidence. Then it is his duty to recommend such measures as he sees fit. Dr. Gordon's attitude is weak and puerile.

Personal and General

Mr. G. C. Bateman is at Elk Lake City.

Mr. Kirby Thomas, 20 Broad Street, New York, was in Toronto on June 28.

Mr. J. B. Tyrrell has returned from the Swastika mining region.

Mr. W. F. Ferrier, mining engineer, Lumsden Building, Toronto, has returned to town.

Mr. H. W. Hardinge, 50 Church Street, New York, has returned from a professional visit through western Ontario in the interest of New York clients.

Mr. Kirby Thomas, of New York, is in the Sudbury region.

Dr. A. E. Barlow has gone north to Cobalt and Porcupine.

Mr. William McGinnis is in Cobalt.

Mr. M. J. Butler, general manager of the Dominion Coal Company, recently visited the company's Springhill collieries.

Mr. Robert R. Hedley, who is now technical adviser to a Vancouver organization named the Canadian Mining Operators, has been spending several weeks in Nelson mining division, West Kootenay, B. C., making enquiries with a view to the purchase of mining properties.

Mr. Norman Carmichael, formerly manager of mines in the vicinity of Nelson, B.C., and now general manager of the Arizona Copper Company, with headquarters at Clifton, Arizona, was in Victoria, B.C., towards the end of June.

Mr. W. Yolen Williams, of Spokane, Wash., will spend several months in the Coast district of British Columbia making enquiries relative to copper mining and smelting, and obtaining other information for the Granby Consolidated M., S. & P. Company, Limited. He will make Vancouver his headquarters while on the coast.

Mr. A. J. McMillan, liquidator of the Le Roi Mining Company, has gone to London. It is understood that a sale of the Le Roi mine, at Rossland, B.C., has been arranged, subject to confirmation by those who were directors of the company when liquidation was decided upon.

Mr. Andrew G. Larson, who lately paid a visit to Toronto, New York, and other cities, has returned to Vancouver, B.C.

Mr. Frederick G. Coggin, of the Deister Concentrator Company, has been spending some time in Idaho and eastern Washington, introducing his company's machines.

Mr. Byron N. White, of Spokane, Wash., president of the company owning the Slocan Star group of mines, near Sandon, Slocan, B.C., has lately been in Whitehorse copper camp, southern Yukon, in connection with the proposed resumption of operations at his Pueblo mine there.

Mr. James McEvoy has gone to the upper Skeena district, British Columbia, to open coal measures on property owned by a Toronto syndicate.

Mr. Jay P. Graves, vice-president and general manager of the Granby Consolidated M., S. & P. Co., Ltd., has returned to Spokane, Wash., from attending an important meeting of the directors held in New York.

Mr. E. Jacobs, of Victoria, B.C., has been re-elected secretary of the Western Branch of the Canadian Mining Institute, for the ensuing year.

Mr. Chas. Camsell, of the Geological Survey of Canada, is to do some reconnaissance work in the Steamboat Mountain district, British Columbia, during the summer and autumn.

Mr. W. M. Brewer, of Victoria, B.C., has resigned as president and director of the Pacific Metals Company to accept the position of general manager of the Matanuska Gold Mines, Limited, owning a free-milling gold quartz property in the Matanuska district, near the head of Cook's Inlet, Alaska. Mr. Brewer left for the north at the beginning of July.

Mr. George Safford, for a long time business manager of the Mining Journal, London, England, has joined the staff of The Mining Magazine.

Dr. A. M. Campbell, who returned from London and Scotland about a month ago, is at present in Porcupine. Dr. Campbell's permanent address is 70 Gloucester Street, Ottawa.

Mr. James Ashworth, late general manager of the Crow's Nest Pass Coal Co., has established an office at 1109 Hornby Street, Vancouver, B.C. Mr. Ashworth has had long experience in all phases of coal mining. He is thoroughly familiar with mining in the Canadian west.

Mr. Louis Reyersbach, managing director, and Mr. Hugh F. Marriott, consulting engineer of the Central Mining & Investment Corporation, of London, England, will visit this country in August. The corporation has recently taken over and consolidated with their own the interests of Messrs. Wernher, Beit & Company and Messrs. Eckstein & Company, the largest operators in Kimberley and the South African Rand. These gentlemen are making a tour of Canada and will visit the most interesting mining localities in this country in company with Mr. G. G. S. Lindsey, of Toronto, formerly president of the Crow's Nest Pass Coal Co. Arriving in New York on the 28th of July, they will proceed to New Brunswick and ultimately reach Vancouver, after which they will visit both the Skeena River and the Portland Canal. Mr. Marriott, it will be remembered, represented, with Mr. William Frecheville, the Institution of Mining & Metallurgy on the summer excursion of the Canadian Mining Institute in 1908.

Correspondence

DEEP DRILLING.

Chicago, July 3, 1911.

Gentlemen,—We note on page 403 of your July 1st issue, a summary of records of deep wells, including mention of one bored in 1905 near Johannesburg, South Africa, to a depth of 5,582 feet.

A few months after the hole referred to in your article was completed, John Skenke, an American drill contractor, using a Sullivan diamond prospecting core drill, class "P," completed a hole at a depth of 6,340 feet. A year or two ago, another American contractor, named William Gallagher, put down a hole on the Rand to a depth of about 6,600 feet.

The deepest diamond drill hole of which we have any record on this continent, was one bored in the summer of 1909, by Messrs. Cole & McDonald, of Virginia, Minnesota, near Republic, Michigan, with a Sullivan Class "D" diamond drill. This hole went to a depth of 3,265 feet.

Yours very truly,
"MINE AND QUARRY,"
S. B. KING, Editor.

Concentrating Methods at the McKinley-Darragh Mine, Cobalt, Ont.

Written for the CANADIAN MINING JOURNAL by A. P. Globe, Mill Supt., McKinley-Darragh Mine.

Before going into the details of concentration at this mine, it should be pointed out that at nearly every mill in Cobalt the mill man has a different proposition in the concentration of Cobalt ores, which calls for some special treatment or permits of some step being omitted, or even permits some practice that would be prohibitive elsewhere

At one mine the values are carried in veins of very high grade ore, the wall-rock carrying very low or no values. Here a large percentage of values can be removed by hand picking or sorting plants. Under these conditions the ore going to the concentrator is reduced to from 10 to 20 ounces silver per ton. This enables the mill to make a high ratio of concentration and also a high grade of concentrates, but a lower extraction than where the veins are of a lower value and the values carried mainly in the wall-rock. The latter does not permit sorting to as great an extent before concentration as the former, therefore the grade of concentrates and ratio of concentration will be lower, but the percentage of extraction much higher, so it is hardly fair to compare such figures as ratio of concentration, average values of concentrates produced and per cent. of extraction.

It is not a matter of concentrating silver, but of the many grades of Cobalt ores.

In the following paper the writer has attempted to give correct information, to the best of his knowledge and belief, and it is to be understood that such figures as tonnage, value per ton, cost per ton and percentage of extraction, each depending one on the other, are estimated to a certain extent; that is, facilities are not provided to weigh every pound of ore and accurately sample mill feed as a customs plant must do. Figures may vary, although the law of averages will correct high and low points over a large tonnage and time.

The general formations milled at the McKinley-Darragh concentrator, are the Huronian slates and conglomerates with a certain amount of Keewatin. Generally the veins are small and split up, yet give a large amount of vein matter.

The metal of economic value in the veins and country rock is silver. It occurs in the form of leaf silver, argentite, ruby silver, dyscrasite, stomeyerite, freieslebenite, associated with smaltite, niccolite, glaucadot, calcite, and other sulphides and arsenides. The wall-rock slates carry a considerable quantity of sulphides and metallics, from a coating or paint of the former to nuggets of the latter. The many combinations formed by the various minerals and gangue give a specific gravity anywhere from 2.7 to 9.9, i.e., from calcite to dyscrascite.

Whereas the cyanide man's salvation often lies in the sliming of his ores, the reverse is the condition here. A certain amount of the values when once slimed will float away and no amount of mechanical concentration will save them, as has been found by returning the pulp over tables again and again under different conditions. As to the question of overcoming this difficulty, it will be seen from the flow sheet and tables that the sliming of values has been considerably reduced.

The accompanying flow sheet illustrates the flow through the mill:

The stamps are provided with slot screen .375-inch x .187-inch aperture, .066-inch wire, 102 drops per minute, 7-inch drop, level discharge, 90 per cent. water. This practice gives stamp duty of about 4.25 tons per 1,250-pound stamp, plus tonnage by-passed equals 146 tons per day of 24 hours for 30 stamps.

The following table gives distribution of values and sizes in feed and discharge of stamps:

FEED.

Mesh.	Per cent.	Assay
On 1¼-inch	11.	19 ounces.
On 1 -inch	14.	19 ounces.
On ¾-inch	21.	19 ounces.
On ½-inch	21.	19 ounces.
On ¼-inch	17.	19 ounces.
Through ¼-inch	16.	19 ounces.

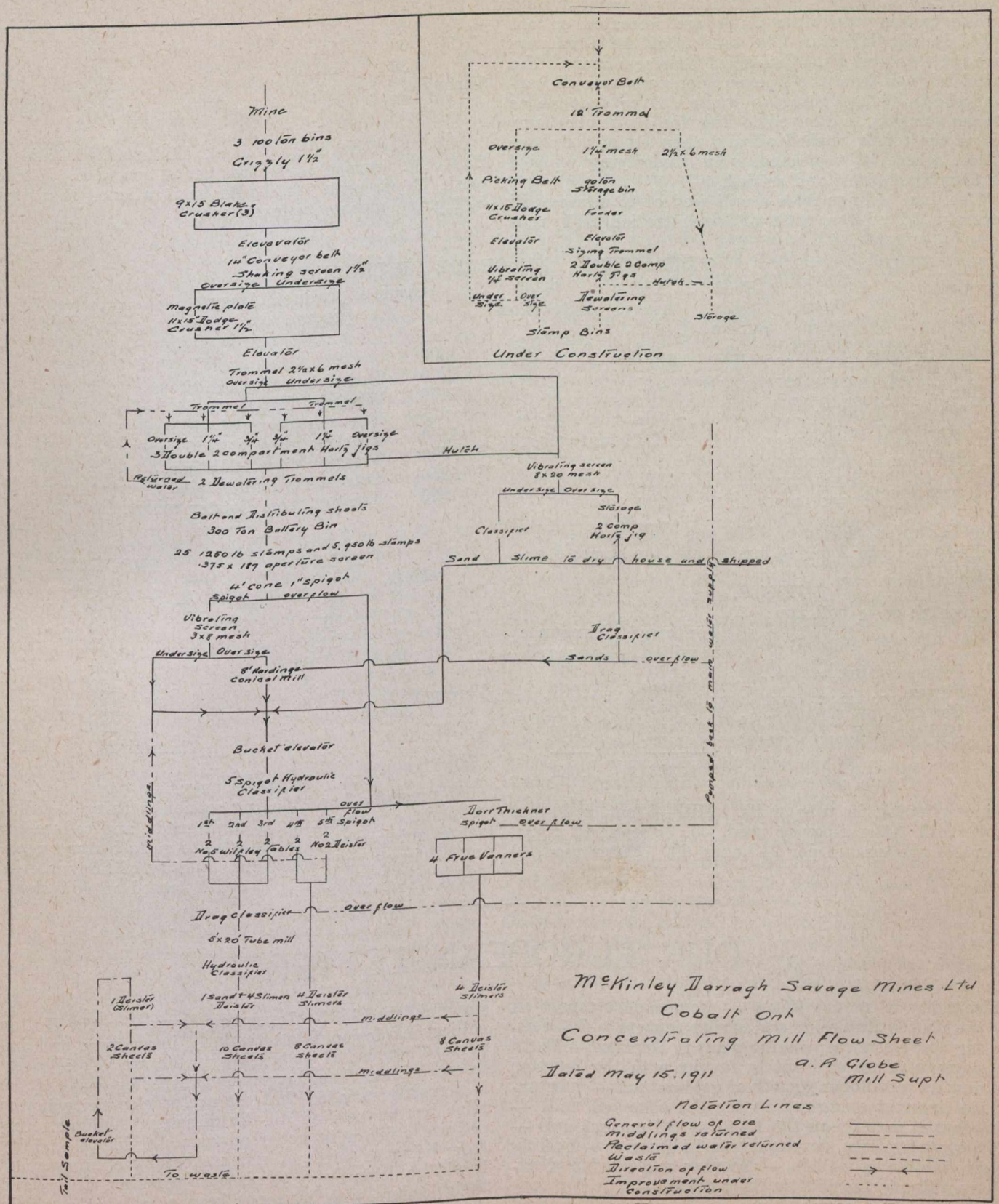
DISCHARGE.

Mesh.		Per cent.	Assay per ton.	Total oz. silver contained in 120 tons.
On	8	17 60	8.00	168.96
	10	4.30	8.24	42.52
	20	16.60	10.20	203.18
	40	15.20	18.32	333.79
	60	7.99	22.16	212.73
	80	6.47	23.60	183.23
	100	6.70	27.56	221.58
	120	1.55	32.36	60.38
	150	1.15	33.92	46.90
	200	3.06	33.76	124.11
Through	200	19.38	29.28	691.40
		100.	19.	2288.78

The run of mine is received in three separate bins, which permits mine sampling of this spotty ore in large lots.

On the first grizzly high grade is picked out and sacked, and after crushing to 3-inch the ore is conveyed to a shaking screen where high grade is again picked out. After crushing to 1¼-inch, the ore is elevated to a trommel 2½ x 6 mesh, where the undersize is washed out and by-passed around the stamps. In this way 18 per cent. is removed. This is joined by the hutch product from 6 Hartz jigs (the largest jig screen being 3-16-inch, round punch). This by-passed material and Hutch product is passed over an 8 x 20 mesh screen, the over-size going to a Hartz jig. The under-size is separated, the sands to table feed, and the slimes are settled and shipped direct, without further treatment. These slimes form about 1 per cent. of the total ore and will average 200 ounces of silver per ton.

The over-size of 8-mesh from the stamp pulp, and tails from fine jig are re-ground in one 8-foot Hardinge conical mill. This product, together with the stamp pulp under-size of 8-mesh, and about 4 tons of sands from original wash (running about 70 ounces per ton) is classified for 10 sand tables and 4 Frue vanners. By coarse crushing only 19.38 per cent. of slimes is made in the batteries, and the value of 17.6 per cent. of the battery pulp is reduced to 8 ounces before fine grinding. With the average stamp pulp


Under Construction
Conveyor Belt
12' Trommel
Oversize
1¼" mesh
2½" x 6 mesh
Picking Belt
90 ton Storage bin
11x15 Dodge Crusher
Feeder
Elevator
Elevator
Sizing Trommel
Vibrating ½" Screen
2 Double 2 Comp Harz Jigs
Hutch
Under Size
Over Size
Dewatering Screens
Storage
Stamp Bins
Mine
3 100 ton bins
Grizzly 1½"
9x15 Blake Crusher (3)
Elevator
14" Conveyor belt
Shaking screen 1½"
Oversize
Undersize
Magnetic plate
11x15 "Dodge" Crusher 1½"
Elevator
Trommel 2½"x6 mesh
Oversize
Undersize
Trommel
Trommel
Oversize 1¼" ¾" ⅜" ½" Oversize
3 Double 2 compartment Harz Jigs
Hutch
Returned water
2 Dewatering Trommels
Belt and Distributing shoots
300 Ton Battery Bin
25 1250 lb stamps and 5 950 lb stamps
·375 x 187 aperture screen
4' Cone 1" Spigot
Spigot
overflow
Vibrating Screen 3x8 mesh
Undersize
Oversize
8' Hardinge Conical Mill
Bucket elevator
5 Spigot Hydraulic Classifier
Middlings
Over Flow
1st 2nd 3rd 4th 5th Spigot
2 2 2 2 2
No 8 Wilfley Tables
No 2 Deister
Dorr Thickner
Spigot
overflow
4 Frue Vanners
Dorr Classifier
overflow
5'x20' Tube mill
Hydraulic Classifier
1 Deister (Slimer)
1 Sand + 4 Slimer Deister
4 Deister Slimers
4 Deister Slimers
middlings
2 Canvas Sheets
10 Canvas Sheets
8 Canvas sheets
8 Canvas Sheets
middlings
Bucket elevator
Tail Sample
To waste
Vibrating screen 8x20 mesh
Undersize
Oversize
Storage
Classifier
2 Comp Harz Jig
Sand
Slime to dry house and shipped
Dorr Classifier
Sands
overflow
Reclaimed water to mill water supply
McKinley Darragh Savage Mines Ltd
Cobalt Ont
Concentrating Mill Flow Sheet
Dated May 15. 1911
A. R Globe
Mill Supt
Notation Lines
General flow of ore
Middlings returned
Reclaimed water returned
Waste
Direction of flow
Improvement under Construction

running 19 ounces per ton the sands will run 22 ounces and the slimes 18 ounces per ton.

The tails from 6 Wilfley sand tables, which will run 5 ounces, are re-ground in one 5 x 20 tube mill and re-treated on 5 Deister tables. The tails from four sand tables treating the finer sands are retreated on old style Deister slimers. The tails from the 4 vanners are retreated on No. 3 Improved Deister slimers. The total tailings from the Deister floor pass over 28 canvas sheets before going to waste. Over the canvas tables the pulp is allowed to flow for about one hour, when the top is washed off and elevated to a Deister table, where it is cleaned. The underlying mineral is then washed off and settled.

The final tailings from a mill feed of 43 ounces will average 4.1 ounces, ratio of concentration 20-1, thus

	FEED... Mesh	%		PRODUCT. Mesh.	%
On	8	.70	On	40	1.3
	10	2.10		60	12.
	20	34.		80	27.
	40	34.70		100	17.1
	60	14.		120	4.
	80	11.10		150	2.6
Through	80	3.40		200	22.0
			Through	200	14.0

Mill, 8-foot Hardinge Conical. H.P used, 50. Speed, 27 R.P.M. Tons of ore treated per 24 hours, 48. Water used, 70 per cent. It should be mentioned that this 50 h.p. includes motor inefficiency.

EXTRACTION AND GRADE OF PRODUCT.

Unit	Feed Assay. ounces.	Tail Assay.	% of Extraction	Grade of product. Assay per ton.	
Hand picking	43	41.4	.35	1500	
Coarse jigs..	39	19.	51.30	1200	Bed skimmed (smaltite).
Fine jig..	40	18.	55.	1450	Jigging through screen bed of.
Wilfley sand tables	23	5.	78.30	975	Treating sizes 8-40 mesh.
Deister sand tables	21	6.	71.50	1150	Treating sizes 40-120 mesh.
Vanners	19	9.	52.20	500	Treating sizes 120-slime.
Deister Slimers	9	5.5	40.	250	Retreating vanner tails.
Canvas Sheets	4.5	4.	13.	200	Tailings from Deister tables.

showing an extraction of 90.55 per cent. The sand in tailings will run 2 to 2½ ounces and the slimes 5 to 7 ounces.

COSTS.

Average costs will run:

	Per ton of ore milled.	Per ounce Recovered.
Concentrating	.670	.007
Power.....	.300	.008
Power plant repairs	.007	....
Mill repairs	.326	.016
	1.303	.031

Fine grinding in tube mills. Mill—5-foot x 20-foot tube mill. Horse-power used, 55. Speed, 19 r.p.m. Tons of ore treated per 24 hours, 60. Water used, 60 per cent.

	FEED. Mesh	%		PRODUCT. Mesh.	%
On	8	58.	On	40	1.
	10	10.		60	4.
	20	20.8		80	13.
	40	1.6		100	13.
	60	.8		120	4.
Through	60	.8		150	17.
				200	36.
			Through	200	12.

Improvements.

At present a hand picking section is being installed to increase the quantity of high grade, and reduce the values going to the stamps, also to get a better screening efficiency and reduce the quantity of fine material going to the stamps. This is illustrated on flow sheet.

OUR EUROPEAN LETTER

Electricity in British Mines — Government report on the Hulton Explosion and earlier reports — Interesting new electrical winding plant in Durham — South African mines still out in favour with the investor despite continuous growth of gold output — Substantial interest evidenced in the Giesecke ball mill — What it may do on the Rand — Oil market dull — Slow petroleum developments in Russia — Falling production in Galicia — Reasons and results of extraordinary London tin fluctuations —

(Exclusive correspondence of CANADIAN MINING JOURNAL.)

London, June 21, 1911.

Electricity in mines is one of the questions that is always being debated now and the definite statement just published in the Government report on the Hulton colliery explosion is particularly interesting and important because of its bearing on the use of electricity in coal mines. The Government inspector says that he is perfectly satisfied that the use of electricity in the mine has no bearing on the disaster. Although this definite opinion is not read as absolving electricity from being a source of risk under any circumstances it will go a long way to reassure working miners and their leaders who have not been at all backward in declaring that the electric switch at the conveyor face was the initial cause of the explosion.

A Government committee was appointed to look into the whole of this class of operation as far back as 1902 and a second committee in 1909 revised the rules sug-

gested by the earlier committee. It was pointed out that although the accidents and ignitions arising from electrical causes were on the increase, yet, having regard to the great increase in electrical plant, the risks attending the use of electrical plant in mines were decreasing, and in no year had the fatal accidents due to electricity been greater than 1.54 per cent. of the total fatal accidents. The risks associated with the use of electricity may be classified as due to either shock or ignition. There are two ways of attacking the shock problem. One is that of employing such a low pressure that the shock would seldom be dangerous and the other is that of employing only properly protected apparatus. The view in this country is that for all fixed plant the latter is the better and indeed the only really safe method. For portable plant complete protection should be aimed at, but having regard to the inherent difficulties in the way of totally preventing contact with live parts, it is advisable to adopt a low pressure as a further safeguard. In the case of fixed plant adequately protected, the question arises as to whether any limits should be set to the pressure under which it should work. Many think that there should be a limit, and a fairly low limit, and ten or even five years ago there was considerable justification for such a view, for at that time high tension cables and apparatus had not been as thoroughly developed as they have been since, and moreover not much attention was then paid to the special requirements of colliery electrical apparatus.

The above mentioned second committee in its report stated very definitely that it saw no reason why a high-pressure system should not be as safe as regards risk of shock and explosion as a medium or low pressure system. The adoption of higher pressures is moreover accompanied by some substantial benefits. A high pressure cable is thinner and lighter and more easily handled and supported than a low pressure cable of the same power, and it is generally of the highest class of construction, and provided with extra thick insulation.

The safe use of high-pressure apparatus turns upon the provision of complete protection. The only satisfactory protective system is the elementary but effective one of encasing all live parts in a substantial metallic sheath or box maintained at earth potential. A good deal of discussion has lately taken place as to the advisability or otherwise of earthing all apparatus. There are difficulties. In dry mines, particularly, good earths are often difficult to obtain, and two earth plates some distance apart may even be at appreciably different potentials until connected. If a difference of potential is maintained it will, of course, lead to the flow of current in the protective armouring, which may have objectionable results. On the other hand the risks of a difference of potential being maintained are small, except possibly in very deep or extensive mines. Armouring may be local or continuous, but the latter is much safer. Indeed, if the armouring is discontinuous a section of the armouring may, in the case of a faulty earth, become dangerously charged. To maintain armouring in continuous conditions involves systematic inspection. It is held that all electrical plant should be systematically inspected, and the absence of competent inspectors should not be admitted as an excuse.

The report insisted strongly upon the need for having all the electrical plant properly looked after, as well as thoroughly well made in the first instance. There is no doubt that competition, which has been more than usually keen in the electrical industry, had in some instances reduced strengths and proportions below a proper limit, but a considerable improvement is taking place, and the report strongly disapproved of the suggestion that the Home Office should officially approve of certain types of mining electrical apparatus. In this most engineers, if not all colliery managers, will agree with them, for official approval would certainly tend to hamper progress, which is particularly needed in the early stages of the mining electrical industry. The quality of workmanship and materials are as important as design or type; official approval could only be a partial guarantee, and would tend to relieve the colliery manager of his proper responsibility for the safety of his mining equipment.

A very interesting winding engine plant operated electrically has just been put in an important Durham colliery. The depth of the shaft is 162 feet, the time of each wind 15 seconds, the average winding speed 648 feet per minute, and the time allowed for changing 10 seconds. The winding gear is fitted with a coned drum, varying from 5 feet 6 inches to 7 feet 6 inches in diameter. The 100 b.h.p. motor is of the three-phase type, 440 volts, 40 cycles, and drives on the drum shaft through a flexible coupling and a train of machine cut helical gearing. The winder is fitted with automatic winding gear, which, in the event of an overwind, trips the main switch and cuts off the supply to the motor, and also applies the main post brakes. This gear also comes into operation in the event of failure of the supply, and is further fitted with an emergency lever, by which it may be brought into operation by hand.

The switch gear consists of an iron-clad column fitted with a three-pole oil switch with overload and no-voltage release, and an isolating switch is provided, interlocked with the main switch and the various doors of the switch column. The controller is of the rising liquid type. the control being carried out by means of one lever, which is "off" in the central position. A small centrifugal pump and motor are provided on the controller, the pump constantly delivering water from a storage tank contained in the controller bed-plate to the tank containing the electrodes. This tank is fitted with a rising and falling shutter, which is operated from the control lever, and regulates the level of the liquid in the tank. The reversing switches are mounted upon the shaft that operates the controller, and one switch is provided for each running direction. The switches are worked by means of a link motion from the control lever.

South African mines in London, although at times showing a desire to spurt, are now again completely out of favour. Yet the industry is not doing badly, although there is the usual falling off in the supply of native labour which is to be expected at this time of the year. The gold output keeps growing. Last March the record, which, owing to exceptional circumstances, had stood since December, 1908, was at last broken. In April the daily average yield was again a record,

but owing to the month being a thirty-day one the aggregate production was below high-water mark. For May, however, one has to chronicle a new record, the total of 685,950 ounces being nearly 10,000 ounces better than in March. The daily average has, on the other hand, fallen by 130 ounces. But this is much more than explained by the drop of 6,500 ounces in the East Rand Proprietary's May return, as a result of the fire on the Driefontein section. Thus the loss of nearly 4,000 "boys" from the Rand's working force last month has not yet affected working results, although it will, no doubt, influence the figures for the current month.

The midsummer Rand dividend list is satisfactory enough, a decrease in the case of the Ferreira being offset by a further increase in the Modderfontein dividend. The latter was rather unexpected considering the heavy capital requirements of the company. The Ferreira is this time only paying about what it is actually earning, the accumulated profits not being further drawn upon for the bonus which has been usual for some time past.

Great interest is being aroused in this country in connection with the Giesecke ball mill, and rumours are current as to the possibility of its displacing the present ordinary stamp batteries. It may be remembered that Lionel Phillips, in Johannesburg, on May 28th, made a reference to this appliance which, although in an experimental stage, he said, was destined to have a great influence on the future of the Transvaal gold mining industry. The inventor of the machine is now on the Rand, but particulars from his home in Germany indicate that the machine will greatly simplify the methods of recovering gold, besides making a big reduction in costs. The mill is meant to displace the ordinary stamp batteries, and the tube mills introduced on the Rand some five years ago, the crushing being completed and the ore reduced to a consistency of slimes by a single operation. There are no screens, and the amalgamation process is also eliminated, the cyanide being applied directly as the product leaves the grinder. The ore is crushed so fine (to 60-mesh screen) that the recovery of the gold by cyanide will be effective. The mill consists of a huge wrought-iron cylinder, about 23 feet long, over 8 feet in diameter for the first third of its length, and about 6 feet for the rest. The reduction of the ore is effected by means of steel balls, which both crush and grind it. The cylinder is divided into three compartments, and the balls in each are graded in size according to the stage of grinding, beginning with balls of about 4 inches in diameter in the first section and ending with about 1½-inch in the last. Within the cylinder are placed some ten rows of so-called "fall-plates" of heavy steel; these lift the balls and the ore about half-way up the cylinder as it revolves, when the whole mass drops upon the next plate. Water is fed in with the ore at the rate of about one-third of a ton to each ton of ore, which means a very heavy reduction in water consumption as compared with stamps.

There has been no special increase in the volume of business in the oil share market here lately. A fair sized full account exists in most descriptions. There is not much news that is fresh from the European oil fields. At Baku the relatively low returns continue, whilst at Grozny the yield in the first months of the year wears a satisfactory aspect. This area has rapidly risen from the position of an interesting petroleum region to that of an important contributor to Russia's total supply, more than making up for the decline at Baku, the importance of which looks like becoming within a measurable time simply one of inland supply and demand. Such must become the case till at least the petroleum reserves in sight at Maikop are exhausted, and it cannot positively be stated yet whether the period will be a long or a short one, or, again, whether Maikop may not yet reveal reserves of petroleum at various levels to dwarf the supplies that Baku may be able to send to the Black Sea shipping port of Batoum. Hitherto Maikop has developed very satisfactorily.

Of what is doing on the other petroleum lands of Russia not much is to be said. There are frequent reports of gusher strikes at Tcheleken, in the Caspian Sea. But little news comes through from Ferghana respecting the Tchimion Oil Company's operations, etc. And the Government boring operations in search of payable petroleum at Uchta in the north do not appear to have yielded satisfactory results. But it is said that these operations are on far too small a scale for forming a useful opinion. They, however, have been carried out at great expense, as the tools and pipes had to be carried over many miles of hitherto untrodden land, and special houses had to be constructed for the workmen.

The falling off in the production of certain wells in Galicia has aroused particular interest, especially in view of the fact that during the last few months British capital in the Galician field has been largely increased. A well in this field costs between $50,000 and $70,000 to drill and from eighteen months to two years before the principal oil horizon is reached. Drilling, therefore, has been fairly slow. Another cause which has contributed slightly to diminish the production has been a local water trouble.

The tin position here is a very uncomfortable one, sensational rises and slumps in the price of the metal being of almost daily occurrence. The Anglo-Continental syndicate, which has been so successfully manipulating the market, has now evidently come to the conclusion that discretion is the better part of valour, and that to push its advantage to extremes would be only to incur dangers the effects of which might be disastrous. Apparently it has come to terms with the bears after unmercifully squeezing them for as long as it could do so without causing a panic. As it is, its operations are likely to have a lasting influence on the London metal exchange, and no one will be greatly surprised if one of their results is a sweeping change in the regulations affecting that organization. Already the establishment of a similar institution in Germany is threatened, and unless the London Exchange arranges to permit dealings in tin other than that of Straits or Australian origin, it is only too probable that the threat will be carried out. It is contended, with some show of reason, that the London Exchange is abusing its monopoly, and that by boycotting tin not produced in the Straits Settlements or Australia it is creating an artificial shortage, which is detrimental, not only to consumers, but to all the various trade interests affected.

GOLDBEARING SERIES OF LAHAVE BASIN, LUNENBURG COUNTY, NOVA SCOTIA

Abstract of report by E. Rodolphe Faribault, from Summary Report of Geological Survey for 1910.

The greater part of the district is underlain by the quartzites and slates of the Goldbearing series; but towards the north and northwest these rocks are cut by granites of Devonian age, which extend northward across South Mountain to the Annapolis Valley, and form part of the very large granite area which constitutes the backbone of the western counties of the Province. A small isolated mass of greenish grey granite was located far away from the main area, at a place situated 2 miles east of Italy Cross station, and one-fourth of a mile north of the outlet of Wallace Lake. At this locality, a recent conglomerate has been prospected for gold.

In the absence of fossils and other conclusive evidence, it has been customary to refer provisionally the Goldbearing series to the lower Cambrian, though on account of their similarity to the quartzites and slates of the Avalon peninsula of Newfoundland, which have been assigned to the Pre-Cambrian, as well as for other reasons, it is possible that they may be Pre-Cambrian.

The series as exposed in different parts of the Province has been estimated to have a total thickness of over 5 miles. This great series of rocks falls naturally into two lithologically distinct conformable divisions; a lower one, called the Goldenville quartzite; and an upper one, called the Halifax slate.

The Goldenville division is mostly made up of thick beds of grey, altered quartzose-sandstone or quartzite, locally called "whin"; interstratified with beds of dark clay slates, which are quite numerous at certain horizons, but almost wanting at others, especially at the top of the division. At many places, and more especially near granite intrusions, these rocks are much altered, and have become schistose, with a development of very minute scales of mica along the planes of schistosity, which gives them a characteristic glistening appearance when split. The Goldenville division has a thickness of over 3 miles of strata in the eastern part of the Province.

The Halifax division is composed entirely of argillaceous slates, in some cases arenaceous, and with occasional flinty layers holding iron pyrites. Dark grey layers occur sparingly, and are sometimes found to be slightly calcareous, especially when occurring at the base of the division. The lower beds are olive green in colour, and are followed by others of dark grey colour which gradually give way to a great thickness of glistening bluish-black, foliated, graphitic, soft clay slates, often pyritous, overlain by banded, black and grey arenaceous slates. The thickness of the Halifax division has been estimated at over 2 miles of strata.

After their deposition these sedimentaries were uplifted and folded into a succession of anticlines and synclines following northeast and southwest courses. They were then subjected to extensive erosion, which removed the upper part of the folds and gradually planed the surface down to its present attitude, exposing the edges of the uptilted, once deeply buried strata. The rocks, generally, dip at high angles, ranging from 45 deg. to 90 deg. from the horizontal.

In view of the intimate relation existing between the structure of the anticlinal folds and the occurrence of the gold-bearing quartz veins, special attention was paid to the location and structure of the anticlines and synclines. A section across the folds along Lahave River from Bridgewater to the old Dalhousie Road gave a succession of five major anticlines and synclines in a distance of 25 miles. Minor folds were also observed along the crest of some anticlines, especially for the first 4 miles above Bridgewater, where the strata have been plicated into a succession of small folds or undulations. Going up Lahave River the five anticlines are met with in the following order from south to north·

(1) Leipsigate Anticline crosses the river at Bridgewater, where it is composed of several minor folds in slate well exposed along the west side of the river. These folds converge westward as they approach the Leipsigate gold district, where they join and form a broad dome along which the Goldenville quartzites are brought to the surface and extend to the west. The most southerly of the minor anticlines extends eastward through the Blockhouse gold mines where the Goldenville quartzites are again brought to the surface on a smaller elliptical dome one mile long by a quarter of a mile wide. From these two domes situated, respectively, west and east of the river, the anticline pitches towards the river, forming a cross syncline which is strongly marked and extends north and south along the river, affecting the other folds similarly but to a less degree.

(2) Spondo Anticline crosses the river 4½ miles north of the first anticline and half a mile south of Mossman station. It extends eastward to the granite, passing the south end of Big Mushamush Lake and through the Spondo gold prospect, where a large saddle-shaped vein has been uncovered. Westward, it crosses Wile and Fire Lakes south of Baker Settlement. It shows nothing but slate along its whole course. A minor anticline between the above two anticlines was located in grey slate at Waterloo, where it crosses Frederick and Matt Lakes, but it could not be traced eastward to Lahave River on account of the drift.

(3) Northfield Anticline crosses the river at Northfield station 3 miles north of the second anticline. Traced eastward it crosses the north end of big Mushamush Lake and continues through Caribou Lake where the slates are superseded by the quartzites which are brought up to the surface along a broad dome extending to the granite. West of the river the anticline passes near Clifford post-office, where it converges with the adjoining north syncline in dark grey slate.

(4) Pleasant River Barrens Anticline is situated 4½ miles north of the third anticline, and crosses the river at an island 2¼ miles north of Riversdale station, where the lower quartzites appear at the surface on a westerly plunge of the fold and spread out towards the east beyond Newburn and New Cornwall to the granite. It crosses the outlet of Indian Lake and the north end of

Church Lake, where numerous cross veins and a few interbedded veins have developed. West of the river the quartzites are overlain by the upper grey slates on the transverse syncline which is here strongly marked; but, a short distance farther west, the quartzites again appear at the surface on a broad elliptical dome, on the eastern end of which the gold mining district of Pleasant River Barrens has been located.

(5) Cherryfield Anticline occurs at a distance of 9½ miles north of the fourth anticline, where it begins at the granite contact on the main river, directly east of Cherryfield station, and extending eastward, crosses the Sarty Road at the school house and the Sam Moore Road half a mile south of the bridge over North River, and ends at the granite, 3 miles farther east. This anticline brings to the surface lower beds than any other fold in the district, exposing at the surface a thickness of 2½ miles of the Goldenville quartzite, which extends southerly for 3½ miles to the Halifax slate, and northerly beyond the next syncline to the granite along the old Dalhousie Road. The strata dip at angles increasing from 25 deg. to 80 deg. on the south side of the anticline, and from 25 deg. to 65 deg. on the north, and appear to form a very narrow dome near the Sarty school house, where quartz veins have been uncovered.

Some interesting granite contacts are well exposed at a few points along the boundary line, one of which may be observed at Dog Falls on the west side of Lahave River, below the bridge, half a mile north of Cherryfield station. As a general rule the quartzites are altered quartz-mica schists, but the strata show no local disturbances as a result of the granite intrusion.

Evidence of dislocation and faulting has been observed, however, at many places, especially in the vicinity of large projections of the granite into the sedimentaries, but the disturbances are apparently the result of movements that took place subsequent to the irruption of the granite. At Upper New Cornwall—between Otter Lake, the northeast end of Big Mushamush Lake, and the south end of Church Lake—the strata are much disturbed, and there is probably an important fault running northerly in the direction of Union Square, Morton Corner, and Sarty, along which the western block has moved south with reference to the east one. Towards the south, this fault probably runs along the eastern shore of Big Mushamush Lake and passes through Slaughenwhite Island and Farmville towards Blockhouse. Along this course much brecciated country rock and quartz is shown. The cross veins operated at Blockhouse are probably a zone of fractures on the southern extension of this fault.

Economic Geology.

Gold.

Leipsigate Gold District.—Two gold mining districts, Leipsigate, and Pleasant River Barrens, are situated in the area surveyed. A detailed survey of Leipsigate was made in 1904 and a report on that district was included in the Summary Report for that year, pages 321-329, together with a plan on the scale of 500 feet to 1 inch, published separately. After 1904, operations were continued until 1908 on the Micmac fissure vein by the Micmac Gold Mining Company, and a depth of 596 feet has been attained. When in operation the Micmac mine proved a good producer, and there is every reason to believe that under good management it should still continue to yield well. In 1905 and 1906 some work was also done at the Owen mine on the same vein. A little prospecting was done in the northern part of the district by Simeon Erust and others, but no important discovery has been made since the survey of 1904.

Pleasant River Barrens Gold District.—The district is situated in Lunenburg County, on the Pleasant River Road. 15 miles north of Bridgewater, between Rhyno and Shingle Lakes, on the eastern end of a broad elliptical dome of quartzites, which is 4 miles long by 2 miles wide, and is surrounded and overlaid by the slates of the Halifax division. The auriferous quartz veins occur at the outer edge of the dome in slate layers interstratified between thick beds of quartzite (which often stand out prominently and form a succession of parallel ridges with intervening swales) curving gradually around the eastern part of the dome and dipping towards the southeast, east, and northeast at angles of 20 deg. to 40 deg. The district has been idle for the last twelve years, hence only a cursory examination could be made of the old workings. Several veins have been uncovered, a few of which have been developed, but none of them have been exploited, except to a limited extent. The more important veins are the Dunbrack, Mill, Pine Tree, Brignell, Ernst, and Bent leads. A specially rich but narrow pay-streak was worked for a short time on the Dunbrack lead at the intersection of an angular vein dipping north 60 deg. One fissure or cross vein, was also discovered by James Deal, crossing the strata in a southwesterly direction. Most of the work was done in the eighties and nineties, and three stamp-mills are reported to have been erected.

On the east side of the river, gold-bearing veins have been uncovered and prospected at several places, but the results obtained appear to have been unsatisfactory. The most important veins developed are the following:

On the southeast side of North River, 2 miles east of Meisner post-office and three-fourths of a mile east of O. Acker's house, a vein was discovered in 1892 by Thomas Acker, and worked by a Windsor company to a depth of 40 feet; a five-stamp mill was built and 60 tons of ore crushed, but the prospect was finally abandoned. The vein is 1 to 10 inches thick, dips north 78 deg., and is interbedded in altered quartzite, in contact with the granite. In 1909 a few other parallel veins were prospected by David Lawrence.

At Upper New Cornwall, at Rocky Point on the northeast shore of Big Mushamush Lake, two veins were opened in or about 1888 by Freeman Millet, in slate between walls of quartzite. On the north vein there is a pit 21 feet deep, and on the south one, two pits 24 feet deep, but the whole prospect is now flooded by the lake.

Farther north, half a mile south of Indian Lake, on the east side of the road, a vein 12 inches thick cutting across the quartzite was prospected by W. H. Prest with two shafts 25 feet deep, and some ore was crushed at the Blockhouse mill. Numerous other cross veins have been located between this prospect and the foot of Indian Lake along the fault passing in this vicinity. Ore-shoots may possibly occur at the intersection of some of these cross-veins with the interbedded veins which are found along the Pleasant River Barrens anticline at the foot of Indian Lake and the north end of Church Lake.

Copper.

Over twenty years ago, at Dalhousie East, Kings County, situated 10 miles northeast of Springfield station, on the west side of Crossburn Road and three-fourths of a mile north of Old Dalhousie Road, a shaft was sunk to a depth of 165 feet on a copper-bearing vein in granite. At the surface the vein appears to strike S 25 deg. E magnetic, and dip vertically. Samples picked up at the mouth of the shaft show the ore to be chalcopyrite and chalcocite in a gangue mostly composed of granite and quartz. An analysis of the samples made at the Mines Branch gave 1.05 per cent. of metallic copper, but did not show the presence of gold, silver, nickel, tin, or tungsten, for which elements they were tested. Irving Smith, who occupied the farm on which the shaft was sunk, and also worked at the mine, furnished the following information: The vein was discovered about the year 1876 by Ainslie Wilson, and the shaft was started in 1890 by a Bridgewater company. The shaft measures 14 by 8 feet, is 165 feet deep, and is timbered to a depth of 100 feet. At the cropping the vein was 12 inches wide, and proved rich to a depth of 20 feet, where large crystals of quartz were found, after which it decreased in size and value, and at the depth of 100 feet it began to dip towards the east, and its size became less than 2 inches. At a depth of about 20 feet, a drift was driven 12 feet one way and a few feet the other. The vein has not been traced at the surface, because its outcrop is probably of very limited extent; as in the case of the King vein at Lake Ramsey, near New Ross. Drift of similar ore is reported, however, to have been found half a mile farther north in the direction of the vein, half way between Irving Smith's present house and Sixtymile Lake, where also traces of copper were found on an outcrop of granite.

Iron Ochre.

A deposit of yellow and red ochre was found at Auburndale, along Heckman Brook, on the west side of Lahave River, and 4 miles north of Bridgewater. The deposit is said to be 1 to 2 feet thick, and 50 tons taken from John Penney's farm were shipped to Halifax in 1908.

Whetstone.

A quarry of slaty rock suitable for the manufacture of whetstones was opened in 1901 by George McFaden, of Bridgewater, at Parkdale, Lunenburg County, at the outlet of Whetstone Lake, 9 miles northeast of New Germany. The rock is composed of beds of hard, greenish, grey, siliceous and argillaceous slate, occurring at the base of the Halifax slate division; the strata dips south at an angle of 75 deg. After about two years' operation, McFaden sold the quarry to a Maine company, which continued operation for a short time, and erected a building for machinery, which, it is said, never reached the quarry on account of financial difficulty. The quarry is now 3 to 6 feet deep, 12 feet wide, and 25 feet long.

Tin and Manganese at New Ross.

At New Ross, Lunenburg County, some distance east of the district surveyed last summer, two important veins, one bearing manganese and the other tin and copper, were opened last summer.

A vein of manganese recently discovered by Ernst Turner in granite, 2 miles to the north of Wallaback Lake, and 8 miles north of New Ross, has been opened by a Windsor company, under Dr. H. W. Cain's management, with a shaft to a depth of 145 feet; and it is reported, with very satisfactory results. The vein varies in width from 4 to 18 inches and dips nearly vertically. The ore, which carries streaks of red hematite near the surface, is found to be exceptionally free from iron at a lower depth. An assay of some samples gave only 0.1 per cent. of iron, with 5 to 6 per cent. of carbonate of baryta. A similar vein of manganese, occurring at a distance of 1¼ miles to the south, was exploited a few years ago by Dr. Cain, but has not yet been reopened.

A tin-bearing vein, also recently discovered by Ernst Turner, at Mill Road, 4 miles north of New Ross, has been prospected under the management of A. L. McCallum. It has been proved to a depth of 20 feet, and for a length of 250 feet, while the float has been traced half a mile towards the north. The vein is 24 inches wide, mostly made up of quartz, merging with granite at the sides, and carries at the middle a streak of rich ore from 3 to 5 inches wide. Several assays of the ore made by Mr. McCallum have given from 10 to 30 per cent. tin, and 8 per cent. copper, present in the form of cassiterite and chalcopyrite, with association of tungsten-bearing and zinc minerals. Several other veins occurring in this vicinity, and showing copper, molybdenite, etc., have not yet been prospected.

Tungsten.

A new discovery of tungsten ore, in the form of scheelite, has been made by W. H. Prest, at Middlefield, Queens County, near the Fifteenmile Brook gold mine, and prospecting was started last fall in order to trace the float to the parent vein.

International Geological Congress

12TH SESSION, CANADA, 1913.

Coal Resources of the World.

OTTAWA, May, 1911.

For some years the attention not only of geologists and mine owners, but also of the general public, has been directed to the question of the coal reserves of the world. The very large increase in the consumption of coal in recent years makes this question of the world's supply of great importance to almost every country. The Eleventh Congress dealt with the iron ore reserves of the world, calling attention to the fact that, along with coal, the iron ore supply is one of the most important factors in industrial development, and to the radical importance of the relation between supply and demand in these materials to the industry of the future.

The Executive Committee of the 12th Session of the International Geological Congress, to be held in Toronto, in 1913, has, therefore, decided to make coal the chief subject for discussion at that session. In order to obtain a sure basis for the discussion and to secure a profitable result, the committee would like to have

the co-operation of colleagues in every country, so that they may publish statistics of the amount and distribution of the world's supply of coal. With this end in view, we have decided to address to the proper authority in each country, a respectful request that there be sent to us for publication a concise report on the geological occurrence, extent of the coal areas, and amount of the reserves in that country.

The statement should include:—

(I.) Coal of economic value contained in seams of workable thickness, situated within a mineable distance of the surface.

(II.) Coal of economic value contained in seams of workable thickness, situated beyond present mineable distance of the surface, but possibly of future availability.

In Group I. should be given coal in seams containing not less than 1 foot of merchantable coal occurring not more than 4,000 feet below surface, including workable submarine areas.

In Group II. should be given coal in seams containing not less than 2 feet of merchantable coal occurring not less than 4,000 feet and not more than 6,000 feet below the surface or submarine areas not included in Group I.

Since estimates of quantity may differ in exactitude, both groups should be subdivided into: (1) Actual Reserves, including cases in which the calculation of the amount is based on a knowledge of the actual thickness and extent of the seams; (2) Probable Reserves, including cases in which an approximate estimate only can be arrived at; and (3) Possible Reserves, including cases in which an estimate in figures cannot be given. Thus:—

In columns 1 and 2 returns should be expressed in figures. In 3 a general statement should be made, e.g., "Large," "Moderate," "Small." All quantities in columns 1 and 2 should be given in metric tons.

In order to have the various reports uniform and easily comparable, a standard classification has been adopted, to which, it is respectfully requested, the matter of each report should be made to conform. A chapter summarizing the chief results will be prepared by the committee, but each report received will appear separately.

This classification is adopted as a simple basis on which the desired information can be received and correlated. The committee recommend a discussion by the Congress, looking to the adoption of a universal standard classification.

The reserves of coal of each of the following classes or subdivisions of classes should be given in conformity with the above schedule. It is hoped that the characteristics mentioned under each class and subdivision of class will enable authors to place in its proper class, not only a well known coal, but even a coal that may not have been closely studied.

Class A.

(1) Burns with short, blue flame; gives off 3 to 5 per cent. of volatile combustible matter.

$$\text{Fuel ratio} = \frac{\text{Fixed carbon}}{\text{Volatile matter}} = 12 \text{ and over}$$

Calorific value 8,000 to 8,330 calories, or, 14,500 to 15,000 British Thermal Units.

GROUP I.

Including seams of 1 foot or over, to a depth of 4,000 feet.

District	Coal Seams		Actual Reserve. (Calculation based on actual thickness and extent.)			Probable Reserve. (Approximate estimate.)			Possible Reserve.
	No of	Thickness.	Area	Class.	Metric tons.	Area	Class.	Metric tons.	
Napanee...	1	3 ft 2 in to 3 ft 6 in	2 sq m	A_2	7,841,118	.....	.....	.....	
	3	1 ft., 3 ft, and 4 ft	.....	.....	.....	Same area	A_1	18,214,560	
Essex.....	5	Aggregate 25 ft.	50 sq. m	B_2	1,312,337,500	.....	.....	.....	
	4	Aggregate 15 ft.	.....	.....	.....	Same area.	B_1	786,750,000	
Mackinnon	2	4 ft and 5 ft	.....	.....	.....	200 sq. m	B_2	1,888,000,000	Large.
Olliver.....	15	Aggregate 60 ft	1½ sq. m	B_1	21,189,580	.....	.....	.....	
				B_2	81,267,320	.....	.....	.....	

GROUP II

Including seams 2 feet and over at depths between 4,000 and 6,000 feet.

District	Coal Seams		Actual Reserve. Calculation based on actual thickness and extent.)			Probable Reserve. (Approximate estimate.)			Possible Reserve.
	No	Thickness	Area.	Class.	Metric tons.	Area.	Class of coal.	Metric tons.	
Mackinnon	1	3 ft	.....	.....	.....	200 sq. m.	B_1	600,000,000	Moderate.
Olliver. ...	2	2 ft and 3 ft	1½ sq m.	A_2	8,538,075	.....	.....	.....	
Ballantyne	.....	.....	.....	.....	.....	150 sq. m.	.....	.....	B_1 large. A_2 moderate.

Mean composition,

Carbon	93 to 95 per cent.
Hydrogen	2 to 4 per cent.
Oxygen and nitrogen	3 to 5 per cent.

(2) Burns with slightly luminous, short flame and little smoke; does not coke and yields from 7 to 12 per cent. of volatile matter.

Fuel ratio, 7 to 12.

Calorific value generally 8,330 to 8,600 calories, or, 15,000 to 15,500 B.T.U.

Mean composition,

Carbon	90—93
Hydrogen	4—4.5
O and N	3—5.5

Class B.

(1))Burns with short, luminous flame and yields 12 to 15 per cent. volatile matter; does not readily coke. Fuel ratio 4 to 7.

Calorific value generally 8,300 to 8,900 calories, 15,-200 to 16,000 B.T.U.

Mean composition,

Carbon	80 to 90 per cent.
Hydrogen	4.5 to 5 per cent.
O and N	5.5 to 12 per cent.

(2) Burns with luminous flame and yields from 12 to 26 per cent. volatile matter; generally cokes.

Fuel ratio 1.2 to 7.

Calorific value 7,700 to 8,800 calories, 14,000 to 16,-000 B.T.U.

Mean composition,

Carbon	75 to 90 per cent.
Hydrogen	4.5 to 6 per cent.
O and N	6 to 15 per cent.

(3) Burns freely with long flame; withstands weathering but fractures readily and occasionally has moisture content up to 6 per cent.; volatile matter up to 35 per cent.; makes porous, tender coke.

$$\frac{\text{Fixed carbon} \quad + \tfrac{1}{2} \text{ volatile}}{\text{Hygroscopic moisture} \quad + \tfrac{1}{2} \text{ volatile}} = 2.5 \text{ to } 3.3.$$

Calorific value 6,600 to 7,800 calories, 12,000 to 14,-000 B.T.U.

Mean composition,

Carbon	70 to 80 per cent.
Hydrogen	4.5 to 3 per cent.
O and N	20 to 30

Class C.

Burns with long, smoky flame; yields from 30 to 40 per cent. volatile matter on distillation, leaving very porous coke. Fracture generally resinous.

Calorific value 6,600 to 8,800 calories, 12,000 to 16,000 B.T.U.

Class D.

Contains generally over 6 per cent. of moisture; disintegrates on drying; streak brown or yellow; cleavage indistinct.

(1) Moisture in fresh-mined, commercial output up to 20 per cent. Fracture generally conchoidal.

Drying-cracks irregular, curved lines.

Colour generally lustrous black, occasionally brown.

$$\frac{\text{Fixed carbon} \quad + \tfrac{1}{2} \text{ Volatile}}{\text{Hygroscopic moisture} \quad + \tfrac{1}{2} \text{ Volatile}} = 1.8 \text{ to } 2.5.$$

Calorific value 5,500 to 7,200 calories, or 10,000 to 13,000 B.T.U.

Average composition,

Carbon	60 to 75
Hydrogen	6 to 6.5
O and N	20 to 30

(2) Moisture in commercial output over 20 per cent. Fracture generally earthy and dull.

Drying cracks generally separate along bedding planes and often show fibrous (woody) structure.

Colour generally brown, sometimes black.

Calorific value 4,000 to 6,000 calories, or 7,000 to 11,000 B.T.U.

Average composition,

Carbon	45 to 65
Hydrogen	6 to 6.8
O and N	30 to 45

The reports should include not only a statement of the location and distribution of the various deposits (if possible, illustrated by means of maps and sections), but should deal with such chemical and physical qualities as are determinative of their technical utilization.

For the rest, every writer is free to act as he thinks fit, though it is very desirable that his statement should not exceed the dimension of — quarto pages of print.

The choice of language is limited to French, German and English.

It is the intention that these reports, together with the chapter prepared by the committee, shall be published before the end of 1912, so that every one interested may make use of them for all purposes, and particularly for the discussion at the meeting of Congress. Under these circumstances it is specially desirable that the separate reports reach us before January 1, 1912.

We, therefore, address ourselves to you, in the hope that you will contribute to the investigations referred to, by drawing up a comprehensive survey of the occurrences of coal in

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We feel sure that the plan we have presented will gain your interest, and that you will not refuse us the benefit of your valued co-operation, and we beg you to rest assured of our gratitude for the assistance that we feel confident you will give us.

All communications on this subject should be addressed to the General Secretary of the Twelfth Congress, R. W. Brock, Director of the Geological Survey, Ottawa, Canada.

G. G. S. LINDSEY, Convener.
F. D. ADAMS,
R. W. BROCK,
D. B. DOWLING,
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Committee on Coal Resources of the World, appointed by the Executive Committee of the International Geological Congress, Twelfth Session.

The Quest for an Ideal Stope Drill

Mr. E. M. Weston, A.S.M.E., after giving the reasons for the failure of various stope drills in the Rand competition, commented as follows on the deductions made by the Stope Drill Committee in their report: (1) "Hammer drills are not at present suitable for the general stoping conditions which obtain on these fields; that is to say, for down holes the reciprocating drill has proved its superiority." One must remember that as far as the hammer drill itself is concerned there are a very large number of one type of hamm-

drill successfully at work on the Rand and several others being successfully introduced, so that the weakness does not lie with the drill, but with the means employed for ejecting the broken cuttings, which included hollow steel. The inference is that if these difficulties could be overcome we have ready to hand a man drill weighing from 50 to 70 pounds.

(2) The second deduction is: "That hollow steel is not at present recommended, the class of material used in its manufacture not being suitable. It is a high-priced article, but it appears to crystallize more rapidly than the cheaper solid steel, and gave more difficulty in tempering, which process, however, was carried out by smiths used to the cheaper material ordinarily employed." Progress is continually being made in the manufacture of hollow steel, and at the present moment I believe the first statement of No. 2 does not apply. Steel used in the bulk of the piston drills in use on the Rand carries about .6 per cent. carbon, and, though not as hard as it might be, can be carelessly heated and tempered by plunging. Already, however, as a result of the experiments carried on at the Robinson Deep, steel of .7 per cent. to .75 per cent. carbon is recommended for some work. Steel of this temper requires more careful heating and tempering, and it has long been known that the slap-dash save a penny a hundred in sharpening costs and send the steel below with the minimum amount of labour and trouble expended on it methods do not pay. Mr. Tom Johnson, in his report, indulges in some plain, but not too plain, speaking with regard to the methods in vogue. Until recently all hollow steel was high carbon steel with .7 per cent. and over, I believe, and such steel should be carefully heated and should have the temper drawn, as is done in the case of picks; and the adoption of these methods, though they might add a few white blacksmiths to shop staffs, would scarcely ruin the mines, as the saving in costs of cutting rocks would run them into thousands against an expenditure of hundreds. Every other progressive mining field I know of has proved this and acts on it. However, to-day steel makers are prepared to supply hollow steel of any temper required, and steel can be procured of .69 carbon exactly similar to that in use in piston drills. It is also stated that one manufacturer has a secret process somewhat similar to that employed in the manufacture of Mannesman piping.

At any rate, hollow steel in long lengths, with a hole as large as ¾-inch in 1¼-inch round steel, is now on the Rand, and holes have been bored with it by both piston and hammer drills on the surface, and experimental holes are now being drilled underground in a Rand mine. This steel per foot of length as used to make drill bits (jumpers) is cheaper than solid steel. The committee express themselves unfortunately in stating that hollow steel appears to crystallize more rapidly than the cheaper steel. What they might have written was that hollow steel was used in hammer drills and in them it tends to crystallize more than solid steel does in piston drills. As a matter of fact, steel used in either piston or hammer drills gives little trouble from this cause if it be annealed once a month. Boring with high air pressure in piston drills in shaft sinking in some of the hardest diabase on the Rand, I have seen solid steel of two carbon contents, owing to the intense vibration, crystallize so that I broke as many as 50 shanks with 12 rock drills in six hours, and the high carbon steel stood better. It is, however, true that the vibrations set up by hammer drills striking 1,000 to 1,500 blows per minute tend in hard ground to cause breakages from crystallization. This trouble has been increased from two causes.

The hammer drill manufacturers do not know that the real requirement of the Rand in the matter of a one-man drill is for a really simple light drill that the native can understand, and will like, which uses only 30.50 cube feet of air at 70 pounds pressure, and which will put down a 4-foot hole, starting with about 1⅜ in diameter and finishing about 1-inch. Now, whether such a drill puts down four, six or eight holes in one shift does not matter so much as the fact that such a machine would do the work of at least four natives, and do it better than they would, and relieve the labour shortage on the Rand and in Rhodesia, while at the same time stopes could be kept ready now and blasting with large charges, and using 6 or 7-foot holes, which are the conditions under which the present small piston stope drill works would be avoided. Hammer drill manufacturers strive to produce machines with a maximum boring speed. Though it is well known that one can get any boring speed one likes as long as the steel will stand (in other words, that the resisting power of the steel in any ground must be the determining factor in hammer drill design), it is amusing sometimes to note the rival claims for boring speed among the various manufacturers, and as soon as one maker produces a machine that will bore, say, upper holes at a reasonable speed, another introduces a machine that delivers a heavier or more rapid stroke on the plea that it will bore faster. Under such conditions one must expect that the resisting powers of the long-suffering drill steel must soon be severely tested, and a return be made to machines designed to drill at the highest economical rate consistent with the size of steel used in them and the air pressure and hardness of the ground.

Tin Corners on the London Metal Exchauge

(Translated from the "Cologne Gazette" of June 13.)

During the past year we have frequently had occasion to call attention to the movements in the price of tin, and especially during the last few days to the present unsatisfactory state of affairs. A small group of financially strong speculators, who already at the beginning of last year successfully forced up prices, have now succeeded by withholding supplies in effecting a corner in tin, which began in February and now reaches its highest point this month. In February, 1911, the price of three months' tin was on an average about £187 10s., whereas the cash price was £190 3s. The difference between the cash and three months' quotations remained about the same during March and April, but in May it reached £10, then £19, and on the 9th June even £42. Cash tin was paid for at up to £233, whereas the quotation for three months was only £191. At the present moment tin for prompt delivery is quoted at £231, and for delivery in three months £190. The possibility of bringing about a condition of affairs so extremely harmful to regular business, and the temptation to such manœuvres lies in the tin contract adopted by the London Metal Exchange.

The determining factor as to whether tin may be delivered against contracts is not its quality, but its origin; that is to say, tin must be produced in the

Straits Settlements or Australia (both British colonies). Prudent members of the London Metal Exchange are, of course, perfectly aware that a state of affairs such as at present prevails is quite incompatible with the standing and influence of the London Metal Exchange, and consequently are thinking of means to make a recurrence more difficult. A movement is, therefore, on foot to alter the tin contract in such a way as to admit to the market tin other than Straits and Australian. Due, however, to the conservative ideas of the English, the delivery of other kinds of tin is being made as difficult as possible, and heavy deductions are made for tin of other origin, as compared to that delivered in the past. Consequently in practice the delivery of tin from other sources than hitherto delivered will only come into question when there is again an artificially created shortage of tin for prompt delivery. The new contract will make it more difficult than in the past to effect illimitable corners. The only logical method would be to introduce a contract which entirely does away with the question of origin, and only prescribes a definite quality. The quality can be fixed exactly both mechanically and chemically. (It may be mentioned that there are already in London a number of assayers recognized by the Metal Exchange). Nevertheless, the present proposition of a few London merchants would be an advance upon the past state of affairs, provided some absolutely necessary alterations are made.

According to the present proposals, there will be deliverable in future tin from Banka and Billiton as well as from China and England, with varying deductions according to the purity of the tin. This purity is to be ascertained by an assayer recognized by the Metal Exchange, and his certificate for this and for the other details of quality is to be affixed to each warrant. German tin is the only kind to be excluded. This is all the less explainable, as the production of tin in Germany forms a considerable part of the world's production, and is steadily on the increase. In 1910 the production of tin in Germany amounted to 11,000 tons —that is, about two-thirds of the English production and about 10 per cent. of the world's production. The attempt to exclude German tin from the market can only be put down to some small-minded business reasons and to an unhealthy Chauvinism. It may be expected from the Committee of the London Metal Exchange, whose quotations are taken as the basis for the trade all over the world, that they will not allow themselves to be influenced by such attempts, but, being fully aware of the responsibility of their position in relation to the trade of the whole world, irrespective of nationality, will act up to it. All the incidents of late and the movement depicted above, show, however, how necessary it is to establish on the Continent an institution holding the balance to the London Metal Exchange—let it be in Berlin, Hamburg, or Amsterdam. The manner in which the London Metal Exchange abuses its monopoly can only hasten the creation of a new exchange elsewhere independent of London.

The By-Product Coking Process and its Future Development*

By MR. ERNEST BURY, Skinningrove.

The writer has chosen this title for discussion by reason of his belief that the by-product coking industry has thoroughly justified its inception, and that the time has now come to enquire into the future possibilities of the process.

By-product coke ovens cannot be said to have had a very rosy time in our country, and criticism of the industry has been unnecessarily harsh. Since Messrs. Pease & Partners led the way at Crook in 1881, there has until quite recent years been a never ending war against the more economic manufacture of coke. It has been variously alleged that the coke from by-product coke ovens was inferior to the produce of the old bee-hive ovens, and that the recovery of by-products along with the production of a first-class metallurgical coke, was impossible. These statements have, by reason of the big development in the by-product coking industry, proved absolutely untrue. In 1898 the amount of coal carbonized in by-product coke ovens in Great Britain was 1.8 million tons per annum, it is now over 8 million tons. With regard to the unsuitability of by-product coke for furnace use, the writer is of opinion that now nothing more may be said, and the old prejudice may be laughed at.

During the last year the plaint against by-product industry has taken on a different hue. It is not now a question of unsuitability of the coke produce, but this large amount of by-product development is going to be the ruin of us, and by-products are going to suffer. This is an unconscious compliment to the industry, whose coke product was supposed to be unsuitable, but let us enquire into the grounds for dread. The most important and valuable by-product from coke ovens is sulphate of ammonia, representing as it does from 1/7 to 3/- net per ton of coal carbonized. The following figures of yield taken from the Blue Book of the Chief Inspector of Alkali Works, together with the average prices, show how little the big development in coke ovens during the last seven years has affected the prices of the principal by-product.

Year.	Total production of Sulphate from By-Product Coke Ovens. Tons.	Total production of Sulphate from all sources. Tons.	Average price per ton of Sulphate of Ammonia. £ s. d.
1903	17,435	233,664	12 9 2
1904	20,848	245,990	12 3 8
1905	30,732	239,114	12 10 9
1906	43,677	289,391	12 0 9
1907	53,572	313,281	11 15 8
1908	64,227	325,228	11 12 0
1909	82,886	349,143	11 5 0
1910	Returns not yet to hand		12 3 2
	Present Price		13 6 0

*Paper read before the Cleveland (England) Institution of Engineers.

Since in 1891, the price of sulphate of ammonia was only £10 17s. 6d., i.e., at a time when the sulphate produce from by-product coke ovens did not exceed 5,000 tons per annum, the extensive growth of the by-product coke oven, coupled with other sulphate recovery works (the gas industry, blast furnace and producer gas processes), can hardly be said to have threatened the value of the main by-product. The answer to the apparent paradox is the growing appreciation and demand for sulphate of ammonia as a fertilizer for cereals, sugar, and vine growing, all three important articles of food. With the food supply at stake there is little chance of this product from coal being put in the background. The only danger would be a cheaper fertilizer, and this is not forthcoming. Certainly there is the possibility for atmospheric nitrate (i.e., nitric acid electrically produced from the atmosphere and combined with lime), but given this possibility, and its production is not great except with very cheap power, there is room for the two products, in the consideration of the world's food supply.

As regards tar and benzol, the other products obtained from by-product coke ovens, there has again been an upward recent tendency. Tar has risen from 16s. to 21s. per ton, and benzol (90 per cent.) from 6d. to 9d. and 10d. This again, the writer would suggest, is due to fresh fields and pastures new. Tar has found an outlet for road dressings, and benzol has developed as a motor spirit, the result being a shortage for the old outlets, which have had to bid against the new usages. In fact, the by-products process depends for its future developments, as do all other processes on fresh applications for its products, and to this end the writer offers to the meeting the following considerations:—

The future of the by-product coking process lies (1) in the development of the process itself, (2) in the application of the process.

Developments in the Process Itself.

Recent years have brought forth many improvements which have helped to establish the process. Flue arrangements have been perfected, whereby regular heating of large coking chambers is produced, the result being even carbonization with minimum repairs to oven lining. It is safe to say that with a modern design of heating flues coupled with the choice of a first-class siliceous firebrick, the minimum life of a by-product coke oven lining may be taken at four years, and the chance of serious breakdown in this direction such as have occurred in the past, may no longer be considered.

The growing possibilities of coke oven gas as a source of towns' illumination, power generation, furnace heating and the like, have furthermore led coke oven inventors and designers to perfect regenerative systems of oven heating whereby the process has been resolved into a highly developed heat economizer, so that where 60 per cent. of the gas evolved was required by waste heat processes for oven heating, an equivalent quantity is now available for any desired extraneous purpose.

Before proceeding, it may be of interest to you to see the design of a by-product coke oven, which is now being erected by the Otto Hilgenstock Coke Oven Company, at Skinningrove, which in the writer's opinion embodies the modern drift of coke oven design. From the illustration you will see that in the first place the gas is admitted to alternate sections of flues, not from a common gas flue or duct, but by independent burners which are accessible and interchangeable from the outside. By this means there can be no mis-direction of the heating gas, and the temperature of the oven walls remains even throughout. In the second place, since the products of combustion, having passed up one section of flues, are drawn down the adjacent flues, as much heat is transferred to carbonization duty as possible. There is, furthermore, the advantage that the products of combustion, instead of collecting in a common flue at the top of the oven wall, thereby tending to overheat the oven crown, are immediately withdrawn, and superheating of the crown is minimized. The regenerators, which are 15 feet deep, are tall and narrow, and no opportunity is afforded the gases to cut across corners, which is the case with squat regenerators. Finally, you will observe that the depth of the carbonizing chamber is considerably higher than the depth of the flue chambers. Most of you who are in coke-oven practice, will admit that the crown of all coke ovens gets too hot by radiation from the mass of hot coke during the latter stages of carbonization, an effect which is harmful, since it produces breakdown of gases, tars, benzol, and ammonia. By increasing the depth of coal beyond the flue depth, the aforesaid radiant heat will be absorbed in the upper thickness of coal, which, of course, will be carbonized, resulting in a greater all round output of coke, gas, and by-products per oven with no further expenditure of heating gas, and at the same time giving a cool crown with greater yields per ton.

The writer believes that, as regards the design of the carbonizing chamber itself, very little remains to be accomplished, except that where the consideration of coke oven gas for any use is of moment, the chambers might be heated by producer gas (regenerated if need be) instead of by coke oven gas as at the present time. Such method of heating was suggested by the writer at the Dublin meeting of the Institution of Gas Engineers in 1907, and would open up, by employment in modern mechanical producers, the large quantities of refuse small coal which are still thrown to waste, or left in the pits, in many parts of this country. The writer is informed that at one plant in Westphalia, a coke oven battery is already heated by producer gas from refuse coal, and suggests that there are many cases in Great Britain, the need for coke oven gas being urgent, where this method of heating would tend to national economy. When all is said and done, it is only the method employed for heating towns' gas retorts throughout past generations.

The writer has suggested that the design of construction of coke oven carbonizing chambers has nearly reached its zenith in the type of oven just described, but the chemical aspect of the process offers a far more extensive territory for development and economy. The last two years may be truly said to have marked an epoch in carbonization practice, since inventors have been driven from the worked-out field of oven design to investigate economies and developments in dealing with the gaseous products resulting from their ovens as carbonization chambers pure and simple. The writer refers, of course, in the first instance to the attempts which have been made to recover sulphate of ammonia direct on the gas main, without having recourse to the usual method of condensation of ammonia liquor, and the subsequent distillation of the latter in the manufacture of ammonium sulphate. To students of coke oven economy, it has always appeared wasteful to cool down from the gases the aqueous vapours containing

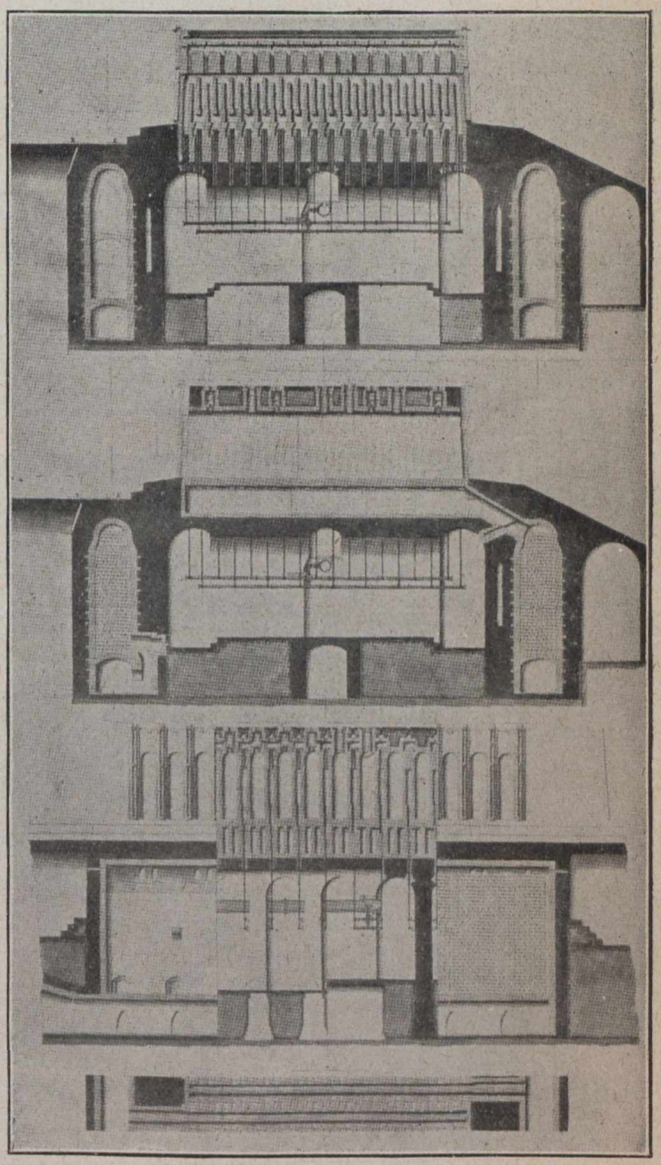
ammonia, forming part of the distillation products of coke ovens, and afterwards to reheat these aqueous products to recover ammonia or ammonium sulphate. Such procedure was the reverse of fuel economy, and accordingly Brunck, in 1903, sought to pass the hot uncondensed tarry gases from his coke ovens direct through sulphuric acid. Brunck's aim was ethically right in seeking to conserve the heat contained in the hot gases from the ovens for the manufacture of ammonium sulphate, but unfortunately his object was barred, in so much as the acid became tarry and dirty sulphate was the result. Furthermore, the tarry products exerted a reducing action on the sulphuric acid, and the sulphurous acid gas produced corroded his gas mains. The entire process therefore became unworkable.

The next attempt at direct sulphate recovery was made by Koppers. This inventor avoided Brunck's method of attempting to treat the hot gases, and decided to cool out his tars in the usual manner before the sulphuric acid washing. The vessel containing sulphuric acid or saturator, as it is called, is inserted as a scrubber, through which the tar-free gases are passed, thus eliminating the chances of loss of ammonia which might occur with liquor or water washing in the usual type of scrubber. The liquors which have condensed in the process of tar removal (containing with wet coal about 80 per cent. of the ammonia) are heated with steam in an ordinary ammonia still, the ammonia and steam from which are passed into the saturator on the gas main. In order to avoid condensation within his saturator, Koppers preheats his gases after tar removal, by passing them before entering the saturator through a "reheater" or "heat exchanger," through which is passed the hot gases travelling from the ovens to the condensing plant. By his invention, Koppers avoids using the scrubbing water ordinarily employed, thus reducing the amount of liquor requiring to be treated by the ammonia still, and therefore, the amount of river polluting effluent which is of serious moment in some parts of the country. Koppers' salt is of good colour and contains a minimum amount of tarry matters.

The most important development in the treatment of coke oven gases and in the recovery of tar and sulphate, is that devised by Dr. Hilgenstock of the Otto Company. The inventor reverts to Brunck's original aim, but instead of passing tarry gases into sulphuric acid, he primarily removes the tar from the hot gases by passage through a tar spray, the temperature of which is so regulated as to completely remove the tars without effecting condensation of the greater bulk of ammonia liquor. From the spray, the gases containing the liquors in steam form, together with the ammonia, are passed directly into sulphuric acid, where the ammonia is caught and precipitated as ammonium sulphate. The gases leaving the saturator are free from ammonia, but still contain the liquors as steam, which is carried on to the ovens and boilers and thus dispensed with.

In the event of the gases being required for benzol recovery, gas engine use, or towns' lighting, the Otto Company employs a fractional method of condensation, whereby the greater portion of the liquor containing very little H_2S, etc., is precipitated immediately below the dew-point. The remainder of the liquor obtained by completion of the cooling is similar to ordinary spent liquor without, however, containing any lime; its amount is so small that it can be mixed off with the coke slacking water.

The next three diagrams and photographs of models will show the extent of these recent simplifications in the recovery treatment of coke oven gases. It will be seen from the illustrations that Otto's new process dispenses with condensers and water for the same, liquor circulating pumps, liquor cellars and stores, ammonia stills and superheaters, lime mixer, lime pump, settling tanks for spent liquor and drains therefrom, steam connections and boiler power, thereby effecting a big economy in ground space. The working costs are reduced by abolition of steam and lime in sulphate making, and trouble in dealing with spent liquor. Finally, all chances of loss of ammonia are reduced to a minimum, since the free or volatile ammonia never leaves the gas main, and losses by circulation and in the distillation process are avoided.

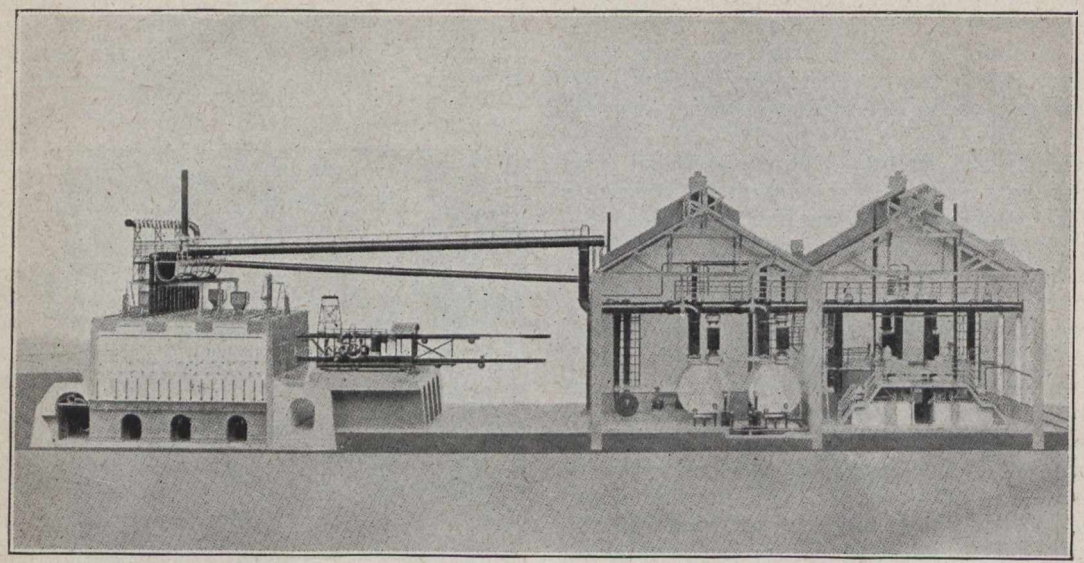


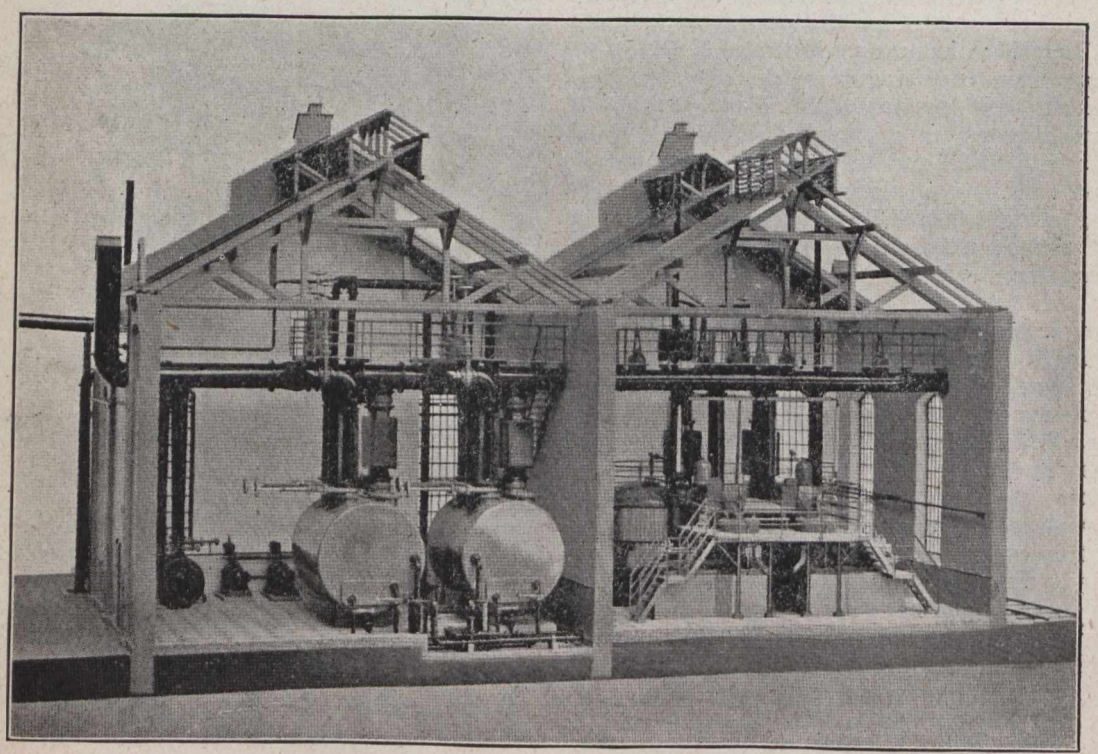
Regenerative Coke Oven

Several points have been suggested against the Otto method of recovery from the hot gases. In the first place it has been stated, that the temperature of the gases, and the reaction heat produced by the ammonia and sulphuric acid in the saturator was insufficient to prevent condensation in the latter, and that external steam had to be supplied to avoid such condensation.

The writer has found that this point turns on the percentage of ammonia present in the coal; very small quantities of condensings containing fixed ammonia salts are produced in the foul gas mains and sprays, and these have to be worked off in the saturator. If the amount of ammonia in the coal is below the equivalent of 1 per cent. of sulphate, the reaction heat in the saturator is insufficient to evaporate these condensings when put into the saturator, and a small amount of steam has to be supplied to the vessel to keep up the temperature. If the sulphate of ammonia exceeds 1 per cent. the reaction heat is sufficient to evaporate the condensings without need for supplementary steam. Under the worst conditions the writer found in Westphalia that one ton of steam per ton of sulphate made was required for the Otto saturator, and since eight tons are required for heating up the liquor from the old recovery method, Otto's worst conditions may be said to have effected very great economy. At Auchengeich, the first Otto direct recovery plant in Great Britain, where the yield of sulphate of ammonia is approximately 1.5 per cent. on the coal, the writer found the following temperatures:

Gas entering sprays	93	deg. C.
Gas entering exhauster (after sprays)	65½	deg. C.
Gas leaving exhauster	66	deg. C.*
Gas leaving saturator	70½	deg. C.*
Gas delivered to ovens	62	deg. C.





Otto-Hilgenstock Direct Recovery Process

It will thus be seen that so far from the saturator losing heat, the temperature rises, and there is no need for the application of auxiliary steam in evaporating the condensings, and this is the case for all coals containing 1 per cent. of sulphate and over.

It has been further alleged that the Otto sprays do

*Gain in temperature by reaction heat 4½ deg. C.

not completely remove the tars, and that dirty sulphates would result as in the case of Brunck. The best answer the writer can give to this statement is, to submit a sample of sulphate which he collected at Auchengeich, which speaks for itself. At the six plants which the writer visited in Westphalia, the highest percentage of tar found in the sulphate was 0.22 per cent., the lowest 0.07 per cent., as compared with 0.06 per cent. in sulphate made by the old process.

Some gas engineers have thought, that by the passage of the gas through sulphuric acid, the calorific value would suffer, presumably through absorption of heavy hydrocarbons, ethylene, and benzine. At Auchengeich the writer found the following calorific values on successive days:

596
602
599 } b. t. u. Gross per cubic foot.
608
581

Since modern London coal gas averages about 580 b.t.u. gross, the writer is of opinion that the weak solution of acid in the Otto saturator has no solvent action on the gas.

It has likewise been suggested that at the temperature of the gases leaving the spray, both naphthalene and benzol will be carried forward with the gas. This, the writer found, took place to some extent, but does not consider it of moment, since, with coke oven plant recovering benzol, both products are brought out by the solvent oil. If the gas is required for town's lighting, the benzol contributes to the value of the gas, the naphthalene being removed by one of the usual solvents. With regard to the question of naphthalene, it may be added that one of Krupp's plants working on Otto direct recovery system, is to be used as town's gas works for Bochum, so that no naphthalene trouble is anticipated in this instance.

In the writer's opinion not one of the least important applications of Otto's new process lies in the facility which it affords for the recovery of ammonium chloride from those coals containing a high percentage of common salt. In such event, the condensings found in the foul gas mains would be collected and concentrated for the recovery of ammonium chloride without passing them into the saturator for conversion to sulphate. The price for ammonia as ammonium chloride is much higher than when combined as sulphate, so that the natural disadvantage of a coal in containing much common salt may be turned to profitable account in this instance.

The Burkheiser Process.

The next important attempt at coke oven economy has been put forward by Burkheiser, who proposes to utilize the volatile sulphur contained in the coal for the manufacture of the sulphuric acid required for the sulphate of ammonia recovery, incidentally effecting purification of the gases en route. As a general rule the amount of volatile sulphur given off in the form of H_2S from most coals will produce more sulphuric acid than required for sulphate of ammonia recovery, the average amount of sulphuric acid obtainable being 40 pounds per ton of coals.

The next illustration shows a diagram of Burkheiser's arrangement. The gases coming from the ovens are cooled in the usual manner, the tar and liquors being completely separated from the gas. The liquors are then distilled in the usual type of ammonia still, and the evolved ammonia returned to the gas main. The dry tar-free gases containing the whole of the ammonia and H_2S, are then passed forward to a small oxide purifier, where the sulphuretted hydrogen is removed by a specially active form of iron oxide prepared by Burkheiser. This purifier is duplicated, one always being at work on the gas main, the other meanwhile undergoing a rapid re-oxidation or re-vivification by a current of air. By this latter process, the iron sulphide formed in the purification is re-oxidized to oxide of iron, the sulphur going forward as SO_2, which is caught in an "air-scrubber" through which is passed the mother liquor to be described shortly. From the working purifier on the gas main, the gas free from H_2S passes into the saturator, which is fed with saturated liquor from the scrubber, into which the gas passes after leaving the saturator. Precipitation of ammonium sulphite takes place in the saturator, the salt is whizzed and the mother liquor drainings are sent to

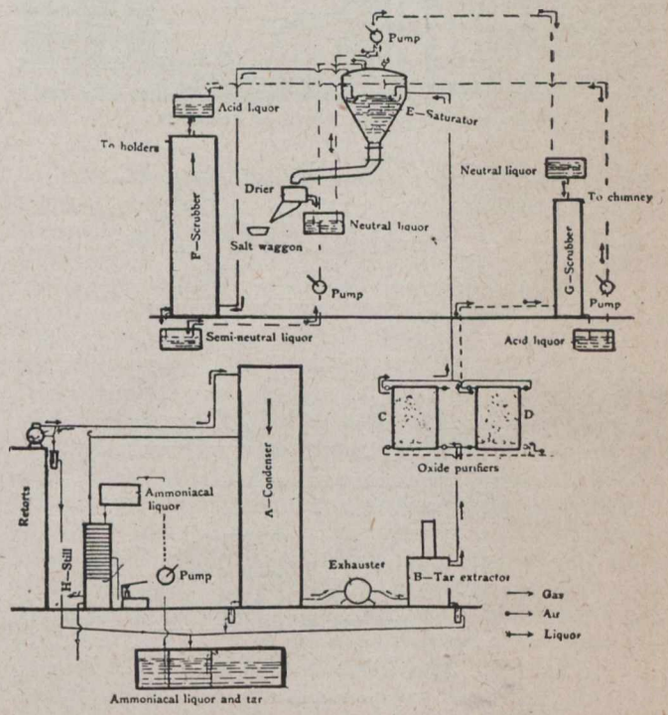


FIG. 1—DIAGRAMMATIC SKETCH OF BURKHEISER PLANT

the "air-scrubber" to take up more SO_2 from the revivifying oxide. In the air-scrubber the neutral ammonium sulphite in the mother liquor takes up SO_2 according to the following reaction:

$$(NH_4)_2\ SO_3+SO_2+H_2O=NH_4.HSO_3+NH_4.HSO_3$$

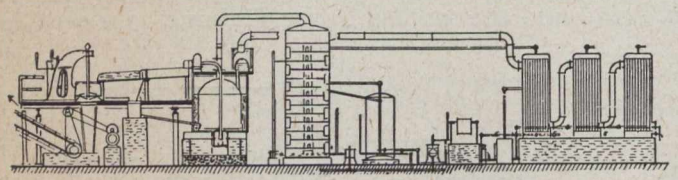
This acid ammonium sulphite solution is then sent to the ammonia scrubber through which are passed the gases coming from the saturator. Here the acid ammonium sulphite takes up the last of the ammonia, forming some neutral ammonium sulphite, and then into the saturator, where it is met by the bulk of the ammonia in the gas to be treated. In the saturator, the acid sulphite is completely changed to the neutral ammonium sulphite, which precipitates out in the manner aforesaid, the mother liquor being returned to the air-scrubber to take up more SO_2, and so on to repeat the cycle of operations.

The ammonium sulphite is converted to ammonium sulphate by repeated sublimation and oxidation in a

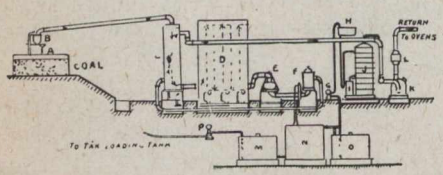
revolving drum. Burkheiser has improved on this, his original scheme, by passing his SO_2 from the purifiers together with excess of air over strongly heated iron oxide in a contact chamber, and thus converting the SO_2 to SO_3. On subsequently washing the gas with this SO_3 liquor, he obtains ammonium sulphate direct, without need for oxidation of the sulphite as in the former instance.

The writer submits for your inspection a sample of ammonium sulphate which he took from Burkheiser's plant at the Hamburg Gas Works.

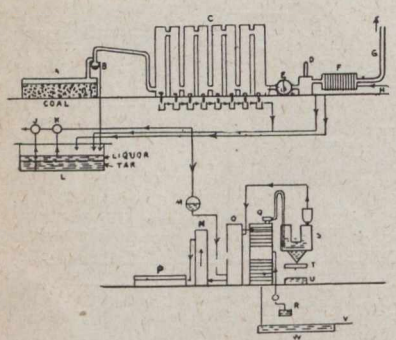
There are several important points about Burkheiser's process which are of interest to everyone connected with carbonizing plants of any kind. In the first place the natural sulphur content of the coal is utilized to manufacture sulphuric acid for sulphate re-



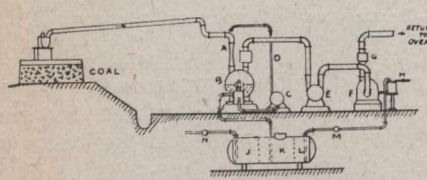
SULPHATE OF AMMONIA STILLS AND ACCESSORIES.



KOPPER S PROCESS



OLD PROCESS



OTTO PROCESS

covery representing a sum from 30s. to 35s. per ton in the cost of manufacture of the latter product, besides affording a home made supply to those plants distant from sulphuric acid works. Secondly the recovery of sulphur or purification of the gas is accomplished in small vessels, thus avoiding the heavy cost of large ground space entailed by the usual massive box purifiers universally employed at gas works. The process is of particular interest to those who are confronted with sulphur troubles in dealing with coke-oven gas for large gas engines. Burkheiser's small purifiers would be of great benefit in such cases, even if the SO_2 were turned to waste and unrecovered, on account of their small first cost and the saving in ground space afforded.

Applications of the Process.

The Utilization of Coke Oven Gas for Town's Lighting

In spite of the big developments in America and Germany which have gone forward in the application of coke oven gas for the lighting of townships, very little has been done in the same direction in this country. As long ago as 1901, Dr. Schniewind described well established coke oven gas works at Everett, Hamilton, Camden, and Sparrows Point in the United States; other works have followed at Milwaukee and Detroit, and the movement has gone ahead. In Germany at the present time progress in this direction is extremely rapid, and many towns are arranging to take their supply from coke ovens. An important review on this subject appeared in a recent issue of the Times Engineering Supplement, pointing out that 212 million cubic feet of gas of the quality usually supplied to towns are daily wasted by the coke ovens of the Ruhr Basin, which at the low price of 7d. per 1,000 cubic feet, represents a sum of £2,000,000 per annum. Essen and Mulheim have commenced to utilize this waste by closing down their town's gas works, and relying on coke oven gas solely, the price of the gas wholesale being 8½d. per 1,000 cubic feet. Bochum has followed suit by taking the gas from Krupp's Hanover and Hannibal Collieries. Barmen, Velbert, and Heiligenhaus have likewise made contracts for the supply of colliery gas, and many others have made arrangements, or are negotiating to a similar end. In all, about 600 million cubic feet per annum have been already placed.

There have been a few isolated cases in this country where coke oven gas has been employed for this purpose, but British gas engineers have not yet seriously considered the by-product coke oven as a possible aid to their industry. There are many instances where collieries or blast furnaces possessing coke oven plant, already provided for as regards their own power requirements, are situated near to large towns, and in these cases the application of coke oven gas for town's lighting might with advantage be carefully looked into. The writer does not suggest that as a gas-making machine, the by-product coke oven is the equal of the modern gas retort. The point is, that as a community we are carbonizing coal for two purposes. (a) For the manufacture of town's gas, coke being the by-product. (b) For the manufacture of metallurgical coke, gas being the by-product. From the point of view of the economy of coal supplies, the two processes overlap so that if the by-product in either instance, coke or gas respectively, can be substituted, a step towards national economy will result.

During the past generation, the main ambition of the gas industry itself has been to derive from the mother coal the maximum amount of gas obtainable, and to this end gas engineers have devoted themselves to devising retorts which would produce the greatest amount of crackling of the volatile matters. A notable instance of this development is the vertical retort, whereby 12,000 to 12,500 cubic feet of gas is made per ton, compared with 10,000 to 10,500 cubic feet when distilled in the old horizontal retort, i.e., a very important movement to conserving our coal supplies. This development has only been made possible by the invention of the incandescent mantle, whereby the thinner gases made under more economical conditions, may be made to give out three times the amount of light for a given consumption of gas. The combined effect of the gas industry's progression may

be expressed, that the yield has been increased by 20 per cent., and that the total gas yield produced has been turned to three times better account.

As a result of these economies, there has been general revision in the methods by which illuminating gas is now valued, and by the introduction of the Metropolitan No. 2 Argand Burner, a large amount of gas is now available, which before the invention of the incandescent mantle, would not have been admissible for town's lighting. Already some 130 gas authorities have by the Standard Burner Bill, availed themselves of power to supply gas under the new economic conditions, and the country may now be said to be free from the old candle-power superstitions, and in a position to make the most of the coal in the production of lighting gas.

From the point of view of our paper, the progress made by the gas world has opened up large possibilities for those coke oven plants with surplus gas available, which are situated in the neighbourhood of large townships. With the care of a gas manager bestowed on a modern coke oven installation, there is no difficulty in making town's gas of modern standard. I make bold to say that there is no plant which could not either by supply of the whole gas, by fractionation, or by enrichment, prove of great financial benefit to an adjacent community. The usual method by which the coke oven manager disposes of his gas is by burning it under boilers, that is a purpose for which raw coal, without carbonization charges, and expensive plant, would be equally suitable. At the colliery, refuse coal would replace the use of gas under boilers, and the value of the latter fuel for steam raising would not exceed 0.8d. per 1,000 cubic feet. At works to which coal would have to be transported, the steam raising value of the gas might be double, say 2d. per 1,000 cubic feet. Even if these figures are increased by 50 per cent., the present value is small compared with the cost of town's gas into the holder. The average cost of town's gas put into the holder at 60 gas works in this kingdom averages 1s. 1d. per 1,000 cubic feet, which offers a handsome margin, after deducting cost of oxide purification (0.5d. per 1,000 cubic feet) between burning coke oven gas under boilers and using it in the town's main. There is ample room for a gain to the coke oven plant, and a substantial reduction to the consumer, and a good deal of overlapping in the matter of coal consumption would cease.

In the above the writer has mentioned the "fractionation" of coke oven gas in the consideration of its supply to towns. By this is meant the separation of the richer gases evolved during the earlier stages of carbonization, for despatch to the town, the poorer gases during the latter stages being retained for oven heating. This was the method employed by Schniewind in the United States, at Everett, Massachusetts, and is also employed by some coke oven gas works in Germany. In this matter and in the question of enrichment likewise, the quality of the coal, and the manner in which the carbonization is carried out, determines the course to be adopted. With very lean coals, one or both methods may have to be employed, in order to keep up the value of the gas. With richer coals, no fractionation, or enrichment is necessary in order to provide gas of present day standard. In the case of the Little Hulton Bill, with which the writer has been associated throughout, the quality of the whole gas made complies in every particular with the desired standards, and is, in fact, identical in character with the gas supplied in the Metropolis, and made by modern vertical retorts, as will be seen from the following table:

Brackley Gas	Coal Gas supplied by one of the Metropolitan Companies					Gas from Glover-West Vertical Retorts.
CO_2	2.15	1.48	1.75	2.11	2.85	1.00
O_2	0.31	0.25	0.52	1.05	0.20	0.05
Unsaturated hydrocarbons	3.81	3.39	4.73	2.98	3.60	2.85
CO	6.87	8.17	7.18	10.00	7.43	8.70
H_2	49.30	49.21	40.50	48.41	46.66	54.70
CH_4	31.00	31.22	39.50	30.80	31.54	29.05
N_2	6.56	6.27	5.82	4.65	7.66	3.20
Gross calorific value. Calories per cu. ft.	144.8	144.5	166.6	145.7	143.4	144.3
Illuminating power by Metropolitan No. 2 Argand burner, at 5 c.f. per hr.	16.0	18.6	18.21	14.48	14.65	15.56

From time to time objections have been launched against coke oven plant as a source of towns' supply. Recently a paper was read by Mr. J. S. Lucking, of Clay Cross, before the Midland Association of Gas Managers, which pointed to the unreliability of coke ovens as a source of towns' illumination. He says that "coke ovens are not worked so regularly as gas retorts, and when the ovens are stopped for three or four hours, it is often 36 hours or more before there is any surplus gas." This, no doubt, was the case in this particular instance, but the writer has not experienced any such serious irregularity. The obvious precaution of any coke oven plant taking upon itself the responsibility of supplying a township, is to so duplicate all the running plant, that breakdowns and stoppages are reduced to the safety margin provided by gas works themselves, and this the writer has found neither difficult nor costly, when the advantages of continuous and steady running are considered. Mr. Lucking raises no point against the quality of coke oven gas, for which he gives the following analysis:

CO_2 0.5%
CO 9.0%
Unsaturated Hydrocarbons 3.0%
H_2 47.7%
CH_4 26.2%
N_2 13.0%

Calorific value=550 b.t.u. gross.
Minimum Candle Power=14.

In view of these considerations, the writer is of opinion that as regards the supply of gas to towns, there are many instances in which the coke-oven industry may be held to have future prospects. Metallurgical coké which cannot be made in gas retorts has to be produced, and since coke oven gas now comes within the class of towns' gases, it may be expected to be no longer a wasted by-product, but of use to metallurgical communities. For instance, if Middlesbrough were supplied with coke oven gas at 6d. per 1,000 cubic feet into the holder, the township would be saved approximately £7,000 per annum in the manufacturing cost. There are many coke oven plants who would be glad

to dispose of their gas in bulk to townships at the price named.

The Utilization of Coke Oven Gas for Power Development.

The writer has had no personal experience of very large gas engines running on coke oven gas, but desires to point to the rapid development in this direction which has taken place in recent years in Germany. It is true that the application of coke oven gas for this purpose is not so extensive as has been the case with blast furnace gas, but this is mainly for the reason that coke oven plants are set down as a rule at collieries, where the domestic need for power is not so great as at ironworks, where often big developments are in progress. The high percentage of hydrogen in coke oven gas is often alleged as the reason for the non-development of this branch of coke-oven possibility, and true it is that coke oven gas engines have to be run on lower compression than is the case with blast furnace gas. Nevertheless, this drawback has not debarred German engineers from utilizing coke oven gas wherever expedient. The Augsburg-Nurnberg firm alone has 49 engines, averaging 1.290 b.h.p., or a total of 63,270 b.h.p., employing coke oven gas solely. These engines, representing a capital expenditure of from £350,000 to £400,000, may surely be said to have placed coke oven gas for engine use beyond the pale of risky experiment. One firm, the Eschweiler Bergwerks Verein, has increased its installation step by step as follows:

2 Engines,	520 b.h.p.	=	1,040 b.h.p.
2 Engines,	1,110 b.h.p.	=	2,220 b.h.p.
1 Engine,	1,160 b.h.p.	=	1,160 b.h.p.
2 Engines,	2,330 b.h.p.	=	4,660 b.h.p.
2 Engines,	2,660 b.h.p.	=	5,320 b.h.p.

Total 14,400 for one station.

This should be sufficient proof of the practicability of coke oven gas driving.

Messrs. Enrhardt & Sehmer have erected 15 engines, developing a total of 17,980 b.h.p., all of which are running on coke oven gas, and at Heinitz, one of their stations, 7 engines are at work developing 11,000 b.h.p. At this latter plant, the annual average gas consumption is 0.57 cubic metres per b.h.p. hour, the composition of the gas being as follows:

CO_2	2.8%
O_2	1.0%
CO	7.6%
Unsaturated Hydrocarbons	3.7%
H_2	50.3%
CH_4	24.9%
N_2	9.7%

On this basis a modern regenerative coke oven plant carbonizing 400 tons of coal per day, would be capable of developing 5,000 b.h.p. Even by supposing only a yield of 50 per cent. surplus gas, and 25 cubic feet per b.h.p. hour, the total power output would be 3,300 b.h.p. for a plant of this size.

The writer believes that a large number of the troubles entailed in the use of coke oven gas, over and above those dependent on engine design, have lain in the want of thorough preparation of the gas before use.

The removal of tars and naphthalene, both of which produce valve troubles, is readily effected by a combination of modern tar extractors in the first instance, and by anthracene washing in the second (the latter being simultaneous with the removal of benzol). The sulphuretted hydrogen which would burn to SO_2 producing corrosion in a heavily water-cooled engine, may be removed either by the usual box-purifier containing oxide of iron, or by Burkheiser's method previously described. Apart from the purification itself, it is of advantage to remove the sulphuretted hydrogen from the gas for the manufacture of the sulphuric acid required by the sulphate of ammonia plant, so that the removal effects a double end. The maximum amount of tar allowed in the gas in German practice is 0.72 grm. per cubic m., and total sulphur 0.3 grm.

The Use of Coke Oven Gas for Furnace Heating.

The employment of coke oven gas mixed with blast furnace gas or producer gas, for the heating of smelting furnaces, is yet in its infancy, but the possibilities in this direction of a large iron and steel plant with by-product coke oven batteries as auxiliaries are not to be denied. If it is assumed that such a plant depends for its power on gas engine development throughout, it is quite within the bounds of probability that surplus gas will be available from both blast furnaces and coke oven plant, which, in the absence of town's gas schemes, would be available for furnace heating. To some extent this is already being done at Kattowitz, in Upper Silesia, where a mixture of coke oven gas and producer gas has been employed since 1906, with large economies in producer coal as a result, and Krupp's have recently adopted the Kattowitz method.

A mixture of three parts blast furnace gas and one part average coke oven gas would pan out as follows:

CO_2	9.0 %	
CO	22.75%	
H_2	13.25%	
CH_4	7.50%	
C_2H_4	.50%	(C_6H_6 having been removed from the coke oven gas).
	44.00%	Total combustibles.

the calorific value being 260 b.t.u. Average producer practice would give a gas between the following limits:

CO_2	= 3 to 6%
CO	= 22 to 28%
H_2	= 9 to 14%
CH_4	= 2 to 3.5%

or a calorific value of from 125 to 175 b.t.u. Say from 33 per cent. to 44 per cent. total combustibles. The only point in which the composite gas would be lacking would be the tars and soots which ordinarily pass over with the producer gas into the furnace. The calorific value of the tars is equal approximately to 11 b.t.u. per cubic foot of gas, thus raising the calorific value of best producer gas to 186 b.t.u. per cubic foot. This addition, however, does not increase the calorific power of best producer gas to the calorific power of the composite gas given, so that the loss of the tars in the latter are not of moment from a calorific standpoint. It may be objected that the absence of the tars might render the composite gas less luminous and more difficult to control in the furnace, but the writer would point out that washed Mond gas is successfully being used for furnace heating. It is also probable that when the composite gas is highly regenerated its high content of CH_4 with the small amount of ethylene it contains, would render the flame sufficiently luminous for its easy control.

In mentioning this use for coke oven gas, the writer is fully alive to its high hydrogen content, and the possible dangers resulting therefrom. Needless to say, that by the employment of such a "composite" as suggested the mixture of coke oven and furnace gases would have to be carefully regulated and governed. A haphazard mixture would be fatal to its success.

The advantages to be derived from following up this use for coke oven gas are:

Substitution of the producers and the cost of working the same and a gas of constant composition free from steam, the latter being a contingency attendant upon most producers with a resulting cooling and oxidizing effect upon the furnace.

For the rest, given the successful application of this use for coke oven gas, steel plants would be run on the gaseous surplus from the blast furnace side, an aim to which our president referred in his opening address, and which would result in an economy of 2s. to 3s. per ton of steel. A battery of coke ovens carbonizing 400 tons of coal per day, would produce sufficient surplus gas, when mixed with three times its bulk of blast furnace gas, to replace the ordinary producers required for the manufacture of 1,700 tons of steel per week.

The Utilization of Benzol as a Motor Fuel.

During recent years the low prices ruling for benzol have discouraged coke oven owners from its recovery, and in most cases benzol has been allowed to pass forward with the gases as boiler fuel. At plants where there is an abundance of cheap fuel this has always appeared to the writer to be wasteful, though possibly in some cases where there was a big demand for power, and fuel prices were high, there may have been little to gain by benzol recovery. The trouble has lain in a restricted market for the product. With the exception of the relatively small quantities of benzol which are used for solvent purposes, cleansing and the like, practically the whole of our benzol goes to the dye industry. There has been little competition for the product and prices have remained low.

Quite recently, however, there has been an upward movement, owing to the growing use of benzol for road motors. France has created a market for our product in this direction, and the large quantities of benzol which are now being exported to that country have raised the price of 90 per cent. benzol from 6d. per gallon to the present figure of 9d.—10d. In our own country, there has been nothing in the nature of a general movement for the employment of benzol in motor vehicles, though Messrs. Sadlers, of Middlesbrough, and one or two other firms have made a start in this direction. Needless to say, some hard things have been said against the new motor fuel, as is usual with all novelties, and motor benzol is having a hot time. Possibly the vested interests may be at the root of the disturbance, and the criticism may be unfair.

The writer has manufactured and had some experience of the use of benzol in road motors of many types, and has found that where due regard is paid to the greater density of benzol, that superior results are obtained over the foreign product. Coke oven benzol possesses a specific gravity of 0.885, whereas the specific gravity of petrol ranges from 0.68 to 0.78. This being the case, benzol contains a greater weight of combustible per unit volume, and, therefore, requires a greater amount of air for its perfect combustion. The sooty plugs and valves which have been complained of when using benzol, have been due to an entire disregard of this essential point. With an auxiliary air supply on the induction pipe these troubles completely disappear. The greater density of benzol has likewise been a source of trouble to the unscientific chauffeur from a mechanical standpoint, since in the float carburetter a more rapid cut off of the fuel is effected by the denser benzol which leads to an insufficiency of supply to the cylinders. By a careful balancing of the carburetter float with suitable weights, the greater density of the benzol may be readily overcome, with the result that a greater weight of combustible is admitted to the engine, which, with the extra air supply before mentioned, will produce a far more effective result than is the case with the lighter spirit, petrol. Both petrol and benzol are sold per unit volume (i.e., per gallon), so that with petrol of gravity 0.7 and benzol 0.882, 1.82 pounds increase in weight of combustible are obtained per gallon in the case of benzol, i.e., an increase of 26 per cent. Making due allowance for the superior difference in calorific values of petrol, a net inducement of 20 per cent. is left to the consumer, reckoned on the volume content. As regards price, petrol is variously retailed in this country at 1s. 1d. to 1s. 3d. per gallon. Allowing 2d. per gallon to the middleman for handling, this would leave the wholesale price of petrol at 11d. to 1s. 1d. per gallon. Since benzol has now crept up to 10d. per gallon wholesale, there seems to have been a considerable amount of levelling up between the two commodities, which with continued perseverance on the part of benzol manufacturers is likely to last, but benzol could rise still further when recognized as a motor spirit.

The foreign interests have had numerous complaints to allege against the claims of the British spirit. It is stated to be highly sulphurous and therefore corrosive to motor engines. The writer prepared benzol containing 0.14 per cent. CS_2 against which this complaint was made, yet many cars have run continuously on such benzol for two years without any corrosive effect having been made manifest. It is not well to call the kettle black, but perol is not altogether free from taint in this particular, as much as 0.1 per cent. to 0.2 per cent. of sulphur being present in the foreign spirit on some occasions. The last straw alleged by the opponents of benzol has been its foul smelling exhaust products. This is, indeed, calling the kettle black, petrol itself is not pleasant smelling; as regards this point, it is entirely a matter of usage. Exception has also been taken to the relatively high freezing point of pure benzol, whereby difficulties transpire in cold weather. On a few occasions the writer has met with this trouble, but by lowering the freezing point by admixture with naphthas, this difficulty has been overcome. In fact, in this connection, with suitable carburetters, crude coke oven naphtha may ultimately serve as a reliable motor spirit.

In order to set all doubts at rest concerning the applicability of benzol for motor use, the writer would suggest that comparative trials be made between petrol and benzol by the Automobile Association. The uses of benzol in internal combustion engines are not restricted to road motors. We live in an age in which air ships have been conceived, and the need for a national motor fuel is urgent. The writer is of the opinion that coke ovens will play an important part in this direction when their possibilities are fully realized.

The Use of By-Product Coke in Suction Producers and Stoves.

In many parts of the country, anthracite is extensively used in suction producers. Anthracite being a

scarce commodity, its price is necessarily high. The writer has been driven to employ by-product coke made from bituminous coal in its stead, and would commend to those depending on anthracite, this future use for the produce of by-product coke ovens. Anthracite prices range from 25s. to 35s. per ton, compared with coke from 12s. to 18s., and the power development for this class of work obtainable from the two grades of fuel is altogether out of proportion to the difference in price. In Lancashire, the writer substituted coke for anthracite; the prices were as 12s. is to 33s., and the power developed as from 90 is to 100 respectively, ratios which speak for themselves. The main point in the substitution of by-product coke for anthracite, lies in the provision of a larger grate area in the former instance, whereby a larger surface of the lighter and harder fuel, coke, may be afforded to the ingoing draught. With hard burned coke no more scrubbing is required for coke-producer gas than is the case with anthracite, and perfectly even running throughout months of work is ensured.

The writer has also found, that in the case of the domestic stoves which are coming into fashion, the same principles hold, that given sufficient grate area, coupled with sufficient depth of fuel, by-product coke will take the place of anthracite at a much reduced cost per calorie.

Finally, the writer would refer to the possibilities of by-product coke ovens as a solution for the conservation of coal supplies, and for the smoke problem. To many of you these questions may have become hackneyed, and to others they may even appear chimerical, but whether we like it or not, the day when they will have to be considered is bound to come. That they are correct in theory no doubt can exist, and their practical treatment will follow. Up to now few methods have been advanced for the ready combustion of hard burned coke in household grates, and there has been a tendency towards the production of a soft low temperature domestic coke, e.g., coalite, which would be suitable for grates of ordinary design. In the writer's opinion this movement is retrograde, since it entails the production of large quantities of paraffiny tars with small yields of gas of very high candle power. By the inception of the incandescent mantle, the need for a high candle gas is no longer of moment, and a large quantity of gas, in view of its application for power and lighting purposes, is of more value to the country as a whole than a large quantity of tars. Making due allowance for our requirements of tar-derivatives for the textile industry, medicinal products, antiseptics, road treatment, etc., the aim of all carbonization processes should be, to obtain as much gas from as little coal as possible, and since this entails (by the high temperatures necessary for such gas production) the manufacture of a hard coke, we must seek some means to utilize the latter, and more economically produced fuel for every possible purpose. This is not so insuperable as the tendency towards coalite production would have us believe. It is true that closed stoves would have to be employed, and central heating, or a composite gas and coke fire might be essential, but all of these are worth the trouble in the consideration of coal economy. The change may not come about until as a race, we decide to abolish the blazing coal fire, but that time is bound to come, although legislation may be the last resort. When this new era in coal economy arrives, and all coal has to pass through a carbonization stage, the by-product coking process will lay still further claims to national utility.

The Problems of Tungsten Concentration

By H. C. PARMALEE.

The mining and milling of tungsten ores has been a growing industry in Boulder County, Colorado, since 1900. In the early days of gold and silver mining in this district the tungsten minerals were unrecognized, and they received various names from the prospectors and miners. In general they were regarded as forms of iron, and were considered without value. In 1900, however, the first production of tungsten occurred, amounting to 40 tons of ore valued at $3,216. Since then the production of high-grade ore and concentrate has increased annually, except during a depression in 1907-8.

The output for 1909 amounted to 1,100 tons of high-grade ore and concentrate, valued by the United States Geological Survey at $396,000. The total output in the United States for the same period was 1,607 tons, valued at $559,500. From this it will be seen that the Boulder County production is by far the most important in this country, amounting in 1909 to about 70 per cent. of the whole. In 1910 the output from Boulder was 1,530 tons of high-grade ore and concentrate, valued by the State Bureau of Mines at $736,700. During the same period the output of all other metals in the county was valued at $161,589.

*Reprinted from Metallurgical and Chemical Engineering.

The tungsten minerals in the Boulder field are the three iron-manganese tungstates, ferberite, hubnerite, and wolframite, and the calcium tungstate, scheelite. Ferberite predominates, but scheelite occurs in many mines, as is shown by the occurrence of lime in the analyses of ore and concentrate—there being no other source of lime worthy of consideration. These minerals are of high specific gravity, scheelite being 6 and the other three ranging from 7.1 to 7.5. They are generally soft and friable. The ferberite occurs in three rather well defined forms which, however, frequently grade into each other. These are (1) Well-crystallized crusts and layers covering the surface of rock fragments and cementing them together; (2) massive granular ore occurring in more dense seams; and (3) the highly silicious ore in which ferberite occurs in fine grains scattered through the gangue.

In breaking ore in the mine the highest grade is sorted and shipped without preliminary milling. At present this grade must average 40 per cent. or more tungstic acid. The lower grades, ranging from 3 per cent. to 15 per cent. tungstic acid, are concentrated by wet methods. Two grades of concentrate are recovered and shipped; the first contains 60 per cent. or more tungstic acid, and the second ranges from 35 per cent. to 40 per cent. The former is usually recovered as coarse concentrate and the latter as slime.

The stability of the tungsten industry depends, of course, on the uses for the metal; and as these are not extensive and the demand is limited and variable, there is always the possibility of intermittent operation of mines and mills. It is safe to say that were it not for the large companies operating in the Boulder district the industry would have a more variable career than it now enjoys. At the present writing there is a large tonnage of unused concentrates in the Eastern market, as well as at the mills, with no immediate demand in sight. The principal use of the metal is still confined to the manufacture of tungsten steel for high-speed tools. Minor quantities are used in dyeing textiles, glazing pottery, colouring glass and paper, making bronze powder, and weighting silks. The manufacture of tungsten electric lamps creates a slight demand, but as 1 ton of high-grade concentrate will suffice for the manufacture of 15,000,000 to 18,000,000 lamps the quantity used is not important.

The reader who may be interested in other details of the Boulder County tungsten field, such as general and economic geology, mining, technology, ores, etc., is referred to the Colorado Geological Survey, which has published a complete report, from which some of the foregoing information has been abstracted.

Location of Mills.

The town of Nederland is centrally located with respect to the tungsten mills of Boulder County. It is reached by stage, 18 miles from Boulder, or by railroad to Cardinal station and thence by stage for 2 miles. At Nederland is the mill of the Wolf Tongue Mining Company. At present this company is running its mill on a custom basis, sampling and paying for the tungstic acid content according to a graduated scale of prices. On ore ranging from 1 per cent. to 30 per cent. WO_3 the price paid per ton increases with each per cent. tungstic acid contained, and above 30 per cent. WO_3 the price per pound of tungstic acid also increases with each additional per cent. This system of outright purchase of ore has superseded the former custom of milling the ore at a certain price and returning the concentrate recovered and is generally more satisfactory. It insures better work on the part of the mill and should make a better return to the miner.

At Cardinal, 2 miles west of Nederland, is the Cardinal mill of the Primos Chemical Company. This plant for the past eighteen months has been retreating the tailings made during four years' previous run, when the methods of saving were not as efficient as at present. The Lakewood mill of the Primos Chemical Company is located at Lakewood, about 2½ miles northeast of Nederland. It is the newest and most attractive of the mills in the district. The company's own ore is treated at present, although in the past a great deal of custom ore has been treated.

Between Cardinal and Nederland is the mill of the Alton Mining & Milling Company, a small plant for company or custom work. On Beaver Creek, about 2 miles southeast of Nederland, are two small mills, one belonging to the Tungsten Mining & Milling Company, treating company ore, and the other owned by Smith & Ardourell, at present retreating the old tailings of the Wolf Tongue Mining Company. The Clarasdorf mill on lower Middle Boulder Creek is idle. In addition to the regular milling there is an effort in a small way to roughly concentrate some of the old mine dumps, either by screening and saving the fine mineral or by hang jigging. Any material obtained in this way is sold to the mills.

Difficulties of Concentration.

The concentration of tungsten ore presents difficulties not encountered with other base minerals. This is particularly true with some of the methods now in vogue. It is believed, however, that all of these obstacles can be largely overcome by applying principles and methods that have proved successful in dressing other ores. Excessive sliming is one difficulty, the cause of which is well set forth in the report of the State Geologist, previously mentioned.

"Ferberite is a rather soft mineral with one perfect cleavage, and generally one or more prominent partings. As a result the mineral is extremely friable even in the massive and massive-granular forms. Much of the ferberite was deposited as aggregates or loosely arranged crystals and crystal grains, forming crusts over the surfaces of rock fragments. One crust succeeded another until in many places the opening was filled. In other places the cavities remained open, but the walls were lined in the same manner. The crystal grains composing these crusts average not more than ⅛-inch in length and about 1/16-inch in diameter. In much of the ore where the crust is broken the crystal grains are easily separated from one another. When to this ready crumbling of the mass is added the extreme friability of the grains and crystals themselves it is easy to understand the excessive sliming. The finer parts of the slime form an almost impalpable mass which, when stirred in water, gives it an inky appearance, and the water remains turbid for ten days to two weeks. To save these slimes is one of the difficult problems with which the tungsten millman has to contend.

"Another serious problem is the successful treatment of the highly silicious ores. In almost all the tungsten mines there is a certain amount of highly silicious ore, consisting of minute grains of ferberite in a matrix of chalcedonic quartz or hornstone. The percentage of ferberite varies widely. Outside of certain limited areas this type of ore is fortunately not very abundant and rarely amounts to 20 per cent. of the product. Various methods of treatment have been tried, but none has given entirely satisfactory results. Even very fine crushing leaves a large part of the ferberite with particles of quartz attached. In concentrating, these grains consisting of quartz and ferberite will be disposed of according to their specific gravity. Those in which quartz is largely in excess will go with the tailings and ferberite will be lost, while those in which ferberite is abundant will go with the concentrates and help make a low-grade product."

Corroborative testimony on the difficulty of treating some of the ores is given by Mr. Victor G. Hills, who was connected with the Colorado Tungsten Corporation during 1905-7. This company treated custom ores, and at that time was doing the best work in the district. Careful records were kept and improvements were made wherever possible. From a list of twenty-one tests on custom lots the following are given as showing the extremes and average in percentage saving:

Lot.	Mine.	Crude Ore, % WO_3	Concentration ratio.	Concentrates.	Saving
4	D	8.07	8.69	62.17	88.90
3	C	6.07	181.81	40.37	5.03
15	E	9.51	8.93	62.59	75.11

In amount of tungstic acid in the crude ore Lot 3 compares favourably with average lots, but owing to its physical qualities it was a failure from a milling point of view. Mere assays would indicate that it was as good as any other ore, but milling tests proved its worthlessness.

The percentage of saving made in the Boulder County mills is largely a matter of conjecture in many instances. The smaller mills practise no regular control, and the larger concerns prefer to make no statement of their saving. Undoubtedly the efficiency is greater than it was four or five years ago, and as the best mill then operating made a customary saving of 75 per cent. to 85 per cent., it is probable that the claims of 90 per cent. saving may be realized in present practice. There is little loss in coarse tailing where that portion is allowed to go to waste, and the main loss is in the slime tailing. The statement is made that coarse tailing will assay as low as 0.1 per cent. WO_3 and that slime tailings from the best mills contain as little as 0.30 per cent. to 0.40 per cent. WO_3.

The mills are of small tonnage capacity. Four of them can treat about 5 tons in twenty-four hours, one of them 24 tons and another 40 tons in the same period. With two exceptions they are built especially for tungsten work and are new. The two old mills are remodelled gold mills, and while not as conveniently arranged as the newer plants, they are doing good work. A notable feature is the large table area required per ton of ore treated, which naturally reduces the tonnage capacity. In no instance is screen sizing being practised with a view to eliminating coarse material which might prove worthless. In view of the friable nature of the tungsten minerals it would seem that sizing should prove worthy of investigation, and certainly classification should be more widely practised.

The stamp is a time-honoured crushing device, and finds favour in some of the tungsten mills. Some of the considerations just given, however, indicate that the stamp is out of place in crushing tungsten ore. The minerals are friable and of high specific gravity. When crushed in stamps such material tends to slime excessively, both by reason of natural properties and the fact that it remains too long in the mortar. When this preliminary step has been taken it follows that elaborate provision must be made for saving fine mineral.

Another fact that indicates the wrong use of the stamp is that much of the mineral occurs in a condition which would permit of its liberation by coarse crushing. But, as a matter of fact, a screen analysis of table concentrates made from stamped ore will show about 60 per cent. passing a 150-mesh screen and almost 80 per cent. finer than 100 mesh. Modern ore-dressing practice would indicate some such method as follows on the average coarse-grained ore: Crushing by jaw crusher and rolls; screen sizing and jigging; regrinding jig tailing, with subsequent classification and table concentration; regrinding table middling, followed by slime concentration on belt machines, and, finally, treatment on canvas if found necessary. Screening might be combined with the classification in such a way as to eliminate a portion of coarse stuff carrying no value.

There is but one mill in the district that is successfully using the jig, and the results are satisfactory to the operators. Other plants are considering the use of coarse concentration, and a second mill will shortly go into commission on this basis.

There are, therefore, two distinct methods of treatment in vogue in the Boulder tungsten field. The first involves comparatively fine crushing with concentration on tables, vanners and canvas plant — the latter being a very important feature and extensive in area. The second includes stage crushing, jigging, concentration on tables and vanners, with a canvas plant as a minor adjunct. The adherents of each method claim an excellent saving, which is not questioned, but the advocates of stage crushing and coarse concentration claim a less expensive plant and cheaper operation. A further claim in favour of coarse crushing is that a greater percentage of high-grade concentrate is recovered, and, since the value of the concentrate is in direct proportion to its grade, it would seem rational to recover as much mineral of high grade as possible and reduce the percentage of fine or low-grade concentrate.

But even with coarse crushing, and every effort made to reduce the quantity of slime, it is noticeable that considerable fine mineral is produced which may float away, even from the boxes receiving concentrates. One of the striking features of all the mills is the provision made for catching this fine floating mineral. Settling boxes of wood or cement are provided, and in one instance the water escaping from the settler passes through a cocoa matting filter. In this connection the idea suggests itself that the use of a coagulant might be beneficial. It is known that fine tungsten concentrate will not settle perfectly clear for several days. The simple expedient of adding a small quantity of lime water will show how quickly the solution will be clarified. On a laboratory scale the mineral thus treated will settle and leave a clear solution in a few minutes. Experiments on a large scale might show that the addition of lime solution at the time of fine grinding would be beneficial in coagulating the mineral and aiding in its recovery. Or, the addition of clear lime water to the concentrate settling boxes might prevent the loss of fine and floating mineral after it had been separated from the gangue. Other salts than lime, which are of proved value in coagulating colloid mater, might be experimented with to advantage.

Magnetic separation has been applied successfully to tungsten ores, but it is not in vogue in the Boulder field. The Boulder ores are remarkably free from sulphides of iron, lead and zinc, cassiterite, arsenopyrite, etc., which usually call for magnetic separation, and this probably accounts for the non-use of expensive magnetic treatment.

Granby's Hidden Creek Copper Mine

As has already been announced, the Granby Consolidated Mining, Smelting & Power Company, Limited, has decided to complete the purchase of the Hidden Creek copper mine, situated near Goose Bay, Observatory Inlet, British Columbia. At the meeting of directors of the company held last month in New York to determine the course to be taken, payment of half the price of the four-fifths interest, due June 15, was authorized, bringing payments on account up to $215,000, and leaving $185,000 to be paid next December to clear the property of liability on this account. In addition, a sum of $200,000 was appropriated for more development work and necessary plant and im-

provements. Further, the purchase of Mr. M. K. Rodgers' one-fifth interest was arranged for, so that the whole interest in the property will be owned by the Granby Company after the final payment shall be made next December, or earlier if deemed desirable.

From Mr. Jay P. Graves, vice-president and general manager, it was learned recently that the reports of six engineers were before the board of directors, when the matter of purchase of the property was being finally considered. The estimates of available ore, computed from results of development work done on the property and cores from diamond drill holes, varied from a minimum of 6,000,000 to a maximum of 12,000,000 tons.

In regard to the appropriation for development work and improvements, above mentioned, Mr. R. M. Sylvester, assistant to the general manager; Mr. O. B. Smith, Jr., superintendent of the company's mines, and Mr. H. J. C. McDonald, one of the company's mining engineers, have gone to Goose Bay to arrange for the energetic prosecution of the work to be done above ground, so that full advantage may be taken of the fine weather for surface operations; also to decide what new development shall be undertaken.

Mr. W. Yolen Williams, who has from the inception of the Granby Company's Boundary district mining enterprise been associated with Mr. Graves, is to at once make Vancouver B.C., his headquarters with the object of gathering exhaustive information relative to copper mining and smelting in the Coast district, so that, before determining upon the course to be adopted in connection with the reduction of the Hidden Creek mine ores, the relative advantages of having them smelted at one of the existing custom smelteries and of establishing its own smeltery on the Coast, may be fully before the management of the company.

The events of the last few months have, therefore, developed in a manner so satisfactory to the directors of the Granby Company as to have influenced them to committing the company to what will without doubt prove its permanent operations on the Coast of an important mining and smelting industry.

The Porcupine Fire.

Just as we are going to press news arrives that many Porcupine mining camps have been utterly destroyed by forest fires. Word also arrives of the deaths of Weiss and Moore, both well known in mining circles.

So far there is no information as to many Toronto men who were in Porcupine.

It is possible, though not probable, that fully five hundred lives have been lost. The chances are that not more than one hundred lives have been offered as sacrifices to the monumental stupidity that made the disaster possible. This moral stands out: We must absolutely spend money in safeguarding our forests before we can refer to them as assets.

We have dwelt upon commercial aspects designedly. But there is another view. Many brave men have lost their lives in Porcupine. The history of the Porcupine fire will never be written adequately. There is no doubt that an amazing amount of bravery was manifested throughout the whole sad episode. Men like Billy Moore lost their lives willingly in attempting to save others. It is one of the traditions of mining camps that men must be brave. Porcupine, from all accounts, lived up to that tradition.

It is necessary for all of us to put our cheque-books at the disposal of the Porcupine sufferers. The next few weeks will witness the keenest suffering. If we can do anything to alleviate that suffering, we must do it now.

We have made arrangements with the Imperial Bank of Canada whereby any branch of that institution will receive and transmit donations to the relief fund. The formal name of the fund is the Canadian Mining Journal Fire Relief Fund. It is especially desired that all mining men become identified with the movement.

Remittances may be sent to any branch of the Imperial Bank, or to this office. A full list of subscribers will be published in an early number of the CANADIAN MINING JOURNAL.

* * * *

The latest news at date of writing places the list of deaths at 87. This is by no means complete. Many of the survivors have suffered horribly. Whilst the loss of property has been severe, it is by no means as large as was at first believed. It is immensely distressing to know that the whole tragedy could have been prevented. Early precautions on the part of mine owners would have insured the immunity from fire of individual plants. An adequate system of fire-ranging would have limited the fire-swept zone.

Two facts are to be remembered. The same kind of holocaust may easily occur again. It is essential that advantage be taken of the experience of men who know the bush. Mining men from other countries rarely realize the urgent need of adopting preventive measures.

Upon the mining population itself and upon the Ontario Government rests the responsibility of acting at once and of continuing to act.

SILVERTON MINES, LIMITED.

The Silverton Mines, Limited, owns the Hewitt-Lorna Doone group, situated three or four miles from Silverton, Slocan Lake, B.C. Much development work has been done on this group during several years, under the direction of Mr. G. Stilwell. The following is an outline of what is now being done and what it is intended to do in the near future:

Mine.—Development work only is in progress. The ore taken out in the course of this work is hand-sorted and the high-grade sorted ore is shipped to the smeltery.

In earlier years several tunnels were driven from the western side of the mountain. Of late years all work has been done from the eastern side, on which a new camp was established to facilitate this development.

No. 4 tunnel has been connected with the work from the western side. Three orebodies have been opened

on this level; these are 115 to 155 feet in length and average 7 feet in width. Raises in these orebodies have been put through to No. 3.

The face of No. 6 tunnel is within about 200 feet of that of the drive from the west on the same level. When connection shall be made, this tunnel will be rather more than 3,000 feet in length through the mountain. Orebodies have been passed through, but only one has been proved up to No. 4.

No. 7 tunnel is 135 feet below No. 6; it has been driven about 700 feet, developing orebodies containing ore as good as any taken from other parts of the mine, for much ruby silver and grey copper occur in this ore.

Mill.—The company has the Wakefield concentrating mill, situated on Four-mile Creek. The equipment has been overhauled and the water supply ditch and flume repaired, ready for the season's run, but operations will not be commenced until about the middle of June, by which time, it is expected, one unit of the Elmore Vacuum Process plant will have been installed, the machinery, etc., for this having already been received at the mill. This plant will be used, in connection with water concentration, to re-treat the zinc middlings. Hewitt-Lorna Doone ores contain a large quantity of siderite, to deal with which the Elmore plant has been obtained, and it is confidently expected that a zinc product, containing 45 per cent. or more, of zinc and 100 ounces of silver per ton, will be made. About 100 tons of ore will be put through the mill daily, but the higher-grade ore will be first sorted out for shipping crude to the smeltery.

The mines of the Silverton Mines, Limited, have had so much development work done in them, and so considerable a quantity of ore is blocked out ready for stoping, that a long mill run is looked forward to, and profitable results are confidently expected.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Dominion Coal Outputs.

The outputs for June will total 365,000 tons, thus exceeding the best previous record for this month, namely, 358,069 tons in June, 1910. The aggregate outputs for the first half of the year during the past four years compare as follows:

1908	1,931,400
1909	1,628,161
1910	1,554,986
1911	1,889,539

New construction is now well under way around the mines. No. 14 colliery is about complete with the exception of the permanent hoisting engine. The output increased rapidly during the month and is now averaging between 700 and 800 tons per day. The new bankhead is working smoothly and with a remarkable economy of labour. The new compressor house at this colliery is as nice a colliery building as one need wish to see. The house is built of the slag-cement brick manufactured at Sydney, and is large and lofty. The compressor is electrically operated, taking current at 6,600 volts. It is built by the Canadian Rand Company, and consists of an alternating current motor of 600 horse power, and compressors with a capacity of 3,000 cubic feet per minute. The absence of heat and noise is very marked, and with the new clean and airy building this compressor-house marks a distinct advance. All the machinery with the exception of the temporary hoisting engine is run by electric power, including the bankhead and screening plant, the ventilating fan, lamphouse, etc., and as a result No. 14 is a remarkably clean and quiet colliery. The growing importance of the Lingan collieries may be gauged by the fact that it has been found necessary to install a telephone central to serve this district.

The tracks for the new pier at Sydney are under construction, and the sub-structure of the pier is being erected. Creosoted piles are being used, the creosoting being done at the neighbouring works of the Dominion Tar & Chemical Company. This is an instance of the self-contained character of the industries which are growing up around the Steel and Coal works. As previously mentioned, considerable use is being made of the slag-cement bricks of the Sydney Cement Company, which are made from the Steel Company's slag. In the same way the Tar & Chemical Company disposes of many of its manufactured products to the mines and works of the Steel Corporation, these being in their turn by-products of the main industries. Even the new houses which the Coal Company is building in such large numbers at Lingan are lined with tar-paper made in Sydney from one of the by-products of the coke-ovens. The slag-fertilizer plant now under construction in Sydney will add one other to the subsidiary industries, and the product will doubtless find a ready local sale.

Editor's Note.—For comment upon the flooding of the Port Hood-Richmond colliery, see editorial pages.

ONTARIO.

Cobalt and Gowganda.

The Buffalo mill report for May shows mill ran 615 hours; ore treated, 3,335 tons; average assay before milling, 37.11 ounces; ounces recovered, 104,255; expenses, $4,925.

A new vein showing some leaf silver has been cut at the 300-foot level of the Ophir Cobalt shaft. The lead is wide but values are not very high so far.

With the 10 per cent. dividend cheque sent to McKinley-Darragh-Savage shareholders, the following statement was submitted: cash on hand, $383,024; ore at smelters, $115,600; ore at mine ready to ship, $38,500; total, $537,124, surplus on June 15. For the first six months of the year there has been produced 1,300,000 ounces, at a cost of about the same as last year, or 17.50 cents per ounce.

The Kerry lease on Peterson Lake is getting some cobalt and silver shot rock from a winze sunk on its vein at the 125-foot level. The vein has been cut at the 200-foot level and here it shows silver.

At the 150-foot level on their Peterson Lake lease the Nova Scotia Company has opened up 40 feet of ore. The vein is from two to three inches wide and the wall rock for some distance will make good milling rock.

Before next month Mr. J. T. Englehart, chairman of the T. & N. O. Commission, will visit Elk Lake and Gowganda with a view to ascertaining the prospects for a railroad.

Porcupine and Swastika.

In the last week three excellent surface discoveries have been made at the Swastika camp and there is now certain to be a centre of activity at this little station on the T. & N. O. for some years. The Swastika mine was staked in 1905 and has been worked for the last four years. The surface discoveries at the Swastika were not nearly as spectacular as any of the three that have recently been made to the north of the railroad. At the 100-foot level of the Swastika there is an ore body 120 feet long and the bottom of the winze sunk to the 200-foot level shows quartz much richer than at any other point or level in the mine. A small stamp mill is operating, and until further development has been undertaken

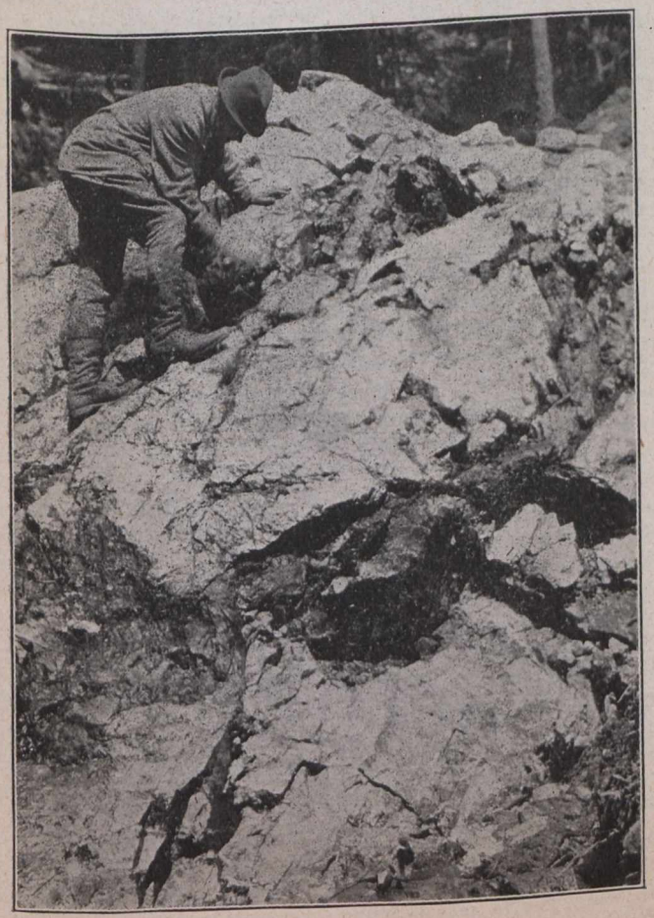
no further addition will be made to it, though a 9-drill compressor has been ordered. The three finds which have attracted most attention to date are to the north of the track, which here runs east and west. Two of them are on the Hurd properties and one on the Miller, and all are promising. Other

Swastika Mining Co., Office and Store.

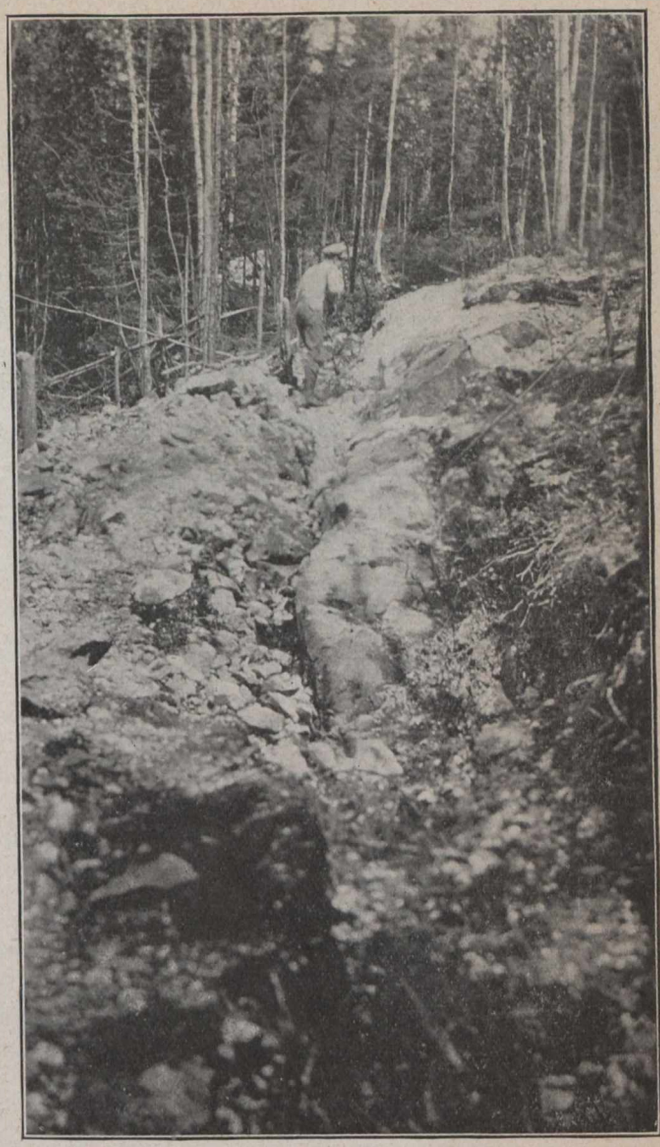
properties in this section with good leads are the Porcupine Swastika, the Homestead mines of Swastika, and the Reeves. A siding has just been completed, an hotel has been opened, and a little settlement is growing up near the tracks at a point about 25 miles north of Englehart.

A discovery has been made on the John Brydge claim in Bristol Township which has caused a great stampede and the staking of every acre of land and water within miles. The original discovery is described as meritorious, by witnesses competent to judge, a wide ore body showing free gold plentifully. The trail in is easily accomplished. A gasoline will carry all equipment down to Redsucker Creek on the Mattagami, when there is but one portage and a walk of two miles to the find. The owners are asking $5,000,000 for the claim.

The T. & N. O. Commission, accompanied by the Hon. Frank Cochrane, officially opened the Porcupine Railroad on Dominion



Outcrop on Martin Group. Swastika Region.



Swastika Region, No. 1 Vein Martin Group.

Day, and on July 3rd the regular service went into operation. Train arrives in Porcupine at ten o'clock at night, and leaves at 5.30 in the morning. Freight is taken into the Dome road. The extension of the steel to the Hollinger is promised for the first day of October, and already the right of way has been cut. To serve the needs of the Pearl Lake section two or three townsites have already been planned, one by the Timmins-McMartin-Dunlap syndicate on the Campbell veteran, another on the Schumacher veteran, and another on the Mattagami River itself. There has been a lumber famine in Porcupine, but now that freight can be brought in, buildings are going up with great rapidity. The census showed that there were 1,500 people living in the settlements round the lake and there are at least 3,000 men working in the mines and prospects of Tisdale and Whitney, so that it would be safe to estimate the present population in the district at between 6,000 and 7,000.

Fire again swept through Tisdale Township, but the only serious loss was at the Dome Extension, where everything was destroyed. Pearl Lake, the Jupiter, and camp 1 of Bewick-Moreing & Company, had very narrow escapes, and many isolated prospectors lost their tents and supplies.

Some very remarkable showings have been made on the McIntyre property on Pearl Lake in the last two weeks, both on the surface and underground. Some of the richest samples

yet encountered have been taken off the surface, and at the 100-foot level a drift on one vein shows free gold in both faces. The ore from a shot drill at 253 feet also shows gold. Two other shafts have been sunk on the property. A 12-drill compressor plant has been ordered.

On a claim just south of the Rea mines, the Armstrong-Booth has just uncovered a new vein which has yielded some very rich samples and pans remarkably. So rich is the dirt that a rocker has been installed and the dirt is being washed. The lead is about four feet wide of quartz and schist.

At the 200-foot level, while drifting on its vein, the Rea Mines has just run into ore as spectacular as the surface, where the vein was very rich and four feet wide.

Some rich specimens of quartz have been taken out of small stringers on the La Palme syndicate's property in northeast Whitney.

One of the veins on the Imperial Porcupine was cut at the 100-foot level this month. The vein shows gold. Some remarkable surface finds have been made on the Dome Extension, and both with diamond drill and in the shaft exploration work at the North Dome has been successful.

The fire at the Hollinger laid bare some very spectacular quartz stringers. Plans at this property are being very carefully laid before the reconstruction of the camp commences.

At a distance of 160 feet from the shaft the Foley-O'Brian cut into its vein, and it is said to be better than was anticipated by the owners. Mr. Harold Rickard, brother of Mr. T. A. Rickard, has now taken charge of the property in succession to Mr. A. F. Motz, who will open up the Shillington-Richardson claim near the Hollinger.

The American Goldfields Company, controlled by the Steindlers of New York, has decided to sink a shaft on its Tisdale property near the West Dome. Two shot drills have been working on the claims until now.

Despite reassuring rumours there has been no conciliation between the Pell and West Dome interests, who own a half share each in the big Curts vein on Edwards Lake. The West Dome Mining Company was offered the other half share at a certain price, which it refused to give, and the whole claim will now be auctioned to the highest bidder in the open market.

BRITISH COLUMBIA.

Mr. E. Jacobs, of Victoria, recently spent seven weeks in parts of West Kootenay, Boundary, and Similkameen districts. Of mining in the several districts he visited, he speaks hopefully. Much important development work is being done, and in several parts production is on a comparatively large scale with, in some instances, profitable results. Agricultural and horticultural matters were also found to be progressive in some of the parts in which time was spent, notably in the vicinity of Grand Forks and Keremees, respectively.

Mr. Jacobs left Victoria for Kootenay on May 8 to attend a meeting of the Western Branch of the Canadian Mining Institute, convened to be held at Trail on May 18. Before proceeding to Trail, he spent several days obtaining information relative to progress at silver-lead mines and concentrating mills near New Denver and Silverton, Slocan Lake. He paid his third visit in eighteen months to the Standard mine, above Four-mile Creek, now being operated by the Spokane company organized early this year to acquire and work it. He was shown the face of No. 5 tunnel, a cross-cut at which had then opened about 85 feet of concentrating ore, in which occurred a fair proportion of clean ore suitable for shipping crude to the smeltery. At Spokane he was afterwards informed that the cross-cut had since proved the ore shoot to be 131 feet wide in this part of the mine. The work of constructing an aerial tramway from the mine to the mill site near the lake, of putting in a water supply system, and erecting a 100-ton concentrating mill, was being energetically proceeded with, the expectation being that all will be in working order during the ensuing fall.

The Van Roi mill, at which operations were commenced about the middle of March, was doing good concentrating work, making two marketable products, namely, silver-lead and silver-zinc concentrates. Mr. Douglas Lay, superintendent, expressed confidence that both mine and mill are in such good working condition that a long and profitable run may reasonably be expected. From Mr. G. Stilwell, manager of the Silverton Mines, Ltd., which has for years been opening the Hewitt-Lorna Doone mine, it was ascertained that the company has large reserves of ore available for extraction, and that during June, after installation of one unit of the Elmers vacuum process plant which is to be used for treating zinc "middlings," the Wakefield mill would be running on ore from this mine.

At Trail, the meeting of the Canadian Mining Institute was well attended and a number of interesting papers on mining subjects were read and discussed. The provincial mineralogist, Mr. W. Fleet Robertson, of Victoria, the retiring chairman of the branch, presided until after announcement of the result of a ballot, which made Mr. Robert R. Hedley, of Vancouver, his successor, and the latter thereupon took the chair. Visits were paid to the Consolidated Mining & Smelting Company's big lead and copper reduction works at Trail, and its Centre Star group of mines at Rossland, all of which were found to be in a flourishing condition, with new and modern plant being put in at the former, and much ore of good grade opened in the latter.

In the Boundary district, the Granby Company was not operating its big smelting works at the time Mr. Jacobs was at Grand Forks, but coke had been ordered from Pennsylvania in order to admit of most of the blast furnaces being blown in again. Meanwhile the works needed repairs and renewals were being made, and plans for important betterments were being advanced. It was gratifying to have assurance that a considerable quantity of ore of higher grade than the average of recent years was being mined by the Granby Company at Phoenix. Later, at Spokane, Mr. Jacobs was informed by Mr. Jay P. Graves, general manager of the company, of the arrangements made by the directors in New York to complete and extensively work the Hidden Creek copper mine, on Observatory Inlet.

The British Columbia Copper Company was found to be using Pennsylvania coke at its smeltery at Greenwood, and the acting general manager, Mr. E. G. Warren, gave the visitor particulars of the company's operations at its several mines in the Boundary district, and across the International boundary line in the neighbouring State of Washington. The company's Lone Star and Washington mines were visited, the trip over the intervening high mountains having been made in the company's automobile. From this mine to the C. P. R. Co.'s Columbia & Western Railway at Boundary Falls, a well-constructed aerial tramway, five and a half miles in length, is now in use. The same company's Wellington camp group, also known as the Jackpot, was visited, and the big occurrence of oxidized ore seen.

Two other items of Greenwood intelligence will be noted—one, that some rich silver-gold ore is being taken out of the old Elkhorn mine, and the other that the Greenwood-Phoenix Tramway Company's big tunnel early in June was in 2,300 feet, with the expectation that 300 to 400 feet more driving will result in one of the ore veins of the Reliance claim being cut.

At Hedley, a day was spent, chiefly in examining the 40-stamp mill and cyanidation plant of the Hedley Gold Mining Company, to which important additions have been made during the last twelve months, with decidedly satisfactory results. The tonnage of ore milled and treated is now much larger than

earlier, and the company is earning comparatively large profits, as is manifest when it is seen that it has distributed already this year $120,000 in dividends paid to its stockholders, this being 10 per cent. on the issued capital.

Around Princeton, several of the coal mines that are being opened were visited; as also was the site of the British Columbia Cement Company's cement manufacturing works, the buildings for which are in course of erection. The Princeton Coal & Land Company, an auxiliary organization of the Vermilion Forks Mining & Development Company (owning the Princeton townsite and various mining properties in the vicinity), has made most progress towards development of coal mining, its mine in the immediate vicinity of the town having nearly a dozen working faces opened, with more that can be opened whenever there shall be a demand for the coal. The chief drawback to this company's material progress is the lack of plant and machinery for sizing and cleaning the coal. After these shall have been provided, a prosperous coal-mining industry will, no doubt, be established here. Among other properties worthy of mention are those of the Osoyoos Coal Company of Nelson, which has fully 60 feet in thickness of coal cut in a prospecting adit; the Princeton Collieries, Ltd., of Vancouver, and the Columbia Coal & Coke Company, of Winnipeg, which last is actively engaged in developing coal seams that have been opened from both Collins Gulch and Granite Creek sides of the basin in which they occur.

An important transaction now in course of negotiation is that for the purchase of the Voigt properties—copper claims, coal lands, timber lands, water rights, etc.—on Copper Mountain, situated a few miles from Princeton. Particulars of these properties will shortly be published; meanwhile Mr. Emil E. Voigt is in Spokane, continuing negotiations with representatives of the Boston and New York men who have made offers for the purchase of the property. The development of the mineral resources of Copper Mountain, with the necessary accompaniment of the establishment of a copper smeltery, would do much to advance the material interests of this part of the big Similkameen country.

Two days were occupied in visiting Tulameen, where Mr. Jacobs had the advantage of much conversation with Mr. Chas. Camsell, of the Canada Geological Survey. Mr. Camsell has spent five or six field-work seasons in the Similkameen, so is especially well informed concerning its geology and mineral resources. The Survey party was arranging to wash Tulameen gravels to try to find diamonds in the wash, it being thought probable that as diamonds are known to occur in the solid rock of the vicinity, there may be some found in the river gravels.

Mr. Jacobs returned to Princeton, and thence to Spokane, Seattle, and Vancouver, by rail. Among others seen in Spokane was the managing director of the Corbin Coal & Coke Company, which has during the last three years been working a coal mine in the Crow's Nest district, southeast Kootenay, and which has opened one of the most remarkable deposits of coal known to occur in the West. The proportions of this deposit are so large that the incredulity of those who are without opportunity to satisfy themselves of the statements concerning them is aroused; nevertheless it is a simple fact that there is on the Corbin Company's coal property a body of bituminous coal of phenomenal size, from which millions of tons can be easily extracted, and, too, of excellent average quality.

In Seattle, information was obtained relative to the work of the Geological Survey of the State of Washington, of the progress of the coal mining of that state, and concerning the work of the United States Geological Survey's mine-rescue training work, in connection with which about 20 men have already been trained and proved competent for rendering aid in case of emergency. Mr. Jacobs has returned to his headquarters in Victoria to there prepare for publication in detail much of the mass of information gathered by him during his trip.

GENERAL MINING NEWS.

NOVA SCOTIA.

Halifax.—Advices from Port Hood state that the water is still rising rapidly in the mine, and that only the choking of the fissure can save the mine from being flooded to the high water mark.

Yesterday the water had risen to within 262 feet of the low level in No. 3 lift, and was rising vertically at the rate of one inch in seven minutes. The water will continue to rise at this rate for some days, and will reach the low level in No. 2 lift within five and one-half days.

The only hope to save the mine is for the fissure to become choked, otherwise the water will rise to the high water sea level, which is about 500 feet above No. 3 low level.

Glace Bay.—The construction of the Dominion Coal Company's new line of railway from Morien Junction to Birch Grove, the company's new colliery, No. 20, was started to-day. The line, which will be about four miles long, will be constructed by the company's own men. The development of this new mine will be rapid after the new railway is completed, and already the company is preparing to sink a new slope which will be started this week, and will be about 2,000 feet south of the present one. The coal at this mine is of the best quality, and it is expected that operations will be far enough advanced to begin the shipment of coal before the close of navigation.

ONTARIO.

Toronto.—After about a dozen postponements, the assets of the Standard Cobalt Mines, the old Cobalt Central, were sold by E. R. C. Clarkson to Philadelphia interests for $100,001.

There was a reserve bid of $100,000, which was exceeded by $1.

Ottawa.—His Excellency the Governor-General in Council has ordered that the regulations for the disposal of quartz mining claims established by order-in-council of the 13th August, 1908, with the restriction of a subsequent order-in-council of the 16th February, 1909 extending such regulations to the reserves set apart by the Dominion Forest Reserve Act, be extended, and made applicable to lands within forest reserves and parks established by the Dominion Forest Reserves and Parks Act, of 1911, with the exception of Elk Park, within the Cooking Lake forest reserve, and the Buffalo Park reserve in the Province of Alberta.

Whereas, under the provisions of the Forest Reserves and Parks Act, 1911, all regulations with respect to the Canadian national parks have been rescinded, his Excellency in-council has been pleased to order that the regulations provided for in the following orders-in-council shall be re-established and made to apply to all Dominion parks proclaimed under the Forest Reserves and Parks Act:

1. The regulations of the national parks of Canada, approved 21st June, 1909.

2. Amendments to the above regulations approved September 26, 1910.

3. Regulations for the use of motor vehicles in the Rocky Mountain park, approved April 8, 1911.

4. Regulations for the management and control of the Dominion Government water and sewer systems and of plumbing and sanitation at Banff, approved June 23rd, 1908.

5. Amendments for the above water, sewer, and plumbing regulations approved March 10, 1909.

6. Regulations for the administration of timber within the Rocky Mountains, Yoho, and Glacier Parks, approved May 21, 1906.

7. Amendments to the above timber regulations approved February 15, 1911.

8. His Excellency the Governor-General-in-Council has also ordered that the regulations established on the 20th April, 1910, for the leasing of Dominion lands for coal mining purposes, with the restrictions of the subsequent order-in-council of February 28, 1911, shall be extended and made applicable to lands within forest reserves and parks established by the Dominion Forest Reserves and Parks Act of this year with the exception of Elk Park and the Buffalo Park reserve. A similar order-in-council has just been passed with reference to the leasing and use of lands containing limestone, granite, slate, marble, gypsum, marl, gravel, sand, or building stone. No lease for quarrying purposes shall be granted without the approval of the superintendent of the park or unless he is satisfied that the granting of such lease will not mar the beauty or the utility of the park or unduly interfere with the purposes for which it is established.

Still another order-in-council recently adopted at Ottawa provides that the waterpower regulations pursuant to the Lands Act, 1908, and amendments, shall be held applicable to all Dominion forest reserves and parks.

Cobalt. — The Cobalt dividends to be disbursed during July are estimated at $1,785,000.

Cobalt.—In a crosscut from the 100-foot level of the No. 123 shaft of the Nipissing an excellent vein of high-grade ore has been cut. This is an entirely new lead and was picked up 150 feet east from the shaft near the O'Brien line. Another vein which did not make ore, was sunk upon, and this is the first tangible result of development near the O'Brien and Chambers-Ferland line in the Keewatin formation. No. 12 shaft of the same property has also been pumped out and some very pretty ore is being mined here.

Porcupine.—A private despatch from Porcupine states that about August 1st the Dome mine will start 20 stamps, and will begin the shipments of gold bars.

Toronto, July 5.—A suit has been instituted against the Kerr Lake Mining Company by the Hargraves Silver Mines, Limited, for the recovery of $150,000, being the valuation of the ores which the plaintiffs claim were taken out of a vein running into their property and at a point outside the boundaries of the Kerr Lake mine.

It is reported the Kerr Lake Company has offered to settle the claim by the payment of $25,000, but that the offer has been refused by the plaintiffs, who will carry the case through the courts.

BRITISH COLUMBIA.

Nelson, B.C., July 1.—With the object in view of the establishment of a school of mining for the Kootenay, the Nelson Board of Trade is in correspondence with the various institutions of learning and scientific institutions in Canada and the United States, respecting modes of organizing a school of this character, and the probable cost of creation and maintenance. The model that is favoured is that of the School of Mines at Sudbury, Ont., which is conducted as a special department of the Sudbury High School, and is the child jointly of the Sudbury School Board, the mining men of the district, and the Ontario Government. This city has reached the point where a new high school building is required, and after the summer term there will be four instructors on the staff. For years fourth year work has been done by the Nelson High School, admitting its matriculants to the second year of McGill and Toronto Universities, and a department of mining, under a mining instructor, is therefore in line.

Vancouver.—The Inland Coal & Coke Company, Limited, capitalized at $1,500,000, with head offices in Vancouver, has been formed for the purpose of taking over the holdings of the Coal Hill Syndicate, southwest of the Nicola Valley Coal & Coke Company's Middlesboro properties. Joseph Graham, general manager of the Coal Hill Syndicate, is the general manager of the new corporation.

Mr. G. I. Wilson, of Vancouver, who was one of the principals in the Coal Hill Syndicate, and who has been interested in other properties in the Nicola coalfields, is the president of the new company; and W. L. Nicol, who was also interested in the Coal Hill Syndicate, is the vice-president.

It is the intention of the company to double the present force immediately. This is made possible by the development work already completed.

COMPANY NOTES

BUFFALO ANNUAL FOR 1910.

During the year the mill treated 41,484 tons, averaging 36.07 ounces of silver per ton, or 1,496,255 ounces, of which 80.07 per cent. was recovered as follows: 25,795 ounces in metallics, 540,078 ounces in jig concentrates, and 632,202 ounces in table concentrates, or a total of 1,198,075 ounces recovered, or 1,098 tons of concentrates, averaging 1,067 ounces per ton, and 1,880 pounds of bullion.

The cyanide plant treated during the year 11,700 tons of slime from the concentrator, averaging 13.06 ounces of silver per ton, or 152,783 ounces, of which 67.62 per cent. was recovered, or 103,321 ounces. The total recovery by mill and cyanide was 1,301,396 ounces, or 86.98 per cent.

The shipments during the year consisted of forty-five cars of ore, containing 1,079 tons of concentrates from the mill and 126½ tons of high-grade ore direct from the mine, or a total of 1,205½ tons of ore and concentrates shipped. There were also several small sales of native silver. The returns from these shipments and sales amounted to 1,392,700 ounces, of which approximately 279,852 ounces were contained in the ore and 1,112,848 ounces in the concentrates, or an average of 2,221 ounces per ton in the ore and an average of 1,031 ounces per ton in the concentrates. In addition to this there were shipped 9,170 pounds of bullion, the smelter returns from which amounted to 114,419 ounces.

Besides the shipments made there was on hand at the mine at the time the report was sent out 11,054 pounds of jig concentrates, containing 11,772 ounces, also 27,435 pounds of table concentrates, containing 11,276 ounces, and 837 pounds of bullion, containing 10,815 ounces, or a total of 33,863 ounces on hand.

During the year the ore reserves were increased by approximately 36,000 tons, or the equivalent of 1,118,000 ounces over that shown at the beginning of the year, which is a slight increase over the extraction for the previous year. This was principally on No. 10 vein. There is a decrease in stock piles on the surface of 7,779 tons, and an increase of ore broken in the mine ready for milling of 3,045 tons, making a total of ore broken in stopes ready for milling of 23,334 tons, in addition to the stock piles on the surface.

During the year the tonnage was broken as follows in the mine: In sinking, raising, and station cutting, 1,287 tons; in drilling, 4,942 tons; and in stoping, 30,521 tons, making a total of 26,750 tons of milling ore broken, of which 33,705 tons were hoisted and 3,055 tons left in the mine. In addition to the 33,705 tons hoisted from last year's tonnage, there were hoisted 7,779 tons from stock piles on the surface, making a total of 41,484 tons hoisted, all of which went to the mill.

Work Accomplished.

The total drifting during the year amounted to 1,412 feet;

sinking, 44 feet; raising, 73 feet; station cutting, 54 feet; and stoping, 53,321 square yards for the year. The totals to date include 977 feet of shafts, 9,028 feet of drifts and 895,260 cubic feet of stoping done in the mine.

STEEL COMPANY DIVIDEND.

The Steel Company of Canada has declared the regular quarterly dividend of 1¾ per cent. on the preferred stock, payable August 1, to shareholders of record July 22.

MOND NICKEL.

Mond Nickel Company is about to issue £250,000 5 per cent. first mortgage debentures at par for the new enlarged smelting works at Coniston, Ontario, and other purposes.

CANADIAN COAL & COKE COMPANY.

The shareholders of the Pacific Pass Coal Fields, at a special general meeting, ratified the by-law passed by the directors for acquiring securities of the Canadian Coal & Coke Company, and for selling to that company securities of Pacific Pass Coal Fields.

The question of the consolidation in the Canadian Coal & Coke Company, Limited, of the control of the large coal properties in the west at Lethbridge, Pincher, Edmonton, and Yellowhead Pass, on the G. T. P., was fully considered and discussed.

The meeting, by a majority of more than two-thirds of all the shares represented, confirmed the by-law, thus approving the consolidation as in the best interests of all parties concerned.

The consolidated companies will control four of the finest coal properties in Western Canada, developed and equipped under the direct supervision of Mr. Charles Fergie, M.E., an engineer of experience and high standing.

The combined capacity of the mines will be about equal to that of the Dominion Coal Company, and their location will permit of the western market being supplied with the shortest haul.

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS.

Following are the shipments from the Cobalt camp for the week ending June 30, and those from Jan. 1, 1911, to date:

	June 30. Ore in lbs.	Since Jan. 1. Ore in lbs.
Badger		55,200
Bailey		40,000
Barber		6,000
Beaver	62,500	779,208
Buffalo		1,405,860
Chambers-Ferland	64,000	703,000
City of Cobalt		557,980
Cobalt Lake	145,760	2,269,450
Cobalt Townsite		480,700
Colonial		88,000
Coniagas	58,030	2,112,210
Crown Reserve		1,275,420
Hargraves		161,100
Hudson Bay		585,960
Kerr Lake	60,050	1,382,090
King Edward		40,000
La Rose	130,344	3,184,570
McKinley-Dar-Sav.	174,575	3,163,605
Nipissing	306,247	3,330,107
O'Brien		673,040
Peterson Lake (Little Nip.)		58,430
Provincial		40,510
Right-of-Way	63,388	642,948
Silver Cliff		106,680
Standard		102,813
Temiskaming		860,852
Trethewey		672,380
Wettlaufer		117,232

The shipments for the week were 1,064,894 pounds, or 532 tons.

The shipments from Jan. 1 to June 30 were 24,875,349 pounds, or 12,437 tons.

Following are the shipments from the Cobalt camp for the week ending July 7, and those from Jan. 1, 1911, to date:

	July 7. Ore in lbs.	Since Jan. 1. Ore in lbs.
Badger		55,200
Bailey		40,000
Barber		6,000
Beaver		779,208
Buffalo		1,405,860
Chambers-Ferland		703,000
City of Cobalt		557,980
Cobalt Lake	124,356	2,393,806
Cobalt Townsite		480,700
Colonial		88,000
Coniagas	59,524	2,171,734
Crown Reserve		1,275,420
Hargraves		161,100
Hudson Bay		585,960
Kerr Lake	60,340	1,382,090
King Edward		40,000
La Rose	170,303	3,254,873
McKinley-Darragh-Savage		3,163,605
Nipissing	188,631	3,518,738
O'Brien		673,040
Peterson Lake (Little Nip.)		58,430
Provincial		40,510
Right of Way		642,948
Silver Cliff		106,680
Standard		102,813
Temiskaming		860,852
Trethewey		672,380
Wettlaufer		117,232

The shipments for the week were 603,154 pounds, or 301 tons.

The shipments from Jan. 1 to July 7 were 25,478,503 pounds, or 12,739 tons.

Following are the figures of German consumption of foreign copper for the months January to May, 1911:

Imports of copper	tons	74,313
Exports of copper	tons	3,211
Consumption	tons	71,102

as compared with consumption during the same period in 1910 of 66,388 tons.

Of the above quantity 64,555 tons were imported from the United States.

B. C. ORE SHIPMENTS.

The ore shipments for the week ending July 1 were 39,044 tons, and the tonnage smelted was 36,835. The following is the record to date:

Slocan-Kootenay Shipments.

Sullivan	659	17,366
Society Girl	20	321
Silver Leaf	5	5
Fern	8	8
Richmond-Eureka	27	1,345
Rambler-Cariboo	31	923
St. Eugene, milled	420	15,576
Queen, milled	420	10,710
Granite-Poorman, milled	250	6,500
Knob Hill	132	1,938
Nugget, milled	110	2,860
Van Roi, milled	800	11,449
Other mines	.....	5,868
Total	2,882	74,869

Boundary Shipments.

Granby	19,744	496,655
Mother Lode	5,334	165,559
Jackpot	525	16,450
Rawhide	4,229	99,166
Athelston	277	3,110
Napoleon	449	3,177
Unnamed	236	510
Other mines	.....	36,252
Totals	30,794	820,888

Rossland Shipments.

Centre Star	4,309	101,455
Le Roi No. 2	425	13,916
Le Roi No. 2, milled	300	7,800
Le Roi	327	6,529
I. X. L.	7	50
Other mines	.....	378
Total	5,368	130,128

Granby Smelter Receipts.

Grand Forks, B.C.

Granby	19,744	496,655

B. C. Copper Co.'s Receipts.

Greenwood, B.C.

Mother Lode	5,334	165,559
Jackpot	525	16,450
Rawhide	4,229	99,166
Napoleon	449	3,177
Athelston	277	3,119
Unnamed	236	510
Other mines	.....	3,485
Total	11,050	291,466

Consolidated Co.'s Receipts.

Trail, B. C.

Sullivan	659	17,366
Centre Star	4,309	101,455
Le Roi No. 2	425	13,916
St. Eugene	91	3,400
Society Girl	20	321
Knob Hill	132	1,938
Le Roi	327	6,529
Silver Leaf	5	5
Fern	8	8
Richmond-Eureka	27	1,345
I. X. L.	7	50
Rambler-Cariboo	31	923
Other mines	.....	37,427
Total	6,041	186,683

TORONTO MARKETS.

July 8, 1911.—(Quotations from Canada Metal Co., Toronto).

Spelter, 5.85 cents per pound.
Lead, 3.65 cents per pound.
Antimony, 8 to 9 cents per pound.
Tin, 46 cents per pound.
Copper, casting, 12.80 cents per pound.
Electrolytic, 12¾ cents per pound.
Ingot brass, 8 to 12 cents per pound.

July 8, 1911.—Pig Iron (Quotations from Drummond, McCall Company, Toronto):

Summerlee No. 1, $22.50 (f.o.b. Toronto).
Summerlee No. 2, $22.00 (f.o.b. Toronto).
Midland No. 1, $19.00 (f.o.b. Toronto).
Midland No. 2, $19.00 (f.o.b. Toronto).
Hamilton No. 1, $18.00 (f.o.b. Hamilton).
Hamilton No. 2, $17.50 (f.o.b. Hamilton).
Clarence, $19.00 (f.o.b. Toronto).
Cleveland, $19.00 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75.
Coal, bituminous, $3.50 to $4.50 for 1¼-inch lump.

July 7.—Tin, Straits, 44.50 cents.
Copper, prime lake, 12.75 cents.
Electrolytic copper, 12.67½ cents.
Copper wire, 13.75 cents.
Lead, 4.50 cents.
Spelter, 5.80 cents.
Sheet zinc (f.o.b. smelter), 7.50 cents.
Antimony, Cookson's, 8.50 cents.
Aluminium, 19.75 to 20.25 cents.
Nickel, 40.00 to 45.00 cents.
Platinum, ordinary, $42.50 per ounce.
Platinum, hard, $44.50 per ounce.
Bismuth, $1.80 to $2 per pound.
Quicksilver, $44.00 per 75-lb. flask.

SILVER PRICES.

	New York. cents.	London. pence.
June 24	52¾	24⅜
" 26	52¾	24⅜
" 27	52⅞	24 7/16
" 28	52¾	24⅜
" 29	52¾	24 5/16
" 30	52¾	24 5/16
July 1	52¾	24⅜
" 3	52⅝	24 5/16
" 4	Holiday	24 5/16
" 5	52⅞	24 7/16
" 6	52¾	24⅜
" 7	52⅝	24 5/16