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NOTICE

Dishonest persons have been attempting to solicit subscriptions for the Canadian Mining Journal without authorization from this office. They have set the subscription rate at one dollar per annum, and have apparently "worked" several places, with what degree of success we cannot tell.

We wish to warn the public against these tricksters. Our agents are provided with papers and forms which are not obtainable by anybody not employed by us. It is an easy matter to detect an imposter. We shall be grateful if persons having knowledge of an offence of this sort will bring it immediately to our notice.

RECIPROCITY

There is need of systematic interchange of opinions and data between Canadian metallurgists and mining men. The Canadian Mining Institute affords an annual outlet to those having something to say in matters technical. There are, however, emergent problems, more particularly in the field of ore treatment and reduction, that require immediate attention. Take, as an example, the milling of gold ores. We could cite instances of two free-milling ores, identical in character, and being mined within a few miles of each other, receiving totally different treatments in the stamp mill. It is often the case that the stamp mill is designed, and its specifications are filled, not to meet the requirements of the ore to be treated, but rather to conform to the predilections or prejudices of the mill manager. Under circumstances such as these, loss is inevitable. Many a mine has been added to the list of failures because of just such unwisdom. Again, the concentration of ores (such as the ores of Cobalt) is a subject fraught with difficulties. Experience will teach many men different truths. Sooner or later a standard method of concentration for each class of ore will be developed—sooner, and with infinitely less expense to all concerned, if a frank interchange of experience be instituted; later, and at indefinitely greater cost, if each operator hugs his own small fraction of success.

Viewing the subject in general, it should be at once apparent that technical men engaged in any of the various processes of mining and metallurgy have nothing to lose and everything to gain by freely comparing notes at all times and seasons.

NOVA SCOTIA MOVES

While Nova Scotia is supplying her sister Provinces with politicians and the larger sort of educationist, and has been exporting professors to the United States, she has chosen for the head of her new Technical College a native of Cambridge, Massachusetts.

Mr. Frederick H. Sexton, whose appointment to the Directorship of Technical Education in Nova Scotia, and to the Principalship of the Nova Scotia Technical College in Halifax, has just been announced, has for the past four years occupied the chair of Mining and Metallurgy at Dalhousie College, Halifax. During these years he has succeeded in establishing a thorough and eminently practical course of instruction in those important branches. He has acquired, moreover, a knowledge of the peculiar conditions which delimit the industrial development of Nova Scotia, more especially as regards mining and metallurgy. With the initial advantages of youth, of a brilliant academic career at the Massachusetts Institute of Technology, and several years of research work and practical experience in previous appointments, Mr. Sexton is well furnished, professionally, for his responsible task. Further, however, Mr. Sexton, by the quality of his work, by his unwearying enthusiasm and by his unusual modesty, has won the warm friendship of all mining men. The Canadian Mining Journal extends to the new Director its heartiest wishes for all success. Nova Scotia has long needed such an institution as the new Technical College, and, we are confident, such a man to govern it as her newly appointed Director of Technical Education.

ASSAYERS

British Columbia points a moral for Ontario. In the former Province examinations for efficiency in the practice of assaying are held under the direction of a Board of Examiners. Persons wishing to practice as assayers must pass this examination before being granted a license. An entrance fee of fifteen dollars is charged, and successful candidates are called upon for an additional fee of fifteen dollars for their certificates. Candidates are examined on their knowledge of the principles of inorganic chemistry, of sampling, of the qualitative determination of the common elements in ores and furnace products, of assaying of gold bullion, copper bullion and lead-copper bullion, and of ores and furnace products. An adequate knowledge of the methods of analysis of coal, and of the standard methods of determining copper, nickel, iron, lead, lime, zinc, sulphur and silica, must be shown. The candidates are also examined in mineralogy. Graduates of certain Schools of Mines and Colleges are exempt from examinations, and may receive a certificate of competency upon payment of the fee. The examinations are largely practical.

It will thus be readily seen that British Columbia does not recognize as an assayer a man who can merely determine the amount of gold in an ore. The Province very wisely demands that certificated assayers must display a thorough familiarity with all the ordinary processes of qualitative and quantitative analysis. Candidates who come up to the necessary standard are very likely to be men of intelligence and honesty. We venture the statement that had the Province of Ontario exercised the same precautions in restricting the practice of assaying to qualified men, many of the fabulously rich assay returns reported from Larder Lake ores would never have seen the light of day. Some restrictions are absolutely necessary. Ontario cannot do better than to immediately follow the example of her Western sister.

PROSAIC MINERALS

While the mineral riches of New Ontario and the new promise of re-vitalized British Columbia have latterly attracted seekers after wealth, certain prosaic branches of the mineral industry are being carried on with quiet though increasing success. In the last number of the Canadian Mining Journal an outline was given of the extent and importance of asbestos mining in Quebec. The present issue contains an article written by the person who has contributed not a little to developing in Canada a successful graphite industry. In a future issue the mining and working of another economic mineral, mica, will be taken up.

In attacking and removing the difficulties that lay in their paths, the pioneers of these lesser industries had none of the glittering incentives that are held out to the seeker after precious metals. Slowly, surely, but with many discouragements, they have exploited their deposits, solved one by one the problems of mining and treatment, and have obtained a market. In every best sense of the term their work has exemplified the *true business* of mining. The iteration of that phrase, "business of mining," is intentional.

Figures of output are important, but more important is this, that Canada possesses several thriving industries and that these owe their existence to the sane, well-directed, practical intelligence of men who have faith in themselves and in their own country.

The Federal Government has devised new legislation which will undoubtedly be acceptable to Western coal consumers. It is provided that in Manitoba, Saskatchewan, Alberta, and Yukon Territory coal mining rights may be leased for twenty-one years at an annual rental of one dollar per annum, payable in advance. No applicant shall be allowed to lease an area larger than 2,560 acres. The area taken up by one applicant must not exceed four miles in its greatest dimension, and all holdings by one person must be contiguous. Applications are made through the Dominion Lands agent, or through a sub-agent of the district. Thirty days are allowed an applicant for registering a location in unsurveyed territory. The lease includes only coal mining rights. The Minister may, however, permit the purchase

of the surface rights of whatever land in the location he deems necessary for the efficient working of the coal mining rights, at the rate of $10 per acre.

The phenomenal drop in Foster (Cobalt) stock, for which no cause is publicly assigned, should be taken as a note of warning. The Foster Mine is, so far as we know, a well-managed mine. It has been and will be a producer. To give anything approaching an adequate return on its heavy capitalization, it must be developed conservatively, and with an eye to the future. An attempt to secure an immediate heavy output might not only diminish the possibilities of the mine, but might fatally handicap it. If this then is true of the Foster, if the stock of a developed mine, with a generally acknowledged claim to fair prospects, is so sensitive to apparently unfounded rumors, what may we expect of the dozens of Larder Lake and Cobalt flotations that have no reason for eixstence beyond a title from the Government, a man-hole in the ground, and a broker's fervent desire to get into the public's pocket!

Here we may pause to observe that several Toronto mining brokers and promoters are advertising lavishly in the press of the Western and Maritime Provinces. We wish to warn those who are desirous of risking their money in mining ventures to refrain absolutely from purchasing stock in Larder Lake or Cobalt concerns, until they have consulted either the Ontario Bureau of Mines or some competent and reputable mining engineer. This is a re-iteration of what has been said before. But so glaring, so patently unsound are the statements made in the "display" advertisements, that they provoke renewed attention. A contemporary mining periodical cites an instance which may well be taken to heart. The L. M. Sullivan Company, of Nevada, a lavish advertiser, received as much as $140,000 in a single day from the sale of mining stocks which it was promoting, yet so tremendous were its expenses that the company failed and had to be reorganized. Advertising was the largest item in its expenditure.

Larder Lake has not yet a mine, much less a producing mine. What conceivable right can any firm of brokers, or any group of promoters, have to spend hundreds of dollars daily in advertising totally undeveloped possibilities? What law sanctions this misappropriation of monies received for an entirely different purpose? But why invoke the law! It is surely not vain to appeal to the common business sense of the long-suffering public!

AMERICAN MINING INSTITUTE

It is announced that arrangements have been consummated for holding a summer meeting of the American Mining Institute in Toronto. The date set is in July. More specific information will be forthcoming later. After a brief session in Toronto the members of the Institute will visit Cobalt, Copper Cliff and various other mining centres. The visit has been arranged largely by officials of the Ontario Bureau of Mines. The local Government is giving assistance, and it is expected that all mning men will heartily co-operate with the orginators of this movement. The American Mining Institute counts among its members nearly every prominent mining engineer in the United States. Its membership also includes many Canadians. As honorary members, it has enrolled the leading scientists of Europe. Toronto should heartily welcome this distinguished body of visitors.

EDITORIAL NOTES

Aluminium may, doubtless will, displace copper to a limited extent for certain incidental purposes. But the supply of aluminium is still insignificant as compared with the output of copper. And even were the world's supply of aluminium increased until it equalled the amount of available copper, it would have very little effect upon the price of the latter metal. For electrical uses copper is incomparably superior to aluminium, and will always be in demand. However, there are a hundred uses to which aluminium could be profitably put were there a more bountiful supply.

CANADIAN GRAPHITE

By H. P. H. Brumell, M.E., Buckingham, Que.
(Toronto Meeting, 1907.)

Of the many useful minerals of common occurrence and wide distribution in Canada, probably less is known of graphite than any other, yet in a quiet and unostentatious way there is being developed an industry in this mineral that promises, in the near future, to be of no small importance to the Dominion. Already there are several companies busily at work with the expectation of producing considerable quantities during the present year. Unfortunately, with regard to the higher grade of graphite (the so-called flake or crystalline quality), the business becomes a milling rather than a mining one as the ore is usually a disseminated one, requiring expert knowledge and special machinery. In the latter respect careful experiment has been required, and the present apparent success has only been won by large expenditure of both time and money.

The industry, which dates back to about 1860, has not until very recently been successful in this country, although with leaner ores it has been profitably conducted in the United States for many years, notably by the Joseph Dixon Crucible Company, the pioneers, on this continent, in the production of graphite from low percentage ores. They began operations as early as 1827.

Character of Graphite.—This mineral, which is, according to locality, termed graphite, plumbago or black-

lead, is essentially a crystalline form of carbon, although its occurrence in that form is practically unknown. It has a specific gravity of from 2.09 to 2.29, according to the percentage of impurity almost invariably found with it; is steel-grey to black in color; feels greasy; lustre, in the crypto-crystalline form, metallic; laminæ thin, flexible and inelastic. The impurities referred to above are usually some form of iron or calcite, while in an ore mined at Calabogie, Ont., the foreign substance is almost invariably one or other, as yet undetermined, of the chlorite group. For commercial purposes and those of this paper the mineral may be divided into three groups, viz., anthracite, amorphous and crystalline, the last being again divided into "vein" and "disseminated" ores. Of the anthracite variety there is a comparatively large deposit near Lepreau Harbor, on the Bay of Fundy, N.B., while the amorphous is found at a number of points in Nova Scotia, New Brunswick and Ontario. The last and most important variety is found, in commercial quantities, to a very great extent in the Archæan rocks lying to the north of the Ottawa River, and to a smaller extent in these rocks in Eastern Ontario. Although widely distributed over large areas of both these Provinces, the most important deposits of economic value in Quebec are confined to the Counties of Labelle and Argenteuil, while in Ontario the Counties of Lanark and Renfrew show a considerable development.

As to the relative value of disseminated and vein ores the writer has always held that the advantage has lain with the former variety by reason of its uniform character and continuity of deposit. Experience in the mining of both has proved this, and the writer is upheld in his opinion by the late H. G. Vennor, who, in the Report of the Geological Survey, 1873-4, writes: "Pure as is this vein-form of graphite, my experience shows that it is to the bedded deposits of this mineral that we must look for our chief supplies, and in this opinion I follow Sir William E. Logan, who, in the report already cited, says: 'The veins of this mineral hitherto found in the rocks of this country, although affording a very pure material, appear to be too limited and too irregular to be exclusively relied on for mining purposes, which should rather be directed to making available the large quantities of graphite which, as we have seen, are disseminated in certain beds.' Such beds are particularly well developed in the portion of Buckingham examined, as well as in the contiguous Township of Lochaber."

Distribution.—It has not been thought necessary for the purpose of this paper to go very deeply into the geographical distribution of this mineral, as very good descriptions of most of the known deposits may be found in the reports of the Geological Survey of Canada; nor is it necessary to go into its geological history for the same reason. Speaking generally, the only deposits of value are confined to rocks of pre-Cambrian age, the mineral being found usually in the Grenville series, or upper beds of the Laurentian system. Certain less important deposits of amorphous ore are occasionally met with in rocks of Devonian or lower Carboniferous age.

It may not be amiss to quote here a brief but very interesting description of the occurrence of graphite in Ceylon. This description constitutes part of the report of Mr. Joseph Hyde Pratt on Graphite in the "Mineral Resources of the United States" for 1904:—"The bulk of the world's supply of the crystalline graphite is obtained from the Island of Ceylon. These deposits are located in the western and southwestern portions of the island, the mineral area in which the graphite occurs being approximately 95 miles long in a north and south direction, with a width of 5 miles at its northern and of 43 miles at its southern end. The commercial graphite deposits occur in veins which traverse a garnetiferous granite rock. These veins vary in width from a few inches to 8 feet, and one has been followed to a depth of 720 feet; but from all accounts such a depth is exceptional. Horizontally the veins are very irregular and limited, and well-defined veins constantly pinch out. There does not seem to be any evidence of a main lode or series of lodes in any part of the district, but there appear to be two zones of the country rock, 4 miles and upward in width (the widest part being 20 miles), which seem to contain the veins that carry the graphite. These deposits have been described in some detail by Mr. George S. Stonier in a paper presented before the Insti-

BUCKINGHAM GRAPHITE COMPANY, BUCKINGHAM, QUE. General View of Works.

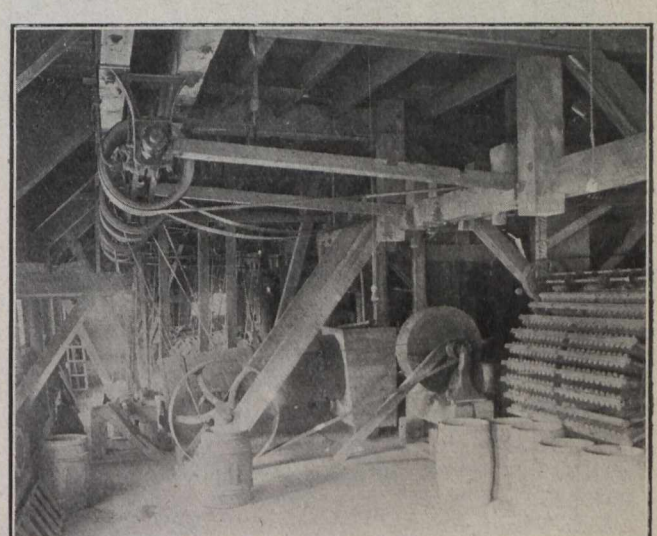
tute of Mining Engineers of London, entitled 'Graphite Mining in Ceylon and India.' He states that horizontal veins seem to be entirely disconnected, and that not only is there no indication of a main lode, but that there does seem to be even a series of connected lodes or veins. A vein four inches wide is considered as profitable mining. The largest mass of graphite which has been discovered in this district weighed nearly 6 tons. From the data at hand, Mr. Stonier considers that the fissures were formed first, and that the graphite, quartz, etc., were deposited in them. The graphite may have been introduced by

Buckingham Graphite Company's Mill, Buckingham, Que.

sublimation, not of carbons, but of hydrocarbons, as is suggested by the fact that a deposition of graphite-like material is often found in the cracks of upper layers of coke made in the closed ovens.

"There are about 300 mines and quarries in operation, which, with the exception of 3, are all worked by the old native methods. Attempts have been made to work the graphite deposits by modern methods, but on account of the uncertainty of the occurrence of the graphite, it has been found more profitable thus far to work the mines according to the old methods. This generally means that the graphite deposits are simply worked to water level. This is done by means of shallow shafts sunk 50 or 60 feet, the ore being hoisted in barrels and the mineral conveyed in boxes to the dressing sheds, where it is roughly picked and packed in barrels for transit to the shipping port, either Colombo or Galle. Here the graphite is resorted and screened, the larger pieces being broken up. In some cases the poorer portions are further concentrated by washing. It is then classified into five sizes, known as lump, ordinary, chips, dust, and flying dust, and these grades are further divided according to quality. It is estimated that Ceylon furnishes about 30 per cent. of the world's output of graphite and 75 per cent. of the value."

Origin.—Regarding the origin of graphite there has been no small amount of controversy, equally strong claims being set forth to prove an organic as those pointing to an inorganic origin. It is not considered necessary, nor within the province of this paper, to go into the subject deeply. Attention may, however, be drawn to two points, which, in the writer's opinion, would point to an inorganic genesis. First the occurrence of graphite in the silver veins on Silver Islet on Lake Superior. In his report on "Mines and Mining on Lake Superior" (Geological Survey Report, 1887-88) Mr. E. D. Ingall says:—"Graphite also occurs in considerable quantity and seems to be connected in some way with the occurrence of the silver. On enquiring of Mr. R. Trethewey as to what connection he had noticed between the existence of this graphite and the occurrence of the silver, with a view to ascertaining its value as an indication, he told me that although they never had silver without graphite, they sometimes had graphite without silver" . . . "In a specimen of the ore collected by myself are to be seen pieces of trap and graphite enclosed in pink spar, whilst in the graphite start out dendrites of silver." Secondly, and coming directly under the observation of the writer, and applying to practically all the deposits in Labelle County, is the fact that wherever the beds of disseminated ore are cut or in any way traversed, as they often are, by diorite, or other dikes, there is a very pronounced enrichment of graphite. At these points there is always an entire absence or marked lessening in quantity of calcic carbonate (calcite) and a very considerable quantity of calcic sulphate (selenite), while the pyrite is replaced by pseudomorphous ferric oxide. Without going into a lengthy argument on the above, might it not be concluded that under certain favorable conditions the calcite gave up part of its carbon, which was re-deposited as graphite, while the pyrites afforded the sulphur which, with the calcium, produced the selenite, leaving the iron to be resolved into ferric oxide. Again, all the known deposits of vein graphite occur in intrusive masses of diorite or pegmatite. Prof. A. Osann, of Mulhausen, Alsace, writes (Rep. Geo. Surv. 1899):—"The occurrence of graphite at Graphite City is connected with the appearance of massive eruptive rocks which in mineralogical composition are very similar to those described in connection with the apatite occurrence." . . . "As far as I could see on my short visit, the occurrence of the graphite is connected with the contact of this eruptive rock with gneiss and granular limestone. The limestone is in these places very much altered; there has been especially a large production of scapolite, pyroxene and titanite."

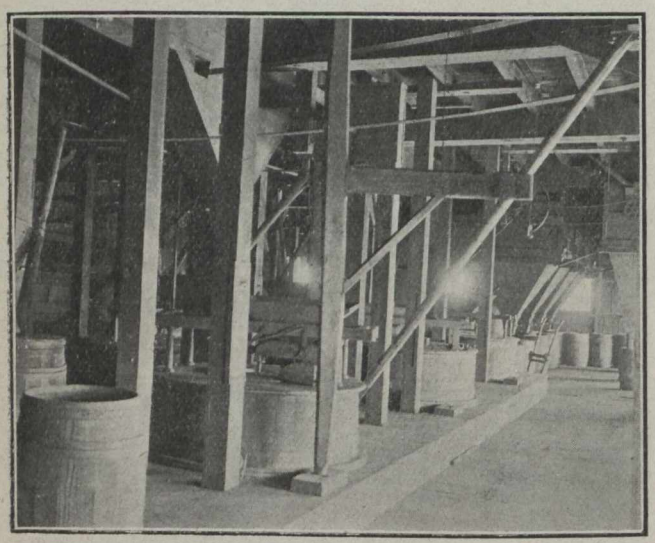


Part of Concentrating Plant, Buckingham Graphite Company, Buckingham, Que

In the limestones, as at Grenville and Calumet, the mineral occurs invariably as segregated masses rather than in veins. In writing the foregoing, reference is made only to the occurrence of the mineral in pre-Cambrian rocks; the amorphous graphite of Devonian and lower Carboniferous age being very probably due to the carbonization of organic remains.

History.—The history of graphite may be given in but few words. Knowledge of the existence of the mineral in Canada antedates the birth of our Geological Survey,

whose staff was, however, not long in taking cognizance of its existence. On 20th June, 1860, Mr. William E. Logan, later Sir William E. Logan, issued a circular letter from Toronto, asking for specimens for the Grand Industrial Exhibition to be held in London the following year, and we find in the catalogue of the Canadian exhibit, note of a specimen of plumbago from Lot 10, Range 5, Township of Grenville, Argenteuil County, Quebec, with the remark that there were two veins. Again in 1862, at the London International Exhibition, the Geological Survey exhibited specimens from Pointe du Chene, Grenville, and Lochaber, in Quebec. Shortly after, in 1867, work was begun in earnest and a small mill erected by the Canadian, afterwards the Montreal Plumbago Company, on a water power on Lot 28 in the Fifth Range of Buckingham Township, Labelle County, Que., the ore being obtained from Lot 28 in the Sixth Range, immediately to the north, and known as the "Castle" property. This mill was operated successfully until 1872, after which work was not carried on very actively, the only product being stove polish, made from material previously mined and at the mill. In 1873, the mill was destroyed by bush fires and all operations ceased.



Part of Finishing Plant, Buckingham Graphite Company, Buckingham, Que.

Work at about the same time was being prosecuted on a pure lump vein by Messrs. Pew & Weart on lots immediately to the east, and shortly afterwards a mill was erected in Lochaber Township on the Blanche River by the Lochaber Plumbago Mining Company, the ore to supply which being obtained from lots to the north, in the neighborhood of Long Lake. This mill proved unsuccessful, and, after treating some 600 to 700 tons, was abandoned. In reference to this mill, and in general to graphite mining in the County of Labelle at that time, Mr. H. G. Vennor writes (Rep. Geo. Surv. 1876-77):—"From information gathered from several of the old settlers in this Township, I learned that the mining operations had been conducted here in a most unsystematic manner, and this fact was borne out by the shape and position of many of the openings which had been made. Mr. Pearce, who acted as general mining captain for this company, spent much of his time in devising plans for the mechanical separation of the plumbago from foreign matter, but with the exception of making some amusing mechanical toys, and adding greatly to the working expenses of the company, accomplished but little. While Mr. Pearce thus experimented, each miner was his own mining captain, and, as might have been expected, the greatest confusion prevailed until the company suspended work. I mention these facts here to explain the true cause of the total failure of this mining enterprise in Lochaber, for the suspension of work at one after another of the plumbago mines in both Buckingham and Lochaber has greatly discouraged those who are interested in their development. In conclusion, I would remark that plumbago yet abounds in both Buckingham and Lochaber, and all that is requisite for its successful mining is a cheap and effectual method of separating it from the impurities which are mechanically mingled with it." During 1875-76 the Dominion of Canada Plumbago Mining Company erected an extensive mill on Lot 19 in the 8th Range of Buckingham, which was in operation for some years. Lack of proper management and an over lavish expenditure of money, however, forced the company into bankruptcy in 1879, when the extensive property was bought in and the business rehabilitated under the name of the Walker Mining Company, which continued somewhat intermittently to operate the property until 1895, when all work ceased. The property lay fallow until 1905, when it was taken up and has since been operated by the Buckingham Graphite Company. In 1890 a mill was erected on the Pew & Weart property, north of Donaldson Lake, on Lot 26, Range 6, of Buckingham. It was re-built in 1892, and continued to produce in a spasmodic manner until about 1900. In 1872 a mill was built and operated at Oliver's Ferry, Ontario, with, it is said, considerable success, the ore being obtained from Lot 21, Range 6, Township of North Elmsley; details as to subsequent years are not available. This is, as far as is known, the only mill erected in Ontario in the early stages of the industry.

To come down to more recent years, the mill of the North American Graphite Company was built on Lot 28, Range 6, Township of Buckingham, in 1895, and in 1904 the mill of the late Walker Mining Company was entirely remodelled by the Buckingham Graphite Company. In Ontario, the mill of the Ontario Graphite Company was erected in 1902, and continued in operation for about a year, when a cave-in of the roof under Whitefish Lake flooded the mine, and all work was abandoned. In the same year the Globe Refining Company erected a small mill at Port Elmsley, which is in operation, though not financially successful, it is said, at the present time. Two mills are at present being erected, one near Calumet Station on the Canadian Pacific Railway, and another on the Lievre River, about six miles north of Buckingham, while extensive development work is being carried on at the Belle Mine, about three miles east of Buckingham. Rumor says that a mill will be erected on this property during the coming spring.

Crude ore has been, in the past few years, shipped from several points in Canada, the most important producers being the Ontario Graphite Company, who exported large quantities of amorphous ores, from their mine in Brougham Township, Ontario, previous to the flooding of their pit. Large quantities of a poorer quality of amorphous ore were shipped from Allanhurst, in Ontario, and from St. John and Petitcodiac in New Brunswick, while a considerable shipment of flake or crystalline ore was made from Grenville, Quebec, by the Keystone Graphite Company in 1900.

Methods.—Like many other industries not wholly proven, there is, in the treatment of the ore, a considerable amount of secrecy observed, which makes it very difficult to write with confidence of the various methods

employed. Speaking generally of the earlier efforts at milling, it may be said that in all instances the operators used the old system of stamping: in point of fact, with the exception of the Pew & Weart mill, all mills were so equipped until 1902, when the first dry mill was erected by the Globe Refining Company at Port Elmsley, Ontario. This company was followed, in 1903, by the Anglo-Canadian Graphite Syndicate of Birmingham, England, who took over the mill erected by the North American Graphite Company and rebuilt it on a dry principle, different, however, to that of the Globe Company. In the earlier mills, after crushing and stamping, concentration was had by stationary buddles, and, in some of the earliest plants, by keeves. The concentrates, after drying, were put through a system of buhrstones and revolving screens, until they were more or less finished, the resultant products being then graded for the various markets for which they were intended. At the mill of the Globe Refining Company, while the writer has not personal knowledge, concentration is had, after crushing and rolling the ore, by means of the Krom Separator or pneumatic jig, after which the concentrates are bolted and only two grades made, all material finer than 60 mesh being discarded. The plant erected by the Ontario Graphite Company in Brougham Township, Ontario, is equipped with the old, and now obsolete, system of stamps and buddles; a treatment to which the ore does not readily lend itself. This ore is unique, inasmuch as that it is practically amorphous, carrying about 10 per cent. of crypto-crystalline or flake graphite, and as both varieties are similar in gravity, but a very poor separation is made. As the crushed and buddled ore had to be dried after the so-called concentration and all the material in the buddles moved by hand, it will be seen that considerable extra expense was saddled on the finished product. The mill of the late Anglo-Canadian Graphite Syndicate, formerly the North American Graphite Company, was originally equipped with stamps and buddles but was, under the regime of the former company, remodelled and now contains Blake and roll-jaw crushers, between which the ore is dried by means of a cylindrical revolving fuel dryer. After coming from the roll-jaw crusher the ore passes through two sets of ordinary belted rolls, passing thence to a series of sizing screens, fitting it for the dry pneumatic concentrators. The tailings from these machines are then treated on the Brumell concentrator, a wet separator which relies on the floating quality of graphite, when dry, upon the moving surface of a body of water. The resultant concentrates from this wet separator are then dried by means of a revolving steam drier when all concentrates are taken to the buhrstones, by means of which, with the necessary accompanying screens and graders, the material is finished and ready for market. The mill of the Buckingham Graphite Company is equipped similarly to the foregoing, though its capacity is very much greater. In this mill the roll-jaw is replaced by a Gates rotary crusher and, in addition, a dry separator, known as the barrel concentrator, is used. In regard to the mills being erected at Calumet and Buckingham, great secrecy has been observed, and it is only from hearsay that the writer is led to say that the methods to be employed will be practically the same as are now used at Port Elmsley, Ont.

Market.—Much has been said, in the markets of the world, with a view to creating a prejudice against Canadian flake graphite, and as the trade has always looked to Ceylon, and old established connections still hold with that country, it has been found no easy matter to introduce the Canadian product. However, as we are now putting on the market material of such high percentage and have always maintained an uniformity of product, we are gradually breaking down the barrier of prejudice and annually gaining ground in the open market. As illustrative of the purity of our finished material, the following assays, made from stock, may prove of interest:—

I.—By Milton L. Hersey, Montreal, from Anglo-Canadian Syndicate Mill.

II.—B. A. E. Tucker, Birmingham, Eng., Anglo-Canadian Syndicate Mill.

III.—By Milton L. Hersey, Montreal, from Buckingham Graphite Company Mill.

	I.	II.	III.
GR	93.96	94.68	96.10
GA	93.80	94.63	96.08
GP	94.14	94.24	93.60
GH	93.94	94.49	94.90
GI	93,50	94.04	96.51
GT	92.74	93.16	81.16
GE	91.18	91.77	77.90
G12	.....	.....	78.08
No. 80	.....	.....	71.30

The foregoing stocks are of higher percentage than any other similar ones now on the market.

In his report on Canadian Graphite, Mr. G. C. Hoffmann (Rep. Geo. Surv. 1876-77) goes very thoroughly into the relative value of Canadian graphite compared with that of Ceylon, which is, and has always been, taken as par. In summing up his work, Mr. Hoffmann says: "From these experiments it will be seen that in respect to incombustibility the Canadian graphite may claim perfect equality with that of Ceylon; and that consequently—apart from any consideration of the proportion and nature of the associated foreign matter—it is in no wise inferior to the latter as a material for the manufacture of crucibles." In this report it will be seen that high percentage graphite was being produced, though not with financial success, as early as 1876, during which year the Dominion of Canada Plumbago Mining Company produced and marketed a small quantity of the following grades:—

A0.—For electrotyping, 82.31 per cent.
A1—For lubricating, 94.85 per cent.
A2—For lubricating, 89.26 per cent.
A3.—For crucibles, 92.35 per cent.
A4.—For crucibles, 94.30 per cent.
A5.—For crucibles, 95.59 per cent.
A6.—For crucibles, 96.36 per cent.

The following tables, from the same report, will illustrate the relative graphite values of vein graphite from Canada, Ceylon and Ticonderoga, N.Y. (the mines of the Joseph Dixon Crucible Company):—

Buckingham, vein graphite, variety foliated, sp. gr. 2.2689 carbon 99.675.

Buckingham, vein graphite, variety columnar, sp. gr. 2.2679 carbon 97.626.

Grenville, vein graphite, variety foliated, sp. gr. 2.2714 carbon 99.815.

Grenville, vein graphite, variety columnar, sp. gr. 2.2659 carbon 99.757.

Ceylon, vein graphite, variety foliated, sp. gr. 2.2664 carbon 99.679.

Ceylon, vein graphite, variety columnar, sp. gr. 2.2671 carbon 99.792.

Ceylon, vein graphite, variety foliated, sp. gr. 2.2484 carbon 99.284.

Ceylon, vein graphite, variety columnar, sp. gr. 2.2546 carbon 98.817.

Ticonderoga, vein graphite, variety foliated, sp. gr. 2,2599 carbon 96.656.

Ticonderoga, vein graphite, variety foliated, sp. gr. 2.2647 carbon 97.422.

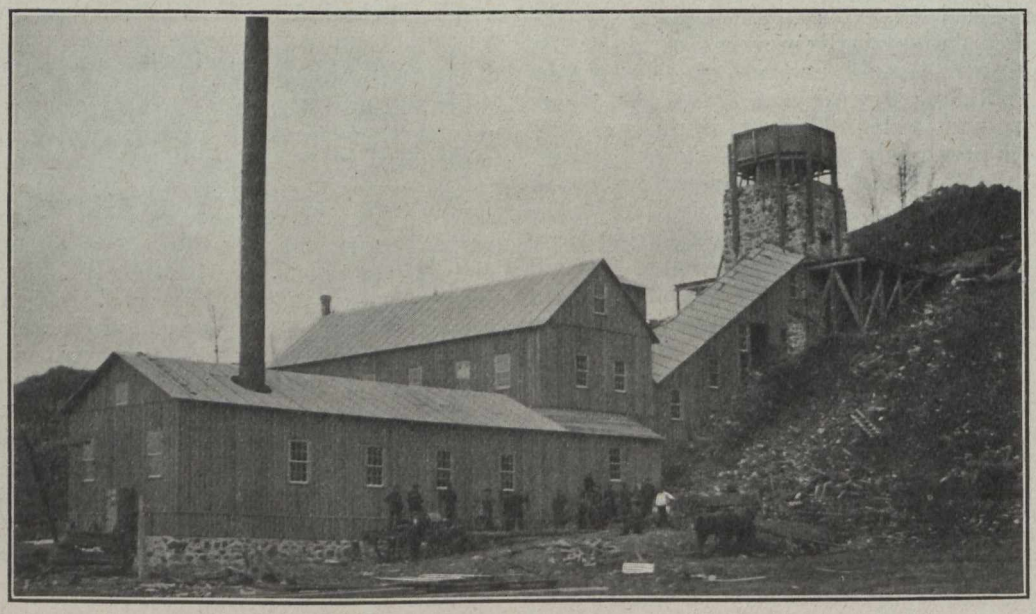
After careful experiment, Mr. Hoffmann prepared and incorporated the following table as illustrative of the relative combustibility of Canadian graphite when compared with that of Ceylon, the latter being taken as par:—

Ceylon, vein graphite, variety foliated, 1.00.
Ceylon, vein graphite, variety foliated, 0.99.
Ceylon, vein graphite, variety columnar, 1.01.
Ceylon, vein graphite, variety columnar, 1.25.
Buckingham, vein graphite, variety foliated, 1.00.
Buckingham, vein graphite, variety columnar, 1.01.
Grenville, vein graphite, variety foliated, 1.02.
Grenville, vein graphite, variety columnar, 1.12.
Buckingham, disseminated, 1.02.
Buckingham, disseminated, 1.01.

Demand.—Generally speaking, the graphite industry has, for some years shown a marked annual increase, due, largely, to the development of electricity and consequent increased use of copper and its alloys, while, notwithstanding the introduction of open hearth steel, the demand for steel crucibles appears to increase. The average price, as well as the production, has also very materially increased, as is evidenced by the fact that in 1895 the combined markets of the United States and Great Britain were 23,513 tons, valued at $1,199,722, or $51 per ton, while in 1902 (the latest figures available to the writer) the same was 34,474 tons, valued at $3,321,525, or $96.45 per ton, of all grades. The fact that high grade Ceylon "lump" sold in 1895 for from three to four cents per pound, and is now selling for from six and a half to nine cents, according to quality, shows either a shortage or an increased demand. If all the mills now built, or in course of construction, were operating to their full capacity and turning out goods of high quality, there would be no difficulty in disposing of their production, as there are in the United States alone crucible manufacturers enough to take all the high grade flake produced, while the stove polish, paint, foundry facings, lubricating and electrotyping trades would easily look after the balance. Again, there is a very large market in Europe, especially in London, Hamburg and Vienna. It may be of interest to know that the North American Graphite Company were, in 1895, very glad to get three and a half cents for flake, while the Buckingham Graphite Company are, to-day getting for the same quality from six and a half to nine cents per pound. During 1902 only about one-tenth of the consumption of graphite in the United States was of domestic origin.

Mr. Joseph Hyde Pratt, in the "Mineral Resources of the United States" for 1904, gives the consumption of crystalline graphite, in the arts and manufactures, approximately as follows: For crucibles, 55 per cent.; stove polish, 15 per cent.; foundry facings, 10 per cent.; paint, 5 per cent.; all others, 15 per cent. The last named division includes powder polishing, electrotyping, steam packing, pencils and various minor uses

Uses.—To go thoroughly into the subject of the various manufactures of graphite and the many uses to which it is put would require a paper much longer than this. In addition to those mentioned by Mr. Pratt, it enters largely into the manufacture of shoe polish, printer's ink, electric light carbons, electrodes, rheostats and other electrical appliances and supplies, and is used by shot, bolt and nut, piano, wire, hat, and many other manufacturers; the means of using it are, however, not all known to the writer. As a lubricant, graphite has attained in late years a position of considerable prominence, and its use as such is rapidly growing. In the original Webster's Dictionary we find a lubricant defined as "that which lubricates: specifically, a substance, as oil, grease, plumbago, etc."



DIAMOND GRAPHITE COMPANY'S MILL, BUCKINGHAM, QUE. View from South-East.

William Kent, M.E., in his "Mechanical Engineers' Pocket Book," says: "Graphite in a condition of powder is used as a solid lubricant, so-called, to distinguish it from a liquid lubricant, has been found to do well where the latter has failed." Rennie, in 1829, says: "Graphite lessened friction in all cases where it was used." General Morin, at a later date, concluded from experiments that it could be used with advantage under heavy pressures; and Professor Thurston found it well adapted for use under both light and heavy pressures when mixed with certain oils. It is especially valuable to prevent abrasion and cutting under heavy loads and at low velocities.

At a meeting of the American Society of Mechanical Engineers, held in New York, in December, 1895, Pro-

fessor Albert Kingsbury, of Durham, N.H., read a paper on "Experiments on the Friction of Screws," wherein he describes certain tests made by himself. The author did not consider that the tests showed that any one of the metals developed less friction than any of the others, but the tests are specially interesting because of the great lessening of friction by means of graphite, as is shown by the following:—

Lubricant.	Mean.
Lard oil, heavy machinery	11
Oil (mineral), heavy machinery	14
Oil and graphite (equal volumes)	07

The following notes are taken from a pamphlet on lubrication, issued by the Joseph Dixon Crucible Company, and refer to part of a report on exhaustive tests made by Professor W. F. M. Goss, of Perdue University:

"Graphite does not behave like oil, but associates itself with one or other of the rubbing surfaces. It enters every crack and pit in the surfaces and fills them, and if the surfaces are ill-shaped or irregularly worn, the graphite fills in and overlays until a new surface of more regular outline is produced. When applied to a well-fitted journal, the rubbing surfaces are coated with a layer so thin as to appear hardly more than a slight discoloration. If, on the other hand, the parts are poorly fitted, a veneering of graphite of varying thickness, which in the case of a certain experiment was found as great as 1-16 inch, will result. The character of this veneering is always the same, dense in structure, capable of resisting enormous pressure, continuous in service without apparent pore or crack, and presenting a superficial finish that is wonderfully smooth and delicate to the touch.

"The experiments with flake graphite as a lubricant justify the following important conclusions:—

"(a) The addition of graphite to oil results in a lower frictional resistance of the journal than would be obtained by the use of oil alone.

"(b) When graphite is used with oil, the amount of oil required for a given service is reduced.

"(c) By the use of graphite a light or an inferior quality of oil may be employed for a given service.

"(d) By the use of graphite, water under favorable conditions may serve as a sufficient lubricant.

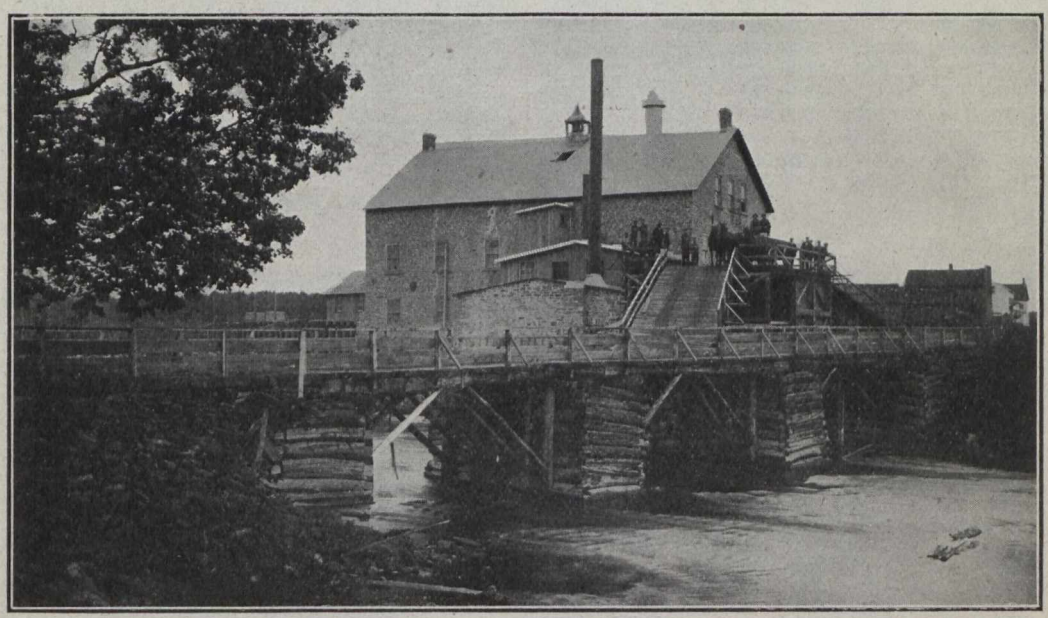
"(e) A small amount of graphite only is required.

"(f) The supply of *too much* graphite unduly thickens the oil and correspondingly increases its internal friction due to viscosity.

"(g) The benefits derived from the use of graphite persist long after its application has ceased. The supply, however, should be constant, though small, for the best results."

In conclusion, it may be stated that, by reason of the high degree of purity attained in the mills of the late Anglo-Canadian Graphite Syndicate and the Buckingham Graphite Company, a considerable demand has arisen for their flake produced for lubrication, both in the United States and Great Britain, as well as in Germany, where graphite lubrication has probably reached its highest point.

Statistics.—It is extremely difficult to obtain correct statistics relative to graphite, more especially on this continent, where it is a notorious face that incorrect returns are almost invariably supplied to the various Government statistical offices, while from the various diverse figures obtainable from official centres of foreign countries it may be assumed that this notoriety is universal.



GLOBE REFINING COMPANY'S MILL, PORT ELMSLEY, ONT. View from South-East

In the following tables it has been the endeavor of the writer to obtain the most correct figures, though, of course, he does not vouch for them.

The annual production and imports and exports of Canada are given in the two following tables, and are taken from the reports of the Section of Mines of the Geological Survey.

ANNUAL PRODUCTION IN CANADA.

Year.	Tons.	Value.
1895	220	$6,150
1896	139	9,455
1897	436	16,240
1898	...	13,698
1899	1,130	24,179
1900	1,922	31,040
1901	2,210	38,780
1902	1,095	28,300
1903	728	23,745
1904	452	11,760
1905	541	17,032

IMPORTS AND EXPORTS OF CANADA.

1895-1905.

Year.	Imports.	Exports.
1895	$38,496	$4,833
1896	40,796	9,480
1897	38,943	4,325
1898	54,153	13,098
1899	62,803	22,490
1900	64,955	46,197
1901	77,893	35,102
1902	67,772	24,839
1903	72,546	43,642
1904	69,546	16,507
1905	.....	8,114

The production, imports and total consumption of the United States are contained in the following tables, taken from the "Mineral Resources of the United States" for 1904.

PRODUCTION AND CONSUMPTION OF THE UNITED STATES.

1895 to 1905.

	Production.		Imports.		Total.	
Year.	Tons.	Value.	Tons.	Value.	Tons.	Value.
1895	3,115	$52,582	8,814	$260,090	11,925	$312,672
1896	1,028	48,460	15,230	437,159	16,258	485,619
1897	1,751	65,730	8,533	270,952	10,284	336,682
1898	2,070	75,200	13,482	743,820	15,552	819,020
1899	3,774	167,106	20,793	1,990,649	24,567	2,157,755
1900	3,365	197,579	14,417	1,390,141	17,782	1,587,720
1901	2,793	167,714	14,325	895,010	17,118	1,062,724
1902	3,297	182,108	18,201	1,168,554	21,498	1,360,662
1903	18,857	225,554	16,007	1,207,700	34,864	1,433,254
1904	19,767	321,372	12,674	905,581	32,441	1,226,953
1905	24,971	318,211	.....	.....	.....	.....

Deducting the cheap and low grade amorphous graphite produced in the United States, and combining the crystalline product only with the imports, we find a market there as follows (the last full figures available):

	Production.		Imports.		Total.		Value
Year.	Tons.	Value.	Tons.	Value.	Tons.	Value.	per ton.
1900..	2,754	$178,761	14,417	$1,390,141	17,171	$1,568,802	$91.35
1901..	1,984	135,914	14,325	895,010	16,309	1,080,924	63.20
1902..	2,088	153,147	18,201	1,168,554	20,289	1,321,701	65.15
1903..	2,269	154,170	16,007	1,207,700	18,276	1,361,870	74.50
1904..	2,840	238,447	12,674	905,581	15,514	1,144,028	73.75

Note.—In the above imports are included large quantities of Austrian crude ore worth only about $14.00 per ton.

The following table, illustrating the world's production, is taken, intact, from the "Mineral Resources of the United States" for 1904.

WORLD'S PRODUCTION OF GRAPHITE, 1895-1903.

(Quantity in Metric Tons.)

	1896.		1897.	
Country.	Tons.	Value.	Tons.	Value.
United States	933	$48,460	1,589	$65,730
Austria	35,972	410,081	38,504	439,610
Canada	126	9,455	396	16,240
Ceylon	10,463	414,405	19,275	1,159,885
Germany	5,248	72,108	3,861	66,126
India	.....	.....	61	316
Italy	3,148	10,193	5,650	11,300
Japan	215	6,925	204	16,075
Mexico	620	5,287	907	8,663
Sweden	14	491	99	3,240
Totals	56,739	977,405	70,546	1,787,185

NORTH AMERICAN GRAPHITE COMPANY'S MILL, BUCKINGHAM, QUE. View from West.

The exports of graphite from the United States would not materially change the above totals. According to official returns, they were in 1901, $365; in 1902, $834; in 1903, $13,365; and in 1904, $12,417.

In the "Mineral Resources of the United States" for 1903, Mr. Joseph Hyde Pratt says:—"The importance of the graphite industry in the United States is well emphasized by this table, and also the benefit that would be derived by this country if large deposits of commercial graphite could be found. There is a general increase in the quantity of graphite consumed, although there has been a very wide variation in the value of the production each year."

	1898.		1899.	
Country.	Tons.	Value.	Tons.	Value.
United States	1,878	$75,200	3,424	$167,106
Austria	33,062	421,058	31,819	395,280
Canada	.....	13,698	1,188	24,179
Ceylon	78,509	9,243,263	29,037	2,904,970
Germany	4,693	97,916	5,196	120,250
India	22	110	1,548	7,572
Italy	6,435	17,423	9,900	55,944
Japan	346	10,265	53	5,120
Mexico	1,857	18,237	2,305	22,847
Sweden	50	1,620	(a)535	1,674
Totals	126,752	9,898,790	85,445	3,704,942

Country.	1900. Tons.	Value.	1901. Tons.	Value.
United States	3,054	$197,579	2,533	$167,714
Austria	33,663	418,126	29,992	369,157
Canada	1,744	31,040	2,005	38,780
Ceylon	19,168	b875,190	22,707	b3,203,215
France	.....	.....	.....	.....
Germany	9,248	136,500	4,435	58,000
India	1,858	9,104	2,530	(c)
Italy	9,720	55,720	10,313	59,211
Japan	94	12,215	88	8,930
Mexico	2,561	25,650	1,473	7,385
Sweden	84	3,186	56	1,900
Totals	81,194	1,764,310	76,226	d3,930,359

Country.	1902. Tons.	Value.	1903. Tons.	Value.
United States	6,085	$183,108	17,110	$225,554
Austria	29,527	368,186	29,589	382,148
Canada	994	28,300	700	23,585
Ceylon	25,593	3,505,455	24,492	1,952,529
France	150	1,140	126	702
Germany	5,023	41,755	3,720	35,462
India	4,648	(c)	3,448	(c)
Italy	9,210	35,934	7,920	28,855
Japan	97	9,876	114	10,950
Mexico	580	3,176	1,952	42,985
Sweden	63	1,900	25	988
Totals	81,970	4,177,830	89,196	2,704,158

(a)—Includes crude.
(b)—These values were taken from the official year books of the United Kingdom.
(c)—Statistics not available.
(d)—Latest available figures used in making up total.

In tabulating the production of the Island of Ceylon, there is to be noted a very great fluctuation, both as to total value and value per ton. It will be also seen that the year 1904 afforded the greatest tonnage, with two exceptions.

PRODUCTION OF GRAPHITE IN CEYLON FROM 1896 TO 1904 (Metric Tons.)

Year.	Tons.	Value.	Value per ton.
1896	10,463	$414,405	$29.60
1897	19,275	1,159,885	60.20
1898	78,509	9,243,263	117.70
1899	29,037	2,904,970	100.00
1900	19,168	(a) 875,190	50.90
1901	22,707	3,203,215	141.00
1902	25,593	3,505,455	137.00
1903	24,492	1,952,529	79.70
1904	26,478	.....	.....

(a)—These values are taken from the official year books of the United Kingdom.

Artificial Graphite.—The introduction of artificial graphite into the market did not, as was feared at one time, revolutionize the industry, as the production of this substance by artificial means consists largely in the graphitizing of electrodes and similar electrical supplies, small quantities only being produced and sold for the manufacture of paints, dry batteries, commutator brushes, etc. The following notes regarding this product are taken from the "Mineral Resources of the United States" for 1903:—

"Methods for the production of artificial graphite have been known for a great many years, but it is only within the last eight years that a method has been devised for manufacturing it commercially. The three principal methods by which artificial graphite has been made are: (1) By heating amorphous carbon to a very high temperature in the electric furnace. (2) By dissolving an excess of carbon in a molten metal at a high temperature; on allowing the metal to cool down, the excess of carbon separates out as graphite. (3) By the disassociation of certain carbon compounds by means of metallic iron, or iron oxide, at high temperatures. The method now employed in the manufacture of artificial graphite was discovered by Mr. E. G. Acheson, who also discovered carborundum. Mr. Acheson defines his method of manufacture as follows:—'This method of manufacturing graphite I would define as consisting in heating carbon, in association with one or more oxides, to a temperature sufficiently high to cause a chemical reaction between the constituents, and then continuing the heating until the combined carbon separates in the free state. It is not, however, limited to the use of oxides, as pure metals, their sulphides and other salts may be used, but for various reasons the oxides are to be preferred.'" (Jour. Frank. Inst., June, 1899).

The following table of the production of artificial graphite is taken from the "Mineral Resources of the United States" for 1904:—

PRODUCTION AND VALUE OF ARTIFICIAL GRAPHITE, 1897 to 1904.

Year.	Pounds.	Value.	Unit Value per Pound, cents.
1897	162,382	$10,149	6.25
1898	185,647	11,603	6.25
1899	405,870	32,475	8.00
1900	860,750	68,860	8.00
1901	2,500,000	119,000	4.76
1902	2,358,828	110,700	4.70
1903	2,620,000	178,670	6.82
1904	3,248,000	217,790	6.71

OCCURRENCE OF GRAPHITE*

The United Kingdom.—At Borrowdale, near Keswick, in Cumberland, were the only graphite deposits of importance. These gave out before 1843, after being worked for nearly three centuries. The mineral occurs here in a compact, much altered plagioclase augite rock described as a diabase, and in the adjoining volcanic ash beds of the Borrowdale series. It occurs near the junction of these rocks with an intrusive dyke, which has the appearance of a diorite. The decomposed feldspar, which forms the greater part of this rock, contains specks of graphite consisting of minute hexagonal plates. Strings of quartz also occur containing nests of graphite. The mineral appears to have occurred very irregularly in veins, beds and pockets. Large masses were met with at the intersection of the veins. It is not clear whether these masses are identical with the pockets or pipes, which were oval in section, sometimes measuring three yards in length by one yard in breadth, and were mixed with strings or bunches of quartz. They attained considerable depth, but began and ended suddenly. Infillings of graphite occurred in the joints in the neighborhood.

Analyses of some of the Borrowdale graphite gave from 78.10 to 91.55 per cent. of carbon, 1.10 to 6.10 per cent. of volatile matter, and 7.35 to 15.80 per cent. of ash, chiefly silica, alumina and iron. One analysis gave as high as 3.15 per cent. of titanium oxide.

*Condensed from an article in a recent Bulletin of the Imperial Institute.

Other occurrences of graphitie in a spotted slate of the Borrowdale volcanic series and in a granite quarry near Penryn, may be mentioned.

In Scotland graphite is found in many places, none of which has been continuously worked. At Craigman, in Ayrshire, a seam 3 to 6 feet thick is composed partly of graphite, "compact, scaly or columnar," and partly of glance coal. The coal has apparently been metamorphosed to graphite by intrusive sheets of greenstone, which now lie both above and below the seam. In Invernessshire, scaly or curved and foliated graphite is found in irregular masses in a micaceous gneiss, intersected by small veins of red granite.

GERMANY.—The only important workings in Germany are at Passau, in Bavaria. The graphite occurs in lenticular masses of highly-decomposed micaceous rock found in the hercynian gneiss, near the line of contact with the granitic rocks. The deposits are accompanied on the foot-wall side by beds of syenite and crystalline limestone, both of which contain a certain amount of graphite, and on the hanging wall by intrusions of gabbro. It is believed that the great earth movements that at an early period affected the district operated most strongly at the junction of the unequally-resisting gneiss and limestone, and that the syenite found its way along this line of weakness. The subsequent granitic intrusions were followed by emanations which decomposed the gneiss where it was crushed, and at the same time deposited the graphite. The gabbro was subsequently intruded, and from it was derived the pyrite which often accompanies the graphite.

Almost everywhere the presence of the graphite is marked by extreme decomposition of the rock, the original minerals and the structure being almost entirely destroyed. The deposition of the graphite seems to have been an accompaniment of this process. Everywhere it seems to have followed the lines of least resistance, being found in regions of crushing and portions of the rock rich in mica. The graphite occurs in large flakes, and is easily concentrated to 90 per cent. carbon by dry processes.

AUSTRIA.—The principal deposits of Austria are in Bohemia, in gneisses, granulites and mica schists, on the other side of the great granitic tract which adjoins the graphite region of Bavaria. Here also the crystalline limestone is met with in the neighborhood of the graphite. In the Bohemian beds pyrite is widely disseminated, an dweathers to a yellow ferruginous crust on the surface. The refined material does not contain more than 50 or 60 per cent. of graphite. In Styria, also, graphite is obtained. It occurs as beds or impregnations in chloritoid schists, alternating with true phyllites. It is remarkably free from pyrite, which occurs only in aggregates visble to the naked eye, and therefore easily removable. It occurs as a soft, earthy, lustreless variety, as "hard graphite," resembling anthracite, and in vesicular or coke-like forms. The vesicles in the third variety are filled with earthy graphite of great purity. Deposits of graphite, supposed to have resulted from the metamorphism of vegetable matter, are found in Moravia, where seams of graphite and of gneiss impregnated with graphite are intercalated in crystalline limestone. Metamorphism is attributed to intrusive sheets of basic rocks now represented by amphibolites.

ITALY.—Graphite is worked in the north-west of Italy, where are deposits very similar to those of Styria.

ASIATIC RUSSIA.—There are numerous deposits of graphite in Siberia, but little work is being carried on. At a mine at Batugal, near Irkutsk, a thick vein of pure graphite appears to have traversed a granitic or dioritic rock. Large lumps of pure graphite are said to have occurred in the adjoining metamorphosed limestone.

INDIA.—Graphite is found in many places in India. The most important deposits are in Travancore State, where it occurs in granulitic rocks of the charnockite series. In certain localities in the Central Provinces graphite is found in a series of garnet sillimanite rocks which overlie the granitoid gneiss. Graphite is also met with in Afghanistan and the Punjab, and it occurs in crystalline schists in the Kumaun district of the North-west Provinces.

CEYLON—From Ceylon the finest graphite is obtained. The mineral sometimes occurs in small scattered flakes in the granulites allied to the charnockite series of Southern India, and in the crystalline limestone. The deposits of commercial importance are, however, from beds, veins or nests in the granulite rocks and are undoubtedly of secondary formation. Large pockets containing many tons of pure flaky graphite alternate with narrow veins branching in all directions through the rock. The crystalline rocks are often altered at the surface, forming a coating of laterite that may be 15 to 18 feet in thickness, in which graphite of poor quality is still visible. By following this graphite down, material of the best quality may be discovered in the solid rock. The graphite has usually a flaky columnar structure, but occasionally large tabular crystals occur with a diameter of as much as 8 inches. A tendency to a radial formation causes the mineral to break up into three-cornered fragments. Sometimes it becomes so stringy as to be nearly asbestiform, or it may assume a compact finely-scaly structure.

The coarse prismatic structure usually occurs with a direction at right angles to the walls of the vein, while in the centre there is a secondary formation of compact mica. Where there has been movement along the vein the fibrous or flaky structure is drawn out more or less parallel to the walls, and in this way is often rendered compact. There is little alteration of the adjoining rock by the action of hot water and gases. Sometimes the adjoining rock is penetrated by scales and flakes of graphite, but not to a greater depth than about half an inch.

NEW SOUTH WALES.—Graphite occurs frequently in New South Wales, though little work is carried on. In Buller County, coal of the permocarboniferous period is converted into graphite by the neighborhood of an intrusive mass of granite. At a point 26 miles north of Walcha graphite occurs in a eurite dyke which is generally micropegmatitic and crowded with spheroidal segregations of graphitic material. The dyke is intrusive n a granite.

VICTORIA.—Fairly pure graphite, in small amount, is found in ordovician slates and graphitic slates.

QUEENSLAND.—Near Maryborough, bituminous coal of carbonaceous age is stated to have been metamorphosed by intrusive igneous rocks, mainly hornblende andisite. It has been converted on the west into graphite, on the east to semi-bituminous coal, anthracite and graphite.

NEW ZEALAND.—Considerable deposits of graphite occur at Pahawan Bay.

CANADA is dealt with in another article in this issue.

UNITED STATES—The deposits at Ticonderoga, Essex County, N.Y., occurring in a fissure vein in a garnetiferous gneiss, the foliation of which it cuts nearly at right angles, are the most important in the United States. Graphite is also met with in a grey quartzite, interbedded

with garnetiferous and micaceous gneiss. The rock contains about 10 per cent. of graphite, half of which is saved. The graphite of Newport, Rhode Island, appears to consist of coal of carboniferous age, metamorphosed into graphite.

MEXICO—At Sonora compact graphite is found where a coalfield of carbonaceous age has been much broken up by trap dykes.

SOUTH AMERICA.—Graphite is found in Brazil, where it is said to be formed by the alteration of carbonaceous beds.

REGARDING LEAD PENCILS

H. P. H. BRUMELL, BUCKINGHAM, QUE.

"Sir, I have been bold to note places with my black-leade."—Letter of John Evelyn, about 1650 A.D.

Why are lead pencils so called? In early German metal mining operations considerable quantities of a substance affording a grey-black streak or mark similar to that of metallic lead (in German, blei) were encountered, and it was assumed to be a variety of ore of that metal. To distinguish it, however, the new mineral was afterwards termed "wasserblei" (Molybdæna). In the graphite trade of the present day the German product is always styled German lead; that of Ceylon is known as plumbago, while the United States product is called graphite.

The making of lead pencils originated at the time of the discovery of graphite at Borrowdale, in England, in 1554. The name lead pencil was evolved through the confusion caused by the German misnomer "wasserblei," the material used being given the name of "reissblei" (drawing lead). To make matters ever more confusing, the makers of lead pencils called themselves "bleiweisschneiders" (white lead cutters).

In the early stages of the industry very crude methods obtained. According to Robt. Jameson, "Manual of Mineralogy," Edinburgh, 1821, "The finer kinds—(of graphite)—are first boiled in oil, and then cut into tables or pencils; the coarser parts, and the refuse of the sawings, are melted with sulphur, and then cast into coarse pencils for carpenters; they are easily distinguished by their sulphureous smell."

John L. Comstock, in "An Introduction to Mineralogy," Hartford, 1834, says: "The finer kinds of graphite are sawn into thin plates, one edge of which is then inserted into a groove, in a small semi-cylinder of cedar wood, which is then sawn off in a line with the wood, and the other half glued on. In this manner the common black lead pencils are made."

As may be seen, the early method of manufacture was most wasteful. In 1795 Coute, a Frenchman, conceived the idea of pulverizing the graphite and mixing it with a binding clay. This mixture, when baked, was used in the old way and afforded a much more uniform product, and by reason of the clay admixture, he was enabled to produce pencils of varying degrees of hardness. With modifications, and the vast improvements brought about by modern machinery, this method is still employed in the making of graphite lead pencils.

Figures are not at hand relating to the extent of the pencil industry, but it is well known that enormous numbers are produced annually in Great Britain, the United States and Germany, smaller quantities being produced in France and Austria. In the United States, according to the Forest Service Bureau of that country, about 320,000,000 are produced annually. To this may be added about the same number for Great Britain and about five times as many for Germany and Austria. For the manufacture of those produced in the United States, 7,300,000 cubic feet, or 110,000 tons of wood are used, nearly all of which is red cedar.

Toward the conservation and economic use of commercial woods, the Forest Service Bureau has made a careful study of red cedar, and recommends several changes in present forest management in order to secure the desired growth. In the Southern forests the cedar will have to be given a better chance, instead of being considered, as now, a negligible quantity in its younger stages, and many of the forest-grown trees, which are now cut for fence posts, can profitably be left to attain their full development, and thus become available for pencil wood.

It is doubtful if any other wood-using industry is so dependent upon a single species as the pencil industry is dependent on red cedar. In fact, red cedar suitable for pencil manufacture is the only wood the price of which is always quoted by the pound.

No graphite pencils or crayons are, as yet, produced in Canada, the market of which is supplied principally by Great Britain, United States, and Germany. The imports for the past twelve years were as follows:

1895	$57,911	1901	$104,455
1896	62,598	1902	105,662
1897	71,211	1903	125,036
1898	73,002	1904	153,598
1899	80,474	1905	172,871
1900	98,832	1906	175,747

PROSPECTING IN UNGAVA

(Continued from page 48.)

For our dog-sledge (komitik) trip to the south we engaged two dog teams and komitiks besides our own. Although March was more than half over, the weather was still severe. We were equipped with a sheet-iron stove, a light canvas tent, deer-skin sleeping bags, and heavy deer-skin clothing. Ample quantities of provisions were taken along and cached on Gillies' Island.

Most of our travelling was done on the snow-covered ice between the islands and the mainland, although several times we were forced on account of loose ice, to travel inland over very broken country. It is then that the Eskimo displays his skill as a teamster. He leads his dogs with the nicest precision over bad ground, skirts the difficult hills, prevent his komitik from bumping over hummocks, and in all exercises wonderful judgment and resourcefulness. He further develops a marvellous degree of cleverness in handling the long Eskimo whip—a deadly weapon, consisting of a short handle of wood or of heavy hide, with a long lash, ten to fifteen feet in length, made of interwoven thongs of rawhide. With this whip the Eskimo can flick a tuft of hair and skin off any recalcitrant member of his team. In the hands of a novice, however, it is suicidal.

About eight days' travelling brought us to Gillies' Island. Three nights we had slept in snow houses. For fuel we had to depend upon driftwood, which we dug up on the island shores. When we found driftwood we cooked our meals on our camp stove and pitched our tent. When no wood was discoverable, we slept in snow houses and dined on biscuits, stick chocolate and deer's fat. Our day's run rarely exceeded twenty-five miles. In stormy weather (and the snow storms of Ungava are not pre-eminently pleasant) we were content when we had covered much less ground. After early breakfast,

the komitiks were hastily loaded, securely thonged, the dogs were harnessed up, and we walked and ran alongside the teams until noon. A breathing spell of a few minutes was then allowed. Sometimes, not very frequently, we brewed a hot pot of tea. Oftener we simply munched our cholocate and biscuits. Usually we allowed a good hour of daylight for pitching our tent or building snow houses. One of our Eskimos took occasional trips after seals for dog feed. The dogs were fed but once a day. During work hours they behaved themselves, indulging only in mild squabbling. All real differences or disputes were settled in the evening, and many were the wounded animals that we had to mend. The leader of each team pulled on a long centre trace. The rest of the team were arranged like the sticks of a fan on either side of the leader, with gradually shortening traces. When a dog misbehaved himself his trace was shortened and the whip was brought into requisition. For the leader it was usually sufficient to shorten his trace.

When we reached Gillies' Island, where our surveying was to be commenced, the ice began to show signs of softening. We managed, however, to complete our work there, although we moved our camp to the mainland opposite. In marking out our claims we used posts hewn from driftwood, clearing away the snow at the claim corners as well as could be, and securing the posts with loose pieces of shale. Before April 1st we finished the location of claims on Gillies' Island, and made a traverse of its shores. In all this work we used two of our Eskimos as chainmen, etc. They proved reliable and intelligent and exceptionally quick. By April 6th we had finished location work on Taylor Island, and had traversed to Nastapoka Falls. A winter view of these glorious falls is compensation for any amount of hardship.

We reached Port Harrison, our winter quarters, on April 11th. A very marked difference in weather was now observable. Although we had encountered a few days of soft weather near Gillies' Island and at Nastapoka Falls, at Port Harrison, winter was still supreme. However, the northern sun had done strange things with our complexions. Our first view of ourselves in a looking glass was a surprise. Our faces were tanned to a rich mahogany color, and our beards bleached to a straw shade.

Late in April the other two white members of our party, who had taken a trip up north, got back to headquarters. The laboratory was once again put into commission, and a series of gold and silver assays and various wet determinations were made. Plans and maps were prepared, and photographs developed. During May snow fell to such an extent as to exclude light altogether from the north side of our dwelling. On May 29th a snow storm of unusual severity completely blockaded us. Not until the first week of June did any approach to a thaw set in. On June 6th the last snow house (igloo), in which one of our Eskimo friends had been living, went out of commission.

The evenings were at this season so long that one could read ordinary print until 10 p.m. without artificial light. Towards the middle of June we began scraping, repairing and painting our yacht and sail-boats. The Innuksuak River (on the north bank of which were our winter quarters) did not clear itself of ice until June 28.

On Tuesday, July 8, three of us, with one Eskimo, sailed north, intending to spend a few days in cruising. With much difficulty we made our way through ice and fog for about twenty miles north of the Innuksuak River. One night, when we had both anchors out, a field of ice drifted down on us. Both anchors were lost, and we escaped with our lives by the sheerest luck. After drifting about in the fog for many hours, we ran into a snug little harbor, where we moored the yacht. The Eskimo and Mr. Young were then despatched in our small tender to get assistance. In three days' time they came back with grappling irons and other necessities. We succeeded in recovering both anchors and hurried back to Port Harrison on July 22nd.

It only remained for us now to destroy whatever dangerous chemicals were left, to dismantle the laboratory, and to pack up as many of our belongings as we could take in the yacht. We had seriously thought of cruising out to the mysterious Belcher Islands; but the ice absolutely forbade this.

Our final "good-bye" was said to our Eskimo friends at Port Harrison on July 26. Violent rain and sleet storms drove the ice into Hopewell Sound and we were held at Leonard Island (one of the most southerly of the Hopewell Islands) until August 9th. Not until a week later did we reach Nastapoka River. Thrice we were forced to beach the yacht to save her, and we had several hairbreadth escapes from being jammed to pieces. By August 23rd all survey work left over from the spring was finished, and we headed for our long run to Moose Factory. After one or two mishaps we made Little Whale River August 30th. Here we stopped three days for repairs.

With the first symptom of warm weather the mosquitoes had appeared in clouds. We dreaded the necessity of landing on a fair day on account of these pests.

September 12 saw us in the mouth of Big River, within sight of Fort George. After enjoying the warm hospitality of this Hudson Bay post, we started south again. We reached Charlton Island without mishap. The second of three beautiful Husky dogs, which we had picked up a few weeks before, died here. Another had been lost at Fort George. The third, a magnificent iron grey fellow, came safely through to Ottawa.

A successful run to Moose Factory, and all but the last stage of our journey was over. After dismantling the yacht we hired a large canvas canoe, and, with a crew of six Indians, we started up the river. It took fourteen days of hard paddling to bring us to Missinabie, on the C. P. R. Our voyage up was without incident. We arrived in Ottawa in the second week of October, 1902, after an absence of eighteen months.

. . . . . .

That the vast deposits of iron ore between latitudes 56° and 58° will some day become valuable is certain. How long a period may elapse before it becomes practicable to develop them by means of the enormous water-powers within a few miles of their best sections will depend upon the gradual perfecting of electrometallurgical processes. There will also be problems of navigation to be met. But the establishment of rail connections at a Hudson Bay harbor and of a Hudson Bay-Atlantic steamship route, will indirectly throw a great deal of light upon all the latent possibilities of the Ungava shore.

Bulletin No. 1 of the Geological Survey of New Zealand mentions an important occurrence of platinum in the Hokitika District. Two localities are cited. At the first of these, Hailey's Creek, the white platiniferous quartz occurs in lenticular veins intercalated with the country rock, which consists of a dark shaly phyllite. Assays yielded from 3 dwts. 8 grs. to 1 dwt. 2 grs. of platinum and of silver from 1 oz. 4 dwts. to 7 dwts. per ton.

Report of the Nova Scotia Department of Mines for the Year Ended 30th September, 1906

The facts adduced from this report prove that Nova Scotia has, in the main, made due progress in developing her mineral resources.

Gold production has fallen off. The actual decrease is 504 ounces. The figures given for iron ore are of doubtful value. If the amount of iron ore imported be correctly given, it leaves but 1,064 tons to the credit of local mines—an obvious error. The coal output for 1906 exceeds that for 1905 by 636,185 tons, and the amount of soke made in the latter year is greater by 140,304 tons than the total for 1905. Gypsum and limestone show a notable increase. Copper ore re-appears upon the list. The table given herewith furnishes the figures of output for the years 1905 and 1906.

		Year ended Sept. 30, 1905.	Year ended Sept. 30, 1906.
Gold	Oz.	15,550	15,046
Iron ore [1]	Tons	73,600	648,042
Manganese ore [2]	"	22	1½
Coal raised [2]	"	5,050,420	5,866,605
Coke made [3]	"	367,778	508,082
Gypsum [3]	"	197,292	247,840
Limestone	"	274,002	400,584
Barytes [3]	"	4,500	3,500
Moulding sand [2]	"	230	1,460
Copper ore [4]	"	...	190

The total revenue of the Mines Department attained the very respectable amount of $643,457.77. Of this the item of coal royalty contributed $575,065.89. A sum of $64,954.57 was paid out in bonuses on each ton of coal consumed in the manufacture of iron and steel in Nova Scotia.

COAL TRADE.

The returns of coal sold during the year 1906 show 5,194,590 tons, as compared with 4,475,284 tons in 1905. Shipments to other Provinces and to the United States have very materially increased. Quebec took 1,739,308 tons, an increase of 246,909 tons in 1905. The amount consumed in Nova Scotia also displays a large increase. The Province took 1,962,206 tons in 1906, as against 1,651,735 tons in 1905.

The following figures give the coal production to counties:

	Total Coal Raised.
Cumberland County	638,728 tons
Pictou County	670,436 "
Cape Breton County	4,318,944 "
Other Counties	238,937 "

It is interesting to note that the Intercolonial Railway purchased 420,269¾ tons of round coal, 12,261 tons run of mine, and 5,099¾ tons of slack. Fifteen companies contributed to this total. Eight of these companies filled contracts for amounts greater than 20,000 tons. The Cumberland Railway & Coal Co. supplied the largest tonnage of round coal to the railway, 85,792½ tons. The Dominion Coal Co. came next with 63,414¾ tons. The Intercolonial supplied 60,141 tons. These, with the Acadia Coal Company, the Maritime Coal & Railway Co., and the Inverness Railway & Coal Co., were the largest contractors with the railroad.

Among the operating companies the Dominion Coal is by far the largest producer, its output being 3,603,985 tons. The Nova Scotia Steel and Coal comes next, with 665,033 tons; Cumberland Railway and Coal ,484,816; Acadia Coal Co., 329,641; Intercolonial Coal Co., 303,426 tons; Inverness Railway and Coal Co., 207,842 tons; Canada Coal and Railway Co., 50,688 tons. None of the remaining collieries exceeds 50,000 tons. 12,123 persons are employed in the coal mining industry.

GOLD MINING.

The total gold production for 1906 is given variously as 15,046 ounces and 13,048 ounces. We believe the former to be the correct figure.

GUYSBORO COUNTY.—In Guysboro County six companies are reported as actively engaged in mining and milling. At Isaac's Harbor the *Boston Richardson Mining Company*, employing 126 men, in two 10-hour shifts extracted 4,819 ounces of gold ($91,561) during 1906, from 35,220 tons of quartz, an average of $2.60 per ton. Instead of timber coverings for the levels, a rib 20 to 30 feet high is left over the levels, chute holes being left at intervals of 50 feet. This system is copied from the Treadwell. The Bromo-cyanide plant has given an average extraction of about 70 per cent. on concenrates carrying from $15 to $20 per ton, at a very low cost. A higher percentage extraction, it is claimed, could have been obtained, but the cost per ton would have been prohibitive. An abstract of the monthly statement for August, 1906, is here reproduced. It will repay examination:

No. of tons crushed	3,839 tons
No. of tons concentrated produced	82.72 tons
Value of ore per ton (assay)	$2 94
Value of concentrates per ton	17 00
Total value recovered	2 55
Cost of operation of mine, per ton	1 08
Cost of operation of mill, per ton	0 19
Cost of operation of cyaniding plant, per ton	0 10
Cost of cyaniding concentrates per ton concentrate	4 39
General maintenance of plant per ton of ore	0 53
Total cost of operation per ton of ore	1 90
Average crushing per stamp per 24 hours	2.98 tons

We consider these figures noteworthy. Here is a plant, treating ore averaging $2.94 per ton, at a nominal net profit of $1.04 per ton. The percentage of concentrates is low, and they carry only light values. The figures reported imply careful management and strict attention to detail. We are glad to notice that 40 stamps are to be added to this mine's equipment. The *Beaver Hat Gold Mining Company*, Lower Seal Harbor, under the management of Mr. S. Clifford MacLean, has been occupied largely in development work. The Seal Harbor Mining Company, soon to be operated anew, ceased work in 1906. The whole plant is to be run by electricity. The *Wine Harbor Mining Company*, managed by Mr. J. Owen James, employs about 40 men. From the 300-foot level comes most of the ore shipped. *California Gold Mining Company*, Cochran Hill, until recently under the management of Mr. G. F. McNaughton, has workings to the depth of 225 feet. All timbering is done by the square sett system.

[1] Iron ore imported, 646,978 tons.
[2] Ton of 2,240 lbs.
[3] Net tons.
[4] Amount exported.

HALIFAX COUNTY.—*The Ecum Secum Gold Fields, Limited,* operates 10 stamps of a 20-stamp mill. The mine was unwatered in August, 1906. The *Harrigan Cove Gold Mining Company,* Mr. Munroe Archibald, manager, has done a total of 470 feet in drifting. It has leased the St. Anthony Gold Mining Company's areas to the north. The Dominion Mining Company (formerly the Boston Tangier Company) have deepened their shaft to 202 feet. The *Dixon Mine,* Cariboo, is being worked on a small scale. On the Baltimore & Nova Scotia Mining Company's property (Cariboo District) nothing has been done beyond keeping the water below the 700-foot level . At Moose River the G. & K. Comapny are open-cutting the slate belt on Area 77. The property of the old Touquay Gold Mining Company is to be reopened. The Oldham Stirling Gold Company, at Oldham, employs 30 men. During the year the inclined shaft was carried to the depth of 969 feet, 129 feet being sunk during 12 months. New levels are driven at shaft bottom. All work here is done by underhand stoping. This is one of the very few Nova Scotia mines where this method of winning ore continues in use. The lead to the deep holds its size and the dip is 40 degrees, as compared with 38 degrees at 800 feet from the surface. Crushing in the Taylor mill, on an adjacent property, yielded two ounces to the ton. Two trials in the company's new mill resulted in a loss of fully one ounce to the ton. No reason is assigned for this remarkably poor work.

LUNENBERG COUNTY.—The most important gold mining in this county was carried on by the Micmac Mining Company at Leipsigate. Sixty men are here employed in double shift. About 3,600 feet of levels have been driven during 1906. It is planned to operate the whole plant by electric power, brought from the town of Liverpool, 20 miles distant. As the mine is wet and fuel very expensive on account of the distance from tidewater and railway, this will be a very pronounced improvement.

AURIFEROUS ANTIMONY.

The Dominion Antimony Company, West Gore, Hants County, shipped a total of 782 tons of ore during 1906, yielding 1,031 ounces of gold ($19,589). Forty men were employed in two 10-hour shifts.

IRON ORE.

At Torbrook, Annapolis County, several mines operated by the Londonderry Iron & Milling Company produced about 27,000 tons of iron ore. The iron ore mined at Londonderry and Brookfield, Colchester County, is not mentioned in the report. The Londonderry output alone must have aggregated over 70,000 tons.

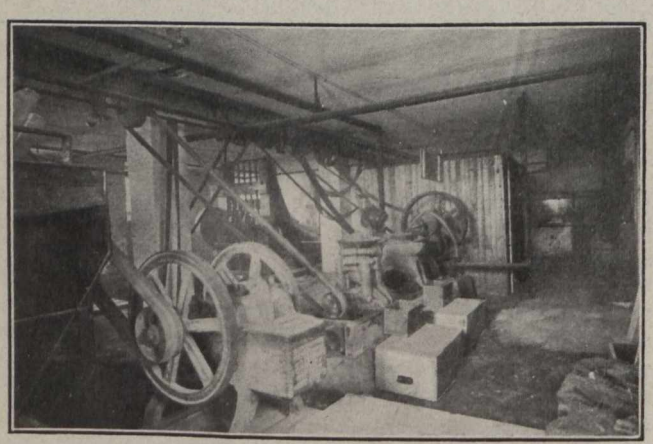
GOVERNMENT DRILLS.

The Provincial Government places three Diamond drills and four Calyx at the disposal of mine owners. During 1906 a total of 2,839 feet 9 inches were bored in carrying on prospecting. The cost per foot averaged from $2.66 for a 566-foot hole mostly in shale conglomerate and sandstone, with a Calyx steam drill, to 50c per foot for a 696-foot hole using a Diamond steam drill. The high cost of the first mentioned boring was due in part to delays in getting supplies.

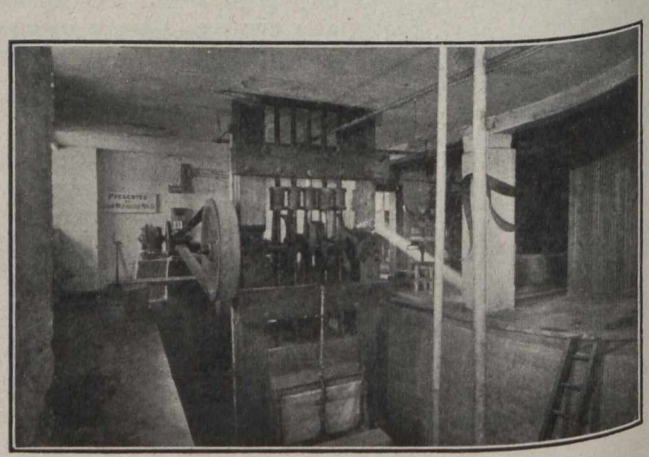
The Mining Laboratory of Dalhousie University, Halifax, N.S.

BY FREDERICK H. SEXTON, S.B.

During the last four years, Dalhousie University, in Halifax, N.S., has established a faculty of engineering containing two departments, civil and mining engineering. The courses are now well organized and running smoothly, and a short history of the installation of the mining laboratory, setting forth some of the difficulties overcome, may be of interest to more than have actually been called upon to equip an up-to-date laboratory with an old-fashioned sum of money.



ORE CRUSHERS



STAMP MILL, SHOWING MOTOR DRIVE

The first step was to install apparatus for conducting work in fire assaying. It fortunately occurred that the Halifax Electric Tramway Co. were tearing down the by-product coke ovens of the plant formerly belonging to the People's Heat and Light Co. The Tramway Co. generously furnished the Mining Department all the second-hand fire brick it wished, for a price about half that of a good grade of common red brick. Enough good sound fire bricks were secured for pot, muffle and reverberatory furnaces. Fortunately, also, one of the mining students was an expert mason, used to handling fire brick, and he laid all the fire brick during spare hours.

The pot furnaces are made up of shells of ¼ in. boiler plate, with a door in the lower part of the front, and draught hole in the upper part of the back. They are

lined with one course of fire brick laid stretcherwise inside. The grate is composed of loose bars of ¾ in. square wrought iron, supported by two 1 in. square wrought iron bars let into the brick work. The grate bars could be pulled out through the door. The furnaces are 15 in. square inside and 2 ft. 8 in. high. The cover is a 2 in. fire brick tile, bound with wrought iron and counterweighted so that it can be easily slid back to open the furnace. The total cost of each furnace to the college was $23.60, of which $21.15 was the cost of the shell obtained from local dealers.

The muffle furnaces are built in the same manner, i.e., a ¼ in. boiler plate shell lined with one thickness of fire brick laid stretcherwise. The furnace is 23 in. square inside, 4 ft. high, and contains an L Battersea muffle. There is a charging door for the coke above the muffle, a stoking door and an ash pit door at the very bottom. The fuel used is coke. The grate bars are the same as in the pot furnaces only of larger dimensions. The cost of a muffle furnace to the college was $48.20, of which the shell alone cost $44.50.

The pot and muffle furnaces have required nothing for repairs for three years except two sets of grate bars, two new baffle plates, and of course new muffles, and they have been in almost constant use during that time.

Later a gasoline muffle furnace was obtained from sums of money paid to the laboratory by people who come to work in it, and has proven most useful for muffle fusions and cupelling. With coke at $5 per ton and gasoline at 26c per gallon, it costs about two and a half times as much to run the gasoline muffle as the coke muffle, the latter being a trifle the smaller.

The working desks for assaying provide room for twelve students and were made for a reasonable sum by a local carpenter.

The next work attempted by the author and his students was the construction of a reverberatory roasting furnace. This has a hearth of 10 square feet area and a grate of 4½ square ft. area. The large ratio between the two areas is necessitated by its diminutive size. The hearth is composed of three large 4 in. tiles of fire clay, which give a very smooth surface with very few joints. There are three air entrances from the fire bridge directly to the hearth, through which fresh air is supplied to the roasting ore. An adjustable shutter regulates this air supply.

A small reverberatory furnace of the style of the English cupellation furnace, with removable test, is contemplated at present for the refining of copper and for cupellation of base bullion.

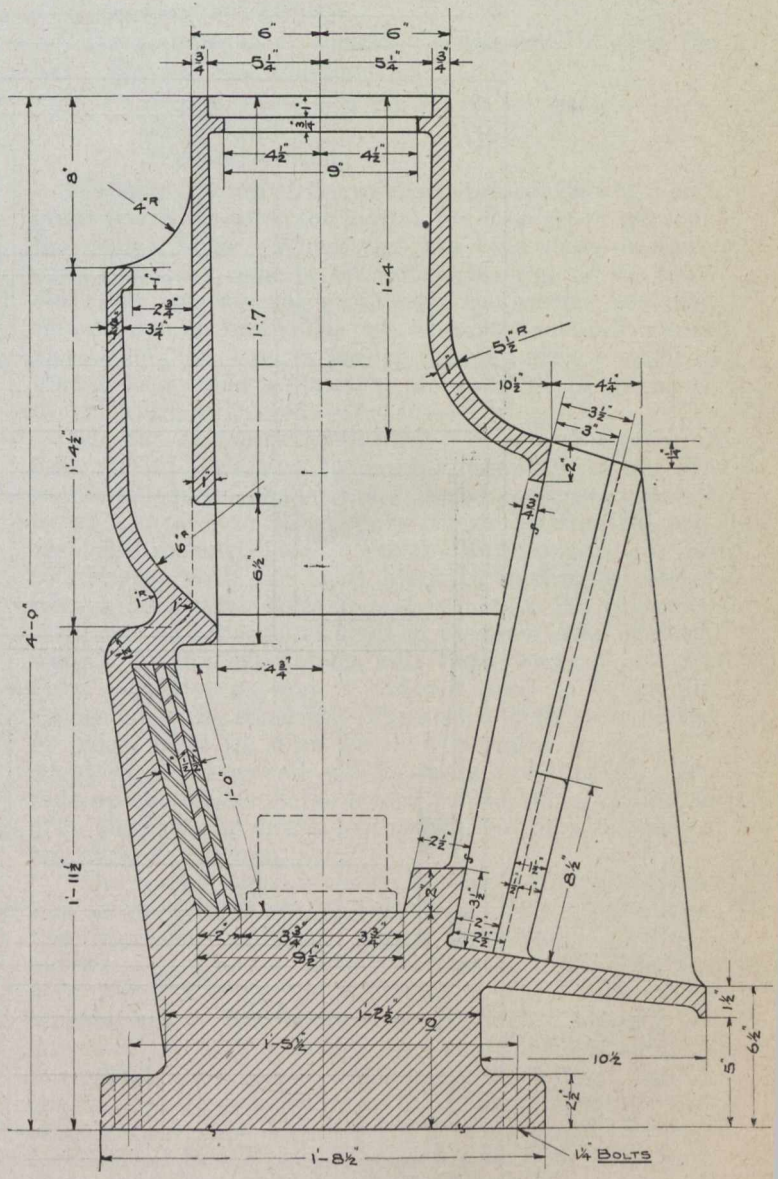
In the main mining laboratory is a single line of shafting running lengthwise, which is driven by a 10 h.p. 220 V., 3-phase induction motor, and which drives all the machinery except the stamp mill. All of the machines are set upon concrete foundations.

The crushing is done by three small laboratory crushers and a small pair of Cornish rolls. The coarse breaking is done by a 4 in. x 6 in. Blake-Marsden breaker, which will crush to 2 in., 1½ in., or 1 in., as desired. The intermediate crushing is performed by a small Gates spindle breaker built especially for laboratory work, which will take ore up to 2 in. diameter and reduce it to ¼ in. to ½ in. size. The finer work is done by a Gates fine grinder, which will grind ore of ¼ in. to ⅜ in. through a sieve of 80 meshes to the linear inch. These three machines are placed side by side, and with their aid a sample may be very quickly prepared for assay.

A sampling floor 10 ft. square, of concrete with a neat cement top finish, has been found to be very satisfactory.

The Cornish rolls were manufactured by the Jenckes Machine Co., of Sherbrooke, Quebec. The rolls are 8 in. face and 12 in. diameter, with manganese steel shells. They have not yet been provided with an automatic feeder, but will be in the near future. They are also set on a solid concrete foundation.

All screening is done in a flat shaking screen. This consists of a flat frame supported by light chains, shaken by an adjustable eccentric, which contains any one of a series of light frames 3 ft. 6 in. by 14 in., with different sizes of wire attached to them. This



CROSS SECTION OF MORTAR

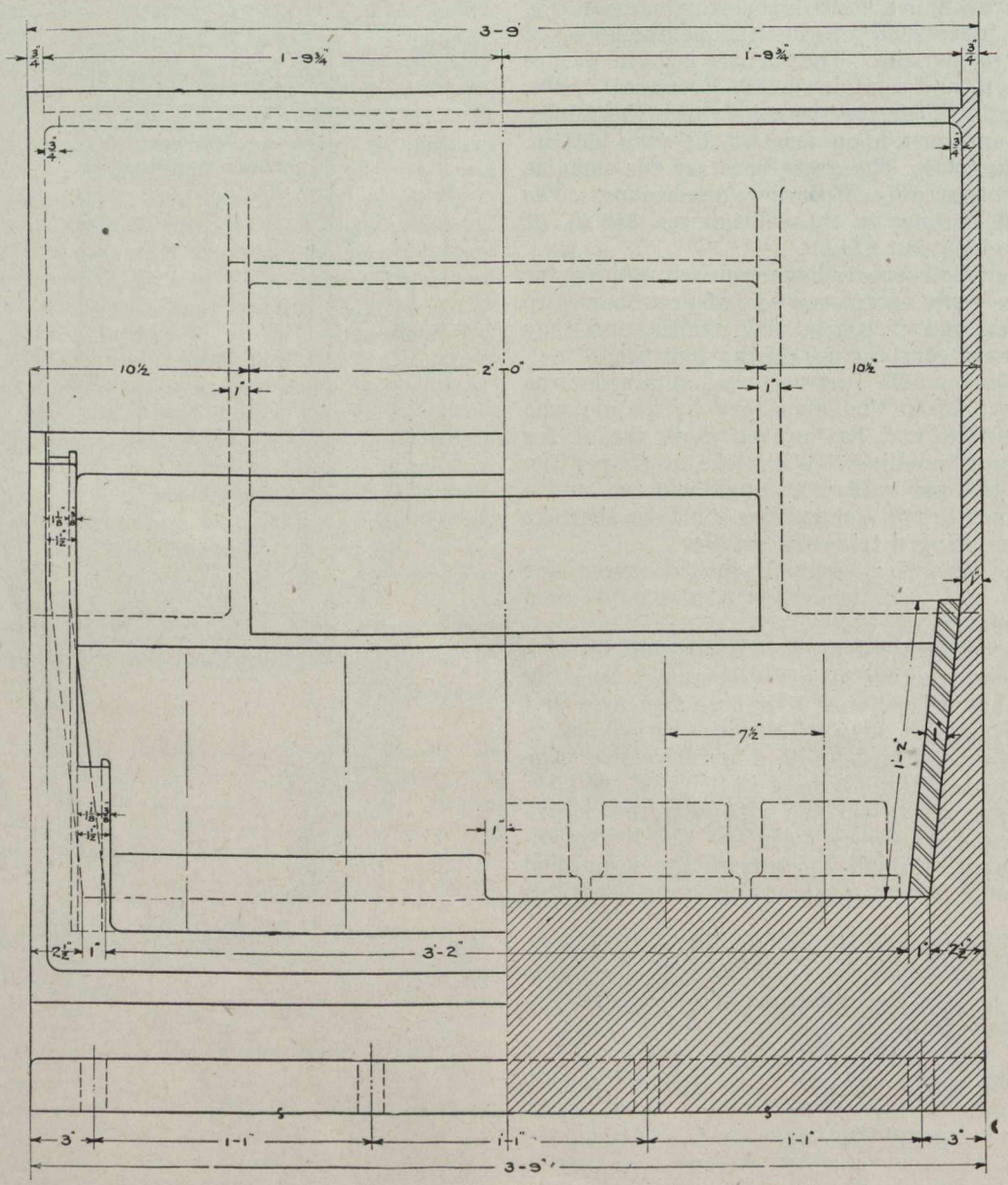
screen is enclosed in a dust-proof casing. It is light enough to be moved from the rolls to the other crushers when needed.

The Mining Department was presented with a vertical duplex air compressor by the Canadian Rand Drill Co., with a capacity of 80 to 90 cubic feet of air per minute. This furnishes us with compressed air for all purposes.

The only machine for concentrating coarse sizes of ore at present is a two-plunger Collom jig presented to the laboratory by the Mining Department of the Massachusetts Institute of Technology. It is fitted with a very complete set of sieves, and serves its purpose very admirably.

A small gold clean-up barrel also constitutes a part of the equipment of the laboratory. This was secured from a gold mining company operating in the Province, for whom it had proved too small, at junk price. It serves many purposes. It fulfills its proper role as a clean-up barrel; it is also used as a tube mill, and serves as a machine in which to carry on slime agitation tests.

The laboratory also is possessed of some simple home-made classifiers. These are made by screwing into a cross-fitting of unequal dimensioned arms a short piece of pipe in the largest orifice for a sorting column. The two orifices at right angles to this piece of pipe would be such that their combined area was one and a half to twice as large as the cross-section of the first piece and by the proper piping the hydraulic water is fed into these two orifices, so that one-half of the hydraulic water meets the other half squarely, and rises with it in the sorting column. If the water is introduced at one side only in the sorting column, it gives rise to eddys and inversion currents that derange the work of the classifier. To the remaining orifice is screwed a reducing connection, into which is driven a wooden plug with the proper sized hole in it to serve as a spigot discharge. To the top of this lower sorting column of hydraulic galvanized pipe is soldered a rectangular box of proper cross-section to serve as an upper sorting column. This box has a slot near the bottom, into which the pulp is fed through a compartment soldered on the back as high as the box. The overflow escapes through a slot with an outward lip situated near the top of the box on the side opposite the feed. These classifiers are very easily and cheaply made, and have given good satisfaction for many kinds of work, from washing the sulphur from coal to classifying coarse, heavily sulphuretted ores.



MORTAR ELEVATION

For concentrating fine ores the Mining Department has a half-size Canadian Wilfley Table, manufactured expressly for the laboratory and presented by the Truro Foundry Company. The wash water can be regulated for every 18 in. in length of the table, thus supplying water on the table exactly as it is needed.

More effort was expended in designing and installing the stamp mill than in any other way. It was felt that the small three-stamp prospecting mill that is used in

so many mining laboratories did not duplicate well enough the actual operation of the common five-stamp mill. It was also felt that the actual full size mill required too much cost and labor in providing it with enough ore if run frequently, and that such a mill was not flexible enough in its adjustments to illustrate different milling practices.

Since the basement in which the mining machinery is installed is only nine feet high, it became necessary to excavate a hole large enough to sink it below the floor level. Therefore a rectangular hole 17 ft. wide and 32 ft. long was dug to a depth of nine feet and lined with a wall of concrete (1:9) 8 in. thick at the top and 18 in. thick at the bottom. The ground excavated was an extremely hard blue clay, so hard near the bottom that a pick could hardly be driven into it. The ground was also very wet, and a feeder was found near one corner of the pit that attained the proportions of 10 gallons per minute at one time, and had to be pumped night and day. To make the pit water-tight, plates of galvanized iron covered with tar were placed in the centre of the walls and bottom, the ends of the plates overlapping one another. There was such a constant inflow, however, that small channels were formed through the setting cement, so that the walls when finished were not absolutely water-tight. The amount of water seeping in now for a week is so small that it can be pumped up in five minutes.

The excavation of this pit and the settling tanks and the mixing of the concrete was performed by laborers, and this was the only work outside of the pipe fitting and part of the carpenter work of fitting the battery frame that was not performed by the author assisted by the students. All the machinery, battery, frame, mortar, etc., was moved into place even without the aid of block and tackle. A great deal of time and effort was required to get the battery frame in place, because there was only a clearance of two inches between the top of the post and the ceiling, and the timbers were heavy. The sills are 12 x 16 inches, the posts 12 x 14, and the back struts 12 x 12 inches unbled Georgia pine.

Following is a description of the installation of the stamp mill abstracted from a paper read by the author before the Mining Society of Nova Scotia on March 9, 1905:

"The stamp mill was designed with two chief ends in view. The first was to provide a wide range of adjustment in order to illustrate to the students the various practices of gold milling, and the other was to make the machine, as far as possible, suitable for testing any of the local ores for the best milling conditions for that particular ore. Thus the students could arrange the mill to have a high drop, high discharge, small number of drops and wide mortar, and carry out Colorado practice aiming at extracion principally by internal amalgamation. On the other hand, they could vary the same adjustments to turn the stamp mill into a machine running in the way of those in South Africa, where the principal aim is capacity and incidental amalgamation. In this way the flexibility and adaptability of the stamp mill is firmly impressed on the students' minds, and the adjustments become real live things that are bound to stay with him, instead of mere book statements that are so likely to fade quickly from his mind if he is not compelled to make practical use of them in after life. It was thought that this mill would be invaluable to an engineer in developing a new property, by giving him a chance to thoroughly test his ore and be sure of no mistake in designing his permanent mill.

"The mortar block was built of concrete set on bed rock. The rock used was a hard, fine quartzite, locally known as 'whin.' This was purchased in the form of small boulders, and crushed in the laboratory 4 in. x 6 in. Marsden-Blake crusher to 2 in. The run of crusher was used because it contained very few fines. The quartzite broke in very sharp angular fragments, and was a most excellent product for concrete. At the bottom the proportions were:

Broken stone (2 in.—0)	5¼ parts.
Sharp sea sand	1¾ "
Portland cement	1 "

"The proportion of cement was increased toward the top. The top was composed of:

Broken stone (⅜ in.—⅛ in)	1 part.
Sharp sand	½ "
Portland cement	1 "

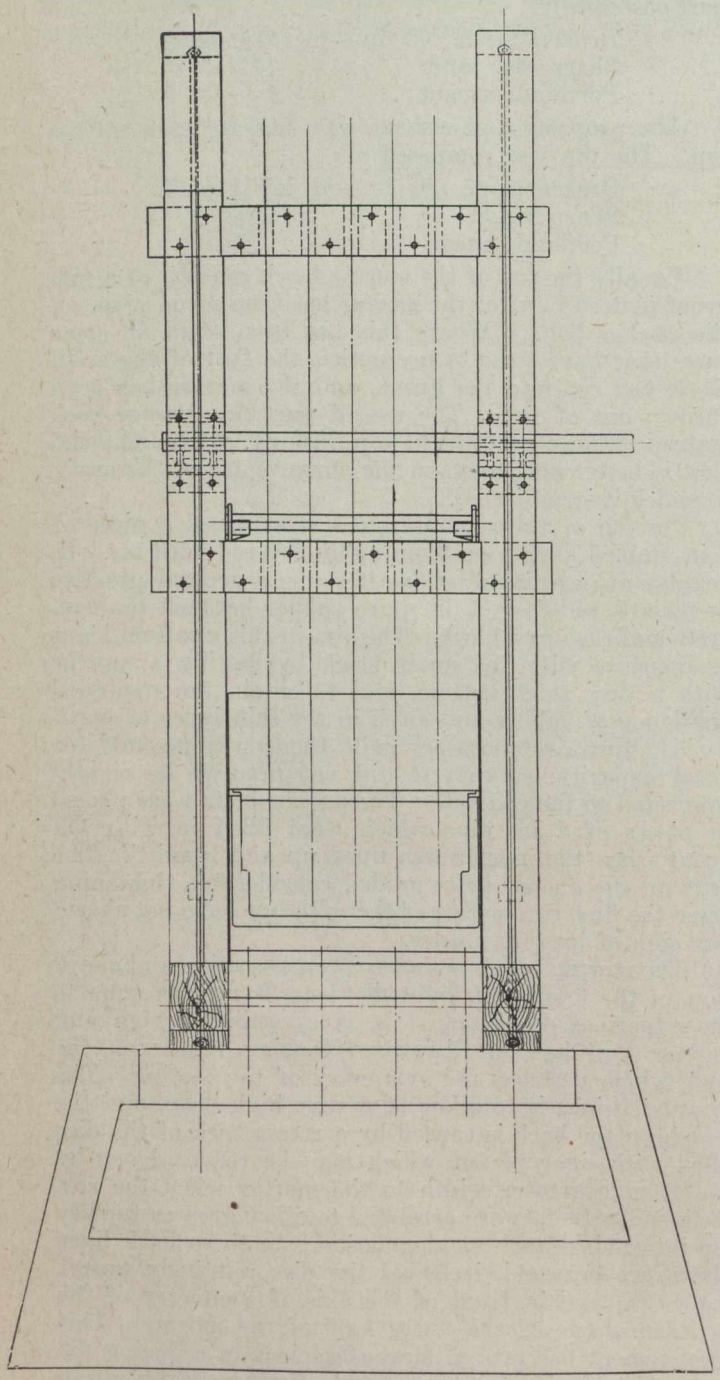
"Usually the top of the mortar block consists of a soft grout poured in after the mortar has been set in place on the anchor bolts. Where this has been done, in some cases that have come to my notice, the foot of the anvil block has cut into the grout, and the mortar has been thrown out of line. The use of part fine broken rock instead of pure sand in the top flushing gives a material that is better able to stand the abrasive jar of the anvil, to which it is subjected.

"On top of the concrete block was placed a piece of 5 in. unbled hard pine, thoroughly covered with tar. In regular modern installations it seems a general practice to place a piece of ¼ in. pure rubber between the concrete and the anvil block. The aim in this small mill was to dispense with the anvil block by casting a mortar with a very thick bottom, and to obtain the combined resiliency of rubber and anvil in the thin layer of hardwood. In this laboratory mill there was no call for great capacity, so that it did not need to be rigidly connected to the concrete. The anchor bolts were placed in pieces of 2 in. pipe which were filled in with 1:1 grout when the mortar was lined up and levelled. The nuts on the anchor bolts needed considerable tightening after the first run or two of the mill, but have not shown any sign of loosening since.

"The mortar which is shown in cross-section and elevation in the figures undoubtedly looks very grotesque to the experienced millman. It is exceedingly high and narrow and has an ill-favored looking hunch on the back which destroys the symmetry of the casting. The unusual height is to allow of a very high drop, and the hunch on the back is caused by a recess back of the dies filled with liner plates, which may be removed one by one to give greater width to the mortar when the rest of the adjustments are arranged to allow greater facility for internal battery amalgamation. As these back liner plates are removed, it leaves the dies relatively nearer the screen and in front of the axis of symmetry of the modified shape of the lower half of the mortar. This arrangement has proven most efficacious in reducing the swash of pulp in the mortar and offering a safe hiding place for the gold amalgam where it is little abraded. This same modification of placing the dies ahead of the centre line of the mortar was employed with great success by a local mine manager for the almost complete recovery by amalgamation of the values from a gold ore running about $200 to the ton, where the gold was so fine it could hardly be seen with the naked eye. When all the liner plates are in place, the mortar has a very narrow shape adapted for fast crushing.

"The mortar is provided with a low lip of 2 in. in the front within a slot of 2 in. cut in the centre of

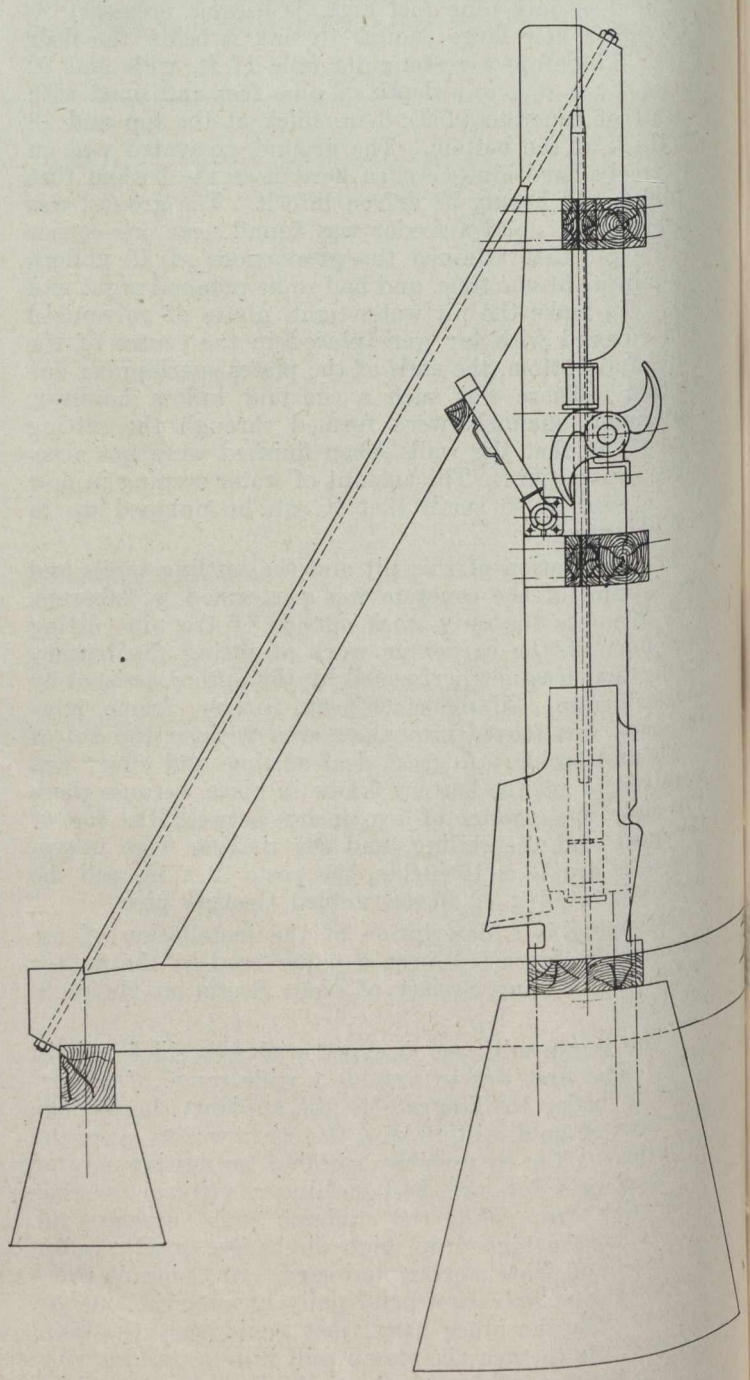
it, through which a bar may be placed to lift the middle die first, in a clean up, and through which the last of the battery sands may be flushed out. It is common practice in Nova Scotia to use flush-bottom mortars without any front lip at all, but it would seem that these offer a good chance for the die to twist or overturn in running, although millmen claim this accident is of very rare occurrence. The bottom of the mortar is cast thick



Front View Battery Frame Timbers of Stamp Mill.

to compensate for the lack of any anvil below it and for its comparatively rigid connection to the concrete mortar block. The front of the mortar is held in by four keys, a pair of long ones and a pair of short ones. With this arrangement, the front can be made in two sections and the upper half taken out to remove pieces of wood, iron, etc., or to replace a loose shoe; while the lower half, which retains the sand to the level of the top of the dies, is undisturbed.

"One inside amalgamated plate is attached to a curved chuck block just below the screen frame. There is provision for attaching a back amalgamated copper plate to the back of the mortar or to one of the back liner plates when using a wide mortar. The water is fed through the front under the screens in six jets through ⅛ in. pipe, between each pair of dies and at each end. The ends of the pipes inside the mortar are set about ¾ in.

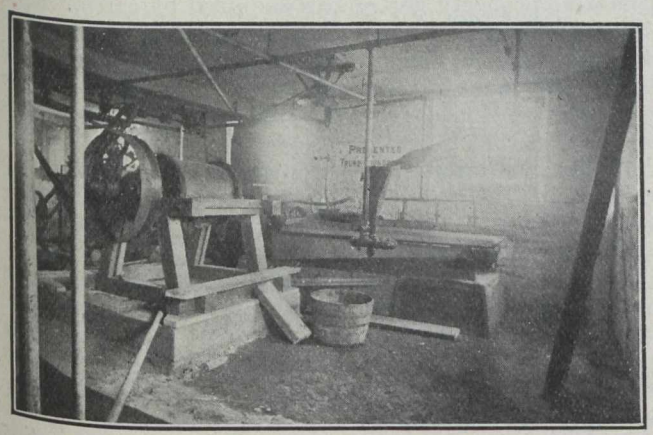


Side Elevation of Stamp Mill.

below the level of the dies, and have an inclination up toward the top of the dies. These jets serve to keep the sand loose and offer a good hiding place for bits of hard amalgam. This is well shown in the clean up, for when the front is taken off a large bunch of bright, hard amalgam is seen in the place where each jet penetrated.

"The number of stamps is five, and their weight is 400 lbs. each. College laboratories very often use a

light three-stamp mill, such as is sometimes used in prospecting or first testing a property. The three-stamp mill is very faulty in principle. There is but one order of drop possible, i.e., 1, 2, 3. If you reverse it you simply call No. 1 stamp No. 3 and get the order 3, 2, 1. In either case there is a tendency to throw the pulp toward one end of the mortar in a bank, leaving the other end die comparatively bare. The three-stamp mill cannot adequately duplicate the ordinary five-stamp mill used in practice, and it should not be adopted for purposes of instructing students. In some laboratories full



WILFLEY TABLE AND CLEAN-UP BARREL

size five-stamp mills have been installed, but this is entirely unnecessary and leads to a great deal of trouble in getting sufficient ore to supply it. Besides this, it furnishes large quantities of products which are awkward to handle in the frequent clean-ups. The small mill for laboratory purposes should as nearly as possible duplicate the machine used in practice, and should strike a fair balance somewhere between a toy and a full-sized mill. The stems are of mild steel turned to size throughout. The cams are of the Canda self-locking type, and are set for the order of drop 1, 4, 2, 5, 3. The arms of the cams are very long and allow of a change of drop from 4 in. to 10 in. The cams are called upon to do their hardest work on the short fast drop, when only a part of the cam toward the point comes in contact with the tappet. In order to stand this usage, the arms and hubs of the cams were made much heavier in proportion to the weight of the stamp than is done in actual practice.

"The mill is fed with a Hendy-Challenge feeder. The actuating arm of the feeder, which is furnished with a long upward curve terminating in a fork, was cut, a piece taken out of it, and welded again to form a short horizontal arm which gives a much more sensitive feed.

"The frame of the mill is a back A frame. It is made throughout of unbled Georgia pine. This type leaves the outside amalgamated plated perfectly free and unobstructed. Each battery post is bolted by a long perpendicular anchor-bolt through the sills to the concrete mortar block. The sills are bolted just in front and back of the mortar block by heavy horizontal tie rods. This gives a construction which is extremely rigid. The inserted plate shows the arrangement of the battery frame as it was first planned. The present arrangement is better because the mortar was turned around to face the other way, leaving the plate entirely unobstructed. The feeder was placed on a platform between the two back struts. The sills were cut off 18 in. in front of the battery post and, as stated above, were bolted by a 1½ tie bolt just in front of the mortar block.

"The outside copper amalgamated plate is 10 feet long with no intermediate drops in it. It is turned up for 1½ in. at each long side, in order that it may be more perfectly cleaned up after each test. It is carried on a table which is supported by four heavy standards which are embedded in two concrete blocks in front of the mortar. Thus the outside plate may be given any desired slope, from one inch per foot to two and a half inches per foot, and is absolultely independent of the mortar. No jar is communicated to the plate from the mortar; and when desired the plate can be easily slid away so that one can work with perfect freedom at the foot of the mortar.

"The mill is driven by a four horsepower, 220-volt, three-phase induction motor. This is provided with external reactance, so that the speed can be varied within wide limits. The motor has a rawhide pinion to minimize the noise of the reducing gear as much as possible.

"This stamp mill was designed primarily for the instruction of mining students, but it can also fulfil other purposes. It is very seldom that a stamp mill is designed to exactly fit the ore that is to be treated. Usually it is well known whether the ore is free-milling or refractory, and it is determined fairly well beforehand what the whole treatment is to be. But the mortar is often designed after some other leading pattern, which is modified to suit some prejudices of the manager of the property. Such a mill as the one outlined above could be made of the greatest service in scientifically testing the ore for a new property to determine the broad lines on which the milling practice should be carried out, and to plan the shape of the mortar, height of drop, etc., according to the results. There should be no difficulty in arriving at very accurate approximations of the best practice for a new ore if enough careful testing is done with the small laboratory machine."

ASSAYING LABORATORY

The four h.p. motor for driving the mill was presented by the Canadian Westinghouse Mfg. Co.; the timbers for the battery frame were donated by Mr. G. J. Partingdon, Jr.; and I. Matheson & Co., of New Glasgow, N.S., furnished the iron work of the mill at cost.

The ore for the stamp mill is broken in the 4 in. by 6 in. Blake crusher, and wheeled in barrows and dumped into the hopper of the Challenge feeder. Thence it goes through the mill and flows down over the plate into a concrete sump. If the tailings are to be concentrated they are pumped thence to a reservoir near the ceiling,

made of an old molasses hogshead, inside of which is a stirrer run by a rope from the main shaft. This stirrer keeps the sand from settling and clogging the discharge. The pulp runs over the Wilfley, the tails going to two large concrete settling tanks in series, each 8 x 4 ft. and 5 ft. deep, and the clear water running to the city sewer. The heads and mids each go to their own settling tank, and the overflow of each is run to the large settling tanks.

Nearly all laboratories in their infancy have had to start in a small way, and have demanded much time and effort from him who has been fortunate enough to first establish them. This mining laboratory possesses nearly all the important types of machines with which

ASSAY FURNACES

the student should be thoroughly acquainted before he starts the practical life of the professional engineer, and it possesses as good a stamp mill for laboratory testing as the author is acquainted with. The laboratory is not as completely equipped as would be desirable for extended research. It is the strong belief of the author, however, that lavish equipment has often led to the confusion of the student, instead of a good, thorough acquaintance with a few important types, and thus the object for which the laboratory is intended is defeated.

The whole laboratory as installed at Dalhousie College has cost about $6,000, plus much time and effort. The results have amply repaid those most interested for the time and labor that they have put into its completion.

FASHIONS IN MINING

J. C. GWILLIM.

Time and place have many values in some phases of mining, quite out of proportion to the value of the commodity involved. Everyone interested in the speculative side of mining feels that there is a time to buy and a time to sell, and the chief concern is to choose these times aright. The general public knows nothing of productive values, and does not really speculate upon them, but upon the optimism of the hundreds or thousands who are interested in seeing the market rise.

A piece of ground adjacent to a bonanza acquires value in much the same way as a piece of real estate in a desirable neighborhood. This idea appeals to the ordinary man, but as a rule there is nothing of real value in it. There are reasons sometimes for the expectation of value; but these are not due to proximity, but to geological conditions which can be understood by very few people. Given two pieces of blank, unprospected ground, the one adjoining a known deposit is preferable to one in no such proximity; both are far more speculative than the piece of real estate. Concerning the fashions in mining, these are as carefully nursed as any fashion of dress or taste of the times. A likely field is pushed forward at first by some real merit, then by wide and subtle advertisement. Men become financially interested in the camp, their friends also come in; there is a good opening for exploitation and inflation of values; property and shares acquired by gift or small payment are talked up until the general public and those who sell to them become interested. Everything combines to make a rising market. Friends have made money; every man who has a dollar in the camp becomes an optimist, and so the fictitious values roll up. The press, the public and the people in the camp itself cannot abide the man who says a word to cool the enthusiasm, so very little on that subject is said. The experience of Southern British Columbia during the decade from 1890 to 1900 illustrates history of a mining boom. Whilst money was pouring into the country and a host of exploiters found themselves busy in keeping up the good times, people lost sight of the inadequate returns from the mines. Later on it was conceded that the costly development would bring about the required production; but before that time the subscribing public ceased to put up more funds, and mining, from the point of view of a great many people, had gone to pieces. Concurrently with the exodus of the brokers, migratory experts and all that floating aggregation which follows a boom, real mining began to pick up. Only properties of merit could stand the withdrawal of outside funds. Many of these even had to cease operations because of the mistrust caused by misrepresentation.

After the Kootenay was dead, in the opinion of those who lived by the money coming in from the outside, and the population had diminished, the production and money coming out of the mines still went on increasing until it is now double that of the best days of the mining boom. At the present time it is much harder to sell a property of real merit than in those days to sell a piece of ground from a few assays. Hundreds of claims held at high figures in 1896 to 1898 have lapsed into Crown lands for want of representation. Yet the mining industry is in a better condition than at any previous time, as far as genuine mining is concerned, and the best interests of the people who intend to make these districts their homes. Ontario itself has cut its teeth in various camps for the last forty years, and in some places has found something to masticate after that process had been endured. Gold, copper and lead have all had a run; there are reports of twenty to forty years ago fully as optimistic and as groundless as those of to-day, upon properties which have now a strong second growth of timber in their excavations. Silver is now a fashionable metal, and a few traces of it can raise financial support. Many of those who are now interested in the phenomenal values of the Cobalt camp may not have even heard of another silver camp in Canada, which, without ever figuring to much extent on the stock market, has produced over twelve million dollars in silver and six million dollars in lead in the last ten years. This has come out of an area in the Slocan of British Columbia, not very much larger than the Cobalt camp; but that B. C. camp, from the point of view of the broker and the public, is decidedly unfashionable.

From another point of view the men and money going into the popular camps does much good, by stimulating industry and development to an extent which would be impossible with the cautious policy of conservative mining. If there are assets in the way of natural resources, these have a chance of discovery and development which they might not have for a very long time, and time alone will show who gets the benefit.

SUMMER MEETING OF A. I. OF M. E.

PROPOSED ITINERARY OF ONTARIO VISIT.

As is announced in another column, the American Institute of Mining Engineers is to meet in Toronto during July. The Toronto meetings will be held at the King Edward Hotel commencing July 23rd. The probable itinerary of the visitors is outlined in the letter from Dr. Miller to Dr. R. W. Raymond, the Secretary of the Institute.

The American Institute of Mining Engineers has a membership of over 4,000. The names of its president and secretary are familiar to mining men all the world over. Mr. John Hays Hammond, the president, is one of the most prominent mining engineers on the continent. Dr. Raymond, who for twenty-six years has held the position of secretary, is an integral part of the Institute. He has devoted his rare abilities almost exclusively to the service of the society. The following letter is self-explanatory:

Copy of letter from Dr. W. G. Miller to Dr. R. W. Raymond:

Dear Sir,—I offer the following as a provisional programme for the meeting of the Institute at Toronto in July, and should like to have your criticisms on it. It will serve as a basis for the work of our local committee.

As the New York trains arrive in Toronto in the morning, it being a night run from New York to Toronto, I suppose a session of the Institute could be held on the afternoon of Tuesday, July 23rd. The other two of the three sessions which you desire to hold might be held on Wednesday forenoon and Wednesday afternoon.

You will see from the programme that I am suggesting only two days' stay in Toronto. My reason for this is that the meeting takes place in mid-summer, and cities are not the most attractive places at that time of the year; moreover, I should think that many of the members of the Institute would prefer to spend the time in the northern mining fields and at some of our northern summer resorts, rather than in the city. However, if you think Thursday should be spent in Toronto, this can be arranged for.

You will also see that I suggest that the address of welcome be given on Tuesday evening rather than at the opening of the session. This would give more time for the addresses, and if they are given in the Parliament Buildings more room will be available.

TUESDAY, JULY 23RD.

Forenoon—Arrival of members of the Institute in Toronto.

Afternoon—Session of the Institute.

Evening—Reception, with addresses of welcome from representatives of the Government of Ontario, City Council, and others in the Parliament Buildings, Queen's Park. Light refreshments.

WEDNESDAY, JULY 24TH.

Forenoon—Session of the Institute.

Afternoon—Session of the Institute.

Evening—Leave by special train for Cobalt at about nine p.m.

If you consider this stay in Toronto too short, we might arrange for a trip by steamer across the lake to Niagara, or some other excursion or entertainment. However, many of the members will be coming to Toronto via Niagara Falls, and they will probably not care to make an excursion thither.

THURSDAY, JULY 25TH.

Forenoon—Arrive at Cobalt, where the members of the Institute and their friends will be met by the Cobalt Local Committee. The party will be sub-divided and will visit various mines during the day. Probably the party, if large, will be sub-divided into three, say, "A," "B" and "C." "A" will visit one mine while "B" is visiting another, and afterwards "B" will be given an opportunity to visit the mine already seen by "A" and vice versa.

Evening—A banquet or reception in the Opera House at Cobalt.

FRIDAY, JULY 26TH.

Forenoon—Visiting mines.

Afternoon—It will depend on the wishes of the members of the excursion as to how Friday will be spent. Mining men especially interested in Cobalt will probably desire about two days to look over the field. Other members of the party may be given a trip farther north on the Government railway, probably over the height of land towards James Bay if they desire, in order to see this newly-opened country, or a steamer trip on Lake Temiskaming may be arranged for. This would start from Haileybury, which lies five miles north of Cobalt on the railway. The party would leave for Temagami, 25 miles south of Haileybury, on the railway, either Friday afternoon or evening or Saturday morning.

SATURDAY, JULY 27TH.

Forenoon—Temagami, steamboat trip up the lake. It would probably suit many of the party to spend Saturday and Sunday at Lake Temagami. This summer resort has been opened only during the last three or four years. It is situated in the Forest Reserve and is surrounded by a virgin bush. There are three very good hotels at the lake—one at the station, one at Bear Island, eighteen miles from the station, known as Temagami Inn, and another, the Lady Evelyn, about thirty-five mlies from the station. These days could be enjoyably spent here, I think, and it would break the monotony of the railway trip.

If any of the members of the party desire to spend a longer period at Cobalt, or wish to visit the new Cobalt silver field on the Montreal River, they could do so, and catch the excursion train at Temagami. This train could leave Temagami either Sunday evening or Monday morning. The run to Sudbury would take about five or six hours.

MONDAY, JULY 29TH.

Forenoon—Arrive Sudbury, met by local Reception Committee. Visit either Canadian Copper Company's mines and works or the works of the Hutton Iron Mine, which is situated twenty-five miles north of Sudbury on the railway. A reception or banquet would probably be provided in Sudbury on Monday evening. Part or the whole of Tuesday could be spent in completing the visit to the mines and works of Sudbury or to the Victoria Mines, west of Sudbury. On Tuesday evening the train would leave for Toronto.

I might say that from Toronto to North Bay the train would run over the Grand Trunk Railway a distance of 227 miles; from North Bay to Cobalt the run would be over the Government railway, the Temiskaming & North-

ern Ontario, the distance being 103 miles. The distance from North Bay to Sudbury is eighty miles.

Should members of the Institute desire to visit the mineral localities of southeastern Ontario, arrangements could be made to make the visit after the Cobalt and Sudbury trip was completed.

It is my intention to prepare a guide book for the use of the members while on this excursion in Ontario. This will give an account of the geography and geology of the districts visited, together with a sketch of the mineral industry in Ontario.

Yours very truly,

W. G. MILLER,

Provincial Geologist.

CORRESPONDENCE

We reprint below a copy of the report of Sectional Committee "A" of the British Institution of Mining and Metallurgy on the standardization of weights and measures. Mr. A. B. Willmott's letter appended deals with this report:

To the Chairman and members of the Central Standardization Committee:

Gentlemen,—The Weights and Measures Standardization Committee submit the following recommendations for adoption by the Central Committee:

1. That the word "ton" shall represent a weight of 2,000 lbs. avoirdupois (29,166.6 oz. troy); that the use of the terms "cwt." and "qrs." be abandoned, and that fractions of a ton be expressed either in pounds or in decimals of a ton.

2. That the "miner's inch" be understood to mean a flow of 1.5 cub. ft. of water per minute.

3. That the word "gallon" be understood to mean the Imperial gallon of 10 lb.

4. That all temperatures be expressed in degrees Centigrade.

5. That gold and silver returns be expressed in terms of fine gold and silver, and not as "bullion."

6. That gold contents of ores, etc., be expressed in money values as well as in weights; and that in this connection the standard value be taken at 85 shillings, or $20.67 U. S. currency, per troy ounce fine gold.

They also suggest that the following questions be appended to any memorandum that may be issued to the members of the Institution embodying the above definitions:

(a) Do you consider the general adoption of the Metric system of weights and measures to be feasible in mining and metallurgical work, or would this in your opinion lead to undue dislocation?

(b) Have you any suggestion to make as to weights and measures other than those already dealt with, which require exact definition?

The question of the adoption of Metric standards has engaged the attention of the committee, as the present movement in that direction in other branches of industry rendered it, in their opinion, inadvisable to ignore it entirely.

The feeling of the Committee, however, is, that while the question should be brought to the attention of the members, it would at present be quite inexpedient to advocate the general adoption of the Metric system in mining and metallurgical work.

On the other hand, an attempt to decimalize existing weights and measures is considered to be a step in the right direction, and as tending to bring about a desirable simplification.

I am, gentlemen,

Yours obediently,

(Signed) H. LIVINGSTONE SULMAN,

Chairman of Sectional Committee "A," Weights and Measures.
December 13th, 1906.

Sault Ste. Marie, Ont., April 25th, 1907.

Mr. C. McDermid, Secretary Institute of Mining and Metallurgy, Salisbury House, London, E.C.:

Dear Sir,—Taking advantage of the opportunity which you have given to members of The Canadian Mining Institute to express their opinions on the proposals made by the Standardiization Committees, I beg to make some suggestions. I would have much liked to see some advanced position taken by the Weights and Measures Committee in regard to the metric system. I quite agree that it would be "inexpedient to advocate the general adoption of the metric system" at the present time. I feel, however, that the majority of engineers favor the ultimate adoption of this system, and believe this can only be accomplished by gradual change. Probably no more opportune time could be found for the partial introduction of the system than when the present standardization is being considered. We have no less than four systems of weights in use in English-speaking countries, namely, Avoirdupois, Troy, Apothecary and Metric, and to add to the confusion several of our weights have dual meanings, as in the case with ton, pound and ounce. No one will deny the advantage of uniformity, and a very considerable number, and I believe the majority, of those giving attention to the matter would favor the metric system. My thought is that so far as weights are concerned, engineers might agree to adopt the metric system at once, and ten years from now, when the metric system of weights will have become familiar to the general population, it will be time to urge the adoption of the metric system of measures. Metric weights can be adopted so easily, and with such slight dislocation of present conditions, that I trust the committee will give this suggestion full consideration. I would suggest a change of the recommendations of the committee to read as follows:

1. That the unit of weight shall be the metric ton, representing 2,204.6 lbs. avoirdupois. That the use of the terms "hundredweight" and "quarters" be abandoned, and that fractions of a ton be expressed in decimals.

2, 3, 4, 5. As given.

6. That the metric system of weights shall be substituted for troy weights in relation to precious metals. That the gold contents of ores be expressed in money values as well as in weights, and that in this connection the standard value be taken at 2,733 shillings (?) per kilogram, or $664.60 (?) U. S. currency per kilogram.

7. The metric system of weights be substituted for the karat and fractions in the weighing of diamonds.

All of which is respectfully submitted.

Yours truly,

A. B. WILLMOTT.

In a recently issued bulletin of the U. S. Geological Survey a statement appears giving the obligation required of employes or members of the staff. These are as follows: He must refrain from publishing facts of a confidential nature, learned in the course of his duties. He further pledges himself not to testify in any mining litigation before the United States, state or territorial courts during his employment on the survey; and for three years after the termination of such employment not to act as expert in mining litigation concerning properties in any district in the United States, upon which he shall have made a full or partial report under the employ of the survey, provided that a period of ten years shall not have elapsed since the completion of the field work to which he was a party and upon which his expert report is based. Confidential geological data collected in the course of mine or district investigations, must not be published without consent of the proper authorities directly interested in said data, and is to be used by the collating or investigating geologist only as a basis for conclusions and generalizations.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Up till the 15th of May it could not be said that coal shipments by water had really, that is, actively, begun for the season. This is a late year. In May of 1906 the Dominion Coal Co. shipped 330,000 tons. They will scarcely do that this May. Predictions have been numerous that the Nova Scotia shipments of coal during 1907 would be much larger than in any previous year. I have myself taken part in the pastime of prophesying. About this time we should be getting doubtful as to the fulfilment of our predictions. But no; though appearances are for the nonce against us, we are quite cheerful. The shipments of the six of the larger companies for the first third of the year should have a depressing effect, but instead all are big with hopes. For the four months of the year four of the companies suffer decreases in shipments, viz., Dominion Coal Co., 18,000; Intercolonial and Nova Scotia Steel and Coal Co., about 2,500 each; while the Cumberland Railway and Coal Co., from a series of troubles, has gone all of 50,000 tons behind. The decrease from these four companies is 74,000 tons. The Acadia Coal Company, on the mainland, and the Inverness Railway and Coal Co., on the island, relieve the situation somewhat, the former having an increase of 12,000, and the latter of 21,500 tons, over the four months of 1906. The net shortage for the four months is therefore 40,000 tons. From the first of June the shipments will be on a scale much larger than in any previous year.

Though last year's shipments were the largest by far on record, the profits of the operators were microscopical. Indeed, it is asserted that of all the companies operating only three showed a balance worthy of the name of profit. It is not, then, to be wondered at if the price of coal has been advanced in Montreal, and the St. Lawrence points generally. And yet this increase in price will not be a means of making the operators wealthy, for the reason that the biggest proportion of the quantity sent to Montreal is on long time, that is, three-year contracts, and that means the same price as last year. In fact, the only company that I know of that has no three-year contracts—I refer to companies shipping by water—is the Nova Scotia Steel and Coal Company. Of course, all of the companies will have some small orders to fill at the increased rate.

Land shipments are greatly hindered by a scarcity of cars. The mainland collieries could almost double their outputs could cars be supplied them in sufficient numbers. This complaint of scarcity of cars is not new, and the wonder is that the I. C. R. authorities do not make provision for increased rolling stock. The late shipping season is given as a reason for the exceptional scarcity at the present time. Hundreds of coal cars are standing loaded with lumber which should have been loaded long ago. The ice has delayed the arrival of steamers on which the lumber is to be shipped. And yet, when all is said, the I. C. R. is to be censured for continued scarcity of cars.

The complaint at some of the collieries still continues as to the scarcity of labor. This scarcity handicaps outputs in some instances. For several years the Dominion Coal Co. has suffered much from a scarcity of loaders, that is, men to load the coal into the pit tubs after it is taken down. Extraordinary efforts have been made to overcome this difficulty this year. In order to secure loaders, special agents were sent to Italy, Belgium and other countries, and the result is that a large number of muscular foreigners have recently arrived. The companies not only suffer from a scarcity of labor, but from the irregularity of the men in coming to work. It is not unusual for twenty-five per cent. of the employees at a colliery to be off work on certain days. Many in the spring go fishing and farming, while in the summer many go frolicking. This is a sign that wages are good; and the funny thing is that these same would be the loudest grumblers were the idleness enforced from scarcity of employment. The collieries will give employment directly to 12,000 men this summer, and nearly as many more indirectly.

The biggest thing in the way of development on the mainland is the opening out of the Allan shafts. Naturally owing to the immense thickness of the seam—forty-five feet to fifty feet—development proceeds slowly. This is a big undertaking, from which big things are expected once the seam is fully opened out. It may be some time yet before the anticipated 2,000 tons per day is reached; at present the output is between two and three hundred tons per day. There should be a steady enlargement of this quantity. Nova Scotia can not only boast of the biggest seam of bituminous coal at present being operated, but of the longest straight, high-angled slope—if I am not mistaken—in the world. The Drummond slope of the Intercolonial Coal Mining Company is now down a distance from the surface of over 7,500 feet, or say a mile and a half. The pitch of the seam is over 21 degrees; therefore the superincumbent weight of the strata at the face of the coal must be something tremendous. The "squashing" almost flat as pancakes of the heavy sticks put in to support the roof bears testimony to this. To take a rake of boxes from the face of the slope to the surface occupies eleven minutes, and yet this colliery can hoist as much coal as when the slopes were less than half the distance. This has been made possible by the employment of heavier haulage engines and thicker steel rope. Twice as many boxes come up on a rake as, say, two years ago. This colliery is over forty years old, and yet is producing yearly more coal than in its younger days. Mr. James Floyd's management of the colliery has up to the present been an unqualified success. In Mr. Blue, as mine manager, he has an able lieutenant.

The men and management at Springhill are to have a trial of the new Industrial Disputes Bill. The men made application to the Department, and have named as their arbitrator Mr. R. B. Murray, of Springhill, while the company has named Mr. Archibald, C.E. I have not heard if they have agreed upon the third man. It is thought that the men believe they have a good case, otherwise they would not have taken the initiative. Our miners are much more reasonable than are the miners in the West. That may be due partly to the fact that they have home leaders, and not foreigners for guides. The P. W. A. is perhaps as desirable a trades union as any on the American continent. Of course, it has its critics, but these are mostly men with Socialistic leanings. To them the P. W. A. is not aggressive enough, which is another word for clamorous. That is, however, the beauty of the P. W. A. Its chief and only paid officer does not need to go round the collieries setting off fireworks in order to make his salary secure. Some would prefer that the P. W. A. was not a semi-secret society. Why should its doors be open to non-contributors? The managers meet and their meetings are not open to everyone, and why should the meetings of the P. W. A.? The meetings of the P. W. A. are for stockholders, so to speak, only, and why should they not be? We ought to be glad that the Western Federation of Miners obtained no footing in Nova Scotia. Wherever in British America that society has found a place it has left discord and strife in its trail.

The British papers have been crowing over an output of 3,865 tons in a day from a colliery in Derbyshire. It is claimed that this beats the world's record. Scarcely. From Dominion No. 2 shaft of the Dominion Coal Co. there was hoisted in a day of ten hours no less a quantity than 4,603, or over 700 tons more than what is claimed as the best day's hoisting in the world. Nova Scotia may be a small place, but for its size it does some wonderful things. It has a coal company that can hoist more coal, ship more and unload from its steamers more coal than any other coal company on the wide continent. And we are only at the beginning of things. It is only ten years since the coal trade really began to grow, and at the rate it is expanding it will be of gigantic stature by the expiry of another ten years.

ONTARIO.

Cobalt, May 16.—The "hugger-mugger" fashion in which Cobalt stocks are introduced in England has been annoying the London Times. Advertisements of the Cobalt Central Company aroused the wrath of the Thunderer, and it proceeded to ask some inquisitive questions. "How much was paid for the properties, and how much working capital has the company?" asks the Times. It then goes on to say that British capital may well fight shy of a field of exploiters who adopt such questionable methods of calling attention to it.

No specific reply can be obtained at this end of the line to these caustic criticisms, but a disposition is shown to give visitors access to the property. While the company holds something like 220 acres of land, only a small portion of that acreage is under development, the section adjoining the Nipissing, and including the Big Pete mine. A 100-foot shaft has been sunk there with considerable drifting, several good veins have been struck, and a concentrator is in operation treating the wall-rock, which is rich in low grade ore. Up to date three shipments have been made, but none were full carloads. The capitalization of $4,000,000 would seem to be quite ample in view of these results. This capitalization is advertised as being low for the acreage, but as the capital is being used for the development of only a small part of the holdings, the point of this argument is not readily apparent.

That great minds sometimes run in the same channel is shown by the fact that one of the local papers in the Cobalt field is asking questions almost as pertinent as those of the Times. The "Haileyburian" wants to know why the directors of the Green-Meehan do not issue statements telling their shareholders a few facts. The mine is a good one, says the Haileyburian, and ought to make money. Why cannot the people who have invested their money be given some idea where they stand?

No adequate reply can be obtained to these questions either, but at the mine a visitor is shown a very likely looking property. Up to the present all work has been in an open cut, by which fairly good results have been obtained. A strong vein can be followed the entire length of the cut, and the ore taken out runs at a good average. A complete plant is now being installed and a much larger production is promised for the summer. A shaft is being sunk from the end of the cut, and drifting and stoping will soon be possible.

Without attempting to pass judgment upon these criticisms, it may be said that whatever adverse comments have been made regarding this field have been based on failure of promoters to take the public fully into their confidence. Glittering generalities constitute a big part of advertising methods on this side of the ocean, but sometimes they fail to convince even the home folks, let alone those in foreign parts. There have been some big disappointments in the Cobalt field, and it is natural the public should be a bit chary. Candor alone will win renewed confidence.

Snow, rain and rising temperature have been received with great gladness here, for it seems certain that the long-delayed spring has at last arrived. All signs point to the breaking up of the ice in Lake Temiscaming within a few days, and the rapid opening of the rivers. Snow is still heavy in the bush, and the lakes in the north country are still covered with a thick coating of ice, but a few more mild days will make a great change. Then will come the rush north. Hundreds of prospectors are lined up along the trails, and hundreds more are ready to make a quick start from the settlements. The "oldest inhabitant" is not so very old that he can remember a season when the ice went out so late. Fifteen years ago it went out as late as the 15th, but this year it is still here on the 16th. As a result prospectors have been much handicapped, and now have but a short season before them.

Opinion is divided as to which of the northern fields will produce the greatest results this summer. First on the list is Larder Lake, which will no doubt draw the larger number. Much is expected of this territory, and it will take a good deal to fulfill expectations. That gold is there is not doubted, but to what extent will hardly be known before autumn. The Montreal River is better known, and confidence is felt in big returns from there. That country has been more thoroughly prospected than Larder Lake, and considerable work has already been done on the development of some of the claims, notably those of Munroe and Saville, which were among the first staked and the first recorded from that section. The Abitibbi is also going to draw some prospectors this season, and already some very rich specimens of gold-bearing rock are shown quietly by men who have returned from there.

That there is to be a marked increase in the production of the camp is indicated by the figures for the first three months. Up to April 1st about 3,000 tons of ore were shipped. There were 16 mines among the shippers, and as six sent out only one car each, the remaining ten must have shipped an average of about nine cars each month. In 1904 the camp produced 158 tons of ore; in 1905, 2,144 tons; in 1906, 5,129 tons. Now with a record of 3,000 tons for only three months of this year, it is evident that the output for 1907 is to be greatly increased. There are several new mines among the shippers, whose output will increase, and several others will make their first shipments soon. The production at some mines has been curtailed owing to changes of equipment in progress, and at others the product has been held back in hopes that market prices would improve. That so much should have been shipped under these conditions gives some idea of what may be expected during the year.

During the past week some rich strikes have been made by some of the well-established companies. Two finds of native silver veins were made on the Buffalo, and Manager Jones went to New York and Buffalo with good reports for his directors. At the Trethewey nearby two promising leads have been reached in trenching. At the Nova Scotia another vein, two inches of which is solid silver, has been reached at the 20-foot level. At the Red Rock a four-inch vein of native silver is said to have been reached. The Cobalt Central has struck another vein similar to those found recently. A two-inch vein very rich in silver was reached at the Temiskaming.

Among the visitors now in camp is Mr. Eric H. Rose, the senior member of the firm of Rose, Van Cutsem & Co., bankers and brokers, London, England. This firm floated the stock of the Townsite Mine, which is owned almost entirely in England, and is interested in other Canadian and American enterprises. Mr. Rose expresses himself as well pleased with the progress made not only at the Townsite, but in the camp generally, since his last visit. He says English interest in Cobalt stocks is increasing, and that capital from the other side can be drawn to Canada if safe and conservative methods are followed.

Another English visitor is Mr. R. Jackson, a stock broker in Leeds. He has handled Cobalt stocks for a year or more, and says investors in the North of England are awakening to the opportunities offered by this field.

During the past week Mr. W. F. Mitchell has been in the camp, coming direct from Los Angeles, Cal. Mr. Mitchell is a large owner in the Casey Mine, and is part owner of gold mines in California and coal mines in Nova Scotia.

The machinery at the Casey Mine was started Monday, in presence of several of the directors. Hand work has been in progress all the winter, and conditions are favorable for rapid production now that the plant is complete.

The O'Brien Mine recently shipped a 32-ton car that brought $125,000 at the smelter. This is at the rate of nearly $4,000 per ton, and sets a new record for the camp.

The big vein at the Temiskaming is holding its own in splendid shape. It is almost two feet in width, and runs 12,000 ounces per ton and upwards.

The main shaft at the Temiskaming and Hudson Bay Mine is now down 40 feet. The big vein is holding its width, and considerable high-grade ore is sacked ready for shipment.

The Nova Scotia Mine, where some remarkable slabs of silver have been found, has another car of fine ore ready for shipment. Steady production now seems assured.

A car of rich ore is ready for shipment at the Kerr Lake Mine, and with the completion of the new plant there should be large shipments from now on.

Mr. Joseph Houston, formerly in charge of the O'Brien Mine, is now in charge of the Right of Way, where a larger plant is being installed.

Mr. George N. Rounds, a mining engineer from Trinidad, Col., is in charge of the Sutton Bay Company's claims on the Montreal River.

Mr. Rupert Simpson is developing the Sutton Bay Company claims on Sutton Bay. He was formerly engineer in charge at the Townsite.

Mr. John A. Macdonald, formerly in charge of the Silver Mountain Mine, is now superintendent of the Foster Mine.

In spite of the numerous "newspaper" reports of the closing of the Foster Mine, work is progressing rapidly, and under the able management of Mr. H. V. Adler, systematic development work is being done and high-grade ore is being taken out daily. Mr. John McDonald, formerly of the Trethewey, has been appointed mine captain.

Another valuable vein has been struck on the Temiskaming Mining Company's property. One of the richest cars of ore from Cobalt was shipped by this mine last week.

The mine owners and other mining men must regret the absurd articles sent out of the camp by the numerous reporters that are loose in the camp. The absurdity of some articles prove amusing, but when the mining interests are sacrificed for "copy" and all sorts of reports are published, it is about time that competent newspaper men were procured for the work.

Every train brings its quota of prospectors and those interested in the field. The Montreal River is now open, and hundreds have gone into that district already, and it would not be the fault of the men if rich finds are not made before fall. It is safe to predict that by the time the river is once again frozen over the silver field will have been extended many miles.

Mr. R. L. Borden, leader of the Conservative party in the Dominion Parliament, was in Cobalt last week for a few days, and was greatly pleased with his visit.

Mr. R. R. Gamey, M.L.A., was in the camp last week looking over his numerous mining interests.

Mr. F. C. Loring of the Trethewey Mine has returned to the camp.

Mr. D. B. Rochester, manager of the Cobalt Lake Mining Company, was in Toronto for a few days last week. Mr. Fralick, mining engineer for the company, is in Ottawa for a business trip.

The Coniagas Concentrating Mill is being constructed, and Mr. Fraser Reid, formerly of Craigmont, will superintend the running of it.

The Mining Inspectors are in town, prior to their departure for the different fields. Owing to the energetic prospecting carried on during the winter months, they will have great difficulty in coping with the situation, but the Department have taken great pains to procure the best possible men, and the prospectors have every confidence that their interests will be well looked after.

Much satisfaction is expressed in camp over the appointment of Professor Mickle as Mines Assessor for the Province. Professor Mickle is especially suited for the position, being a man of recognized integrity, and also one who is thoroughly acquainted with the mining situation of the Province.

GENERAL MINING NEWS

BRITISH COLUMBIA.

The Payne Mine, now controlled by Montreal capital, is to be re-opened. In its day it yielded nearly a million and a half dollars in dividends.

The Wellington Colliery Company, of Cumberland, has closed a contract to ship 20,000 tons of coal to Nome.

The Slocan district is showing decided signs of revival.

Mr. Neil McEachren is to drive a 50-foot tunnel on his large lead of free milling quartz on the west bank of the Columbia River, between Revelstoke and Arrowhead.

The main shaft of the Centre Star Mine, Rossland, is completed to the fourteenth level, and a pocket has been cut below this level. The new hoist, ordered on May 4, 1906, is only now ready for operation.

Electrical locomotives are now being used on the third and eleventh levels of the War Eagle, and on the fourth level of the Centre Star. They are giving satisfaction.

Atlin, B.C.—A new company has been formed to work the placer gold deposits of Otter Creek, near Surprise Lake. The property is about five miles in extent. The new company's name is The Otter Hydraulic Gold Mines Company. It will be under the joint management of Messrs. W. R. Jamieson and H. Malvin.

The Cariboo Mine, Camp McKinney, has been unwatered to the 400-foot level, and new timbers have been put in. Tracks are being laid in the drifts and cross-cuts. Mining will be actively started in the middle of May, when 10 stamps will be put in operation.

The tunnel on the Nicola Valley Coal and Coke Company's property at Coal Gully, has been driven in over 600 feet. The Company is supplying the railroad with 100 tons per week.

On the west side of Bowen Island, 18 miles north-west of the City of Vancouver, a copper property is being worked. A shaft 6 x 9 feet is being sunk. Part of the areas are on the water edge. A group of Winnipeg capitalists are the prime movers in floating a $1,000,000 company to operate these claims.

A seam of coal has recently been discovered in the Nicola district a few miles south of the town of Nicola.

A 200-ton mill is being erected at the Blue Bell Mine, operated by the Canadian Metals Company. Mr. S. S. Fowler is acting as consulting engineer, and Mr. J. C. Dufresne is superintending the work.

Dr. J. Bonsall Porter, of McGill University, visited Greenwood on May 10th.

The Bertha Consolidated Company, whose properties are situated in the Kettle Valley, have struck ore in their new tunnel.

G. B. McMillan's action against A. D. Wheeler and wife for $25,000 commission on the sale of the Krao Mine, was dismissed with costs by Mr. Justice Clement.

ONTARIO.

Cobalt.—Owing to the condition of the roads shipments from Cobalt have been somewhat restricted of late, but on all the principal properties development work is being very actively prosecuted, and interest in the district in general is being well maintained. For the four months ending April 30th, production aggregated 6,742,667 pounds, or nearly two-thirds of last year's entire output. The most important shipper has been the O'Brien, followed closely by the Nipissing, although the latter, it should be added, has been prevented from sending out ore recently on account of the breaking up of the ice in Cobalt Lake. The Cobalt Lake Mine is now about to commence shipments, and two carloads of ore have already been sacked, while another carload of smaltite will be ready to ship towards the end of this month. The Coniagas continues to make an excellent showing, and is now working six veins, from which some very high-grade ore has been mined. Some 1,500 feet of drifting and cross-cutting has been done at the 75-foot level, while it is expected that the new concentrator, having a capacity of 100 tons daily, will be completed for operation before the close of the month. A new strike

is reported to have been made recently on the Buffalo, a rich new vein eight inches in width having been uncovered. The installation of a concentrator at the Trethewey is under contemplation, as there is a large tonnage of relatively low grade material which might thus be profitably treated. The Erie-Cobalt Company has ordered additional machinery, and work is being carried on with double shifts on the Lorraine, where the shaft has reached a depth of a hundred feet. A plant is also to be installed on the Temiskaming and Hudson Bay Company's property, while a five-drill compressor and steam hoist have been installed at the Wabo. At Kerr Lake the Jacobs Mine is said to be looking exceptionally well. The report circulated that the Foster Mine had closed down was entirely foundationless. The mine is being systematically developed, and appears to be under honest and capable management. At the Nova Scotia some 500 feet of drifting has been done at 60-foot level, in addition to work at the 110-foot level, and on Shaft No. 3. It is expected that a shipment will be made shortly.

Larder Lake.—The inclement weather has to some extent checked the rush of prospectors to Montreal River and Larder Lake, but it is expected that before the first of June travel will be unprecedented. A stamp mill has been ordered for the Blue Bell Mine, at Larder Lake, which property will be under the direction of Mr. W. E. Hotson, a mining engineer of New York.

The following inspectors have been appointed by the Ontario Mines Department. No especial districts have been assigned to each. They will work generally, as need arises, over the whole Province: Mr. A. H. A. Robinson, Mr. A. G. Burrows, Mr. G. C. Mackenzie, Mr. James Bartlett, Mr. G. R. MacLaren, Mr. David Houston, Mr. C. W. Murray, Mr. R. Irwin, and Mr. E. Wade.

The Grace Mine, in Eagle Lake district, will be re-opened soon. Mr. J. H. Caslor, of Buffalo, is putting up a stamp mill. The mine is advertising for miners and carpenters.

The 35 feet by 64 feet power house at the Nancy Helen Mine is completed, and the foundations for the machinery are ready. A hundred horsepower gas-producer is to run an engine for a six-drill compressor.

A discovery of pyrrhotite is reported from the north side of Lake Wahnapitae. It is said to carry 3 per cent. nickel and 1 per cent. copper.

NOVA SCOTIA.

The Nova Scotia Steel Company is about to commence operations at the new colliery at Point Aconi, which will be known as Sydney No. 6.

In an interview at Montreal, Mr. F. P. Jones, of the Dominion Iron & Steel Co., is reported to have stated that an increase of 50 per cent. in production from the company's works is anticipated for this year, and it is thought that the monthly average will reach 30,000 tons.

The Dalhousie-Kings School of Mining, Glace Bay, C.B., has closed for the summer, after a successful season's work. The average attendance was 35. Instruction was given in English, mathematics, chemistry and surveying.

It is understood that the North Atlantic Collieries, Limited, will operate areas in and around Port Maria. The company has 36 leases. There are six seams of coal running through these areas, and they possess a very large estimated tonnage. The present shaft of the Gowrie and Blockhouse will probably be utilized. The leading directors of the company are Messrs. B. F. Pearson, of Halifax, George E. Drummond, of Montreal, and H. M. Whitney, of Boston. The company was organized in 1903, under the Joint Stock Companies' Act of Nova Scotia.

The Nova Scotia Royal Gazette of May 8th makes formal announcement of the appointment of Mr. Frederick H. Sexton to the Directorship of Technical Education in Nova Scotia, under the provisions of the Act passed at the last session of the Legislature.

Sydney No. 3 colliery, owned by the N. S. Steel and Coal Co., is to be operated on single shift. General Manager T. J. Brown believes that the cost of production will thus be considerably lessened.

It is reported that a deposit of infusorial earth at St. Ann's, Cape Breton, is to be worked again. It is owned by New York capitalists.

The coal-washer of the Londonderry Iron and Mining Company, Londonderry, N.S., was destroyed by fire on the morning of May 8th.

Two electric pumps are working in the Hub Colliery, Glace Bay. The Hub was flooded last winter on account of a fire. Hoisting cages have been installed, and the work of cleaning up is proceeding expeditiously.

The Nova Scotia Steel and Coal Company is pushing the work of shaft sinking on Sydney No. 4. It is expected that this mine will start producing coal during the coming autumn. The company owns the land in the vicinity of the mine.

ALBERTA.

From Edmonton the report comes that gold strikes have been made on Little Smoky River, beyond Yellow Head Pass.

EXCHANGES.

The Mining Investor for May 13th has been received.

Mining Engineering (London) for May has been received.

The Coal Trade Journal, May 15th, notes the strong position of the anthracite coal market.

In the Mining and Scientific Press, May 4th, Mr. T. A. Rickard writes of "Great Gold Mines."

The Journal of the Franklin Institute for May gives an able paper on the "Modern Locomotive."

The Science and Art of Mining, May number, contains an instructive article on "Indian Coal Fields."

The Mining World, May 11th, gives a paper on the "Determination of Silica and Alumina in Iron Ores."

South African Mines, April 13th, in an article on "The Metallurgy of Gold Fields' Mines," specifies some of the advantages of tube mills.

The Engineering and Mining Journal, May 11, presents a copiously illustrated descriptive article on "Magnetic Separation of Iron Ore in Sweden."

In the May 18th number of the Engineering and Mining Journal is an excellent description of "The Tungsten Deposits of Boulder County, Colorado."

The Mining Journal (London), May 4th, has been received. In this issue Prof. William Gowland's presidential address before the Institution of Mining and Metallurgy is concluded. The leading editorial deals with "Railway and Mining Development in China."

The Maritime Mining Record, May 8th, makes some very caustic comments on certain pseudo-Socialistic writers who spread themselves in the daily press. Many of these "Socialists," the Record points out, are irresponsible babblers. The Record does well to scourge those silly people whose chief desires are first to see themselves in print and next to stir up strife.

The March number of our contemporary, The British Columbia Mining Record, has reached us. The Mining Record is, as usual, bright, clean and attractive. The March number contains an article on "Copper Mining—an Important Industry in British Columbia," from the pen of Mr. E. Jacobs, the managing editor. Mr. Jacobs exhibits in all his work a keen, incisive style and a remarkably thorough knowledge of all matters pertaining to the mining industry of the Province which his paper so ably represents.

PUBLICATIONS RECEIVED

Bulletin No. 32 (May 9th, 1907) of the Institution of Mining and Metallurgy, has its usual quota of excellent technical papers.

The Quarterly Bulletin of the Imperial Institute, Vol. V., No. 1, contains an exhaustive article on the occurrence of graphite. A previous article dealt with its uses.

Both bulletins are beautiful specimens of typography. They are profusely illustrated with photographs and with geologic maps and sections. Twenty-eight micro-photographs accompany the reports.

Bulletin No. 1. (New Series). New Zealand Geological Survey. "The Geology of the Hokitika Sheet, North Westland Quadrangle," by James Mackintosh Bell, M.A., Ph.D., F.R.G.S., assisted by Colin Fraser, M.S.C., Wellington, New Zealand, 1906.

Bulletin No 2. (New Series) New Zealand Geological Survey. "The Geology of the Area Covered by the Alexandra Sheet, Central Otago Division," by James Park, M.I.M.M., F.G.S., etc., Director of the Otago School of Mines.

These bulletins are of more than passing interest to Canadians, in that they have been prepared and issued under the direction of Dr. J. M. Bell, a graduate of Queen's University, and a nephew of that distinguished Canadian geologist, Dr. Robert Bell.

The general and economic geology of two important districts of New Zealand is carefully described. Dr. Bell has emphasized the economic side of his work as much as possible. The description of certain gold-bearing areas is extremely interesting. We shall, at an early date, have occasion to refer more particularly to this feature of the reports. Meanwhile we wish to record our pleasure in receiving such excellent examples of painstaking and capable departmental work.

"Notes on the Mineral Fuel Supply of Canada," a pamphlet from the Transactions of the Royal Society of Canada, has been received. Dr. R. W. Ellis, of the Geological Survey, is the author. This pamphlet will be the subject of extended notice in the next issue of the Canadian Mining Journal.

CATALOGUES AND TRADE PUBLICATIONS

Bulletin No. 12, issued by the Jeffrey Manufacturing Company, Columbus, O., is entitled "The Care of Electric Mine Locomotives in Service." This is virtually a manual of directions for practical men. The Jeffrey people signify their desire to put it in the hands of all engineers and mine managers. It is amply illustrated with photographs and diagrams.

From Allis-Chalmers-Bullock Limited, is received Bulletin No. 1410. The subject is the Gates Tube Mill for nut pulverizing in mining work. In South African gold mines the tube mill, as a profitable addition to the stamp mill, has made a permanent place for itself. Preliminary treatment of a gold ore in the tube mill increases the capacity of the stamp mill and gives an even product. The Gates Tube Mill, as manufactured by the above firm, is simple in construction and thoroughly satisfactory in service.

"The Deister Concentrator," Mr. C. B. Fitch, Canadian agent, is the subject of a small pamphlet issued by the Deister Concentrator Company, Fort Wayne, Indiana. The Deister occupies a floor space of eight feet square, and, crated for shipment, weighs 1,000 pounds. It requires but one-fifth horsepower, and is operated at a speed of 320 r.p.m. The main frame, supporting the driving gear, is of eight-inch channel steel, held together by steel plates. The table bases are made of the best grade of charcoal iron, so arranged as to prevent longitudinal motion. A wedge adjustment provides for tilting the table, which is supported in ball and socket bearings. The stroke and differential can be changed at will while the table is in operation. The deck (or working surface) is rhomboidal in form and is made of wood covered with linoleum. The surface measures 5 feet by 8 feet. The feed box extends the whole width of the deck, thereby ensuring even distribution of pulp. Alternate riffles extend to the extreme edge of the table, the intermediates being shortened. The riffles are arranged in groups, each group being separated from the next by a higher riffle, which has the effect of flooding the preceding group of riffles with a comparatively quiet body of water, in which fines and slimes readily settle and stratify. The advantage of this device is obvious. The movement of minerals is sidewise. The coarsest and heaviest minerals are expelled from the table within 18 inches of the feed and the lighter and finer minerals at points nearer the lower end of the table.

PERSONAL AND GENERAL

It is interesting to note that Canada's experience of the difficulty of securing and retaining the services of qualified geologists to undertake Government work is by no means unique. Thus Mr. S. F. Emmans, in a report of the United States Geological Survey, notes with regret "the increasing exodus of members of the economic force of the survey in consequence of their employment by large mining organizations at salaries much greater than those they have been receiving from the Government seriously impairs the efficiency of the work of this branch of the survey. It is only by years of practical experience in the field that the geologist, however excellent his preliminary training, becomes competent to carry on independent work in investigating a mining district, and the loss of trained men in this work is, for a time, irreparable."

The terms of the resolution recently passed by the House of Commons, providing for a bounty on pig iron and steel manufactured by electrical processes, reads as follows:

"That it is expedient to provide that the Governor-in-Council may authorize the payment out of the consolidated revenue fund of the following bounties on pig iron and steel ingots manufactured in Canada for consumption therein, when such pig iron and steel is the product of Canadian iron ores smelted in Canada by electricity, viz., on pig iron manufactured from Canadian ore by the process of electricity smelting during the calendar years: 1909, $2.10 per ton; 1910, $2.10 per ton; 1911, $1.70 per ton; and 1912, 90 cents per ton. On steel ingots manufactured by electric process direct from Canadain ore, and on steel ingots manufactured by electric process from pig iron smelted in Canada by electricity from Canadian ore during the calendar years: 1909, $1.65 per ton; 1910, $1.65 per ton; 1911, $1.05 per ton; and 1912, 60 cents per ton."

Apropos of the foregoing, that in Sweden, where about one million tons of iron ore, or one-fourth of the ore raised, is smelted in the country, electrical methods are becoming more and more general. The present demands for electricity may be estimated, according to Mr. E. Hammerstrom, in "Teknish Tidskrift," at 111,000 h.p. for iron smelting, 100,000 h.p. for railway working, and 320,000 h.p. for nitric acid manufacture.

Mr. S. F. Parrish, at one time manager of the Le Roi Mine, at Rossland, B.C., has opened an office as a consulting engineer at Tonopah, Nevada.

Mr. R. B. Lamb, late of Hedley, B.C., has been retained as consulting engineer by the Barnes-King Mining Co., of Kendall, Montana.

Mr. W. H. Jeffrey has resigned the superintendentship of the Crescent Mine, near Greenwood, B.C., to assume the management of the LaRose Mine at Cobalt.

Col. J. H. Conrad, one of the principal owners of the new mining camp near White Horse, Yukon, is visiting New York on business in connection with his Western interests.

Mr. James McEvoy, geologist and chief engineer for the Crow's Nest Pass Coal Co., has had a severe attack of pneumonia, from which, however, he is now recovering. He hopes to resume his duties shortly.

Mr. W. C. Thomas has been appointed resident general manager for the Dominion Copper Co. at Phoenix, B.C., in succession to Mr. T. R. Drummond. Mr. George Williams has received the appointment of the company's smelter superintendent.

Mr. Bernard McDonald, well known in Canada, has opened an office at 40 Wall St., New York.

Mr. R. R. Hedley, after visiting the Cobalt and Sudbury districts, returned on May 12th to British Columbia, where he will commence at once the special work for which he has been retained by the Federal Department of Mines.

Mr. S. S. Fowler, of Nelson, B.C., general manager of the Canadian Metals Co., is visiting New York.

Mr. Bruce R. Warden, of the C. P. R. Mining and Metallurgical Department, Bankhead, Alta., has been retained to superintend the installation of machinery at the Nicola Coal and Coke Co.'s Middleboro Colliery, at Coulee, B.C.

Mr. Paul Johnson, for many years identified with western metallurgical works as manager, respectively, of the Hall, Greenwood, and recently of the Hadley Smelter, is on his way to Europe, where he will probably settle.

Mr. W. H. Aldridge, general manager of the Consolidated Mining and Smelting Co. of Canada, spent some days in business in Montreal and Toronto during the past week. Mr. Aldridge expressed great satisfaction that the coal strike in the West had been settled, and is inclined to the opinion that there will be no further trouble of this nature for some time, at least, so far as the coal mines are concerned. The metal miners, however, are now demanding a general increase of wages of fifty cents a day, at a minimum wage of four dollars a day for miners and three dollars and a half for muckers, which in view of existing conditions is regarded as exorbitant. As a result of the recent coal strike, the Boundary smelters closed down, and it is not expected that operations will be resumed until June.

Mr. H. Harris, recently superintendent of the Hall smelter, has been appointed superintendent of the smelting works at Hadley, Prince of Wales Island, Alaska, under Mr. Thos. Kiddie.

Mr. J. C. Houston has accepted the post of superintendent of the Right of Way Mine at Cobalt.

Mr. W. R. Brock, Professor in Geology, Kingston School of Mining, will make a report on the Larder Lake gold area for the Ontario Bureau of Mines during the coming summer. Mr. Brock is especially well fitted for this work, his reports on the gold and copper deposits of British Columbia having attracted much attention during recent years. The Government is to be congratulated on securing the services of so competent a man to make the report on this district, which is now attracting so much attention.

Mr. R. E. Hore, who was one of the assistants of the Provincial Geologist of Ontario during the last year, is now in charge of a prospecting party for Mr. D. O'Connor, of Temagami.

Mr. M. B. Baker, Lecturer in Geology at Kingston School of Mining, is spending the summer at the University of Heidelberg, and is working under the well-known Professors Rosenbusch, Goldschmidt and Salamon.

Mr. J. Walter Wells, at one time Provincial Assayer, is in charge of an exploring party in the Temagami-Montreal River section.

The paper on "Grogs" read at the recent meeting of the Ontario Clay Workers in Toronto, by Mr. M. B. Baker, Lecturer in Geology of the School of Mining, Kingston, has appeared in half a dozen papers all over the world, and is said to have been translated into French and Swedish. This affords further evidence of the good work which Mr. Baker has been doing in connection with the clay-working industry.

Mr. Eugene Coste has returned to Toronto from Colombia, South America, where he went early in March to examine certain oil fields.

Mr. G. R. Mickle, Professor of Mining, School of Practical Science, Toronto, has accepted the position of Assessor for the Ontario Mines Department. The duties devolving upon the Assessor will be of an extremely exacting nature. Mr. Mickle should fill the requirements of the situation very satisfactorily.

Mr. H. E. T. Haultain has been appointed general manager of the Canada Corundum Company, Craigmont, Ont.

Mr. W. A. Carlyle, for the past seven years general manager of the Rio Tinto Copper Mines, Spain, has resigned that position to take up consulting work in London, where his temporary address is Bank of Montreal, Threadneedle St.

Mr. A. A. Hassan, mining geologist and consulting engineer, is in the Montreal River district, studying geological conditions. He will also visit Larder Lake and Lady Evelyn Lake, and will examine the Nipissing and several other Cobalt properties. Subsequently Mr. Hassan will proceed west to examine several mines near Nevada City, California, and from there into the High Sierras to watch the development of the Bishop Creek Gold Company's Mines, near Bishop, California.

Dr. J. Mackintosh Bell, Director of the New Zealand Geological Survey, will visit Canada in July. Dr. Bell expects to spend some weeks in Ontario.

Mr. O. N. Scott, consulting mining engineer, left Toronto on May 14th to inspect mineral claims in the Sudbury district.

At the Great Cobar Copper Mine, New South Wales, of which Mr. J. D. Kendall is consulting engineer, arrangements are being made for doubling the present output by installing additional plant having a nominal capacity of 1,000 tons a day, at a cost of £160,000.

The annual meeting of the Royal Society of Canada was held last week at Ottawa. Feeling reference was made to the recent death of the late Dr. W. H. Drummond, and a poem to his memory by Mr. William Campbell was read, of which the two closing verses ran:

"But here on the shores behind him,
Where the manly heart is still,
He leaves a vacant place in our song
No other singer can fill.

He who gave us, so joyous,
Amid all our doubtings and fears,
Those heart-deep songs of a people,
Brimming with laughter and tears."

STATISTICS AND RETURNS

Cobalt ore shipments for the week ending May 11, 1907:

	Pounds.
May 6, Coniagas Mine to Perth Amboy	62,000
May 10, Coniagas Mine to Perth Amboy	62,000
May 8, Right of Way Mine to Newark, N.J.	1,400
May 8, Trethewey Mine to New York	43,360
May 8, O'Brien Mine to Perth Amboy	65,210
	233,970

Cobalt ore shipments for the week ending May 18, 1907:

	Pounds.
May 13, O'Brien Mine to Perth Amboy, N.J.	88,100
May 17, O'Brien Mine to Perth Amboy, N.J.	82,170
May 14, Coniagas Mine to Copper Cliff	41,760
May 16, Coniagas Mine to Perth Amboy	63,300
May 18, Coniagas Mine to Perth Amboy	64,560
May 15, Temiskaming Mining Co. Ltd. to Bergen Junction, N.J.	54,500
	396,390

Following are copper returns for the week ending May 11 for the British Columbia districts as specified:

BOUNDARY SHIPMENTS.

Mine.	Week.	Year.
Mother Lode	3,840	69,787
Emma	153	3,246
Providence	38	568
Oro Denoro	82	1,338
Other mines		291,832
Total	4,113	366,771

ROSSLAND SHIPMENTS.

Centre Star	1,469	30,265
Le Roi	1,708	46,662
Le Roi, No. 2	374	7,937
Le Roi, No. 2, milled	1,050	3,370
White Bear	123	775
Other mines		1,500
Total	4,724	90,509

KOOTENAY-SLOCAN SHIPMENTS.

Sullivan	600	11,400
La Plata, milled	425	8,075
Second Relief, milled	145	2,765
Queen, milled	185	3,515
Eva, milled	230	230
Hunter V.	80	1,813
Queen Victoria	159	1,245
St. Eugene	133	5,141
La Plata	58	1,235
Arlington, Slocan	47	283
Vancouver	60	201
Other mines		6,373
Total	2,122	42,276

The total shipments from the mines in the above districts for the past week were 10,959 tons and for the year to date 499,556 tons.

Shipments from the Cumberland Railway and Coal Company collieries, Springhill, N.S., amounted to 29,872 tons for the month of April.

The following figures, indicating German consumption of foreign copper for the period January to March, 1907, inclusive, have been supplied by L. Vogelstein & Co., 100 Broadway, N.Y.

	Tons.
Imports of copper	26,506
Exports of copper	2,113
Consumption	24,393

as against 28,700 tons for the same period in 1906. Of this amount 7,007 tons were imported from the United States.

COMPANY NOTES

The nineteenth ordinary general meeting of the Tilt Cove Copper Company (Newfoundland) was held on May 6th at their offices, 9 Queen St. Place, London, E.C. The Committee of Management reported to the shareholders the balance sheet and profit and loss account for the year ending December 1st, 1906. The profit and loss account shows a credit balance of £47,508 10s. 6d. The Cape Copper Company's Tilt Cove establishment audited accounts for the year ending 31st December, 1906, show a net profit of £99,340 7s. 10d. This balance has been divided equally between the Cape Copper Company and the Tilt Cove Copper Company, as provided for by agreement. Out of the available profit of £50,985 3s. 8d. the committee recommended a final dividend of 4s. 6d. per share, making a total distribution for the year of 10s. 6d. per share, or 26¼ per cent., leaving the sum of £3,510 9s. 11d. to be carried forward to the next account.

The Devil's Rock Silver Mining Company, Limited, has secured the right of increasing its capital stock from $500,000 to $850,000, by the issue of three hundred and fifty thousand shares of new stock at $1 each.

At a meeting held on May 9th the directors of the Crow's Nest Pass Coal Company decided to recommend to a special meeting of shareholders on May 21st the issue of $500,000 of new stock. The growing necessities of the West demands an expansion of the company's facilities.

By supplementary letters patent dated April 16, 1907, the powers of the LaRose Mining Company, Limited, have been extended to enable them to carry on in all their branches the operations of a mining, milling, reduction and development company generally in any part of the Province of Ontario.

The International Steel Company of Canada, Limited, has increased the number of its directors from three to seven.

Messrs. Peacock Bros., of Montreal, have received an order from the Nova Scotia Steel Co. for an immense air compressor for their Newfoundland Mines. The compressor is to have a capacity of 3,000 cubic feet of free air per minute, and is to be delivered by the end of August.

Cobalt, Silver Queen, Limited (Ontario).—The report of this company for the year ending March 31st, 1907, states that development work was restricted by the non-arrival of machinery, but this, notwithstanding 442,141 lbs. of ore were shipped, and 109,273 lbs. remain on hand. The workings, including the sinking of a shaft to a depth of 145 feet and laterals driven east and west, aggregated nine hundred feet, and ore to the value of $700,009 was blocked out. During the year $120,000 was distributed to shareholders. The ore continues to maintain its width and value. The balance sheet shows receipts of $157,915 from the sale of ore and disbursements on account of construction, machinery, etc., of $17,859; and of mining, labor and supplies, $34,191.

Dominion Copper Co. (British Columbia).—This company has arranged to retire a part of its outstanding issue of 6 per cent. bonds to the value of $175,000. It is stated that the company has now an available cash balance on hand of $700,000, and it is expected that a first dividend at the rate of 10 per cent. per annum will be declared shortly.

Cobalt Townsite, Silver Mining (Ontario).—The following cable, under date May 1st, has been received at the London office: "Have made new discovery in crosscut to the north, the width of vein is 3 in. Assay results very satisfactory, 3,650 ozs. of silver per ton of 2,000 lbs. We have shipped to-day third carload 20 tons. May 3: third carload estimated value, $5,000. This is net after paying all costs (office note). This cable refers to the third shipment, viz., 20 tons of ore on May 1."

Crow's Nest Pass Coal (British Columbia).—The annual report of this company has been issued to shareholders, and contains the following information:

"The aggregate of the profit and loss account is $703,592. From this amount the directors have paid four quarterly dividends of 2½ per cent. each, making 10 per cent. for the year, and amounting in all to $350,000, and have carried forward to 1907 $353,592 to the credit of profit and loss account. The coal mined this year amounts to 806,901 tons, as against 831,249 tons mined in 1905. The production of coke amounted to 213,295 tons, as against 257,702 tons in 1905. The difference in production is due to the strike, which commenced on the 22nd of September and lasted for practically two months. Had the strike not occurred, and the average been maintained, the output would have reached the million-ton mark for the year."

Following is the income account, as compared with the two previous years:

	1906.	1905.	1904.
Balance previous year	$351,801	$203,320	$1,870,813
Net profits for year	351,791	497,899	406,049
Premium on new stock	.....	35,400	38,865
Total	$703,592	$736,619	$2,315,727
Dividends	350,000	349,418	348,427
Balance	$353,592	$387,201	$1,967,300
Reserve fund	.....	35,400	1,764,000
P. & L. surplus	$353,592	$351,801	$203,300

In an interview at Winnipeg, Sir William Mulock, referring to the recent strike at the Fernie collieries, pointed out that the

public had suffered great inconvenience in the past from labor disturbances in the coal areas, and in view thereof he thought some effort should be made to avoid like inconvenience in the future. This, he thought, might be done, by coal consumers in storing a reasonable supply in advance of actual requirements. For various reasons it is custom of the mines in the Crow's Nest region to mine coal only in sufficient quantities to fill the cars awaiting loading. If the supply of cars is restricted, mining ceases or is reduced; while, if at other times there is a surplus of cars, the mines are not always in position to take advantage of the increased facilities. In short, a hand-to-mouth policy has been pursued, with the result that any interruption in the supply has been immediately felt by the public.

NEW COMPANIES

The Sturgeon River Coal Company, Limited, Edmonton, Alberta.

The Galbraith Coal Company, Limited, non-personal liability, Lundbreck, Alberta.

The Southern Alberta Coal and Fire Clay Company, Limited, non-personal liability, Taber, Alberta.

The Bornite Company, Limited, capital $20,000, divided into twenty shares of $1,000 each, Victoria, B.C.

The Crown Coal and Coke Company, Limited, capital $2,000,000, divided into two million shares of $1 each. Head office, Spokane, U.S.A.

The Brown Alaska Company, Limited, capital $1,000,000, divided into one million shares of $1 each. Head office, Seattle, U.S.A.

The Cobbler Sexton Mining Company, Limited, capital $1,000,000, divided into one million shares of $1 each. Head office, Woodstock, N.B.

The Mississippi Cobalt Silver Mining Company, Limited, capital $1,000,000, divided into one million shares of $1 each. Head office, Carleton Place, Ont.

The Giant California Mining Company, Limited, non-personal liability, capital $5,000,000, divided into fifty thousand shares of one hundred dollars each, Victoria, B.C.

The British Columbia Gypsum and Plaster Company, Limited, capital $100,000, divided into one thousand shares of one hundred dollars each. One of the objects of this company is to obtain mineral claims situate on the west side of Thompson River, opposite Spatsum, B.C.

The following company to operate in Canada was recently registered in London: Western Canada Investment Company, Limited; capital, £100,000, in £1 shares. Objects: To carry on an investment, financial, and agency business in Canada or elsewhere; to seek and secure openings for the employment of capital in any part of the world; to search for, prospect, examine, and explore mines and ground supposed to contain minerals or precious stones; to acquire, hold, dispose of, and deal with gold, silver, copper, lead, tin, quicksilver, iron, coal and other mines, mining, water, timber and other rights, etc. No initial public issue. The first directors (to number not less than three nor more than five) are: C. Bulkeley-Johnson, of Gladwood, Melrose, N.B.; R. D. Fordyce, Brucklay Castle. Aberdeenshire; and A. Partner, The Briars, Tolworth, Surbiton. Qualification, 500 shares. Remuneration as fixed by the company. Registered office: 24 Coleman St., E.C.

METAL, ORE AND MINERAL MARKET

Aluminium—No. 1 ingots, 41 cents per lb.
Antimony—22½ to 23 cents per lb.
Arsenic, white—7⅞ cents per lb.
Barytes, crude—$11.50 to $14.50 per short ton.
Bismuth—$1.40 to $1.50 per lb.
Cadmium—$1.40 per lb.
Carbon, for drills—$78 to $85 per carat.
Carborundum, powdered—8 cents per lb.
Chromium, metal pure—80 cents per lb.
Cobalt, f.o.b. Cobalt, Ont., unrefined—35 to 90 cents per lb.
Corundum—7 to 10 cents per lb.
Feldspar, ground—$9.75 per short ton.
Fluorspar, lump—$10 per short ton.
Graphite, domestic—$50 to $150 per short ton.
Gypsum, lump—$4.50 per long ton.
Infusorial earth, ground—$15 to $30 per ton.
Lead—6 cents per lb.
Manganese, pure metal—75 cents per lb.
Mica, ground—$80 per short ton.
Mica, scrap—$15 per short ton.
Molybdenum, pure—$1.70 per lb.
Molybdenite ore, 95 per cent. pure—$4.50 to $5 per unit.
Nickel—45 cents per lb.
Platinum, ordinary metal—$31 per ounce.
Pyrite, 38 per cent. to 45 per cent. sulphur, lump—10¼ to 11¼ cents per unit.
Quicksilver—$41 to $42 for 75-lb. flask.
Talc—$16 to $19 per ton.
Tungsten, pure metal—$1.25 per lb.
Tungsten ore, 60 per cent. pure—$400 per ton.
Tin—44 to 45 cents per lb.
Zinc sheets—$8.60 per 100 lbs.

MARKET NOTES.

Northern pig iron, No. 2 foundry, ranges up to $27 for quick deliveries.

Copper is still quiescent. Lake copper, 25 to 25½ cents per lb.; electrolytic, 24 to 24¼ cents per lb. The London market is less active; Standard, £102 3s. for spot.

Tin—New York, 44 to 45 cents per lb.; London, £189 per long ton for spot.

Lead—New York, 6 cents per lb.; London, £19 17s. per long ton.

Silver has advanced fractionally. New York, 65⅝ cents per ounce; London, 30 9-16 d. Mexican dollars, 50½ cents.

Spelter has declined—New York, 6.35 to 6.45 cents per lb.; London, £25, 17s. 6d. per long ton.

ELECTRIC STEEL

In a paper on the induction furnace, by Mr. Hermann Roechling, read before the Verein Deutscher Eisenhüttenleute recently, he refers to the experiments made at Voelklingen with two furnaces, one containing 50 to 60 kg. (110 lbs. to 130 lbs.), and the other 300 k.g. (660 lbs.). Alternating current of 50 periods was used. With the smaller furnace the power factor was very unsatisfactory; the figure given is 0.95. For the larger furnace no figure is given; it is said that the power factor is poor, but it is hoped to improve matters. To melt pig iron and heat it to about 1,200 degrees C. (about 2,200 degrees Fahr.), about 385 kw. hours per ton was required in the 300 kg. furnace. To complete a charge of scrap, about 600 kw. hours are required. The cost of this amount of electrical energy would be too high to render the process economical, and this is the reason why molten metal (instead of cold scrap, etc.) should be charged into the furnace, since in this way a considerable amount of electrical energy may be saved. By starting with molten basic or open-hearth steel, it is possible to refine the bath with a low expenditure of energy. For instance, at Voelklingen it has been found repeatedly possible to completely deoxidize ordinary molten basic steel and to remove sulphur and phosphorus down to mere traces and to recarburize the metal to 1 or 1½ per cent. of carbon and to finish the charge, with the total expenditure of 150 to 200 kw. hours per ton. With this expenditure it was possible to produce the finest sorts of crucible steel. If it is considered that this is possible with a furnace which contains only 300 kg. (660 lbs.), it is evident that with a larger furnace much better results may be obtained.