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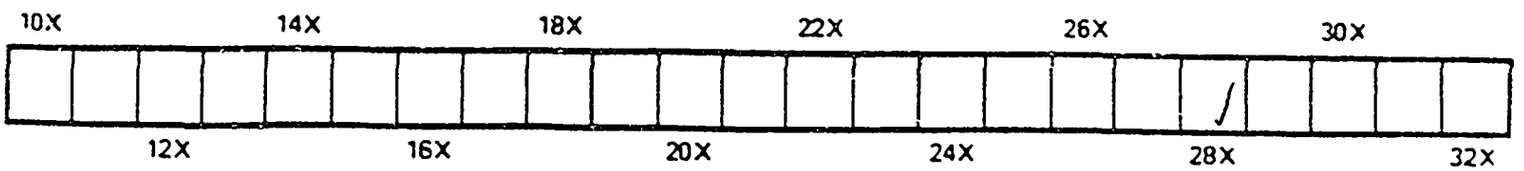

24th YEAR OF PUBLICATION

# The Canadian Mining Review

Established 1882

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### INTRODUCTORY NOTE.

The readers of the REVIEW will be pleased to learn that Mr. H. Mortimer-Lamb, Secretary of the Canadian Mining Institute and Editor of the REVIEW, is making steady, if not rapid, progress towards recovery. It is expected that he will soon be able to resume his duties.

### THE NEW DIRECTOR OF THE GEOLOGICAL SURVEY.

The directorship of the Geological Survey of Canada, which has been vacant since the death of Dr. Dawson, five years ago, has just been filled by the promotion of Mr. A. P. Low, B.A.Sc., F.R.G.S. Mr. Low is a native of Montreal and was educated at the Montreal High School and McGill University. From the latter institution he received the degree of Bachelor of Applied Science in the year 1882, graduating with first rank honours. He was appointed to the staff of the Canadian Geological Survey in 1882, and was promoted

Mr. A. P. Low, B.A.Sc., F.R.G.S.

to the rank of geologist in 1891. After making several surveys in eastern and northern Quebec, Mr. Low was engaged for more than six years in exploring the Labrador Peninsula, on the resources of which he is the recognized authority. In 1896 he received the McGill Memorial Prize from the Royal Geographical Society, in acknowledgment of the far reaching value of his services. In 1897 he accompanied the "Diana" scientific expedition to Hudson's Bay, and in 1903 and 1904 commanded the "Neptune" on a similar expedition to Baffin's Land, and other parts of the far North. He is a Fellow of the Geological Society of America, and of the Royal Geographical Society

of England, and a member of many other learned societies. Mr. Low, in addition to his high attainments as a geologist, is marked by a strong sense of the practical utility of his profession, and he is quite *au fait* with mining interests of the day. His splendid personality, as well as the qualifications already mentioned augurs well for his directorship. The REVIEW extends its congratulations both to Mr. Low upon the important position to which he has attained, and to his Department on the appointment of so able a head.

## MINERAL PRODUCTION.

The statistics of the Mineral Production of Canada for 1905, compiled by Mr. E. D. Ingall, with the assistance of Mr. J. McLeish, which forms a part of the Summary Report of the Geological Survey, has just appeared in separate form. Increased production is the dominant feature of this valuable report. The total mineral production for the year amounts to $68,574,707, against $60,343,165 for the year previous. This is an increase of about 14 per cent. The increase too applies to all products except petroleum, natural cement, and gold from the Yukon. In the last named case there has been a falling off in the output of placer gold amounting to more than $2,000,000. This decline is attributable to lack of mining facilities for working at depths and not to exhaustion of the ore deposits.

The following are the percentage ratios of the principal minerals:—

| | |
|---|---|
| Coal | 25.77% |
| Gold | 21.14% |
| Nickel | 11.02% |
| Copper | 10.83% |
| Asbestos | 2.19% |
| Petroleum | 1.24% |
| Brick, Stone and Lime | 8.62% |
| Silver | 5.26% |
| Lead | 3.84% |
| Cement | 2.81% |
| Pig Iron from Canadian Ores | 1.53% |

All the coal mining districts show an increase, the aggregate of the whole being about $1,000,000.00, or 6 per cent. Approximately 60 per cent. of the coal mined in Canada comes from Nova Scotia, 20 per cent. from British Columbia, 20 per cent. from Alberta, Saskatchewan and the Yukon Territory. It has the largest output, according to value, of any single mineral mined in Canada, and added to the metals, makes up 80 per cent. of the total production.

The output of silver has increased $1,558,862, or more than 50 per cent. over the previous year. This is due to the large development of silver mining at Cobalt, and to the splendid results that have been obtained. The extraordinary richness of the ore, and the comparatively small amount of development necessary, as well as the low cost of mining, are important features of this unique mining camp. "Carloads of ore, reported at from $60,000.00 to $100,000.00 in value, have not been unusual."

The newly discovered deposits at Windy Arm, Lake Tagish, on the boundary between British Columbia and the Yukon Territory, give promise of a further increase in the supply of silver during the present year.

The copper production of Canada has increased during the past year by more than four and a half million pounds. This with the increased price of that metal, has given an increase in value of more than two million dollars. The copper production has increased in each of the provinces in which copper mining is carried on, namely, British Columbia, Ontario and Quebec. The output of the mines of the Boundary District alone is estimated to have increased by one million of dollars during the past year.

The total amount of pig iron manufactured in Canada during 1905 was 527,932 tons, valued at $6,492,972.00, as compared with 303,454 tons, valued at $3,582,001.00 in 1904. Of this amount less than one sixth is yet made from Canadian ores. However, 116,779 tons of iron ore was exported from Canada during the year. The Government bounty paid for pig manufactured from Canadian ores in 1905 amounted to $1,900,-206.00.

Aided by bounties to the amount of $334,224.00 the output of lead increased during 1905 by nearly 50 per cent. or more than a million dollars. Over 90 per cent. of this output has been exported to foreign countries. The lead refinery, established two years ago at Trail, and the Corroding Works recently begun by the Carter White Lead Company at Montreal, will however eventually lead to the manufacturing in Canada of nearly three-fourths of the amount at present produced.

The nickel production of the year amounted to 18,876,315 pounds, valued at $7,550,526.00, as compared with 10,547,883 pounds, value $4,219,153.00, in 1904. Some of the ores from the Cobalt district contained nickel varying in amount from 4 per cent. to 7 per cent., but these have not yet been smelted and hence are not included in this output.

Concerning zinc, Mr. Ingall writes: "The zinc ores of British Columbia, which were formerly regarded as merely detrimental constituents of the combined lead and zinc sulphuret ores of the province, have for some time been the subject of great interest on account of the demand which has recently arisen for ores of this metal. Already attention has been turned toward utilizing the zinc blende associated with the argentiferous galena of the various camps in East and West Kootenay. Mill practice has been altered at some of the mines already operating so as to give a satisfactory separate zinc product, and attention is also being turned toward the opening up of various claims where the large proportion of blende present has formerly debarred profitable work. The *Daily News*, of Nelson, B.C., estimates a production for the province of over 13,000 tons with an average content of 42 per cent. of this metal.

The recently erected smelter at Frank in Southern Alberta, owned by the Canadian Metal Company, will insure the utilization of much of the ore in the country. The production of zinc ores in this province is likely to increase very largely in the future should the active demand continue, as their existence in quantity is already known at very many places.

The whole question of supply and utilization of those ores is now under investigation by a commission instituted by the Federal Government.

The asbestos industry shows a substantial advance over the output of previous years. The production is classified as follows:—

| | Tons. | $ |
|---|---|---|
| Crude | 3,768 | 472,859 |
| Mill stock | 46,902 | 1,013,500 |
| Total asbestos | 50,670 | 1,486,359 |
| Asbestic | 17,594 | 16,900 |
| Total products | 68,264 | 1,503,259 |

Exports of asbestus according to Customs returns were 47.031 tons, valued at $1,386,115.

A further increase in the production of asbestos is to be looked for when the recently discovered deposits in the Lake Chibogamoo district shall have been utilized

The natural rock cement production has declined markedly during the past year, while that of Portland cement has greatly increased. There is now manufactured about 1,346,548 barrels, but 718,275 barrels are yet imported. The present value in Portland cement is about $1.30 per barrel. There are nine factories operating in Ontario, two in Quebec, one in Nova Scotia, and one in British Columbia. The list of exports, appended to this report, indicate that there are exported from Canada, in the raw state, over five million dollars worth of copper, $1,386,115.00 worth of asbestos and $2,777,218.00 worth of silver in the ore.

## THE ANNUAL MEETING OF THE CANADIAN MINING INSTITUTE.

The eighth annual meeting of the Canadian Mining Institute was held in the rooms of the Chateau Frontenac on March 7th., 8th., and 9th., 1906. Deep regret was felt at the absence, through illness, of the Secretary, Mr. H. Mortimer-Lamb, whose inability to attend the meeting was much deplored.

At the opening session, Wednesday, March 7th, at 10.30 a.m., the annual report of the Council was read, together with the financial statement for the year. A discussion arose over the comparative statement of the expenditures of the two previous years, which the Treasurer submitted as usual, in connection with his annual report. After discussion by Mr. Coste, Mr. Brown, and one or two other members, it was decided to submit the comparative statement also to the auditors before inserting it in the annual report.

The removal of the headquarters of the Institute to the rooms rented from the Canadian Society of Civil Engineers, was discussed by Mr. Smith, Dr. Barlow, Mr. Hopper and Dr. Porter, and it was explained that the new quarters were more commodious and better situated than those formerly occupied, and that they also gave the Institute the use of the lecture hall and library of the Canadian Society of Civil Engineers. The President then delivered his annual address: Members of the Institute from other provinces were gracefully welcomed to the ancient capital; the historic associations centering around the City of Quebec, the noble work of the heroic pioneers of New France, and the history of the early geological research in the district of Quebec, and the early development of mining, especially in the district of the St. Maurice, were vividly recalled; the industrial mining developments of the Province, and the promise of a brilliant future were eloquently portrayed. The President's address provoked much enthusiasm.

A vote of thanks was unanimously passed by the Institute to Dr. Porter for his services gratuitously given in taking up the work of Secretary for a few weeks previous to the meeting, which was rendered necessary by the regrettable illness of its able secretary, Mr. H. Mortimer-Lamb.

The following gentlemen were appointed scrutineers: Messrs. A. P. Low, Chairman, F. Hobart, and J. J. Penhale, and special instructions were issued to the scrutineers regarding the qualification of voters and the recognition of ballots.

The second session met on Wednesday at 3 p.m., the president, Mr. Smith, in the chair. The first paper to be presented was that by Mr. Ingall on the subject of "The Mineral Production of Canada". This paper, owing to its wide interest and importance, has been reviewed at length elsewhere in this issue. Following Mr. Ingall's paper, on the invitation of the president, Mr. W. G. Miller, Provincial Geologist for Ontario, added a few details regarding the mineral production of that province. The total mineral production of Ontario for the past year, had attained a value of $23,500,000.00, which is much in excess of any previous year. The nickel production—9,503 tons—was larger than it has ever been before. There was also an increase of 4,525 tons in copper, while the silver from Cobalt, a new production, exceeded two and a half million ounces in round numbers. The production of steel was also greater than in any previous year.

Mr. J. B. Tyrrell, Dawson City, reported for the Yukon. The placer gold deposits of that district are by no means exhausted, but certain conditions, especially of transportation and water supply, must be made easier before they can be worked to the fullest advantage. Mr. Coste added some remarks pertaining to the discussion, dealing chiefly with the question of the utilization of the iron ores of foreign and domestic supply, after which Mr. J. Obalski, I. M., Director or the Department of Mines for the Province of Quebec, made some remarks on the mineral statistics of the province of Quebec for the year.

The third paper of the session was "The Ore Deposits and Geology of the Sudbury District," by Mr. Hixon, Mr. Hixon emphasized the importance of a knowledge of the geological structure to the economical development of the mines. In the discussion which followed, part was taken by Messrs. Dickson, Barlow and Coste. This was followed by a paper by Dr. C. W. Dickson, Kingston School of Mining, on "The Genetic Relation of Nickel-Copper Ores." This was discussed by Messrs. Hixon, Hopper, Barlow, Walker, Adams and Coste, and in reply by Dr. Dickson.

Mr. Obalski then presented a paper on the "Rare Earths in Pegmatite Veins". It was noted that within the mica-bearing pegmatite veins of the Province of Quebec, several rare minerals have been found, Uranite, Monazite, Uraninite from the Villeneuve Mine, Samarskite and Fergusonite from the Maisonneuve, with Clevite from the Pied des Monts, and Orthite and Allanite from Lake St. John. Several of these are important as containing radium or as indications of tin. The meeting then adjourned.

At the evening meeting Dr. Adams occupied the chair, owing to the President's absence on Legislative duties. Mr. J. E. Hardman, M. E., then delivered an illustrated address on "The Chibogamoo Mining District", in which the history of the important developments which have recently taken place in that district was interestingly sketched. Mr. Low then presented a summary of the Geological Report, which is reviewed on another page of this journal. Mr. Obalski paid high tribute to Mr. Low's services to mining interests in the Chibogamoo district, after which he presented a paper entitled "Probabilité de Trouver des Mines au Nord de la Province de Québec". Reference was made to the probability of large mineral development throughout the Huronian belt in the Northern part of the province of Quebec, from Chibogamoo to Lake Temiskaming. Following this paper Mr. Obalski read a paper by Monsieur Armand Moscovici, "Notes sur un Dépot de Pyrrhotine Nickelifère sur une Pointe appelée "Malachite Pointe." The

resemblance of nickeliferous sulphides found on the shore of lake Chibogamoo to similar ores at Sudbury, was pointed out. One analysis of these by Mr. Hersey yielded 12.03% copper. 39% nickel, with traces of cobalt.

Following this paper there was a discussion, of the preceding papers, in which Messrs. Hardman, Dickson, and Low took part, and remarks were added by the chairman.

An important paper by Mr. Lamb, on "The Advisability of the Establishment of a Federal Department of Mines," was then presented by the chairman, and one by Mr. J. B. Tyrrell, on the same subject.

In the discussion which followed these papers, part was taken by Major Leckie, Mr. Ingall, Mr. Hardman, Mr. Miller, and Mr. Low, as well as the chairman. On motion of Major Leckie, seconded by Mr. Tyrrell, the President of the Institute was requested to appoint a committee to urge upon the Government the desirability of establishing a Department of Mines, and certain other measures relative to the mining interests of Canada.

The fourth session of the Institute opened on March 8th., at 10 a.m., the president in the chair. The comparative statement of the Treasurer, since audited was read, and the report was then adopted.

The advisability of having the discussions of papers promptly reported, that is, within at most, one day's time, was suggested by Professor Walker. Dr. Porter replying for the secretary said it could easily be done by spending more money on reporting, and if the meeting desired it he would bring it to the attention of Mr. Lamb, before next meeting. The proposal was favorably received. A discussion of the desirability of the unification of mining laws was introduced by Dr. Porter. The question was referred to the committee to be appointed to wait upon the Government, as already mentioned. In the discussion of this subject Mr. Miller, Major Leckie, Dr. Porter and the President took part.

Mr. D. B. Dowling, B. A., Sc., Geological Survey Department, then presented a paper entitled "Notes on the Utilization of Poorer Grades of Coal Slack", in which methods of utilizing to the best advantage the lignites and poor coal of the West, were discussed. Further discussion on the subject of this interesting paper was carried on by Messrs. Leckie, Porter, Ingall and Smith.

Through the President, the Hon. Mr. Brodeur, Minister of Marine and Fisheries, extended an invitation to the Institute to an excursion upon the St. Lawrence, in the icebreaking steamer "Montcalm." A trip was made as far down the river as Montmorenci, and thence up to Cap Rouge. The local committee provided luncheon on board, and a most enjoyable afternoon was thus spent, the party being happily augmented by a number of ladies and gentlemen from Quebec.

The annual dinner was held in the banqueting room of the Chateau Frontenac, and about sixty members were present. The guests were: His Honour, Sir Louis Jette, K.C.M.G., The Lieutenant Governor of Quebec; The Hon. Mr. Jean Prevost, the Provincial Minister of Mines; Mr. George Garneau, Mayor of Quebec; Dr. James Douglas, of New York; Past President of the American Institute of Mining Engineers; Major Shepherd and Mr. White. A number of other gentlemen were invited, but were unable to be present.

The toasts were: The King, proposed by the Chair; the President of the United States, proposed by the Chair; the Lieutenant Governor, proposed by the Chair and replied to by Sir Louis Jette; the Department of Mines of the Province of Quebec, proposed by the Chair and replied to by the Hon. Mr. Prevost; the City of Quebec, proposed by the Chair and replied to by the Mayor, Mr. Garneau; the Mineral Industry, proposed by Dr. Adams and replied to by Mr. Hobart and Mr. Hixon; Our Guests, proposed by Dr. Porter and replied to by Dr. Douglas; the President, proposed by Mr. Hardman and replied to by Mr. Smith.

The menu was as follows, the cards being of asbestos paper in recognition of the importance of that industry in the Province:—

MENU.

Hors D'œuvre.
Malpeeque Oysters.

Clear Green Turtle au Madore.

Fillet of Sole a la Marguery.

Boudins de Votaille a la Perigore.
Broiled Fresh Mushrooms on Toast.

Larded Tenderloin of Beef Boquetere.
Spinach aux Fleurons—Petits Pois au Beurre
Potato Croquettes.

Asparagus, Sauce Mousseline.

English Snipe on Corbeille.
Water Cress.

Punch au Champagne.

Salade Panachee.

Pudding Glacee Nesselrode.
Petits fours assortis—Desert Café Noir.

Sherry—Hock—Claret—Champagne.

In addition to the formal toasts there were a number of songs and recitations, and the dinner was most successful in every respect, and was pronounced by all who attended to be one of the most enjoyable ever held by the Institute.

The morning session opened on March 9th, at 11 a.m., President Smith in the chair. A paper by Dr. F. D. Adams, on "The Need of a Topographical Survey of the

Dominion of Canada, particularly with reference to the development of the economic resources of the Dominion," was presented, in the absence of the author by Mr. James White, Geographer of the Department of the Interior. The paper was discussed at considerable length by Messrs. White, Barlow and Ingall.

Mr. J. W. Evans then presented a paper on "Some Laboratory Experiments in the Electric Smelting of the Titaniferous Iron Ores of Hastings County," which was very fully discussed, Messrs. Obalski, Smith, Leckie, Hixon, Coste, Porter, Hay and Grove taking part.

The desirability of having abstracts of papers only presented, and thus of gaining extra time for discussion, was introduced by Major Leckie. Dr. Porter pointed out that this matter was connected with the printing of papers, which lay with the members, who often fail to realize the necessity of sending their papers to the secretary's office sufficiently in advance to admit of their publication before the meeting. At this stage of the programme, Mr. L. Heber Cole was presented with the President's gold medal, which was given for the best paper presented in the Student's Competition of last year, a paper entitled "Mine Surveying in the Centre Star Mine in Rossland." In making the presentation the president expressed the hope that it would be an incentive to all Dr. Porter's students to give student papers, which are always much appreciated. Dr. Porter was also called upon, and speaking for the three great Canadian mining schools, emphasized the value of the prizes to the students of mining, and of the healthy interest which they evoked amongst the students.

A resolution was then passed that, in the opinion of the Institute, the Dominion Government should enact legislation providing for the payment of a bounty of $3.00 per ton on pig iron, the product of ores raised or mined in Canada or Newfoundland, the act to remain in force for five years from the date of passage, and that a copy of this resolution be forwarded to the Premier, Sir Wilfrid Laurier, and to the Hon. W. S. Fielding, Minister of Finance.

Also, that in the opinion of this Institute bituminous coal should be admitted into Central Canada free of duty, and used exclusively for the manufacture of coke, for use in blast furnaces producing pig iron, and that a copy of this resolution be forwarded to the Premier, Sir Wilfrid Laurier, and to the Hon. W. S. Fielding, Minister of Finance.

Two papers were then presented—one, on the question of "The Education of Mining Engineers," by Dr. Porter, and one on "Laboratory Methods in McGill University by Dr. Stansfield." An interesting discussion followed these papers, in which a leading part was taken by Dr. James Douglas, of New York. Dr. Douglas emphasized the importance of the student giving more attention than is usual to the intellectual and literary side of his life. With regard to the extent of a purely technical education, he endorsed the view of Dr. Porter, that students should be taught the fundamental principles, and the use of instruments of precision. He considered the best general man to be one of very wide technical knowledge, not necessarily of too precise technical knowledge with regard to any one subject.

Important part in the discussion was also taken by Messrs. Hixon, Daru, Ingall, and some further remarks were made by Dr. Porter.

The closing session opened at 2.30 p.m., the President in the chair. A report of the scrutineers was submitted, the officers elected for the ensuing year being as follows:—

*President.*

Mr. Geo. R. Smith, Thetford Mines, Que.

*Vice-Presidents*—For One Year.

Dr. F. D. Adams, Montreal.
Major R. G. Leckie, Temagami P.O., Ont.

For Two Years.

Frederick Keffer, Greenwood, B.C.
G. Herrick Duggan, Sydney, C.B.

*Treasurer.*

J. Stevenson Brown, Montreal.

*Secretary.*

H. Mortimer-Lamb, Montreal.

*Councillors.*—For One Year.

| | |
|---|---|
| Mr. John Blue | Mr. J. C. Gwillim |
| Mr. C. J. Coll | Mr. Jas. McEvoy |
| Mr. Thos. Cantley | Mr. W. G. Miller |
| Mr. Frank B. Smith | Mr. Harry Williams |

For Two Years.

| | |
|---|---|
| Mr. W. H. Aldridge | Mr. Thos. Kiddie |
| Mr. B. A. C. Craig | Dr. A. E. Barlow |
| Mr. A. M. Hay | Dr. J. Bonsall Porter |
| Mr. R. T. Hopper | Mr. W. D. Robb |

On motion of Mr. Coste, seconded by Mr. Hopper, a vote of thanks was tendered the Hon. Mr. Brodeur for the use of the steamer "Montcalm," and also to the Captain of the steamer, for his courtesy on the excursion of the previous day.

On motion of Mr. Hopper, the Quebec M. & C. Ry. Company were tendered the thanks of the Institute, and a vote of thanks was also passed to the citizens of Quebec for their hospitality on the occasion of our visit.

Mr. Obalski's services, as Chairman of the Dinner Committee, were also a subject of appreciation.

Prof. R. W. Brock, Mining School, Kingston, then presented a paper on "The History of the Rossland District," illustrated by lantern slides, after which Mr. J. J. Penhale presented a set of lantern slides illustrating the asbestos industry, in connection with a paper on that subject by the President. Dr. Porter also showed a number of views from the mining fields of South Africa. This brought to a close the proceedings of one of the largest and most successful meetings in the history of the Institute.

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## ON THE ADVISABILITY OF THE ESTABLISHMENT OF A FEDERAL DEPARTMENT OF MINES.*

By H. Mortimer Lamb.

### HISTORY OF THE GEOLOGICAL SURVEY OF CANADA IN ITS RELATION TO THE MINING INDUSTRY.

So long ago as 1832 a petition praying for the establishment and maintenance of a Geological Survey of old Canada, was presented to the House of Assembly. But although the recommendation received the endorsement of Sir John Colborne, then Lieutenant Governor of Upper Canada, it was not even considered

* This paper was left in an unfinished condition by Mr. Mortimer Lamb, who was taken seriously ill shortly before the meeting of the Institute at which it was to be read, at Mr. Lamb's request it was revised and completed by Dr. Frank D. Adams.

by the Legislative Committee to which the matter was referred. Subsequent petitions met the same fate; until in 1841, the united parliaments, under the administration of Lord Sydenham, voted the sum of £1,500 sterling for survey purposes. In this year, Sir William E. Logan, (then Mr. Logan), who was born in the City of Montreal in the year 1798 and had already won for himself a considerable reputation in Great Britain, for his admirable geological work in South Wales, and his important discovery whereby the question of the origin of coal was established in favor of the theory of growth *in situ*, came to Canada on a visit to his brother residing in Montreal, and impressed doubtless with the great opportunities so new and vast a country offered for original research, signified in a letter written at this time his intention, "provided he could make the necessary business arrangements," of offering himself as a candidate to undertake the geological survey of Canada; "*and," he wrote, "if I once begin it will not be my fault if it does not go ahead." Lord Sydenham while riding near Kingston was thrown from his horse and died from the injuries which he sustained. He was succeeded by Sir Charles Bagot, who after referring the matter of the appointment of a geologist to Lord Stanley, then Secretary of State, for the Colonies, offered the position, on the strong recommendations of such distinguished British scientists as De la Beche, Murchison, Sedgewick and Buckland, to Logan in the spring of 1842, and in August of the same year he entered upon his duties, but for several months his services were gratuitously performed. The actual institution of the survey may then be said to date from the 1st of May, 1843. Mr. Logan's first assistant was Mr. Alexander Murray, (afterwards C.M.G., who subsequently became Director of the Survey of Newfoundland). It may here be noted that from the beginning, great stress was laid on the advantage likely to accrue in the direction of mineral development in Canada as a result of systematised geological investigation. This was in fact, the chief argument advanced by the petitioners to Parliament urging the establishment of the Survey; it was the view taken by Lord Sydenham in his support of the measure; and Logan himself as is evident from the opinions expressed both in his published letters and in his official reports, and equally so by his years of useful work, never ceased to regard this as the paramount aim and object of his endeavors. Thus in a letter addressed to Sir Henry De la Beche, in 1843, he wrote, "The main object of the investigation is no doubt to determine the mineral riches of the colony," and again in his evidence before the Parliamentary Committee on the Geological Survey in 1855, he said "The object of the survey is to ascertain the mineral resources of the country, and this is kept steadily in view. Whatever new scientific facts have resulted from it, have come out in the course of what I conceive to be economic researches carried on in a scientific way. . . My whole connection with geology is of a practical character." In short, as is somewhere stated, Sir William Logan belonged to that school of geologists whose motto is "Facts, then theories." And the reports for which he was responsible attest the accuracy of this claim. For example, in the "Report of Progress of the Geological Survey from its commencement to 1863," over one-fifth of the volume, or close on two hundred pages is devoted to economic geology, specific information being here given in respect to mineral occurrence, location and utilization; while in general the various reports contained in this volume are characterized by the amount of practical information afforded. In 1844 Mr. Logan established in the "Upper Chamber" of his brother's warehouse in Montreal a museum in which to display the large quantities of organic remains and minerals collected by himself and Mr. Murray, during their summer explorations; and still bearing in mind economic requirements, he employed at his own pecuniary risk, a chemist to make the necessary analyses of mineral specimens.

It was not until the following year, Logan having meanwhile drawn heavily on his own resources for the expenses of the work, that, thanks to Lord Metcalfe, the Survey was placed on a better footing, the employment of a chemist was authorized and the grant increased, covering a period of four years, to £2,000 per annum. But even under these improved conditions the difficulties of carrying on the work efficiently were enormous, not only by reason of financial disabilities but on account of the physical obstacles to be overcome. The greater portion of the country was, of course, a *terra incognita*, so that the geologists were obliged to devote the major part of their time in the field to topographical observations. In another of his long and interesting letters to his friend, De la Beche, Logan wrote: "I wish I could let you see the map of our journey across from the St. Lawrence to Bay Chaleur. The length of our winding line is 111 miles, in which we dialled the twists and turns of two rivers, one thirty-five miles and the other sixty-five miles, obtaining the bearings of the reaches by prismatic compass and the distances by Rochon's micrometer, and registering at the same time the quality, contents and attitude of every bed of rock we saw, with barometric heights, etc. The distance between the rivers we triangulated by means of well marked peaks. I think you would say we deserve some credit for it." In later years, he also refers to the time occupied in work of this character. "It will be easily understood," he remarks, "that this geographical work must unavoidably impede the rapidity of geological examination; and the necessity of so much measurement to fix the position of rock exposures, forces us, in order to make even a moderate progress, to examine fewer of them, or to give to each a shorter time than we would like, and thus, perhaps, to overlook some of its characteristics." This point was well emphasized by Prof. Agassiz in his evidence before the select committee above referred to, in which after speaking of the inadequate means placed at the disposal of the geologists, he says, "Topographical surveys, to be satisfactory ought to be founded upon astronomical observations, but who would therefore expect that astronomers should leave their telescopes, go into field, chart in hand, and draw maps. Mining operations bear to geology the same relations, that geodetic operations bear to astronomy. All that may be fairly expected of a geologist, is to prepare a geological map of the province he surveys, and thus obtain the information, without which the mineral resources of a country cannot be satisfactorily ascertained."

At the close of the year 1846 Dr. (then Mr.) Sterry Hunt, who subsequently did so much useful work in connection with the survey in Canada, was appointed to the staff, replacing Mr. De Rottermond, as chemist and mineralogist.

Meanwhile the Provincial Act, passed in 1845, had made provision for the continuation of the Geological Survey for five years only, and the time was drawing to a close. However, not without a delay that interfered considerably with the work of the Survey, the

*Life of Sir William E. Logan—by B. J. Harrington, p. 111. (Montreal: Dawson Bros., 1883.)

act was finally renewed with the same provisions. In the same year the Government decided to send a collection of Canadian economic minerals to the first of the great International Exhibitions in London, inaugurated by Prince Albert. This collection was prepared and placed in the charge of Mr. Logan, who by-the-way during his stay in London, was called upon to defray his own expenses. The exhibit, which obtained a medal, came in for a great deal of notice and praise, the *Times* referring to it as the most interesting and the most complete of all the collections sent from the British Colonies. While in London, Logan was elected a Fellow of the Royal Society. Up to this time actual geological investigations and examinations had been conducted in the mineral bearing districts of Lake Superior, Lake Huron, their coasts and islands; the Huron-Erie Peninsula; the Ottawa river valley; the Eastern Townships from the Richelieu to the Chaudière; in the St. Lawrence valley, the Island of Anticosti; the Gaspe Peninsula; the north shore of the St. Lawrence for a considerable distance east and west from Montreal and the country between Lake Simcoe and Kingston. By way of contrast it may be noted that whereas in 1857 geological work in Canada—a country then comprising 331,280 square miles—was being undertaken by a staff of two geologists and a chemist, in the State of New York whose area is about 46,200 square miles, a geological staff was employed including four geologists, four assistant geologists and a palæontologist; with an annual grant of £2,000 as against one of $20,000, exclusive of the cost of publications.

In 1854, in consequence of a popular demand that steps should be taken to give a wider circulation to the valuable reports and publications of the Survey and thus make them more generally accessible to the public, a select committee on the Geological Survey was appointed by the Government. The evidence before this committee of Messrs. Logan and Hunt, and of other distinguished witnesses, namely: Prof. James Hall, of the New York Survey; Prof. T. J. Chapman, of University College, Toronto; Mr. Alexander Russell, of the Department of Crown Lands; the Rev. Andrew Bell, of L'Orignal; Prof. Horan, of Quebec, and of Prof. Agassiz, makes very interesting reading and was of a highly complimentary character, but referred to the difficulties under which the survey was working.

Notwithstanding the generally favorable impression which Logan and his work had made upon the people of Canada, there must have been some who were still skeptical as to the advantages which the country would derive from the Geological Survey. The Committee, therefore, did not fail to interrogate Logan closely on this subject. "Can you," they asked, "give any illustration of the manner in which a sound scientific basis leads to practical economical results?" and again, "Have you in your survey as your principal object the establishment of new scientific facts, or has your attention been directed to discovery and pointing out economic advantages?" From Logan's answers to these questions we make the following extracts.

"The object of the survey is to ascertain the mineral resources of the country and this is kept steadily in view. Whatever new scientific facts have resulted from it have come out in the course of what I conceive to be economic researches carried on in a scientific way. . . . . Thus economics lead to science and science to economics. The physical structure of the area examined is, of course, especially attended to, as it is by means of it that the range or distribution of useful materials, both discovered and to be discovered, can be made intelligible. A strict attention to fossils is essential in ascertaining the physical structure. . . I do not describe fossils but I use them. They are geological friends who direct me in the way to what is valuable. One of them who is not yet specifically baptized, helped us last year to trace out upwards of fifty miles of hydraulic limestone. . . . . My whole connection with geology is of a practical character. I am by profession a miner and a metallurgist. A due regard to my own interests forced me into the practice of geology, and it was more particularly to the economic bearings of the science that my attention was devoted."

After hearing the evidence, the committee made the following recommendations:

(1) Republication of a revised edition of not less than 20,000 copies of the reports, with a coloured map.

(2) Publication of the same number of annual reports in future years.

(3) The periodical publication of 3,000 copies of plates and descriptions of fossils, etc.

(4) Gratuitous distribution of reports in certain directions and the remainder to be sold at cost price.

(5) Establishment and maintenance of the museum and library upon an efficient footing.

(6) To provide for the supply of geological and mineralogical specimens to other museums.

(7) The employment of topographical surveyors and their parties to assist in the geological surveys, when judged necessary.

(8) The employment of two or three additional explorers.

(9) The employment of a resident assistant, as keeper of the museum, and in the general business of the office.

(10) The employment of a second assistant geologist, charged more especially with the exploration of mineral localities. (But to this the rider is added: "The committee wish it to be understood that in the present state of the country they consider this the least essential addition to the establishment, and unless ample funds are provided, they would not advise it, to the prejudice of any other of their recommendations.")

(11) The encouragement of voluntary assistance by the publication of questions and short instructions now and what to observe and collect.

(12) Securing the aid of deputy provincial surveyors, and requiring candidates in the future to pass an examination in the rudiments of geology.

(13) The establishments of certain points in different parts of the country, as a basis from which local surveys may be reckoned.

(14) Requiring railway companies to furnish plans and sections of their surveys.

Accompanying these recommendations an estimate was furnished, in which the annual cost of the Department was placed at $6,000.

At the Paris Exhibition of 1855 Canada's collection of minerals, in the charge of Messrs. Logan and Hunt, was very highly commended, and for his services in this regard Logan was awarded a gold medal and presented by the French Emperor with the cross of the Legion of Honour, and in the following year, Her Majesty conferred on him the honour of Knighthood, and the Geological Society bestowed on him the Wollaston Medal, as a sign of their appreciation of his work. On his return to Canada the Geological Act of 1850 had expired, and doubtless apart from the findings of the select committees, the honour shown to Sir William while abroad and the influence he personally exerted upon his return, was to no small de-

gree responsible for the renewal of the Act for a further term of five years and the increase of the annual grant to £5,000.

The years 1860 and 1861 were uneventful in the history of the Survey, but in 1862, under its auspices, another large collection of minerals was exhibited at the London International Exhibition of that year, Sir William Logan being appointed Commissioner. Upon his return to Montreal in 1863, his great volume on the Geology of Canada was completed and published. Meanwhile, as has already been shown, the existence of the Survey had been extremely precarious, on account of its dependence upon an altogether insufficient annual grant. Accordingly Sir William now addressed a letter to the Minister of Finance under the McDonald-Dorion administration, urging in the strongest terms the necessity of more liberal action on the part of the Government.

The fund provided for the maintenance of the survey in 1863 was, he pointed out, exhausted and a certain sum was falling due for the cost of illustrating the report, while the grant of the previous session was insufficient to pay expenses, and allowed nothing for publications. He had, in fact, not only disbursed $4,000 out of his own pocket in the purchase of works for the library, surveying instruments, etc., but, in order that the work should be carried on during the year, Parliament having dissolved without granting supplies, he actually advanced the necessary funds, amounting to upwards of $10,000, for the purpose. Shortly after this letter was written a change of Ministry occurred and the Act making provision for the Survey was again renewed for another period of five years. Nothing of notable importance appears to have occurred until 1866, when another mineral exhibit, which was instrumental in attracting much attention to Canada, was sent to Paris in charge of Dr. Hunt and Mr. Richardson.

Early in 1869 Sir William Logan resigned the Directorship, and was succeeded by Mr. (afterwards Dr.) A. R. C. Selwyn, an English geologist, who for many years had directed the Geological Survey of Victoria, Australia. Mr. Selwyn, however, does not appear, judging from his earlier reports, to have devoted as much attention to the subject of economic geology as his illustrious predecessor, although in the Report of 1871-72 some valuable information is afforded by Mr. Richardson on the coal fields of Vancouver Island, and by Mr. Vennor in connection with the occurrences of iron and apatite in the Counties of Leeds, Frontenac and Lanark, and of gold in the Township of Marmora. In this year also a first attempt was made to compile mining statistics, figures being given for the three years, 1869, 1870 and 1871. In view of the great developments that have since taken place it may be of interest to quote from these returns. Thus the average annual production at this period is stated as follows:

| Name of Province. | Value of Product at Mine. |
|---|---|
| Ontario | $996,982 |
| Quebec | 330,209 |
| Nova Scotia, (coal) | 1,192,365 |
| Nova Scotia, (gold) | 351,266 |
| Nova Scotia, (other minerals) | 220,000 |
| New Brunswick | 262,288 |
| Newfoundland | 233,702 |
| British Columbia (gold) | 1,336,066 |
| British Columbia (coal) | 151,952 |
| Total annual average | $5,044,830 |

On the grounds, however, that mine owners neglected to make the returns asked for, no further attempt was made to continue this useful work until many years later. The volumes of 1874-5-6-7 are largely scientific in character, much space being occupied also with somewhat trivial details recounting incidents of camp life and travel. Mr. Selwyn, however, appears to have shared the views of Sir William Logan in respect to the importance of exploration in the iron and coal fields of Nova Scotia and Cape Breton, for in the Report for 1874-75, he explains that unusual attention has been devoted to geological work in Nova Scotia, as "the development of coal and iron mines exerts a far greater and more beneficial influence upon the material progress and prosperity of the country than can be ascribed to that of any other product of mining industry." At the same time he complains of the inadequacy of his staff and the urgency of better provision in this respect, pointing out that two-thirds of the time and attention of explorers was then being occupied in making topographical measurements for the construction of the essential preliminary maps.

In 1877 "An Act to make better provision respecting the Geological and Natural History Survey of Canada, and for the maintenance of the Museum in connection therewith," was passed by the Dominion Parliament, but while the scope and objects of the Department were enlarged, so as to include various branches of natural history, there was at first no corresponding increase in the appropriation granted. This was subsequently remedied, and the Survey commenced to take up natural history work of various kinds, but still showed little disposition to assist the miner in a practical manner. At length, after the issuance of what happened to be a very meagre report for the years 1880-81-82, complaint became so general that a select committee was appointed by the House of Commons to obtain information as to the methods adopted by the Geological Surveys in Canada and other countries in the prosecution of their work, with a view of ascertaining if additional technical and statistical records of mining and metallurgical development in the Dominion should not be procured and given to the public. After hearing the evidence, the committee published a lengthy report, from which the following extracts are taken:—

"The committee.....notices the serious lack of attention to the mining industries of the country in actual operation. Under the administration of Sir William Logan, but little progress had been made in actual mining developments, particularly in the limited sphere of his labours—the present Provinces of Ontario and Quebec. Since his day, not only has the field of practical mining been greatly enlarged by the addition of the Maritime Provinces with their extensive coal and gold mines in actual operation, but in the previous fields we have to note the discovery and development of the iron and gold deposits in Ontario, the phosphates of Kingston and the Ottawa Valley, the gold of the Chaudière district and the copper, iron and asbestos deposits of the Eastern Townships, yet we look in vain in the present report for any information, either of a statistical nature of their production, or of a descriptive or geological character, as to their progress or peculiarities. Thirteen pages of the last report suffice to narrate the work of the Survey for the last two years, in connection with the mines in actual operation in the whole Dominion. . . In the opinion of the committee, the primary object of the Survey should be to obtain and disseminate, as speedily and extensively as possible, practical infor-

mation as to the economic mineral resources of this country, and scientific investigations should be treated as of only secondary importance, except when necessary in procuring practical results."

In concluding their report the committee strongly recommended the appointment to the staff of the Survey of a duly qualified mining engineer, whose special business it should be to keep himself and the public informed as to all mining developments and progress, and to procure and preserve full statistical information in respect thereto.

But it may be stated in fairness, that this very report which came in for much unfavourable comment and criticism, contained an account by Dr. Dawson of the discovery and value of the Crow's Nest coal area, probably one of the most important announcements of an economic character ever made by the Survey.

It is to be noted also that in his summary report for 1885, Mr. Selwyn refers to the publication of thirty-seven reports, signifying by their titles their special bearing on mines, mineral deposits and statistics of mineral production, while special examinations of mining districts were begun in 1883 in the Lake of the Woods gold region, the phosphate region in the townships of Wakefield and Templeton; and, in 1884, in the Marmora gold and iron bearing region, and the mining region around the north shore of Lake Superior, as well as in some of the Quebec mining districts. The investigation by the Parliamentary Committee appears, however, to have served some useful purpose, inasmuch as a Mines Branch in the charge of Messrs. Coste and Ingall was afterwards established, and a first and comprehensive statistical report issued in the volume for 1886, in which the total value of the mineral production of Canada for that year is given as $10,529,361. In the preceding volume, Mr. Coste also contributed an interesting paper entitled "Observations on Mining Laws and Mining in Canada, with suggestions for the better development of the mineral resources of the Dominion," and many of the comments in regard to the defects in the law of that time, apply with equal point and force at the present day. The annual reports from henceforward certainly show that a greater interest in mining developments was being taken by the Survey than formerly, and a great deal of valuable information bearing on this subject is made available. Although the Klondike excitement did not eventuate until nearly ten years later, the Survey as early as 1887 called attention to the gold potentialities of the region in a report written by Dr. Dawson, who had associated with him on his expedition, as assistants, Messrs. McConnell and McEvoy; while in addition to useful facts secured by Dr. Bell relative to the Sudbury district, by Mr. F. D. Adams and in the Laurentian country, Dr. Ells in the Eastern Townships, and by Mr. Bowman in Cariboo district, B.C., special investigations in the mining districts were undertaken by Mr. Ingall of the Mines Section. In Part II of the Report for 1887-88 also appears Dr. Dawson's most valuable treatise, on "The Mineral Wealth of British Columbia," which to this day is in frequent request; while in the following year Dr. R. W. Ells reported very fully on the Mineral Resources of Quebec. In the spring of 1889, Mr. Coste resigned charge of Mineral Statistics Division, and was succeeded by Mr. E. D. Ingall.

In 1890, a new Act was passed repealing the Act of 1877, in which the duties and objects of the Survey were set forth as follows:—

(*a*) To make a full and scientific examination and survey of the geological structure, mineralogy, mines and mining resources of Canada and of its fauna and flora;

(*b*) To maintain a museum of geological and natural history and arrange for exhibition such specimens as are necessary to afford a complete and exact knowledge of the geology, mineralogy and mining resources of Canada;

(*c*) To collect and publish full statistics of the mineral production and of the mining and metallurgical industry of Canada; to study the facts relating to water supply. . . and of mines and mining work in Canada.

The Act also constituted the Geological and Natural History Survey a separate department, instead of a branch or sub-department of the Department of the Interior. In calling attention to a provision in this Act by which no persons unless science graduates of recognized schools or colleges may be appointed to the staff, Dr. Selwyn in the report of 1890-91, comments as follows:—

By these provisions "it is hoped to maintain the efficiency and high scientific standing of the department, but in order to insure this desirable result a scale of remuneration should be established in the department, more in accordance than it is at present with that which obtains elsewhere, and even in other departments of the public service and in the universities of Canada, for acquirements and experience such as is required of the technical officers of the Geological Survey, and in view of the risks, hardships and responsibilities they are often called upon to undertake." This representation is alluded to in passing, as it is a grievance of a very real nature which still exists, and it is hoped may in the near future be remedied.

In connection with the collection of mining statistics it may be mentioned that in 1891 an attempt was made to seek the co-operation of the Provinces, and thanks to the good offices of Mr. John Robson, then Provincial Secretary, the endeavour met with ready response in British Columbia. In this regard Mr. Ingall in his report for 1892 writes "The confidence of the mining community . . .now gained, has resulted in an increasingly hearty response to our circulars," and this statement is borne out by the exceptional value and comprehensiveness of the report of the Division of Mineral Statistics and Mines at this date.

In January, 1895, Dr. Selwyn resigned the directorship of the Survey, and was succeeded by Dr. George M. Dawson. Much more attention was now being given to mining developments, and the first annual report for which Dr. Dawson was responsible is of unusual interest. Thus, an account is given of borings undertaken for petroleum under the auspices of the Survey, at Athabasca Landing; Mr. McEvoy reports on recent developments of economic minerals in the Kamloops area, and refers to the occurrence of cinnabar at Savanas. He also describes his observations on hydraulic mining in Cariboo. Mr. McConnell gives a statement of the characteristics of the important mines of West Kootenay; Mr. McInnes reports of the occurrence of economic minerals near Sault Ste. Marie; Dr. Ells describes the occurrences of iron, galena, ochre and mica in the counties of Ottawa, Pontiac and Carleton; Mr. Low calls attention to discoveries of hematite and siderite in the Labrador Peninsula; Mr. Fletcher refers to iron and coal developments in Nova Scotia, while Mr. Faribault's report on gold in this Province is of great practical value. This gentleman in speaking of quartz mining in Nova Scotia, points out that the gold-bearing deposits in that Province are really in the form of saddle veins on

anticlinal folds and shows that on a proper recognition of this fact largely depends the success and future of deep gold mining in Nova Scotia. He also advises the adoption of a method of mining followed in Bendigo, where the occurrences are of a very similar nature, which consists in sinking perpendicular shafts on the anticlinal axis from which cross-cuts and levels are driven to intersect the interbedded saddles. Mr. Ingall, reporting in this volume, complains however that the funds placed at his disposal were insufficient for the prosecution of important mining work which had been initiated by the Mines Section.

In 1895, the Survey undertook a new duty in supplying small typical collections of Canadian minerals and rocks to educational institutions in Canada, and no less than fifty-nine collections of this kind, embracing 6655 specimens, were furnished. In addition, the excellent work of the previous year was extended along similar lines.

In short, during Dr. Dawson's all too short term of office as Director of the Survey both his own-work in the field and that of the department generally was of an eminently useful and practical character. This is well pointed out by Dr. F. D. Adams in his "Memoir of George M. Dawson," *where he states "his work . . . . contributed largely to great development of the mining industries. . . during recent years, for his reports, though thoroughly scientific, always took account of the practical and economic side of geology, and accordingly commanded the attention and confidence of mining capitalists, mine managers, and others interested in the development of the mineral resources of the country." Dr. H. M. Ami, in his appreciative biographical sketch also refers to the consideration given by Dr. Dawson to economic work "Through his personal efforts," he writes, "and that of his staff, he did so much to disseminate information regarding Canada's mineral resources, that the mining interests of the Dominion may now be said to be fairly well established upon a firm and non-speculative basis."

Dr. Dawson died suddenly on the 2nd of March, 1901. And from that time to the present the Survey has been without a Director. These duties, however, have been performed by Dr. Robert Bell, who as Acting Director, has had the responsibility of the work, but neither the honour nor the emoluments which should go with it. Under Dr. Bell much work of great value has been done by the Survey; but in its relation to the mining industries it is necessary to add that the present system, which remains practically the same as that followed a quarter of a century ago, is by many, competent to express an opinion, regarded as antiquated and inadequate having regard to present requirements, the growth to which the mining industry has since attained, and the important position it now occupies. And by contrasting the methods adopted by the United States' Survey with those still followed by our own, this complaint appears to have certain justification. Taking, for the sake of example, one branch, the Mining and Statistical Division of the Survey, it is impossible to truthfully assert that its scope or usefulness has been greatly, if at all, extended since the date of its inception. In fact it is currently believed that the officer in charge of the branch has received little, if any encouragement at any time to special effort in this regard. The geological reports themselves too, although frequently of great value from an economic point of view, are with some exceptions, still somewhat unsuitable for general circulation, since they rarely contain the practical details and facts in that readily accessible form which the busy man of affairs, contemplating an investment in any one of our mineral industries is desirous of having placed at his disposal.

*Bull. Geol. Soc., Am. Val. 13, 1901.

### THE ESTABLISHMENT OF THE MINES BRANCH OF THE DEPARTMENT OF THE INTERIOR.

It was doubtless in consequence of a realization of the requirements in this respect that the Government in July, 1902, established in connection with the Department of the Interior, a Mines Branch, in charge of Dr. Eugene Haanel, Ph.D., who received the title of Superintendant of Mines. The establishment of the Mines Branch did not include a statement of its functions, but a memorandum suggesting the lines on which organization should proceed, was prepared and presented to the Minister.

The work to be accomplished by the Department would, the memorandum states, most conveniently be distributed among the following sections:—

1st: *Mineral Resources.*—The general object of the work of this branch to be the collection and publication of data regarding the economic minerals of the country and of the processes and activities connected with their utilization. This to be accomplished under the following two heads:

(a). *Statistics*: Covering the investigations into (1) the production, consumption, exports and imports of the economic minerals of the country, (2) the collecting of figures relating to costs, freight, markets, etc. These tabulated on a proper system of classification, with discussions as to the causes of variation of production, exports and imports, fluctuations of market, etc., should be published annually, or at such frequent intervals as may be found practicable.

(b). *Technological*: Covering the preparation and publication of bulletins and monographs giving information in a concise form regarding (1) the location, mode of occurrence, extent and character of the various economic mineral deposits, (2) assays and analyses of ores and in the case of building material, tests of strength and endurance of pressure, etc., (3) description of the method of exploitation, treatment for extraction of metallic contents, or resultant products. The information to be obtained from material already published, but scattered and in a great measure inaccessible, to be supplemented wherever necessary by visit of officer in charge to the respective localities. A separate monograph for each mineral, as coal, iron, copper, nickel, gold, etc. (except building materials which may be written up as a class to be published, giving all available information in reference to them. The publications specially framed to meet the needs of the public commercially interested in these matters and annually bound in one volume, entitled "The Mineral Resources of Canada." The separate monographs to be distributed as widely and freely as possible to bring the mineral wealth of Canada prominently before the investing public and thus aid in bringing capital into the country, necessary for the development of its resources.

2nd: *Mining Geology.*—Covering the investigation of mineral areas and mining camps, determining the mode of occurrence, extent and character of the ore bodies and furnishing to the practical miner clues regarding the probable direction in which to exploit his property, and by a careful study of the associated rocks and their relation to the ore bodies establishing principles which shall be helpful as a guide regarding the occurrence of similar ores in other regions. This to include the preparation of good topographical and geological structure maps of important mining districts.

3rd: *Metallurgy, Assaying and Chemistry.*—The personal of this section would be occupied in assaying the ores and first marketable products of mines collected by the mining geologists, and performing such rock-analyses as may be required by the mining geologists for purposes of determining the composition of rocks in association with the ore deposits.

The further work of the section would consist in analysing such material as may from time to time be sent to the Mines Branch from outside parties.

CONCLUSIONS.

This historical survey brings us down to the present time and to review the economic work accomplished by the Survey in a few words, it may be said that practically all the information which we possess concerning the mineral resources of the Dominion has been collected by the officers of the Geological Survey, with the exception of that which we owe to the Provincial Mining Bureaus of British Columbia and Ontario, and to the Mines Branch of the Department of the Interior, all of which have been established within the last few years. But while the Survey has been immense value in the development of the country, the establishment of a separate Mines Branch in the Department of the Interior may be held to indicate that in the opinion of the mining men of Canada the Survey has not in recent years, on its strictly economic side, kept pace with the growing requirements of the mining industry, and that the immense mass of information which it has collected has not been reduced to a sufficiently accessible form.

In this connection, however, it must be noted, that with the exception of experimental metallurgy, every line of work which is set forth as within the purview of the Mines Branch, has been already taken up or is now being prosecuted by the Geological Survey of Canada. In making this statement it must be clearly understood that there is no intention, in what has been said, to minimize the value of the work accomplished by the Mines Branch of the Department of the Interior since its inauguration, but merely to point out that, while by means of a large special grant placed at its disposal the Mines Branch has been able to produce a number of reports of marked economic value, the production of such reports does not demand the existence of such a separate bureau. Given a properly reconstructed Geological Survey, of which the present Mines Branch might form part, it could employ the same extra grant with at least equal economic efficiency.

Such work of the highest quality, is being carried out on an enormous scale by the Geological Survey of the United States, which working in the territory immediately south of us, has to deal with conditions which resemble very closely those obtaining in Canada at the present time. Moreover the work done by this Survey has so emphatically commended itself to the mining interests in the neighbouring Republic that the Government have repeatedly extended the scope of the Survey and greatly increased the sum appropriated for its use.

As a matter of fact, our mining community in Canada, while admitting that the Geological Survey of Canada has accomplished an immense amount of good work in times past, points to the immense increase in the volume and value of the mineral output of Canada as shown by the following figures:—

TABLE SHOWING MINERAL PRODUCTION OF CANADA.

| | Value in Dollars. |
|---|---|
| 1871 | 5,044,830 |
| 1887 | 10,221,255 |
| 1887 | 11,321,331 |
| 1888 | 12,518,894 |
| 1889 | 14,013,913 |
| 1890 | 16,763,353 |
| 1891 | 18,698,953 |
| 1892 | 16,628,417 |
| 1893 | 20,035,082 |
| 1894 | 19,931,158 |
| 1895 | 20,648,964 |
| 1896 | 22,584,513 |
| 1897 | 28,661,430 |
| 1898 | 38,697,021 |
| 1899 | 49,584,027 |
| 1900 | 64,618,268 |
| 1901 | 66,339,158 |
| 1902 | 63,865,797 |
| 1903 | 62,532,210 |
| 1904 | 60,343,165 |

It also points out the present position which the product of the mine holds, as compared with the agricultural exports of the Dominion, as shown by the following figures:—

TABLE SHOWING THE AGRICULTURAL EXPORTS OF THE DOMINION.

| | Value in Dollars. |
|---|---|
| 1896 | 39,659,686 |
| 1879 | 46,377,927 |
| 1898 | 68,919,688 |
| 1899 | 62,528,107 |
| 1900 | 73,281,760 |
| 1901 | 66,872,292 |
| 1902 | 80,705,186 |
| 1903 | 99,420,195 |
| 1904 | (about) 98,300,000 |

In view of these figures and of the fact that the agricultural interests of Canada have been and are being enormously developed by the Government, through the Department of Agriculture under the charge of a special minister of the Crown, our mining men ask why the great mining interests of the Dominion might not be similarly cared for.

It is not here necessary to enumerate the many ways in which the Governments of other countries do, and our Government could, actively assist in the development of mining industry. Our views on this matter have already been set forth in a paper read before this Institute and printed in one of the volumes of our Transactions. (Jour. Can. Min. Institute. 1902, pp. 585-595). Our aim here is merely to point out that the mining industries of Canada might at the present time be greatly assisted if the work of the Geological Survey and the Mines Branch of the Department of the Interior was taken up seriously by the Government, correlated, systematized, extended, and made to conform to modern requirements. The duplication which now exists would thus, in the interests of economy, be avoided and the whole work would be put upon a proper businesslike basis.

If this were done, it is certain that the mining interests of the country would be well served and that the action of the Government would receive the hearty endorsation of everyone interested in mining and that furthermore, as the value of the work became increasingly evident the Government would feel justified in providing additional means for its prosecution, so that a larger staff of properly paid and thoroughly efficient men, *au fait* with the modern methods and results of science as applied to the study of these economic problems, could be permanently employed by the Government in the development of the mineral resources of our country.

All Canadians would be sorry to see the Geological Survey of Canada lose its independent existence, seeing that it is a branch of the service of which, with all its faults, we Canadians have reason to be proud. But if the happy result above indicated could be insured by the appointment of a Minister of Mines who would

have direct supervision of this work, the expansion of the Geological Survey into a Department of Mines and Geological Survey, would receive the support of the whole mining community.

## THE EDUCATION OF MINING AND METALLURGICAL ENGINEERS.

By Professor JOHN BONSALL PORTER, Ph.D., D.Sc.

Until a comparatively recent day Engineers as a body have shown little interest in what may be broadly termed Engineering Education, and have left it to the Universities and Technical Schools to formulate and carry out such schemes for training young men as they have seen fit. There have of course been notable exceptions and many Engineers of the highest rank have given invaluable advice, assistance and sympathy, but the general feeling of practical engineers and perhaps particularly of Mining Engineers to teachers of Engineering has been more or less unfriendly.

Under these conditions the natural tendency of professors to become pedantic was not sufficiently neutralized, and although the public demand for advanced education led first to the foundation of professorships in engineering in each of the great Universities, and later to the development of special faculties and schools of Engineering with elaborately differentiated departments covering the several branches of the subject; yet, in general the methods of teaching remained somewhat academic to say the least.

It is but a very few years since it was possible, or even quite a matter of course for young men to be granted University degrees in Mining Engineering without even having seen a mine, and in other branches of Engineering the situation was no less absurd.

The so-called Summer School established twenty odd years ago by Columbia University and adopted (usually as an optional course) by several other Mining Schools was the first and most important move in the right direction. The equipment of Engineering Laboratories and later of special laboratories of ore dressing and metallurgy, was almost equally useful; and now every school of importance is provided with laboratories, and offers its students so called practical and experimental courses in many branches of engineering.

These changes and the introduction of manual and technical training in both elementary schools and colleges have met with approval from practical engineers, and during the last few years the technical journals and the Transactions of Societies have contained a great number of papers on Engineering Education. Further practising engineers and works managers have displayed interest in the education of young men and have shown a far greater willingness than heretofore to admit students to their establishments and to offer employment to engineering graduates.

This general interest in technical education is most gratifying to those professionally engaged in engineering teaching and is bound to result in great good, but it is not without its dangers.

The practising engineer, no matter how thorough his own education has been, usually finds little or no direct use in his practise for higher mathematics and for the pure sciences, and he fails to realize the immense part played in his own intellectual development by the study of these subjects. On the other hand he is constantly concerned with technical details and naturally looks with approval on any school which turns out men ready with facts and figures for immediate use. His influence is therefore almost always in favor of technical as compared with scientific education.

For somewhat similar reasons the majority of engineering students—at least in North America—are very keen to work at studies which have direct and obvious bearings on their future profession, and are grudging of time given to pure science. They fail to see why in a mining course, for example, mining itself should be assigned fewer hours of study than certain other subjects, and why all professional subjects together should occupy but one quarter of their course.

Similarly, many managers and even thoroughly educated engineers in judging the comparative merits of young men seeking employment, naturally prefer those who have a maximum of technical knowledge and can at once be made useful to men whose knowledge is more general.

Under these influences the engineering courses are being somewhat rapidly modified even in the more conservative schools. As a whole the changes are for the better, but, at the moment it is probable that in this country at least, too great weight is being given to the technical side of education. Certainly there is great confusion in the minds of many laymen and some teachers between Science and Technology. How to do a thing is taught rather than why to do it, and in the stress and rush of filling students with facts the infinitely more important business of teaching them to think is almost forgotten.

This utilitarian tendency is shewn most fully in the Correspondence Schools which have sprung up within the last few years and now number their students by hundreds of thousands. These schools have largely taken over the work once attempted by night schools, mechanics classes, etc., and as a whole do it admirably, but they are unfair to their patrons in that they often ignore or make light of difficulties and give their students a somewhat exaggerated idea of the completeness of their own knowledge. The young men who take these courses are rarely able to spare the time and money necessary for a University education and what they do learn is therefore all to the good, but it is unfortunate that these schools so often fail to make it clear to the students that purely technical knowledge is after all only half knowledge, and that the highest achievements in engineering are only possible for men who are thoroughly familiar with the principles of the pure sciences underlying all engineering practice.

Technical schools and similar institutions usually occupy a position in advance of the Correspondence Schools, but generally speaking their standards of admission and of class work are comparatively low, and it is left to the more conservative Universities and to certain exceptionally thorough technical schools to provide the highest type of engineering teaching.

This teaching should be in general very similar for all branches of engineering. The preparatory work should include good elementary training in the usual school subjects, in elementary mathematics and in at least one modern language. Latin is also very desirable, and last, but far from least, the students should be able to write English accurately and clearly.

Assuming this preparation to be of the standard of the best Canadian and American schools, the engineering course should then take four years, two of which can be devoted with advantage to Advanced Mathematics and to Physics, Chemistry, Geology, etc. With these pure science subjects there may be a certain amount of elementary shop work intended not to fit the men to be mechanics, but merely to familiarize

them with materials of engineering and with the elements of shop and foundry practice. Time must also be found for mechanical drawing and some sketching.

The long vacations should also be utilized in part for further shop experience in real works, or, in the case of mining students, for labourer's work underground, and for field classes in surveying.

The two final years may then be given with safety to more technical studies. Pure mathematics being now sufficiently in hand its engineering applications to structures and machines are considered under the heads of Applied Mechanics and Machine design. The elements of electrical and mechanical engineering are also essential to all engineers, and miners need also elementary Metallurgy and Mineralogy. The studies in chemistry and geology must also be extended, and laboratory work must be done in the one and field experience gained in the other.

The main part of the work last outlined can be done in the third year of the course and a portion of this year and almost the whole of the fourth can be given to what may be called "professional work," that is to say to special studies in the branch of engineering chosen by the student. In the case of Mining and Metallurgical students the various branches of mining and ore dressing and of advanced work in metallurgy may be included.

It is obvious that no very elaborate detail can be taught in Technical courses which have to be carried through in a single year or at best in a year and a half, but elaborate work is not needed in engineering classes. The essential thing is to get students in the way of thinking as engineers, and to familiarize them with the general principles and fundamental problems of their profession. It would be impossible in one year or indeed in ten, to teach a student the detailed technology of the whole of his selected branch of engineering and it is obviously rarely possible to select the particular part which he will afterwards practice. It is however quite possible to give an intelligent young man a general view of the subject, and then to teach him the technology of a limited number of carefully selected typical processes, and if he knows these thoroughly he will have no difficulty later in learning whatever special processes he is called upon to use. In other words if a man is taught to think as an engineer and to work as an engineer in any one branch of mining or metallurgy, he can whenever necessary quickly qualify himself for any other branch when the circumstances make it necessary.

In what has been said above, practical work, summer schools, and laboratory experiments have been mentioned, but it remains to discuss them at some length. The student of engineering should at an early period in his course have some training in shop work on the ordinary materials of construction. He will not be able to spare time enough to become a skilled workman or even a half skilled apprentice, and he must be made to understand this clearly; but he can and should work long enough to know something of the use of tools, and to understand the qualities of the materials of construction which he is about to study theoretically. This elementary shop work is often carried out in work shops connected with the schools and universities themselves, and frequently can be done in the afternoons of days, the mornings of which are given to more academic studies. This method is economical of time and there are many advantages in having the teaching and shop work under the same direction, but unless a boy is to get thorough practical training later, it is better for him to go to an ordinary shop where he should be required to work full time each day under ordinary shop discipline. In no other way can he be made to realize what work really is; the intimate acquaintance with workmen is also very useful.

This shop work if done outside of the school can usually be arranged for the long vacation.

This shop work can usually be arranged for the long vacation, which should be long enough to give time for it, and for a reasonable holiday. Two periods of two or three months each in two successive vacations should suffice for an ordinary boy, especially as practical technical training is also required at a later period in his course. This latter technical work is even more important, in my opinion, than the shop experience. It should, if possible, follow the general science teaching, and precede the specialisation. The students should first be taken into the mines in a body and be given an opportunity to visit and study works under the guidance of a staff of competent instructors. After a month or two of this field work, each student should obtain bona-fide employment in some works in his chosen speciality, but the exact nature of the work is of no very great moment, so long as it is good engineering work, done by good workmen intelligently directed. The important thing again is to get the student in touch with real work and real wage-earners, and to give him an idea of scale. The elementary shop work may be done if necessary at convenient times in a school workshop, but this technical work must be real in every respect. The student should, for the time being, become a plain workman on wages, responsible to his foreman for certain duties, and liable to penalty or discharge for cause.

The time to be given to the work must depend on circumstances. Three months under the right sort of foreman, in a small but interesting mine or works, will teach as much as a year of ill-directed drudgery. Furthermore, students differ greatly in the readiness with which they take to practical work. Some are the better students for having had many years of hard apprenticeship; but very frequently the man who has spent even one year in practice finds it difficult to return to his classes He is earning money at work, and can often ill-afford to give it up, and again become dependent on his people. Study also often proves irksome, and sometimes very difficult, after a man has been actively employed in work. As a result, many men fail to return to their final studies, and thus lose what should be the most useful part of their education.

If a definite time for practical experience must be set in advance, it is probable that two periods of about four months each in different works, or one period of a year, would be about right; but in this, as in all other matters of technical education, it is far better to make the regulations somewhat elastic in respect of field work and advanced study. Much time can be saved the students, and their work made more effective, if each case is separately considered by the responsible head of their school.

This last and most important period of practical training should follow the elementary engineering studies and if possible come between the third and the fourth year in a four years' course. From it the student comes back to his work with fresh enthusiasm yet without having got out of touch with academic methods as he would have done had he spent a longer period at work. He now enters on his advance work and the teaching may be highly specialized and quite technical, but care must be taken to keep fundamental principles in sight, and the detailed technical work should be carefully laid out to cover only certain important typical operations. This academic work can

be made much more interesting and effective by the free use of technical laboratories, in which engineering machinery (and in our case ore-dressing and metallurgical apparatus) can be used; but here, as in the lecture room care must be taken to teach principles, not processes. Certain processes must of course be used, and a good deal of careful detailed work done; but the primary purpose must always be to teach general principles, and mere technology must be kept in a secondary place.

The best function of laboratories, aside from the limited use necessary to illustrate fundamental principles, is to develop the individuality of the students. Each man should be given certain carefully selected pieces of independent work, and he should be encouraged to attack the task in his own way. One or two comparatively heavy investigations are far better than many short experiments, and the instructor in charge can often do his men far more good by showing interest, and yet letting them work out their own salvation whenever possible, than by being too ready to set up apparatus and smooth over difficulties. This advanced individual work can utilize to the full the resources of even the most magnificently equipped laboratories; but care should always be taken especially in schools which are very rich in practical apparatus, to see that the students should do a few things thoughtfully, and with a clear apprehension of their bearing, rather than that they should get shallower experience of many processes and machines.

In connection with this advanced study the men should be taught to write up their work, and to apply the knowledge gained in works, laboratories and lecture rooms, to some practical problems in engineering. In this, questions of estimates and costs should be considered for the men are now about to go out into the world, where costs form an essential element in every enterprise. Estimates made even by advanced students are likely to be far from right, but their preparation gives the men extremely valuable experience, and a competent instructor can do excellent work by discussing economic matters with his men in this stage of their training.

This should end the school course in engineering, for no amount of mere teaching will turn a boy into an engineer, still less into a mining engineer. If, however, he is given a good grounding in science and the principles of engineering, then put in touch with practical engineering work, and finally taught the elements of the technology of his subject, he will be prepared as well as any school can prepare a man to go out into the world and learn to become a good engineer.

Such a course of study as has been outlined above is very different from the old-fashioned course in Mining, and in fact is different in some respects from any course in Mining offered at present, although many schools approach it, and each year sees changes made which bring our science courses closer to this ideal. In this connection the author takes the liberty of briefly outlining the course in Mining and Metallurgy offered by his own University, not because he believes it to be by any means perfect but because it illustrates very well the modern practice in engineering teaching.*

At McGill University students are required when entering to show a good knowledge of mathematics, of one modern and if possible one ancient language and of the usual English and general subjects of the higher schools. They are then required for two years to devote their time to advanced mathematics, physics, chemistry, elementary mechanics and surveying. They also give a great deal of time to drawing and to shop work. In addition to their studies in the University they are required to do one month each year of extra mural work in surveying.

Up to the end of the second year, all engineering students take the same course, after that differentiation begins, mining and civil engineers giving more time to surveying and surveying field work, while electrical and mechanical engineers spend additional time in the drafting rooms and machine shops.

In the third year in the Mining and Metallurgical courses, lectures are given on the elements of Mining Metallurgy and ore dressing and final work is done in the more general engineering subjects.

At the end of this year the class is taken to the field and five weeks are spent in studying mines and metallurgical works under the personal direction of the staff of the department. The district visited is carefully chosen with a view to offering the students the best possible opportunities for observation, and the method in general is to first spend ten days or a fortnight in one particular mine or works, thus familiarizing the students with the plant and making them quite at home in it. The remainder of the period is then spent in visiting other works, one or two days being given to each and the differences in method, etc., noted and studied.

During these excursions, which are ordinarily carried out in a private car chartered for the purpose, students and staff live together, and informal lectures and discussions are held whenever practicable, in order to call the attention of the men to the salient points of interest.

While this class work is going on arrangements are made with the managers of the works visited to take on individual students for the remainder of the summer as workmen. In this way it has always proved possible to provide employment for all men who have not already secured engagements for the summer, and at the end of the field school the class disbands, not to play for three months, but to go to remunerative individual work.

On the return to the University in the autumn the detailed technical and laboratory work already referred to is seriously begun.* Certain typical operations are performed by the whole class such as a stamp mill run, the concentration of a lead or copper ore, and a short campaign with a copper or lead blast furnace, by the whole class, but the main work of the succeeding six months is individual and each man is encouraged to take up the same investigation which is especially interesting to him, such as the concentration of the ore from some mine in which he hopes to obtain employment, or the smelting of a particular material, etc. This individual work, whatever it is, is under the eye of competent instructors, and assistance is given when needed, at the same time and when possible in the same connection, he is required to design a works and to prepare approximate specifications and estimates as already outlined.

In a recent paper by Dr. Stansfield† the method of

* The illustrations accompanying this paper need no description beyond that printed on the plates. They are chosen with a view to illustrating the character of the Ore Dressing and Metallurgical laboratories alone and do not by any means cover the whole equipment of the department, much less of the course as a whole.

* In the appendix will be found a copy of the instructions given to students at the beginning of their elementary work. The more special advanced work is similarly covered wherever possible by instruction papers which need not be repeated here.

† Can. Min. Inst., Vol IX, 0906.

laboratory teaching in Metallurgy is admirably set forth in detail. The method employed in the Mining and Ore Dressing Laboratories is so similar that it need not be more fully described here.

The University course thus closes with a year of work as practical as possible, yet so laid out and directed as to be theoretical as well. The student is thus prepared to go out into his profession. His education is however but half over, and if he wishes to achieve high success in the end, he must content himself with a subordinate post for many years, and work hard and patiently to master the details of his special business, to learn to command men and to know himself.

An appendix to this paper, entitled "Laboratory Notes on Trial Runs in Ore Dressing," has been omitted owing to lack of space.

Fig. 2a.—Plates, Tables, Amalgam Pans, etc. Nos. 37a, 31, 40, 41, 43, 48.

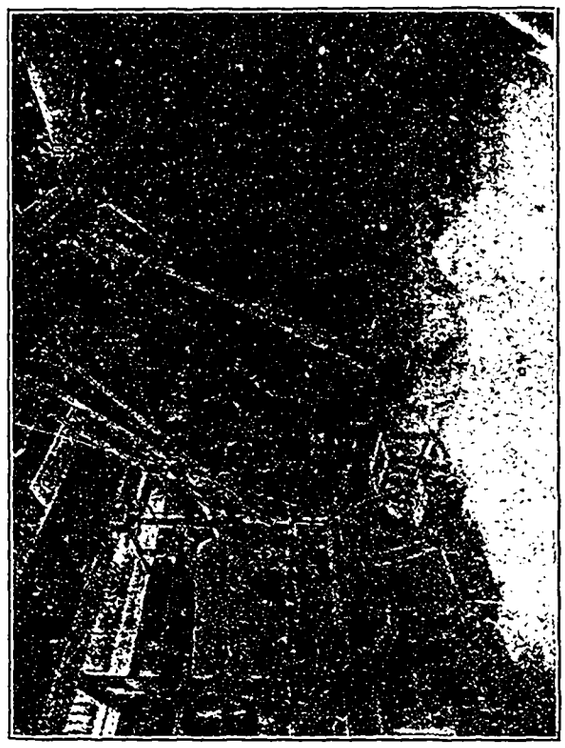

Fig. 2b.—Sampling Floor, Crushers, Rolls, Elevators, and Jigs, Nos. 1, 2, 3, 12, 20.

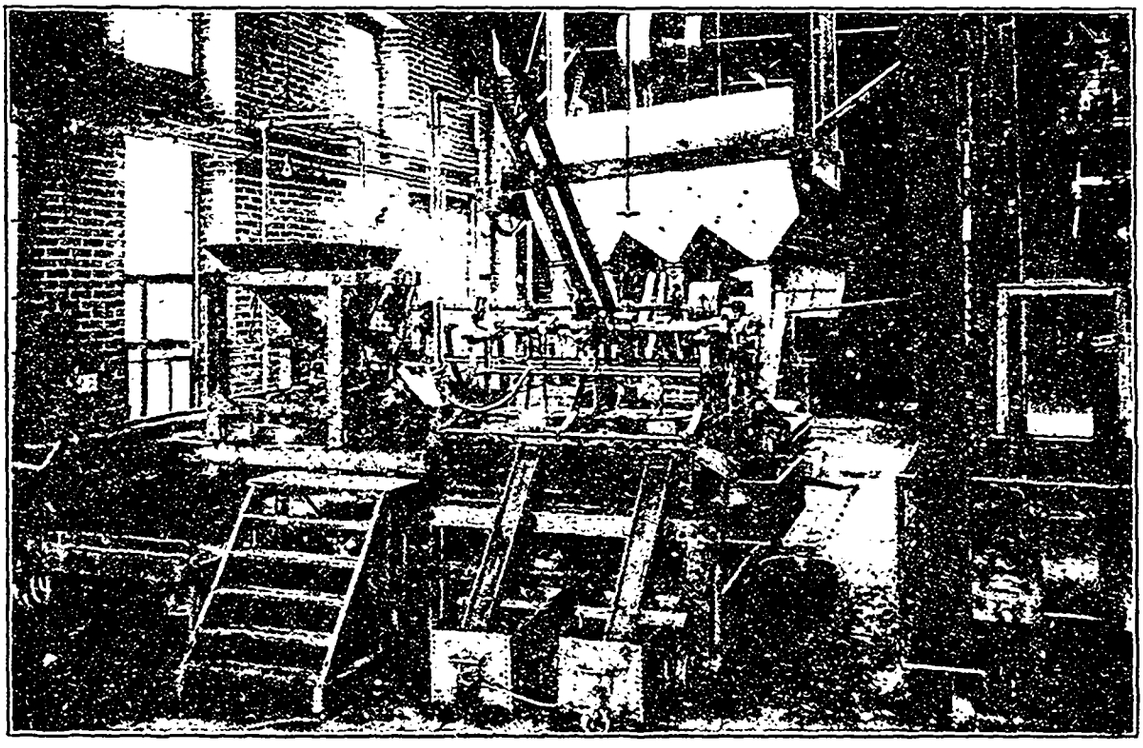

Fig. 3.—Jigs and Feeder, Trommel and Drying Table, Nos. 20, 15, 19, 47.

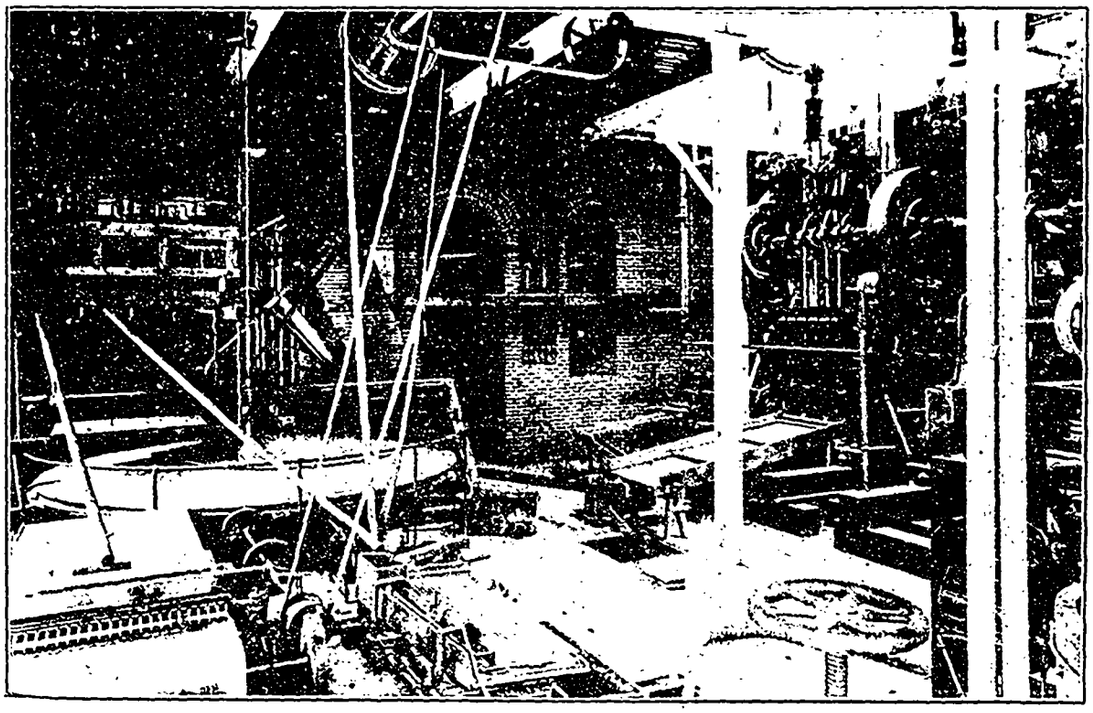

FIG. 4.—Batteries, Classifiers, and Tables, Nos. 8, 11, 37a, 25, 31, 36, 37.

FIG. 5a.—Bartlett Table and Slimer, Jigs and Classifiers, Nos. 32, 33, 21, 22, 26

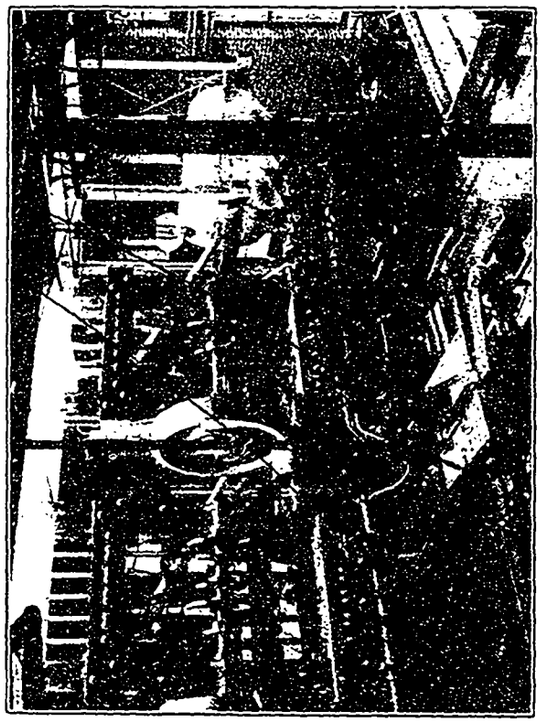

FIG. 5b.—Stamp Batteries, Steam Stamp, Jigs and Rittinger Table, Nos. 8, 9, 10, 21.

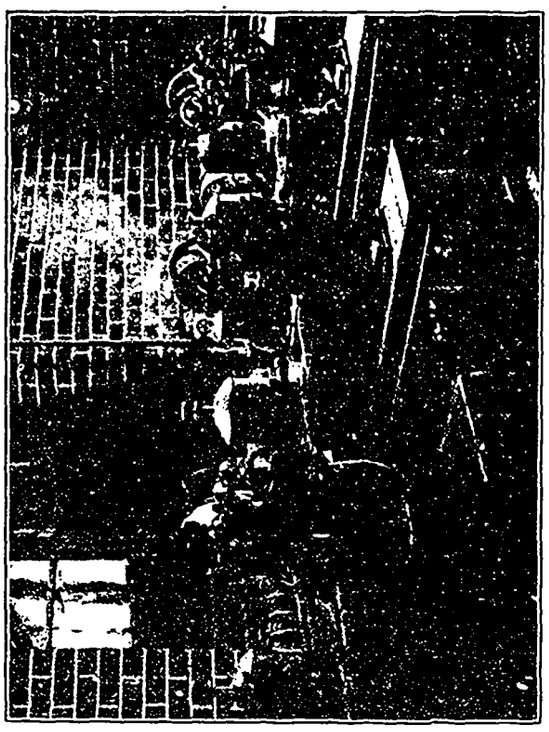

FIG. 6a.—Small Amalgam Pans and Vezin Jigs, Nos. 42, 23.

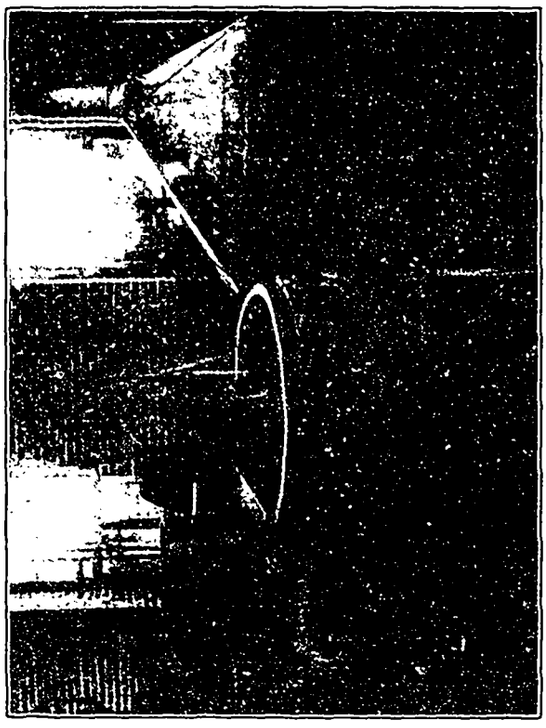

FIG. 6b.—Amalgam Pan, and Settler and Drying Table, Nos. 40, 41 and 48.

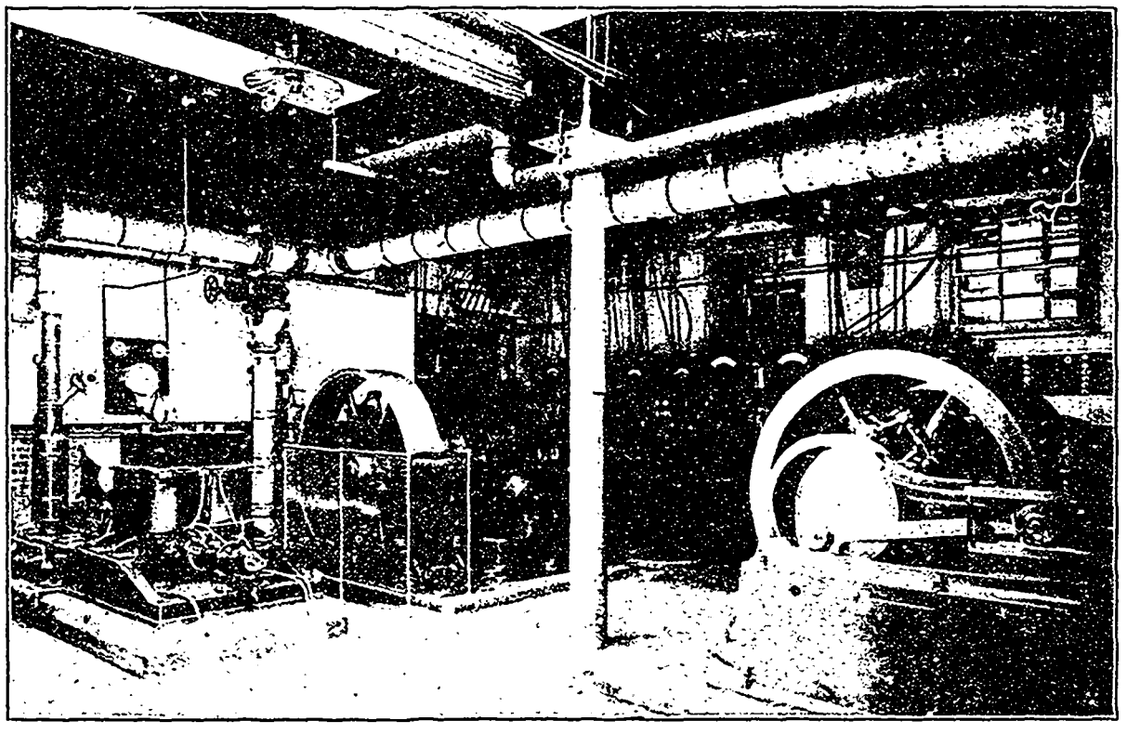

FIG. 7.—Electric Light and Power Station, Engineering Department.

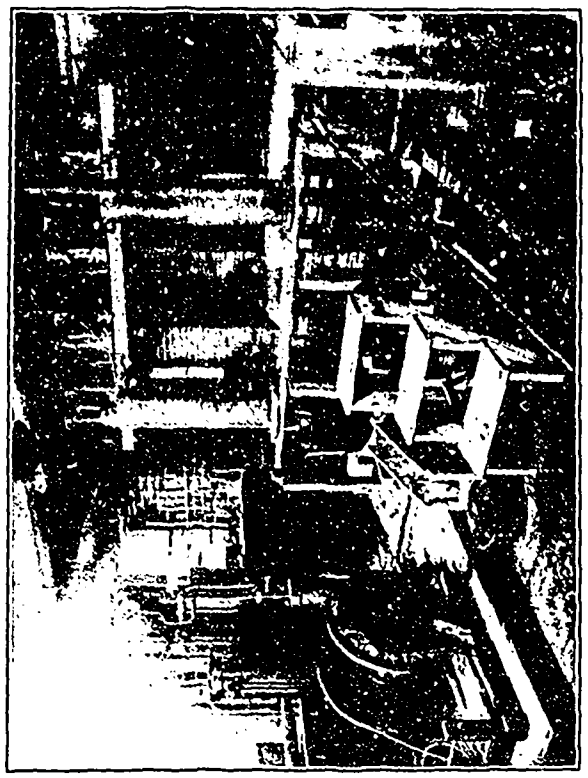

FIG. 8a.—Cyanide Plant, No. 40.

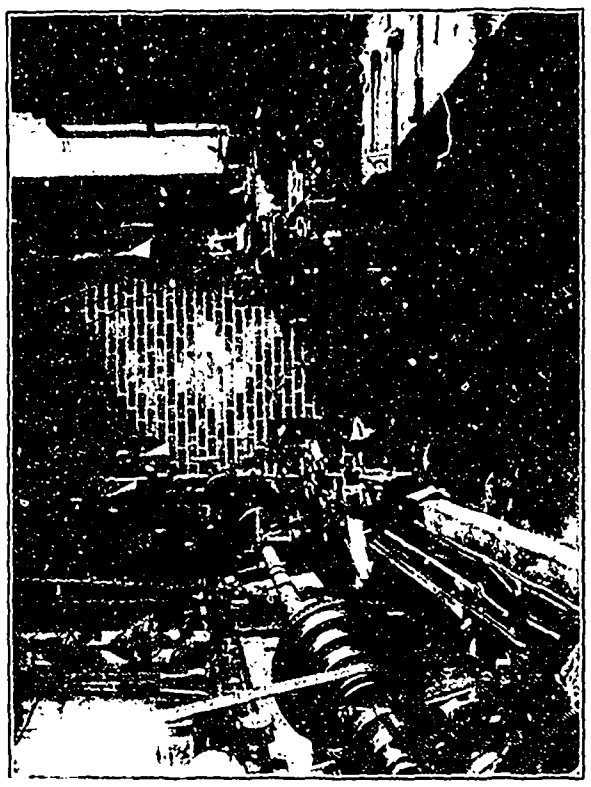

FIG. 8b.—Machine Shop, Mining Department.

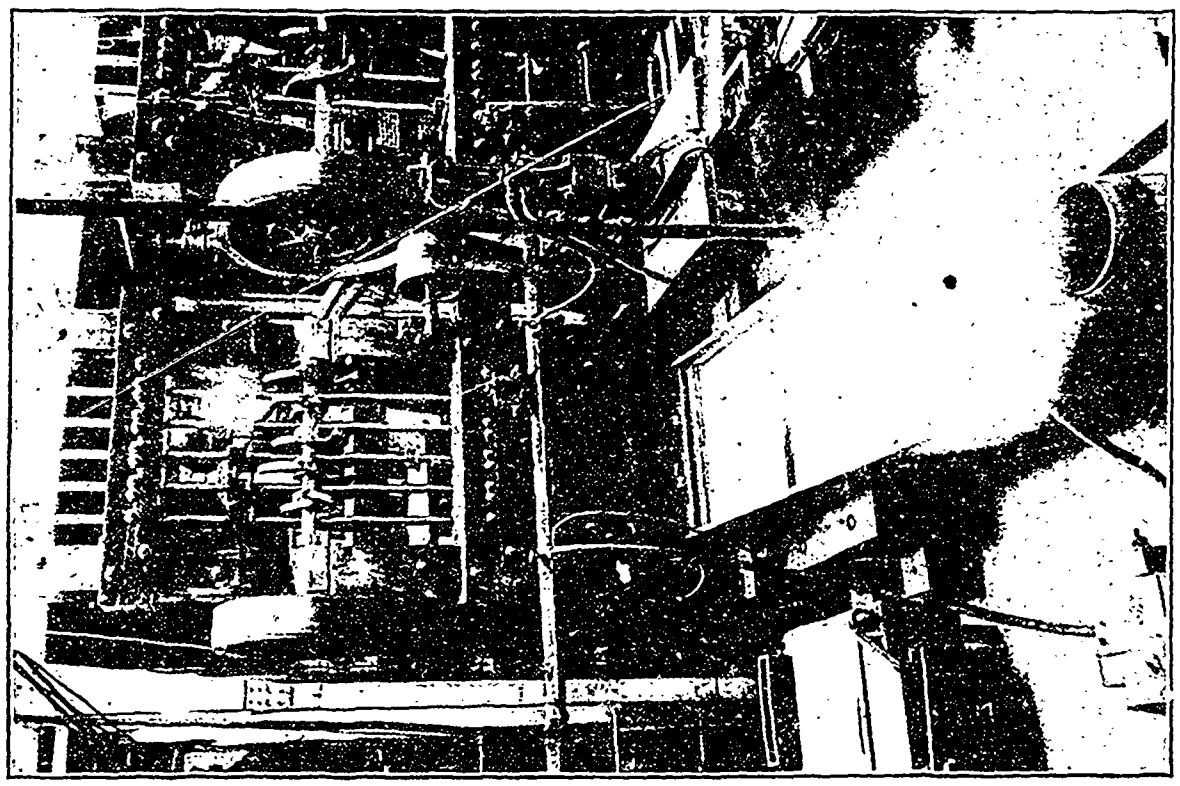

FIG. 9.—Stamp Batteries and Plates, Nos. 8, 9, 10, 37n.

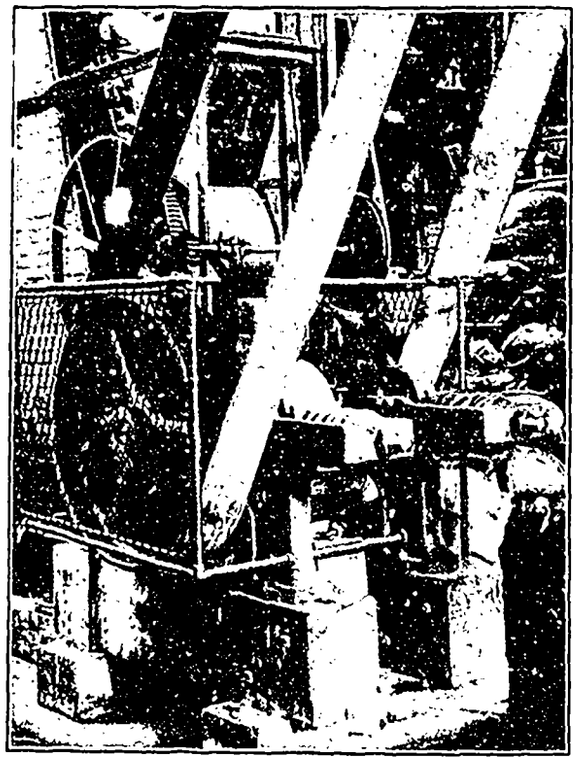

FIG. 10a.—Crushing Rolls, No. 12.

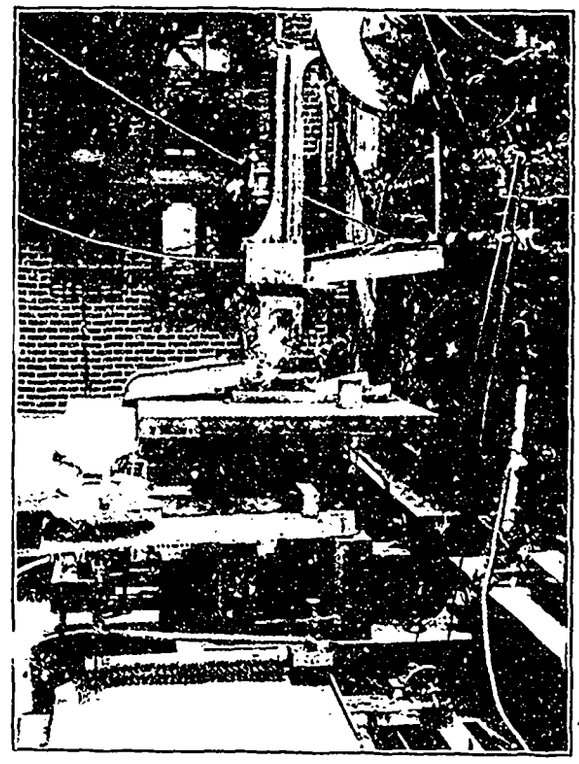

FIG. 10b.—Steam Stamp and Table, Nos. 10, 39, 27, 35.

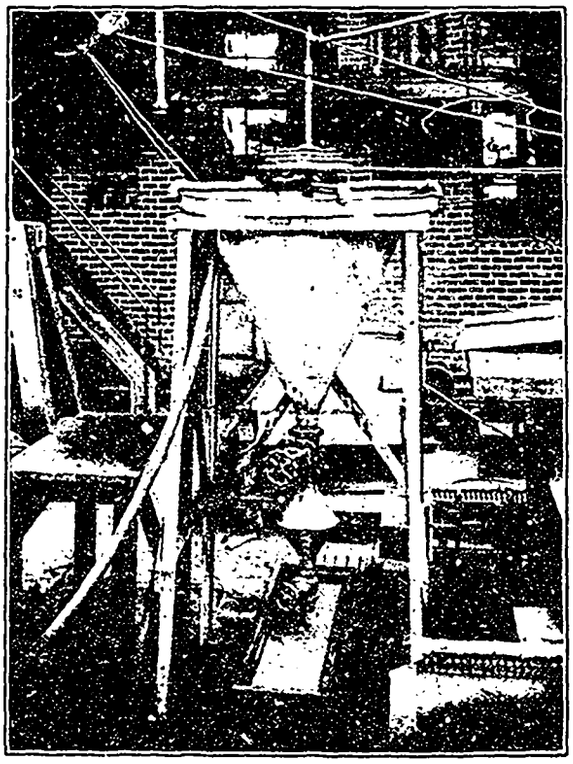

FIG. 11a.—Classifier arranged as Washer for Fine Coal, No. 26.

FIG. 11b.—Wetherill Magnetic Separator, No. 43.

KEY TO FLOOR PLAN OF McGILL MINING LABORATORIES.

ORE DRESSING DEPT.

1. Comet Crusher.
2. Dodge Crusher.
3. Ball Mill.
4. Sample Grinder.
5. Roller Jaw Crusher.
6. Hydraulic Lift.
7. Bridgman Sampler.
8. Five Stamp Battery, 600 lbs.
9. Two Stamp Battery, 1,000 lbs.
10. Steam Stamp.
11. Huntington Mill.
12. Crushing Rolls.
13. Suspended Challenge Feeder.
14. Challenge Feeder, Portable.
15. Tulloch Feeder, Portable.
16. Blake Crusher.
17. Shaking Screens.
18. Shaking Screens.
19. Trommel, with 3 fields.
20. Large Jig, 2 comp.
21. Large Jig, 4 comp.
22. Three small Jigs, 2 comp.
23. Three Vezin Jigs, 1 comp.
24. Spitzkasten, 4 comp.
25. Brown Sizer, 3 comp.
26. Three Large Cone Classifiers.
27. Three small Cone Classifiers.
28. Pointed Box Settler.
29. Three Brass Tube Classifiers.
30. Seven Glass Tube Classifiers.
31. Wilfley Table.
32. Bartlett Table.
33. Bartlett Slime Table.
34. Small Riffled Table.
35. Small Riffled Table.
36. Evans Buddle.
37. Frue Vanner.
37a. Battery Plates, Large.
38. Battery Plates, medium.
39. Battery Plates, small.
40. Amalgamation Pan, large.
41. Settler.
42. Six Amalgamation Pans, small.
43. Wetherill Magnetic Separator.
44. Heberli Magnetic Separator
45. Centrifugal Separator.
46. Pneumatic Jig.
47. Steam Jacketed Drying Table.
48. Steam Jacketed Drying Table.
49. Cyanide Plant.
50. Elmore Plant.

METALLURGICAL DEPT.

60. Brueckner Roaster.
61. Hand Roaster.
62. Blast Furnace, water jacketed.
63. Fore-hearth.
64. Cupellation Furnace.
65. Wind Furnace.
66. Forge.
67. Gas Muffle.
68. Gas Furnace Table.
69. Electric Furnace Table.
70. Chlorination Barrel.
71. Power Saw.
72. Grindstone.
73. Drop Test.
74. Electrolytic Table.
75. Power Lift.
76. Iron Table.
77. Polishing Apparatus.
78. Small Blower.
79. Experimental Open Hearth Furnace.
80. Recording Pyrometer.
81. Soft Coal Muffle.
82. Six Wind Furnaces.
83. Six Muffle Furnaces.
84. Three Gas Muffle Furnaces.
85. Draft Cupboard.
86. Seven Working Benches.
87. Bucking Board.
88. Bullion Rolls.
89. Root Blower.
90. Hydraulic Press.

POWER, ETC.

100. 15-H.P. Motor.
101. 15-H.P. Motor.
102. 15-H.P. Motor.
103. 10-H.P. Motor.
104. 2-H.P. Motor.
105. 2-H.P. Motor.
106. 2-H.P. Motor.
107. 2-H.P. Motor.
108. 1-H.P. Motor.
109. 2-H.P. Motor.
110. Ventilation Fan.

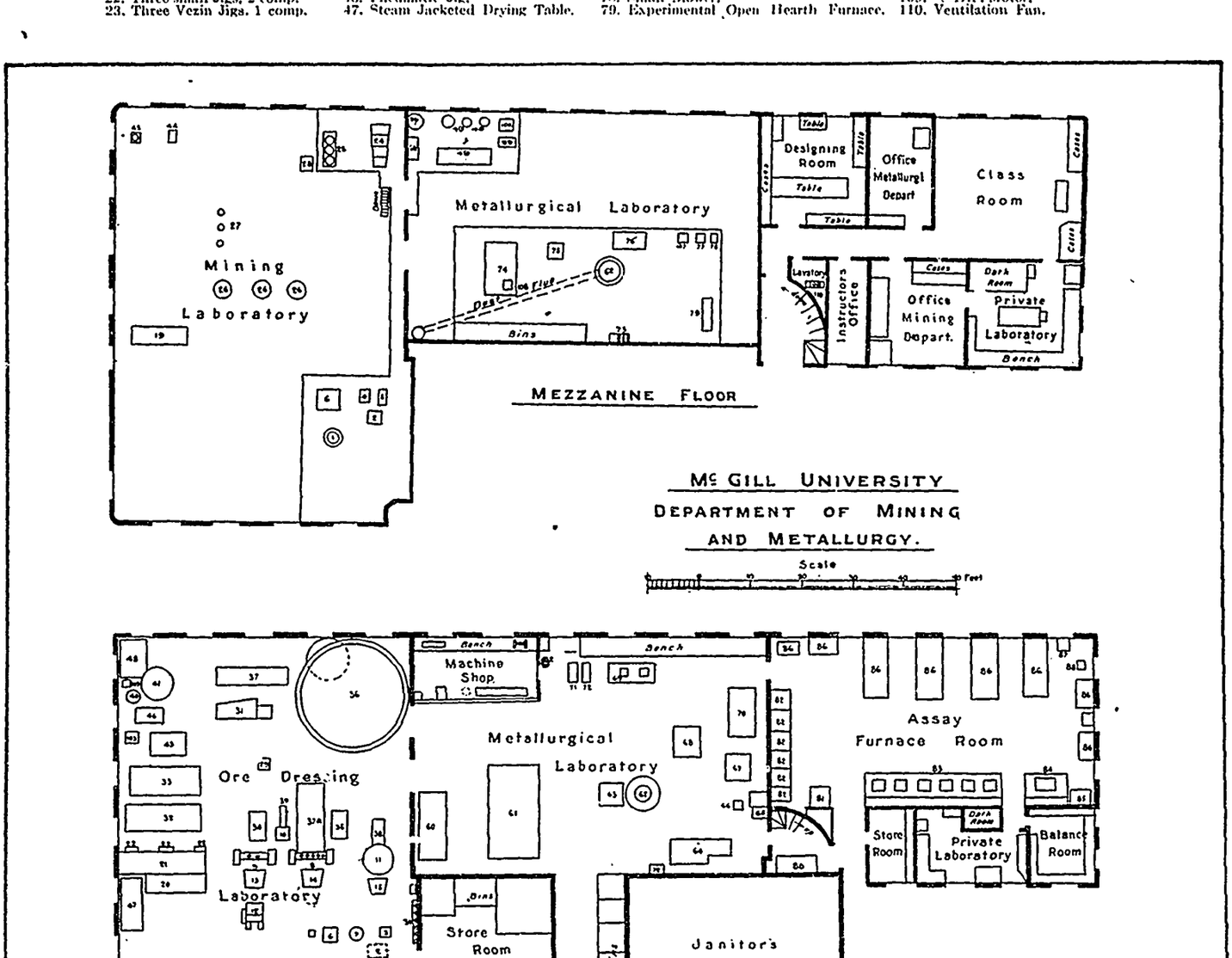


FIG. 12.—FLOOR PLANS OF DEPARTMENT OF MINING AND METALLURGY, McGILL UNIVERSITY.

# THE TEACHING OF METALLURGY IN COLLEGE LABORATORIES, AND A DESCRIPTION OF THE EQUIPMENT AND USES OF THE METALLURGICAL LABORATORIES AT McGILL.

By Dr. A. Stansfield, Montreal,

In writing an account of the Metallurgical Laboratories of McGill University, it became evident that a broader subject, the teaching of Metallurgy in college laboratories, its uses and its limitations, should first be considered. A discussion of the subject accordingly forms the introduction to this paper.

Metallurgical laboratory teaching has not yet reached any standard pattern. The widest divergence of opinions exists with regard not only to the scope of such teaching but even as to whether any metallurgy worthy of the name can be taught at all in the college laboratory.

A recent paper by H. C. Jenkins,* on "The Equipment of laboratories for advanced teaching and research in the Mineral Industries", produced such a crop of discussion in the Institution of Mining and Metallurgy, in London, that it would be hard to find anything to add to what was said of written on that occasion.

Without raising the wider question, whether metallurgical laboratory teaching is worth doing at all, it will be advisable to indicate the uses of such laboratories in metallurgical teaching.

Students on this continent have very great facilities for obtaining practical experience in smelters and metallurgical works both during the annual summer schools that are held in connection with most of our mining schools, and by taking subordinate positions in such works during the long summer vacation. It is therefore unnecessary to attempt in the laboratory to instruct the student in the practical operations of roasting or smelting which he can learn so much more easily and perfectly in the smelter. There are however many parts of a metallurgist's education that can be more easily gained in the laboratory than at the smelter.

The metallurgical laboratories of a university have several distinct uses, all of which, however, should conduce to the education of the student, and these uses may be outlined as follows:—

1. *The use of furnaces and other appliances to illustrate the lectures.*—This is particularly useful in lecturing to junior students who have not yet visited metallurgical works.

For such students the laboratory furnaces, if on a reasonable large scale, tend to give concrete ideas of the real furnaces, and also enable some metallurgical principles, for example the principles involved in firing with hard or soft coal, coke, gas or oil to be presented vividly.

2. *The teaching of fire assaying.*—This, although forming a part of the teaching in metallurgical laboratories, will not be considered in this paper.

3. *The use of metallurgical measuring instruments.*—The pyrometer for measuring high temperatures, the calorimeter for measuring the calorific power of fuels, and the microscope for the examination of steel and other metals are all instruments whose use should be acquired by the metallurgical student.

4. *Properties of metals, fuels, and refractory materials.*—The more important mechanical, physical and chemical properties of the common metals, alloys, fuels, refractory materials and fluxes can be easily learnt with the aid of simple furnaces and appliances in the laboratory, and knowledge so gained is far more useful than if acquired from books.

5. *Study of metallurgical reactions.*—The reactions that are at the root of many metallurgical operations can be studied very perfectly in the laboratory, with the aid of simple and inexpensive appliances. Thus the roasting of an ore can be exactly studied, and the chemical changes that take place, and the temperature necessary for each stage of the process can be determined. Prof. Howe* shows how such work can be carried out by a class of students, but in many cases the object of such experiments would be to improve commercial practice in certain particulars, and should be taken as an advanced student's thesis or even as research work by a member of the teaching staff.

6. *Large furnace runs.*—In laboratories provided with large scale furnaces for roasting or smelting, it is usual to have occasional runs of such furnaces. The lecturer explains beforehand the particular problem that is to be met and the calculations necessary for making up a smelting charge. The students carry out as far as possible the operations during the run, and after the clean up, the result of the run is presented to the class and compared with the results predicted and with the results that would be obtained in actual practice.

When time permits, it is desirable that the students should themselves make the chemical analyses before and after the run, and the sampling of the materials composing the charge and of the products of the run affords valuable experience. The opportunity may also be taken to sample and analyse the furnace gases, determine the furnace temperatures, measure the amount of air entering the furnace, and the amount and rise of temperature of the jacket water in the case of a blast furnace campaign.

Taken in this way a small furnace run has an educational value quite apart from the practical experience gained by the student, and is not open to the criticism of being merely a bad imitation of works practice.

7. *Student's theses.*—One of the most important uses of metallurgical or ore dressing laboratories is or enabling advanced students to attempt to solve some definite problem in connection, for example, with the treatment of an ore. A large number of such problems can be worked out satisfactorily on quite a small scale, and then if time permits can be repeated on as large a scale as the laboratory affords, thus enabling the effect of scale to be quantitatively determined.

Work of this character tends to throw the students largely on their own resources, and affords extremely valuable training, teaching precise experimental methods, careful observation and correct reasoning from the results of experiments; it also encourages initiative in devising new methods.

8. *Use of laboratories by teaching staff.*—Apart from direct use by the students, the laboratories are useful to the staff; their use tends to prevent the teaching becoming too academic in character. Each member of the staff should have some research, either on theoretical or practical lines. Outside testing or experimental work should be undertaken to keep the staff in touch with technical and commercial requirements.

*Trans. Inst. Mining and Metallurgy, London, Vol. XIII.

*H. M. Howe, "Metallurgical Laboratory Notes." In the introduction to this work he discusses the teaching of metallurgy, and insists that principles rather than practice should be taught in the College laboratory.

Any information directly gained in this way is far more valuable than that obtained at second hand or from books.

Having outlined some of the uses of a metallurgical laboratory one can the better consider the actual equipment and how far it comes up to the requirements already outlined.

The laboratories at McGill consist of a furnace room 60 ft. by 38 ft. and 18 ft. high, a smaller room for fire assaying 54 ft. by 24 ft. and smaller rooms for balances, chemical and photographic work, microscopy and pyrometry.

GENERAL SUMMARY OF EQUIPMENT.

The main laboratory contains a water jacket blast furnace with interchangeable crucibles for smelting either lead or copper ores, a reverberatory roasting furnace, a Bruckner roaster, a cupellation furnace, and a chlorination barrel.

These appliances are on a relatively large scale, and will be described later in detail.

There is also a large, 17 inch, crucible furnace provided with forced draft, a large gas muffle furnace or forge, a brick topped table with gas and air connections for experimental gas furnace work, another brick topped table equipped for electric furnace work. A table with terminals for low voltage current for electrolytic experiments and a model open hearth regenerative gas furnace.

The fire assaying room contains a number of wind furnaces and muffle furnaces for coke, soft coal, oil and gas which will not be considered in the present paper.

The several furnaces may now be considered in detail with the uses to which they can be put.

*Bruckner roasting furnace.*—The rotating drum has an external diameter of 2 ft. 8 inches, and a length of 5 feet, and is lined with 4½ inches of fire brick. It is fired by means of soft coal or wood in a movable firebox. The charge of ore used is about 250 lbs.

*Reverberatory roasting furnace.*—A view of this is given in Fig. 7b. The hearth measures 6 ft. by 14 ft. internally, and will take about 1,500 lbs. of ore.

There are three working doors on each side of the furnace. The flue descends at the end of the furnace and returns beneath the hearth constituting a dust chamber.

The fire box was originally 4 ft. by 2 ft., but the consumption of coal has been greatly reduced and the efficiency of the furnace increased by reducing the fire box to 3 ft. by 1½ ft. and introducing a steam jet forced blast into the closed ash pit, thus turning the fire box into a gas producer.

The chemical and physical changes that take place during the roasting of powdered ore can be studied quite as well if not better in a small gas fired muffle furnace, but the reverberatory furnace affords approximate information with regard to the roasting of any particular ore on the large scale, and has much educational value in regard to the economical firing of such furnaces. One of the difficulties connected with the use of large reverberatory furnaces in the laboratory is the great length of time that must elapse before the furnace has become thoroughly heated.

A large roasting furnace is sometimes necessary in order to roast quantities of ore for subsequent smelting operations.

The stall or kiln roasting of lump ores of copper has been successfully carried out on a small scale in one of the wind furnaces.

*Water jacket blast furnace.*—This is circular, having an internal diameter of 21 inches at the tuyeres, and 33 inches at the top of the jacket. The height from tuyeres to charging door is 7 ft.

There are 3 tuyeres of 2½ inches diameter, and the furnace is blown by a No. ½ Root's blower driven by a 15-h. p. electric motor.

There are two crucibles both on wheels, the one for lead smelting containing a large well with the usual siphon tap for the lead, and spout for the slag. The copper crucible is much shallower, and originally the matte and slag were tapped periodically into slag pots where the matte settled by gravity and was separated from the slag when cold. The slag obtained in this way was never very clean, and experiments were made first with an internal crucible, tapping the slag and matte off at different levels; and finally by adding a fore-hearth in which the matte settled from the slag. The fore-hearth is 34″ by 25″ by 19″ high externally, and is lined with ½″ asbestos, 2½″ of fire brick and 2″ of brasque and covered with 3″ fire clay tiles, as it was feared that a fore-hearth with so small a flow of slag and matte would be apt to freeze up. To further prevent loss of heat, the usual spout between furnace and fore-hearth is omitted, and the molten charge allowed to enter the fore-hearth through a covered channel below the level of the slag in the fore-hearth. It is in fact the Herreshoff fore-hearth, but without any water cooling.

As a further precaution a gas blowpipe is arranged so that a flame could be introduced between the surface of the slag and the tile cover if any signs of freezing are observed.

A granulating apparatus is arranged to deal with the slag and works satisfactorily. The general arrangement is shown in Figs. 3 and 4. The slag from the fore-hearth is very much cleaner than has previously been obtained.

The blast furnace can easily be blown in, run for two or three hours, and blown out during the student's working day, the crucible and fore-hearth having been heated up previously; but the work of cleaning up and preparing for the next run is very considerable.

During the run, in addition to weighing and charging the ore, fluxes and coke and to manipulating the molten slag and matte, the students are required to determine the volume and temperature of the jacket water, the speed of the blower, pressure of blast, condition of furnace at the tuyeres, and on top of the charge, rate of flow of slag, and of granulating water, etc., and the data so obtained are worked up and form the subject matter of a subsequent lecture after the necessary analyses have been made.

Having obtained satisfactory slag settling facilities, the next problem to be attacked was that of pyritic smelting, and the first experiment made in that direction met with a reasonable degree of success, the slag and matte analyses agreeing very closely with the predicted values and interesting information was obtained from the gas analyses.

The author considers that these furnace runs very greatly increase the value of the lectures on this branch of the subject.

In running a blast furnace, even so small as the one at McGill, it is noticeable that the students are apt to be occupied by the actual operations of weighing, charging, tapping, etc., to such an extent that they are likely to lose the educational value of many of the phenomena to be observed. As it is not intended to train the students as expert weighers, chargers or tappers this preoccupation with the actual operation is apt to detract from the educational value of the run, and as far as the investigation of the principles of

smelting goes a furnace on even smaller lines would answer every purpose, and would have the additional advantages that less ore and fuel would be needed, that the students could be left more entirely to their own devices in running the furnace, and that they would be able unaided to clean up the products of the run and make out balance sheets.

The author has on two occasions built and operated with students small brick furnaces 9″ sq. inside, and has smelted in each a few hundred pounds of copper ores without serious difficulty. As so small a furnace would inevitably freeze up if it were attempted to tap the products. A small fore-hearth was added and the molten products were kept hot by a flame issuing from the crucible of the furnace.

Working on a small scale, it is usually impossible in furnace work to imitate both the arrangements and the results of large scale operations. One may build and operate a model furnace, but it will not usually give normal results. To obtain good conditions, it is usually necessary to depart widely from the adopted type of furnace—such changes being due mainly to the very much greater loss of h at that occurs on the small scale.

In metallurgical laboratory teaching, when this alternative offers, the author would not recommend in general that the works pattern should be followed, but that an entirely new furnace should be designed that will enable the principles to be experimented with and demonstrated, and have perhaps a few large scale appliances that can be at once models and working furnaces.

*English Cupellation furnaces.*—This furnace was originally installed as the smallest furnace that could be obtained ready made that would serve as a reverberatory smelting furnace. It is obvious that a metallurgical laboratory would not often have enough argentiferous lead to need the use of a 48″ by 30″ test. The furnace has been used for smelting lead ores and it is intended to remodel it with a view to the regular smelting of either lead or copper ores. In this, as in the roaster furnace, a steam jet forced draft has been added with great advantage.

*Crucible furnace.*—A crucible furnace 17″ sq. has been provided with forced blast, and it is easy in this furnace to melt steel in crucibles or to test the fusibility of refractory materials.

The blast for the blast furnace and for the crucible furnace is furnished by a No. ½ Root's blower driven by 15 h.p. motor. For small gas furnace work a 1 h.p. blower giving up to 1 lb. pressure has been added to avoid running the large blower and motor.

*Gas furnaces.*—For metallurgical teaching and research purposes, the ordinary city gas affords an ideal heating agent for many purposes, and as Prof. Howe very clearly points out, it is better in general to use a fuel that will afford constant, easily regulated and definite conditions of temperature and of atmosphere in which to study definite metallurgical problems, than to introduce at the same time the difficulties connected with the use of coal or other solid fuel.

A 1 h.p. high pressure blower has recently been installed and piped to different parts of the laboratory and with the aid of some home made blow pipes of various sizes and a few fire bricks it is easy to construct small furnaces as occasion arises.

A brick topped table (Figure 3) provided with a hood and connections for gas and air is specially convenient for this class of work, while a combined forge and muffle furnace obtained from the American Gas Furnace Company has proved very convenient for roasting small quantities of ore, for fire assaying and for researches in which a number of bars of steel were heated nearly to their melting temperature in order to ascertain the conditions under which steel became "burnt" and the true nature of the so-called burning.

Those who have designed model furnaces may be interested to hear of a model open hearth furnace constructed at McGill. It was built as a model on the 1 inch to the foot scale of a 50 ton tilting open hearth furnace, with the exception that coal gas was used and that chequers were provided only for the air. Without going into detail, it may be said that using an amount of gas proportionately, about equal in heat value to that used in the large furnace, the chequers did not have nearly the effect that was expected, and it was found that on account of the relatively larger area of the walls of the small scale furnace, and the actually smaller thickness of the walls the loss of heat was so great that the chequers never became thoroughly heated.

Using a larger supply of gas the supply of preheated air was inadequate to burn it, and it became obvious that for small scale gas furnaces the gas blow pipe with air preferably preheated in a pipe stove was decidedly more efficient, and that in order to exhibit the effect of chequers in preheating air the furnace would have to be built larger, using producer gas, or else the most extreme care should be taken to avoid loss of heat by the use of thick walls containing very poorly conducted layers, such as asbestos pulp.

It is intended to construct a small gas producer with a view to illustrate details in the production and uses of gaseous fuel.

*Electric furnaces.*—A brick topped table (Fig. 2) has recently been constructed to which not only the electric current but also gas, air and water has been led. The gas and air being intended as a substitute for the more costly electric power for the drying and preliminary heating of certain of the electric furnaces; while water is sometimes needed for cooling the terminals and metal casings of furnaces.

Many varieties of electric furnace have been experimented with, but owing to the relatively high voltage and low current available, the arc furnaces have been more generally useful. The horizontal arc furnace of Moissan has been found especially useful in melting metals for demonstrational purposes. The vertical arc furnace is also useful for melting metals and for reducing metals from their ores. The production of calcium carbide in this form of furnace has been found to be a suitable exercise for class purposes.

For the electrical smelting of ores, furnaces of the Heroult type have been used in which two vertical carbons dip into the furnace and arcs are formed between these and the charge. Resistance furnaces are more satisfactory for many purposes than are furnaces, but the necessity of using current at 110 volts renders small resistance furnaces exceedingly wasteful of power.

The power available for electric furnace work is about 200 amperes of direct current at 110 volts, and while this is sufficient to exhibit the principles of electric heating and to enable many experimental points to be determined, it is inadequate for carrying out electric smelting even on the smallest satisfactory scale, especially when low resistance furnaces have to be used. It is hoped that a sufficient supply of alternating current at 110 volts and a transformer for reducing to lower voltages will be provided to enable

some of the newer processes to be worked out on a scale that would afford information to intending manufacturers, and training for students who wish to specialize in electro-metallurgy.

*Microscopy.*—The outfit consists of cutting and polishing machinery for preparing the specimens of steel or alloy, a special microscope for examining the specimens and a long photographic camera for recording the microscopic structures so revealed.

*Pyrometry.*—A thermo-electric pyrometer is usually employed for measuring temperatures in the laboratory. This is connected to a galvanometer which indicates the temperature, and a photographic apparatus enables continuous records of temperature to be obtained. Several pyrometers of the Callendar type are also available for use.

*Calorimetry.*—A Mahler bomb calorimeter is used for determining the calorific power of fuel.

*Analytical work and fire assaying.*—The students are expected to have attained to a reasonable degree of proficiency in these subjects before commencing their final year's work, and the laboratory work in that year is so arrainged as to involve some quantitative chemistry and fire assaying, thus enabling the students to make use of the knowledge they have gained in these methods. The necessity for a reasonable degree of speed and reliability in their work is impressed upon them in this way, and they become more ready to carry out such work at short notice.

*Electrolysis.*—A table has been fitted up for electrolytic work, being provided with a 1 h.p. 10 volt dynamo driven by a 1 h.p. motor, a small storage battery has been added to enable experiments to be left running over night.

Within the limits of this paper it has been impossible to do more than hint at most of the experiments that have been made or can easily be carried out in these laboratories; the limiting consideration is usually the short time at the disposal of the student rather than any limitations of the laboratory. Nevertheless the author is only too painfully aware of deficiencies in the equipment, and endeavors as time and money will permit to raise the standard both of the laboratories and the work that is done in them.

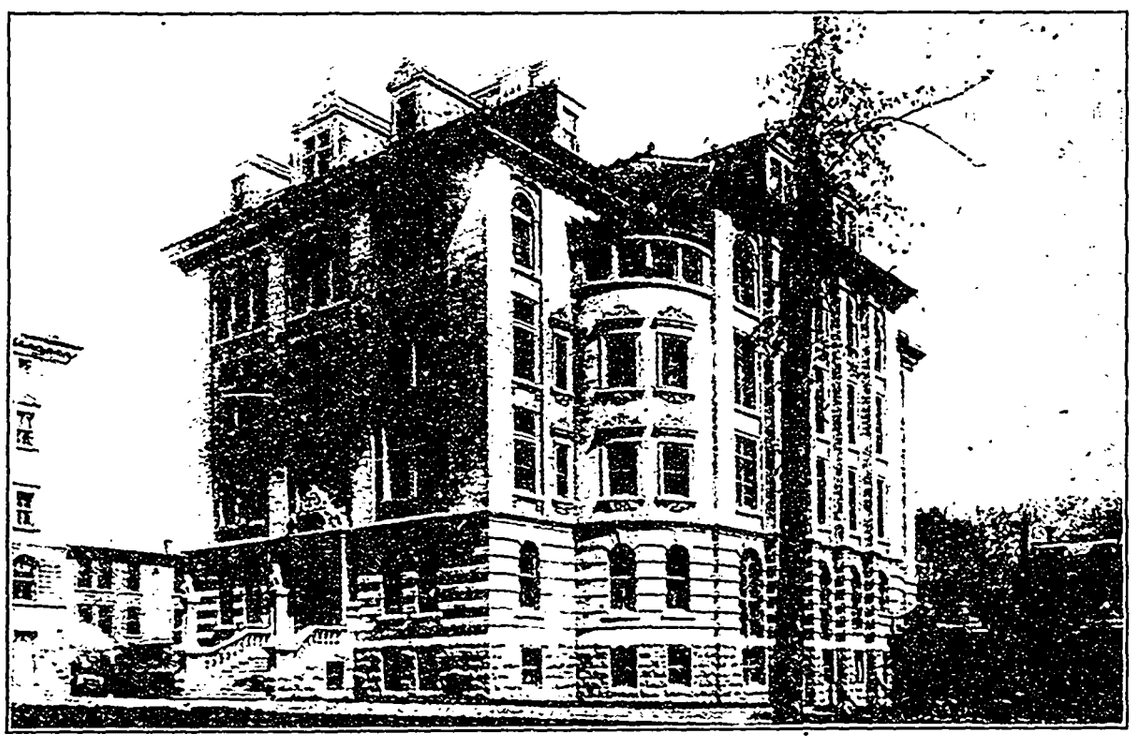

FIG. 1. Macdonald Chemistry and Mining Building, McGill University.

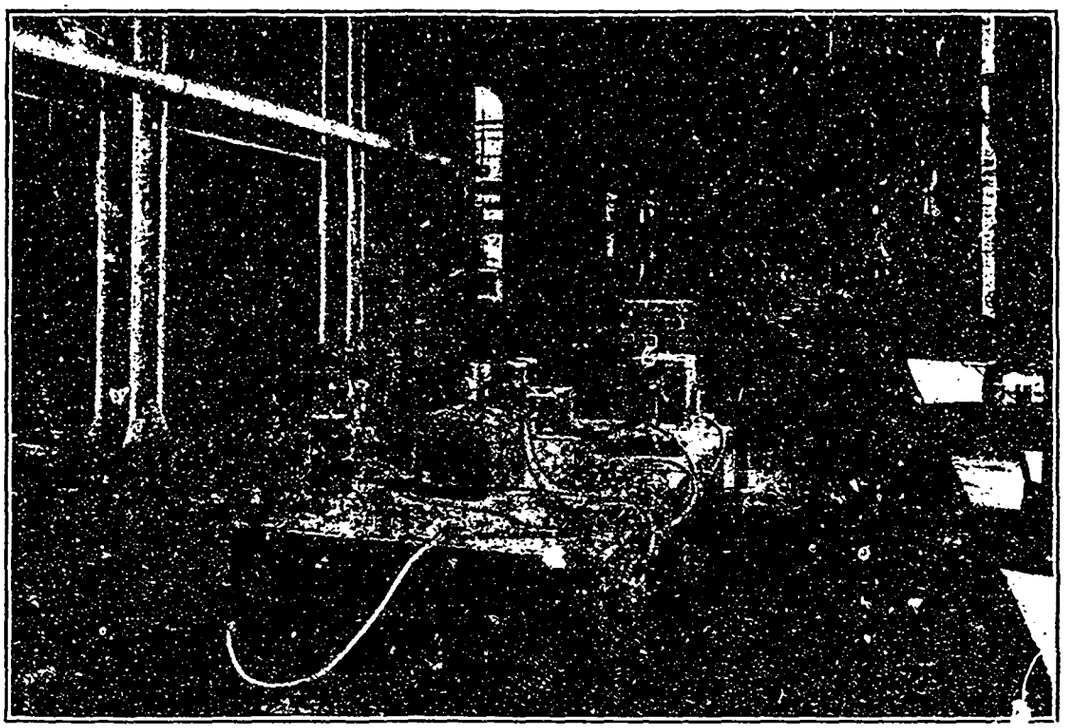

FIG. 2.—Electric Furnaces, No. 69.

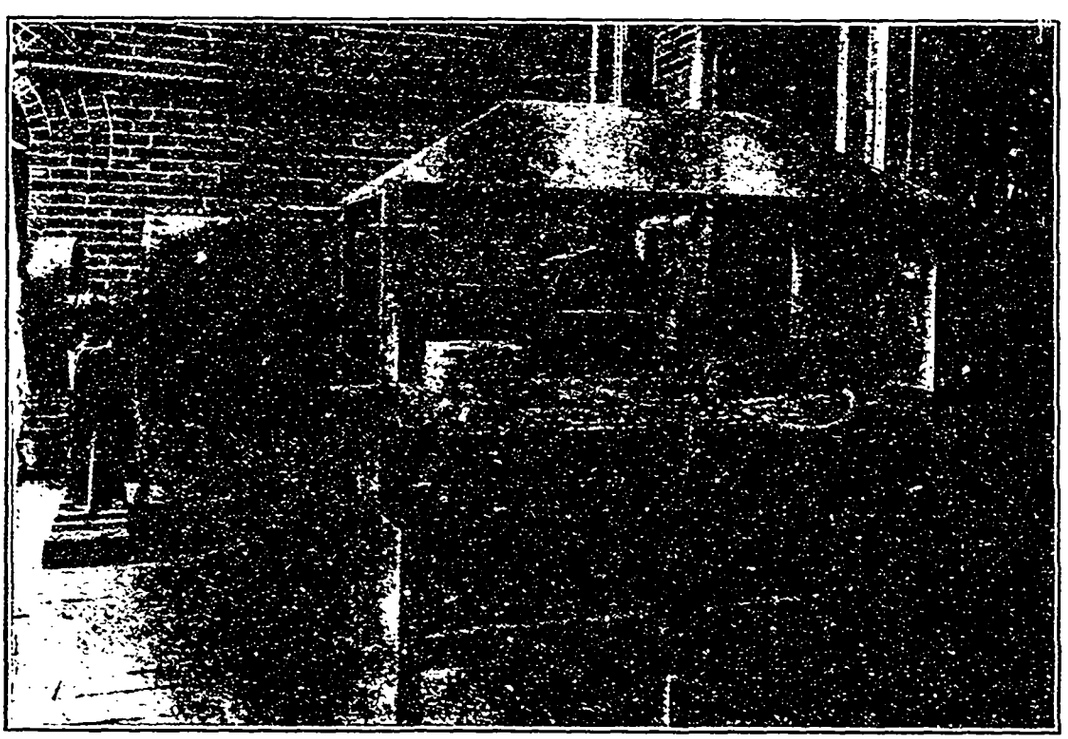

FIG. 3.—Gas Table, Gas Muffle and Chlorination Barrel, Nos. 67, 68 and 70.

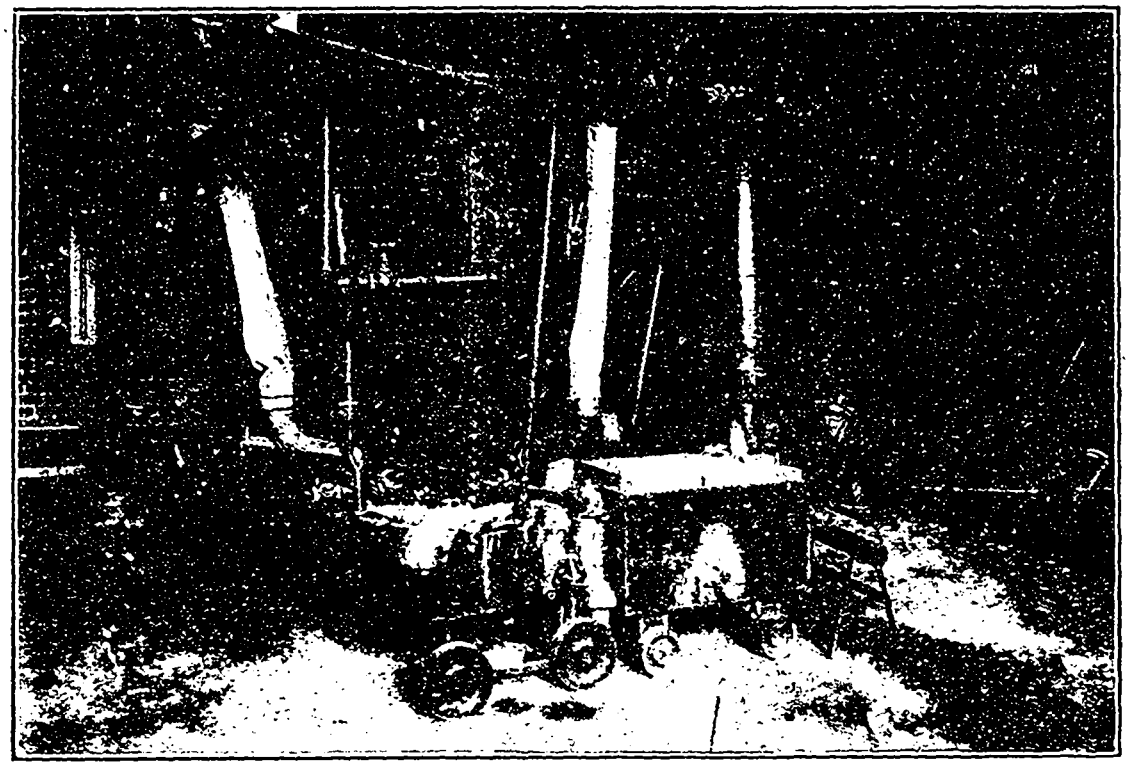

FIG. 4.—Water Jacket Blast Furnace and Fore Hearth, Nos. 62 and 63.

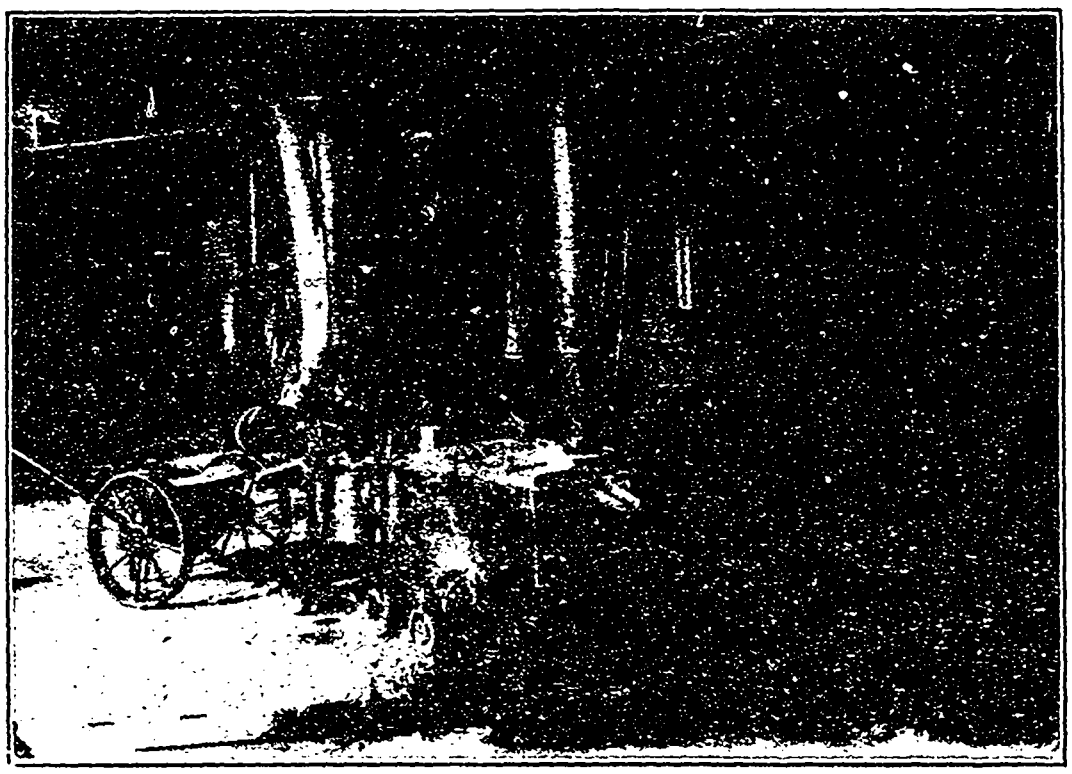

FIG. 5.—Water Jacket Blast Furnace and Fore Hearth, Nos. 62, 63.

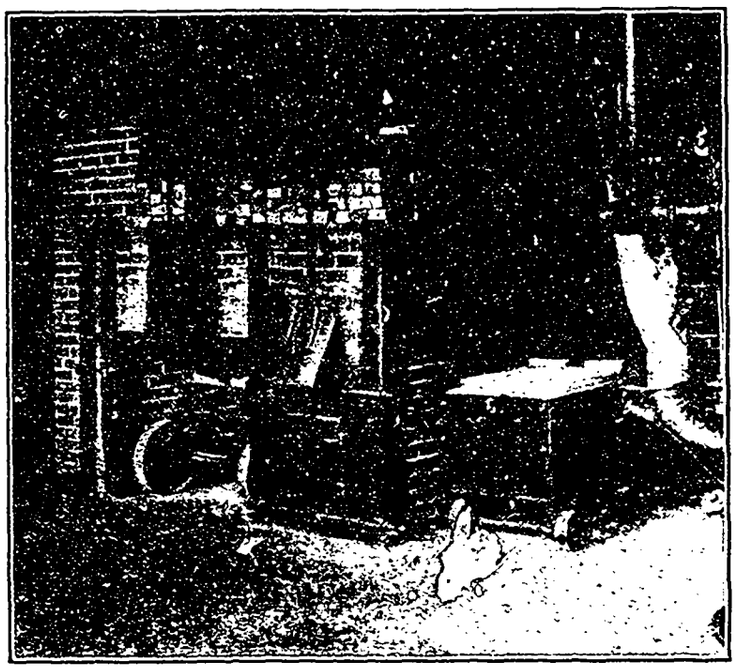

FIG. 6.—Cupellation Furnace, No. 64.

FIG. 7a.—Experimental Open Hearth Furnace, No. 79.

FIG. 7b.—Hand Reverberatory Roaster, No. 61.

## MR. N. D. DARU.

Mr. Nanabhai Dayabhai Daru, B. Sc., B. A., of Bombay, B. Sc. in engineering and metallurgy, London, an Associate of the Royal School of Mines and Barrister at Law, is at present in Ottawa, being an attaché of the Indian Government to the Geological

Survey of Canada. Mr. Daru is a native of Daru-Falia Surat, India, and has been sent to Canada by the Indian Government to study the methods employed in mining in this country. He is under instructions to make a thorough of this subject, and to remain in the Dominion for two years, during which time he will visit the principal mining centres. Mr. Daru has already made many friends in Canada, especially among the mining fraternity.

## ECONOMICAL COAL MINING.

One of the most successful and interesting electric coal mining equipments is found at the Tropic Mining Company's mine located on the Zanesville & Western R.R. at Deaverton, Morgan County, Ohio. The Tropic Mining Co., here operate in the No. 6 seam, which has an average thickness of 3'—8" the coal being of very excellent quality, and is known on the market as the "Celebrated Tropic Coal."

The average daily output of the mine is about 1,400 tons run of mine coal in 8 hours. In order to reduce the cost of mining and decrease the percentage of "slack", nearly all the mining is done by chain machines. The Tropic Mining Co., have installed an electric plant which furnishes power to the mining machine, electric locomotive and stationary motors. The power plant consists of two 100 K.W.-250 volt direct current, belted generators, built by the Jeffrey Mfg. Co., of Columbus, Ohio, each generator being driven by a 16" x 6" McEwen Engine. The switchboard is of the skeleton type and equipped with necessary instruments and switches for controlling the dynamos. Steam is supplied by a battery of two 72" x 18' Atlas boilers equipped with the necessary apparatus for supplying feed water to the boilers. In the power house is also installed a double reversible 10" x 12" hoisting engine with two 3' 6" drums, which furnishes power for the rope haulage installed for handling the cars on the slope. The length of the rope haulage is about 1,200 feet the maximum grade being 15 per cent. Twenty cars is the average number hauled per trip, the empty cars being returned down the slope by gravity. The entries are driven 16 feet wide with an average height of 4' 6". The rooms are driven to a depth of 250 feet and a width of 30 feet the room necks being 12 feet wide. There is at present installed 9 electric undercutting mining machines of the chain type. Eight of the machines were furnished by the Jeffrey Mfg. Co., of Columbus, Ohio, and are of their well known Class 17-A. machines, making an undercut of 6 feet in depth and 44 inches in width. The average number of runs per day of eight hours in 40 runs and the maximum runs each machine is sixty. The mining machines are equipped with self-propelling arrangement by which they can readily be moved from one point in the mine to another without delays.

On account of the thin vein 3' 8" only very small mules or ponies can be used for gathering the cars from the face workings. The weight of the mules employed is between 500 and 600 lbs., the maximum height of the mules being 52". The coal is gathered to four different partings by 14 mules and 14 drivers, each mule with driver gathering on an average of about 120 cars per day. This includes coal, slate and other materials which are taken out of the mine.

Each driver takes care of about 14 rooms and at present the average length of the mule haulage is 900 feet. To haul the mine cars from the partings to the bottom of the slope, a six ton Jeffrey standard type electric locomotive is employed. The locomotive averages about 60 trips per day of eight hours and handles between 1,200 to 1,350 cars per day. The average length of haul from the four partings is about 1,200 feet, there being but very slight grades against the "loads" the maximum being about 2 per cent. and this only for a short distance.

The locomotive haulage is laid with 30-lbs. steel rails, but in the rooms the weight of the rails is 16 lbs. per yard. The locomotive when delivering the loaded cars to the bottom of the slope has to make a "flying switch" for a side track, and as portion of the track on which the loaded cars are delivered is on a grade, it is necessary for the locomotive to pass over the switch at full speed in order to give the loaded trip enough momentum to clear the switch at the side track. The trip rider uncouples the cars and the switch is thrown automatically by the locomotive as it passes. The locomotive handles from 18 to 30 cars per trip, the weight of loaded cars being 3,900 lbs.

The tipple designed for an output of 2,000 tons of coal per day, is equipped with an automatic Phillips cross over dump, which readily handles the output of the mine. The blacksmith shop is equipped with a four horse power stationary motor which furnishes power to drive the blowers for the forges and other shop tools.

All apparatus at the mine is handled on an efficient and systematic schedule which makes possible a maximum output at a minimum cost of production. The Tropic Mining Co., of which Mr. George M. Jones is President has its main offices located at Toledo, Ohio, the mine being in charge of Mr. J. D. Jones, General Manager of the Company.

## THE ASHLAND EMERY AND CORUNDRUM OCMPANY.

This company is now operating the Burgess corundum in the town of Carlow, Ont. and, it is reported with manifest success. The plant consists of a mill 110 by 60 feet. There are six concentrators, in which the crushed material is treated, the iron being eliminated by means of a revolving magnet. The Wilfley tables of the latest pattern are used, the system of dry concentration being practically the same as used in gold reduction mills. The company have ordered $20,000.00 worth of additional machinery from England, which is about to be installed. The power is furnished by a 70 h.p. engine, with two 70 h.p. boilers. Thirty-five men are employed. The company owns the water power at Little Carlow, from which electric power can be developed.

## LE ROI DIVIDENDS.

On Feb. 28th, the shareholders of the Le Roi Mining Company received a dividend for the first time since November, 1899. The amount paid to date by this mine, exclusive of the last dividend, was $1,305,000. With this last payment of $75,-000.00 added the total distribution for the present company now amounts to $1,380,000.00.

The Le Roi Two is now engaged in extracting ore from what is the longest ore shoot that has yet been located here, 1,200 feet, with a width of from three to three and a half feet, and, what is more important, the ore carried by the ledge is of a high grade. Besides this, there has been found on the 1,350-foot level of the Le Roi Two a good shoot of ore of a shipping grade, which is 750 feet below the point where the long and rich shoot is located.

## ATIKOKAN IRON MINES.

A spur line is being built at the Canadian Northern Railway from its main line to the Atikokan Iron Mine, 135 miles west of Port Arthur. It is expected to be ready for operation within the month.

## THE MINING SHARE MARKET.

Specially reported for the CANADIAN MINING REVIEW, by Robert Meredith & Co., Mining Brokers, 57 St. Francois Xavier Street, Montreal.

Since we last reported a great change has taken place in the market for mining shares. The activity throughout British Columbia has drawn public attention to the shares of companies in that district, and the reports from Cobalt, have inaugurated a regular little boom, causing the floatation of several companies, the stocks of which are selling at a premium before their actual value has been determined.

There is abundant evidence that this year is going to see great activity in mining, throughout Northern Ontario, and British Columbia. In the latter province, even now, the smelters are all running, plans are out for increased capacity, and the output of ore is daily increasing.

Mining is being carried on, on practical business methods, already some companies are on a dividend paying basis, and the prospects are that others will join them.

For some time past, there has been persistent buying of all the loose stock in the market, and now it is impossible to pick up any large blocks of stock at anything like quoted prices. The few small amounts offering are gradually being taken up, but as there is nothing like a boom, and the situation is perfectly healthy, there is every reason to expect an advance not only in the good dividend paying stocks, but also in many of the long forgotten, low priced, low grade properties.

The latest quotations are as follows:—

| | Bid. | Asked. |
|---|---|---|
| Can. Consolidated Mines | 135.00 | 138.00 |
| Centre Star | .45 | .46 |
| Can. Gold Fields | .07¼ | .07½ |
| Granby Consolidated | .13 | .13¼ |
| St. Eugene | .90 | — |
| Rambler Cariboo | .39 | .40 |
| North Star | .03½ | .06 |
| Monte Christo | 02¼ | .03 |
| White Bear | .02 | .03 |
| California | .02 | .02½ |
| Virginia | .02 | .05 |
| Deer Trail | .02¼ | .03 |
| International Coal | .35 | .36 |
| Sullivan | 03 | .04 |
| Jumbo | .29 | .30 |
| Roselle | .24 | .25 |
| Cariboo-McKinney | .01½ | .02 |
| Dominion Coal (common) | .78 | .80 |
| Dominion Coal (preferred) | 120.00 | 122.00 |
| Dominion Iron and Steel (common) | .33½ | .34 |
| Dominion Iron and Steel (preferred) | .81½ | .82 |
| Intercolonial Coal (common) | 80 | .86 |
| Intercolonial Coal (preferred) | .98 | 100 00 |
| Nova Scotia Steel and Coal | .63 | .64 |
| Nova Scotia Steel and Coal (preferred) | 118.00 | 120.00 |

## COURT DECISIONS.

### DECISIONS IN IMPORTANT PATENT CASES.

A number of decisions have recently been rendered by various courts throughout the country bearing upon various branches of the electrical industry and of more than usual interest.

In the United States Circuit Court of Appeals for the Third Judicial Circuit in Philadelphia a decision was handed down in an appeal from the Circuit Court for the Eastern District of Pennsylvania in the case of the Westinghouse Electric & Mfg. Company against the Cutter Mfg. Company. This suit involves an infringement of the Wright & Aalberg patent on automatic circuit breakers of the edgewise shunt carbon type in which the shunt carbons are at the top of the device and the movable contacts are carried by a long swinging arm equipped with toggle mechanism for giving it a wide throw in opening the circuit. This general type of circuit breaker has been regarded as the most practical device for interrupting circuits carrying heavy current exclusive of the oil break or magnetic blowout circuit breakers. The Court in its decision enjoined the Cutter Company from the manufacture of circuit breakers which come within the claims of the Wright & Aalberg patent.

In the United States Circuit Court for the Southern District of Ohio, the Court sitting at Cincinnati, the case of the General Electric Company against the Bullock Electric Mfg. Company was decided in favor of the former. This suit involved the Reist patent on the manufacture and sale of armatures for dynamo-electric machines ventilated by having certain forms of space-blocks inserted between the different groups of laminæ forming the core or magnetic circuit of said armatures. His Honor Judge Thompson in his decision restrained the Bullock Company from infringing upon the patent in question. The court held that two forms of ventilators being involved in this suit both were infringements. The result of this decision as construed by the court established the fact that all forms of ventilated armatures now in practical commercial use came within the terms of this patent. Its importance therefore is at once apparent.

In the case of the Westinghouse Electric & Mfg. Company against the Diamond Meter Company, of Chicago, an interlocutory decree was filed by His Honor Judge Humphrey in the United States Circuit Court for the Southern District of Illinois, sitting at Peoria. In this decree the Diamond Meter Company is permanently enjoined from manufacturing, using, or selling induction wattmeters under the Tesla Patents Nos. 511559 and 511560.

In the United States Court at Cleveland, Ohio, His Honor Judge Tayler recently enjoined the Milloy Electric Company from making, selling or using trolley stands or Milloy trolley bases. This suit involves a charge of infringement of the Van Depoele reissue trolley patent No. 11,872 of the Thomson Houston Electric Company. The Thomson Houston Electric Company recently entered suit against the Holland Trolley Supplies Mfg. Company, of Cleveland, Ohio, for infringement of the Van Depoele trolley stands. The United States Circuit Court for the Northern District of Ohio and Judge Tayler in his decision enjoined the Holland Company from making, selling or using trolley stands or Holland trolley bases.

Lasell v. Hannah, an appeal from the Supreme Court of British Columbia, was taken up in the Supreme Court of Canada. The appellant bought the action claiming from respondent 12,500 shares of stock in the Thistle Gold Co., and to restrain the winding up of the Sutherland Gold Mining Co. The questions in dispute arose out of an alleged agreement in respect to operating certain gold mining locations in the Cariboo district, British Columbia. At the trial Mr. Justice Martin dismissed the action as regards the Thistle Gold Company, and condemned the defendant Hannah to hand over the shares to Lasell, or alternatively for $12,500 with costs. This decision was reversed by the judgment appealed from on the ground that the agreement amounted to a conspiracy to deprive other shareholders in the gold mining company of their interests. Hon. C. Wilson, Attorney-General for British Columbia, for the Appellant, Ewart, K.C. and Morphy for respondent. Judgment was reserved.

## COBALT NEWS.

A uniform report states that metallic gold has been found in the diabase near the head of Cross Lake. While this is news to a majority, it is a fact that metallic gold is occasionally found in the ore of the Drummond Mines, Ltd., and has also been found on the Buffalo property, and again to the north of Clear Lake.

A diamond drill to test what is at the bottom of Cobalt lake arrived at Cobalt recently and will shortly be put in commission. Where the drill will work there is some forty feet of water.

The enterprising citizens of Cobalt are mooting the building of a trolley line to connect the towns of New Liskeard, Haileybury and Cobalt.

Quite a lot of machinery has been sent into Cobalt during the last six months, and orders have been placed quite recently for new plants to go to the Ker Lake property, and to the property now being developed by Messrs. Rothschild and others. It is understood that both of these orders went to the Canadian Rand Drill Company.

Reports of the finding of gold between Sassaginaga Lake and Clear Lake are numerous, and it is believed that a valuable gold discovery has been made there.

The rubbish that is being talked and written about a market for Cobalt, and the ores of the Cobalt camp does not create any excitement in the town. The men who have been selling ore know too well the difficulties which are attached to their ore to believe that any cheap and simple process will speedily be found.

The Silver Lead Mining Company has sold its property to an American Company for $210,000.00 after spending in developing and prospecting only some $4,000.00. The property is situated near Ker Lake.

The Chief of Police at Cobalt states that theft is a thing unknown in the district. Prospectors can leave their tools on a claim for weeks and go back and find them safe; the same way in the town. The mines are shut down on Sunday, and the day is well observed. However, it is understood that the Government has decided to take precautionary measures for the enforcement of law and order in Cobalt in view of the anticipated rush to the district this spring.

Prospectors are strongly of the opinion that a mining inspector should be stationed at Cobalt, in view of the importance of the camp. Many lots are frequently awaiting inspection. The local press is bringing the matter to the attention of the public, and of the Government, and also of the Minister of Lands and Mines.

Development work is progressing very extensively southwest of Cobalt. Finds of all kinds are made or reported daily, but prospectors naturally do not talk about what they have until the prospector has passed their claim.

A new company has been formed in Haileybury, to be known as the Silver Lake Mining Company. They have several lots in Coleman and Bucke, which they will develop at an early date.

Numerous fake companies are reported to be operating on the basis of properties in Cobalt. Some of these properties are not for sale. Some of the companies have no property, or if they have it is not within the mineral belt. One advertisement announces that there is a vein of calcite on the promoter's property. Probably the statement is true, but it is apparently intended to deceive the ignorant, who are not aware of the nature of calcite.

It is generally expected that by October next the Government will open five square miles of the Gillies timber limit to prospectors. In anticipation of this the firm are now putting a camp on that part of the limit from which prospectors are excluded, and by the opening of spring it is thought the greater part of the timber will have been cut and shipped.

A report from Cobalt says: A stock exchange will soon be one of the institutions here, a charter has been applied for and is expected any day, a site for the building has been secured for $8,000, and a commodious structure will be at once erected pending the erection of the permanent exchange. The building has been secured where business will be carried on temporarily. It will be open call, and nothing but the best properties listed, wild cats will be carefully excluded. The prices for seats are fixed for the present at $50.

## MINING INCORPORATIONS.

### ONTARIO.

North American Cobalt Refining Company, Limited.—Capital $1,000,000.00, in shares of $1.00 each. Head Office, Hamilton. Provisional directors: Messrs. Geo. Taylor, Jno. McMartin, Louis Henry Timmins, William Griffiths Trethewey, Alexander Longwell, David Alexander Dunlop and William John Blair.

Temagami Iron Mining Company, Limited.—Capital $10,000.00, in shares of $100.00 each. Head office, Toronto. Provisional directors: Messrs. Thos. Boyd Caldwell, Herbert Watson Fleury, William James Fleury, Boyd Alexander, Conyngham Caldwell, Wm. Mulock the younger and Donald Wm. Falconer Caldwell.

Cobalt Silver & Copper Mining Company, Limited.—Capital $500,000.00, in shares of $1.00 each. Head office, Sault Ste. Marie, Ont. Provisional directors: Messrs. Frank Eugene Ketchum, Geo. Porterfield McCallum, Cyrus Wm. Baldwin, Christopher John Brook and Charles Henry MacBean.

Queen City Mining and Development Company, Limited—Capital $150,000.00, in shares of $5.00 each. Head office, Toronto. Provisional directors: John Brush LeRoy, John Russell Hemphreys and Thos. Mitchell.

The Savage Mine of Cobalt, Limited.—Capital $500,000.00, in shares of $1.00 each. Head office, Toronto. Provisional directors: Messrs. Gordon Taylor, Geo. Wishart Spence, Lilian Murray Heal, Susan Whitaker and Ada May Duncan.

Cobalt North Ontario Mining Company, Limited.—Capital $10,000.00, in shares of $1.00 each. Head office, Haileybury, Ont. Provisional directors: Messrs. Joseph Edmund Myers, Geo. Albert Mason and William Harrison Altman.

The Williamson Marks Mines, Limited.—Capital $300,000.00 in shares of $1.00 each. Head office, Toronto. Provisional directors: Messrs. Henry Walter Williamson, Ira Marks and James Playfair.

Red Rock Silver Mining Company, Limited.—Capital $1,000,000.00, in shares of $1.00 each. Head office, Haileybury, Ont. Provisional directors: Messrs. David Alexander Dunlop, Noah Anthony Timmins, Melvin Geo. Hunt, Robert McBride and Henry McBride.

Tarentorus Mining Company, Limited.—Capital $700,000.00 in shares of $1.00 each. Head office, Sault Ste. Marie, Ont. Provisional directors: Messrs. Andrew Edwards, Robert Hector McAllister, Samuel Geo. McAllister, Alexander Vallier and John Charles Curtain.

### BRITISH COLUMBIA.

Eureka Copper Mines, Limited.—Capital $250,000.00, in one million shares of 25 cents each.

Prince Henry Mining Company, Limited.—Capital $500,000.00, in shares of $1.00 each.

Southern Cross Copper Mine Company, Limited.—Capital £150,000, in 150,000 shares of £1 each.

Williams Creek Dredging, Transportation and Agency Company, Limited.—Capital $50,000.00, in shares of $10.00 each.

## NOVA SCOTIA MINING INTELLIGENCE.

Memo of mining areas in Nova Scotia applied for under Prospecting License during month of March:—

| DISTRICT. | AREA. |
|---|---|
| Oldham District | 12 |
| Stormont | 165 |
| Gold River | 20 |
| East Rawdon | 6 |
| Shelburne Harbour | 24 |
| Montague | 12 |
| Leipsigate | 22 |
| Mill Village | 9 |
| Voglers Cove | 6 |
| Malaga | 12 |
| Cow Bay | 11 |
| Uniacke | 3 |

## CHIBBOUGAMOU MINING DISTRICT.

An interesting and important report on the Chibougamou mining region, by Mr. A. P. Low, has just appeared as a publication of the Geological Survey. The live interest which is now being taken in the affairs of Chibougamou, and the growing sense of the importance of the mining industries of the northern part of the Province of Quebec, as well as Mr. Low's particular fitness for this investigation, will make the report one of exceptional value and importance. The report covers the work of two months during the season of 1905 by Mr. Low and party. It comprises 61 pages and is accompanied by an index map. For the benefit of those proposing to visit the region, the various routes are discussed, and that which is considered the best, via Lake St. John and the Chamuchuan River, are described in detail. The geological features of all the principal routes of travel throughout the district are described, and the economic possibilities of the locality concisely discussed. The portion of country described in this report is drained by streams emptying into the Nottaway and Rupert rivers, both of which discharge into the southeastern part of James Bay. It is, roughly, eighty miles from east to west; seventy from north to south. The southern boundary of the area is about 280 miles north of Ottawa city, and lies directly north of the country between Montreal and Ottawa. Three possible routes from the south are by way of the Gatineau, the St. Maurice and the Chamuchuan rivers. The last is considered by Mr. Low the best. Details of this route have been given by Mr. J. E. Hardman, in a paper on this district, which appeared in the last September number of the REVIEW, and so they may be omitted from this brief resumé.

The region is described as a rolling table land, having a general elevation of 1,400 feet above sea level at the southern boundary, near the water shed, and following generally to less than 900 feet in the northwest part. The general surface is broken by long, low ridges of rocky hills, which, in a few places, are more than fifty feet above the surrounding water levels, and whose general trend is from northeast to southwest. Where the ridges are close together the intervening valleys contain swamps, drained by small brooks; but more often the ridges are wide apart and the shallow valleys are covered with networks of lakes, fringed with swampy land. As the lands under consideration are from 900 to 1,500 feet above the sea, it is doubtful if they will ever be available for purposes of agriculture, though they may serve as grazing lands.

More than three quarters of the surface of the region is occupied by igneous rocks, leaving only comparatively small areas to the sedimentary. The latter consist chiefly of the limestones and dolomites of Mistassini, which, from their resemblance to the Upper Huronian limestones about Lake Superior, are possibly of that age; and conglomerates and arkose rocks, which are taken to be the same age as the similar rocks at the west of Lake Temiskamingue. Kewatin schists, older than these, are probably also present. There are also highly crystaline gneisses and schists, which resemble the Grenville series of the Laurentian, whose alteration has been so complete that it cannot be told whether they were originally igneous rocks or sedimates. Of the undoubted igneous rocks diabase occupies the largest area, and is the oldest. It is cut by masses of gabbro and anothosite rocks, and also by as many as three different kinds of granite. The asbestos-bearing serpentine, which thus far is the most important rock of the district, economically, may be an alteration of product of the diabase just mentioned. It is therefore a matter of doubt whether it is of Lower Huronian age, or belongs to the older Kewatin rocks of similar composition.

The important minerals of the district are gold, copper and asbestos, all of which are found in the serpentine and diabase rock. Gold occurs in a large quartz lense, having a total width of forty feet, and a proved length of 500 feet. The gold is found both free and in combination with sulphides of iron and copper. The highest return from a single assay quoted is $11.48 to the ton. The average value of a number of gold-bearing specimens taken by Mr. Hardman was $3.14 per ton. There are a number of other quartz veins which have been sampled throughout the region, but thus far they have not yielded gold. Copper has not been found in important amounts, as yet, but is known to occur in many places in diabase along its contract with the intruded granites. Some exploratory work has been done on a few of these, but they have not thus far proved successful.

The asbestos deposits are considered by Mr. Low to be geologically similar to those of Thetford and Black Lake, and, from the size of the veins and the quality of the mineral, be ultimately of much economic importance. At present, however, transportation charges from the railway at Lake St. John are about fifteen cents per pound. Even if reduced by one half, by making a winter road, they would still be so great as to effectually prevent the successful operation of the property. Mr. Low, therefore, concludes that the success of the Chibougamou mining camp depends upon the building of hte railway to Lake Chibogamoo. This from the nearest point in a line of railway already built is a distance of 205 miles.

## INDUSTRIAL NOTES.

In many classes of electrical work a wide speed variation is required and to meet the demands of such service the Westinghouse Electric & Mfg. Company has developed a line of direct current motors having a speed range of four to one on a single voltage. This wide speed variation is obtained by field control, and the type SA motors compare favorably in every respect with the best direct-current constant-speed machines.

The new motors are exactly similar mechanically and electrically to the Westinghouse type S motors except for the addition of auxiliary poles and coils. These are introduced in order to control the field form during the variation of field strength necessary to obtain so wide a range of speed. The cast steel poles with machine-formed coils are placed midway between the main poles and securely bolted to the frame. The construction is very simple and introduces no complications whatever, nor does it make difficult the removal of the main poles and field coils, as is evidenced by the fact that an auxiliary pole and coil can easily be taken out, without in any way disturbing the main field winding, by simply disconnecting the coil connections, withdrawing the bolts which hold the pole to the frame and sliding the pole and coil out parallel to the shaft.

The auxiliary field winding is connected in series with the armature and therefore produces a magnetizing effect which is proportional to the armature current. The auxiliary coils are placed as close to the armature surface as mechanical considerations will permit and their turns are concentrated at that point. This arrangement adds materially to the performance of the motor as it applies to the corrective influences of the auxiliary winding directly at the points where the distorting effect of the armature current is strongest. This arrangement is much more effective than the distribution of the ampere turns along the length of the auxiliary poles. The magnetic field of the auxiliary winding acts in direct opposition to that produced by the armature current. The resultant field is made up of three components—that due to the shunt winding, that due to armature reaction, and that due to the auxiliary windings. The field distortion usually produced by armature reaction is therefore overcome and the shape of the magnetic field at the point of commutation is maintained as formed by the main poles, and good commutation is made possible over a wide range of speed.

Type SA motors are shunt wound, which gives a definite speed for each point of the controller, which is nearly constant for all loads. Heavy overloads may be momentarily developed without injurious sparking. The motors are reversible without danger and without readjustment of the brushes, and, as the armature and auxiliary windings are connected permanently in series, it is only necessary to change the external armature connections to reverse the directions of rotation.

These motors develop their full rated output throughout their entire range of speed. They will carry full rated load at any speed within their range for six hours with a temperature rise not exceeding 40 degrees cent. in armature and field, and not exceeding 45 degrees cent. on commutator, as measured by thermometer. At all loads and all speeds commutation is excellent, and an overload of 25 per cent. may be carried for one hour without injurious sparking. All motors are thoroughly ventilated, running cool and at a uniform temperature. Their efficiency is high and their speed regulation practically exact. With the exceptions noted, type SA motors are mechanically identical with the type S, and corresponding parts are interchangeable.

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The Westinghouse Machine Company, of Pittsburg, Pa. on March 9th filed a second bill of complaint against the Allis-Chalmers Company, of Milwaukee, Wis., in the United States Circuit Court for the District of New Jersey, in which the latter concern is charged with the infringement of a certain patent relating to the manufacture of the Parsons Steam Turbine.

It will be remembered that the Westinghouse Company filed a similar bill in the same Court about a month ago; but while the patent which in that suit related to the method of fastening the blades into the rotating and stationary elements of the turbine, this last patent is even of a more important character. In the bill filed on March 9th the Westinghouse Company alleges that the Allis-Chalmers Company in the manufacture of the Parsons type of turbine is infringing upon the patent number 639,608 of Dec. 19th, 1899 which protects a method of tying the outer ends of the blades together so as to prevent vibration or the breaking of the longer blades.

The outcome of this litigation is watched with interest by all users and manufacturers of steam turbines, particularly on account of the fact that the use of these engines is increasing to enormous proportions. The Westinghouse people claim to be the largest manufacturers of this style of steam engine in the country, having been the pioneers in that field.

They have over 500 in operation throughout the country aggregating a capacity of about 1,000,000 horse power, while at the present time there are under construction in their shops at East Pittsburg 100 units of these turbines approximating a total of one quarter million horse power.

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The remarkable strides recently made in the design and construction of large gas engine units both in this country and abroad, have clearly indicated that the possibilities for the application of that form of prime mover are practically limitless.

German builders were among the first to appreciate this fact, and, as a result, have perfected the best types so far produced. American builders, however, have not been slow to see the advantages offered by large units, and the Allis-Chalmers Company of Milwaukee, for one, has been placing before the purchasing public, for some months past, its Gas Engines of the Nurnberg type, in capacities ranging from 300 to 5,000 horse power and for all power purposes.

An 1,800 B.H.P. Allis-Chalmers Unit was recently ordered for the Crystal City, Mo., plant of the Pittsburg Plate Glass Co. It is of the well known four cycle, double acting type, direct coupled to a 1,000 K.W. Allis-Chalmers generator.

The Illinois Steel Company, Chicago, at present using a large number of Allis-Chalmers steam units of various kinds, has very recently ordered two large gas engine generating units, twin tandem type, 1,000 K.W. each. These machines will be installed in the company's present power plant for lighting and power purposes.

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To meet the requirements of their increasing business, Allis-Chalmers-Bullock, Limited, of Montreal, have made a number of additions to their sales organization. Among them is Mr. T. J. Lynch, who has been appointed district manager at Toronto. He is already well known there having for two years superintended on behalf of the Allis-Chalmers Company, of Milwaukee, the construction of the fifteen million gallon pumping engine for the City of Toronto. Previous to that he was connected with the Metropolitan Water Works and Sewage Commission of Boston.

Allis-Chalmers-Bullock, Limited, under the new management have entered on an aggressive policy in the pursuit of business. They have leased a suite of offices in the new Trader's Bank in Toronto, added to their office staffs in New Glasgow and Winnipeg, and are spending a large sum of money in improving the equipment of their shops at Montreal. The plant is running night and day to keep pace with orders received and further important additions to it are contemplated in the very near future.

The W. S. Tyler Company, Cleveland, Ohio, the well known manufacturer of wire cloth screens and ornamental iron work, have just issued a handsomely illustrated catalogue (No. 24). The many varieties of ornamental iron work manufactured by the W. S. Tyler Company afford excellent subjects for illustration, and they are well shown in admirably executed half-tones. The catalogue contains 92 pages, is printed on a fine quality of paper, and is artistically bound. It is alike creditable to the firm and useful to its patrons.

## MINING NOTES.

(From Our Special Correspondent.)

### BRITISH COLUMBIA.

Mining in a sense has been slack here during the past month owing to the state of the roads. But preparations have been made for active work on many of the smaller properties during the coming season and the properties which have already been developed have shown the tremendous impetus that has recently been given to the industry when it is stated that upwards of 425,000 tons of ore have been shipped during the first quarter of the year, that is at the rate of 1,700,000 tons for the whole year. This represents on a conservative estimate a value of $3,500,000 for the first three months of 1906 and includes nothing but gold, silver, copper and lead, the zinc shipments which have not been regularly made up to the present, not being accounted herein. Half of the value is represented by the enormous shipments from the Boundary, while Rossland, the Slocan and Kootenay furnish the remainder in about equal shares.

But the value of the zinc ore is likely to sensibly increase the year's estimates. Already the Bluebell mine is shipping its ore for concentration and separation at the Fernau plant at Pilot Bay, on Kootenay lake, which product will afterwards figure, partly, in the returns of the zinc smelter at Frank, as soon as that plant is ready for operation. The Aurora mine, close by the famous St. Eugene, has already sent a preparatory shipment to Frank and so have half a dozen or more other properties. All these, however, may be considered for the present as merely tentative shipments, more or less for experimental purposes, although it must be taken for granted, seeing the expressed opinion of J. C. Fernau and the amount of money which he has caused to be expended on the erection of his zinc plant, that many if not all of these tentative shipments will prove regular sources of a supply of zinc ore.

It may also be noted that the North Star mine has entered upon a new period of its existence and is again shipping ore, about 1,000 tons being sent during the month of March to the C.P.R. smelter at Trail. The North Star mine was one of the largest shippers in East Kootenay being situated near the Sullivan where a new smelter has been erected by the American Smelter combine at Marysville, which is now treating about 500 tons daily and from which a larger output is to be expected as soon as arrangements have been properly effected. One reason for the increased shipments from mines such as the North Star is the recent lowering in the rates of smelting made by the smelters at Trail and Nelson. This again is partly due to increased facilities of railroad transportation and perhaps more to the economies effected by the new process of desulphurizing ores generally known as the Heberlein method. The Hall Mines smelter and the Canadian Reduction works, at Nelson and Trail respectively, are making large and expensive improvements in this direction and the fruit of these improvements is being seen in the increased output from the district in general.

There has been some trouble in the Boundary over the question of power for the mines and smelters which, up to the present, has not been satisfactorily adjusted. That an adjustment will take place is evidently the opinion in the Boundary as the B.C. Copper Company is going ahead with the enlargement of its plant. The trouble is over a contest between the Cascade Power Company and that known as the West Kootenay as to who shall supply the power for the Boundary people. The management of the Granby, according to reports appearing in Washington papers, has acquired a source of power on the Columbia river over the boundary line and expect to be permitted to transmit the power proposed to be generated there to British Columbia. Probably this will not seriously be pressed unless the trouble between the rival power companies within the province leads to a close down of some of the mines or smelters because of lack of power.

Rossland again is having a spasm of high grade ore discoveries. From time to time high grade streaks of ore are found in the mines, especially in the vicinity of the Josie dyke, a dyke which runs through some of the principal properties and west of which very little mining has been done in comparison with that done to the east of the dyke. This is sometimes in connection with the occurrence of extremely rich knife like layers of sylvanite, sweetening the whole ore body, as for instance upon the Annie, one of the Le Roi No. 2 properties. Lord Ernest Hamilton lately announced in Nelson the possession of such a streak of high grade ore upon the Le Roi No. 2, of which company he is chairman. A somewhat similar discovery has been announced in connection with the Le Roi itself, which, like that of the old subsidiary company, is in connection with the Josie dyke. However, the main ore body of the Le Roi is a large one and is, in fact, a shear zone, rather than a true fissure, the ore being mineralized from a certain portion of the ore body outwards each way, gradually dwindling to unremunerative ground. Hence it is a desideratum in the mining of Le Roi ore to ship as much of the vein as is possible, so that the vein shall not be "gophered" by taking out merely the richest portions. The Le Roi No. 2 has not nearly as large an ore body. It has several, and the copper values are generally very much stronger than those of the larger property. Hence the mining of the one and the mining of the other cannot well be compared as seems to have been attempted in London during the struggle for the management of the Le Roi. Generally there is a feeling of distrust in Rossland as to the method in which the Le Roi has been worked in times past. In the spring of 1902 it was announced that the Le Roi values had fallen to a point which was below commercial returns. The stock immediately fell in price, yet, within the last six months of that same year the Le Roi paid $600,000 dollars profits. The manager was then changed and within a year the same startling discovery as that of 1902 was made and there was another slump followed by another declaration of profits. As it is publicly announced in Rossland, even now, that all strikes must first of all be reported to the dictorate in London, these extraordinary fluctuations are commented upon adversely and are tersely summed up in the expressed opinion of an old manager, Bernard Macdonald, after returning from a visit to the old country. He said, "The London men do not ? a mine all they care about is a hole in the ground on which they may gamble!"

F. W. Rolt's letter, appearing in the March issue of the Canadian Mining Review, shows these very points strongly enough in the figures which he quotes. He is, of course, arguing in favour of the mine not running its own smelter, saying nothing as to the fact that the successful mines of the district, large mines, are putting their ores through their own smelters, in order that the profit of smelting should be added to the profit of mining, a very necessary thing indeed when the ore is low grade and in large bodies. One word here may be said as to the costs of smelting in Northport. It may be noted that in an English article upon the Hunter V mine at Ymir, which supplies lime to both Trail and Northport that the cost of the lime at Trail is more than double than the cost of the same rock at Northport, 65 cents and $1.50 a ton being approximately the figures, given in English money. Hence it may be seen that the course being taken by Mr. A. J. McMillan, has something to recommend it, although, like nearly all his predecessors in the Le Roi, he may make a mistake. All the predecessors, however, have not acknowledged their mistakes but have occasionally, like manager Macdonald charged them up to the alleged gambling proclivities of the head people in London.

Southeast Kootenay.—The shipments of silver-lead ore from Southeast Kootenay show that for the first two months of the year that 7,759 tons have been sent to the smelters, a large increase over the output of 1905.

Slocan.—The Bluebell mine is now making steady shipments to the Frank smelter.

The ore shipments for the week were 20 tons of silver-lead from the Reco and 20 from the Ruth.

A fine body of rich ore has been struck in the upper tunnel of the Mercury. A carload will be out in a few days.

The Silver Glance at Bear Lake has closed down for a time on account of slides.

Ore is being rawhided down from the Sunset and stored at the freight shed at Cody.

The owners of the Index mine on the South Fork forwarded a few days ago over a ton of supplies, and intend immediately putting to work a crew of men to fully prospect the property.

The new manager of the Cork has decided to enlarge the mill and double its capacity.—From the Rossland *Miner*.

BOUNDARY.—Satisfactory results seem to have followed the shipments of ore from the Napoleon mine, near Marcus, Washington, controlled by the B.C. Copper Company. A small development plant has recently been installed at the mine, consisting of a 5 drill Rand compressor, 50 h.p. boiler, etc. At present the ore is hauled on wagons or sleighs to the railway siding, but surveys have been made for both gravity and aerial trams. The main tunnel is now in over 200 feet.

A piece of giant powder went off in one of the furnaces of the Dominion smelter at Boundary falls, damaging one of the water jackets and requiring repairs. Occasionally this happens in nearly all smelters.

In the tunnel being driven on the Iron Clad, Wellington camp, good galena ore has been encountered. The owners are W J. Porter, G. W. Rumberger and Jack Farrell.

It is expected that more work will be done this spring on the Monte Cristo group, north of Phœnix, acquired some time ago by the Granby company to prove the ore bodies.

The B.C. claim, situated on the west fork, has proven rich in gold and silver, a recent assay giving $1,700 in gold and $278 in silver. The ledge varies in width from 18 inches to 4 feet, and has been traced for 3,000 feet. The claim gives promise of becoming a valuable property.

A steel plant is about to be established at Grand Forks. The contract has been let for the erection of a building 40 x 60 feet, which will be built in connection with the Boundary Iron Works. The new plant will employ some ten men at the outset.

## ONTARIO.

Two formerly worked mica mines near Bancroft are to be re-opened in the early spring.

The Atlas Arsenical Company, Manager Mr.W. Hungerford, of Belleville, are making preparations to develop a property of some five acres extent, which was recently purchased in the Deloro district. A shaft of 180 feet was sunk some time ago, and there are said to be indications that gold and arsenic, in paying quantities, will be taken out this season.

The Copper mine at Eldorado is going ahead splendidly. Carloads of copper are being shipped to the Nichols Chemical Co. for treatment and are bringing in big profits. New drills and other machinery are being installed. A new smelter of 50 tons daily capacity will be in operation in May of this year. This promises to be one of the most profitable mines of the county.

The Stanley Smelting Works at Bannockburn shipped a carload of pig lead to Toronto this week. The price $98 per ton is phenomenally high. They are having good success with the new smelter which is running continuously. Hematite iron from the old Eldorado mine is used for fluxing purposes. All the lead mines of the company will be operated soon. The company have re-organized on a much larger basis and will develop the lead industry on an extensive scale.

A large steel rolling plant for Port Arthur is the latest Mackenzie & Mann scheme. This was announced by Messrs. MacKenzie & Mann's representative at Port Arthur, who stated that after the erection of the smelter at Port Arthur, the Company would construct an extensive rolling mill plant there. This will be the first of its kind in Western Canada. The reason given is that the Company has discovered that the quality of ore secured there is specially adapted for the manufacture of high grade steel.

No steel rail mill is in contemplation as yet, the company simply intending to convert its own pig iron into steel rods, etc.

## NOVA SCOTIA.

Dr. McLennan, M.P. for Inverness, N.S., has recently brought to Ottawa some samples of coal from a newly discovered seam at Mabou. The specimens are said to be of a very superior quality.

Messrs. M. P. MacNeil & Co., of New Glasgow, have secured the contract for erecting a number of buildings at the Allan Shafts for the Acadia Coal Company. It is understood that the contract calls for buildings costing in the vicinity of fifty thousand dollars, and which will be all fireproof. The machinery used for the Allan Shafts will be of the most modern design. The sinking is now down fifteen hundred feet, and their plans are to leave a barrier of three hundred feet between the shafts and the old Ford Pit, which is still believed to be on fire.

## QUEBEC.

The Calumet Graphite Mining and Milling Company, which has been operating for some time a graphite property near Calumet station on the Canadian Pacific, has decided to erect a modern graphite milling plant on its property, and it is reported that the Krom Machine Works, of Jersey City, N.J., have received the contract for the necessary machinery. The property has been opened up to a considerable extent. One shaft on the slope of a hill has a depth of 80 ft., following several graphite veins of columnar and scaly structure. A tunnel commenced at the foot of a hill will be driven toward the shaft, the bottom of which is 90 feet above the tunnel level. There are a number of openings all over the crest of the hill, showing more or less the occurrence of the scaly variety in a disseminated form through limestone and quartz. The area owned by the company comprises 258 acres. Some 60 tons of the vein graphite mined in the shaft have been sent to the Globe Refining Company, New York, some time ago, and yielded 32 tons of good crucible material, which has been used in the manufacture of crucibles to good advantage by English and German manufacturers.

## COMPANY MEETINGS AND REPORTS.

At the annual meeting of the Nova Scotia Steel & Coal Co., held at New Glasgow, N.S., March 29, the fifth annual report of directors showed volume of general iron and steel business transacted by the company last year was larger than that of any previous year, increase being 28,825 tons, and in value being $597,887.37.

From the steel department 28,225 tons of finished matter was shipped, and 28,723 tons of pig iron was sold. There are orders on the books for much larger tonnage of steel and pig iron at higher prices, than have prevailed last year. The quantity of coal mined was 58,141 tons more than the previous year. Profits for the year were $359,906.63, making total of $1,255,656.44, at credit of profit and loss account.

The general manager reported on the operations of the year, referred to the great inconvenience to shipping caused by large snow fall of winter of 1904-05, which necessitated an extra expenditure of from $25,000 to $40,000.

He referred also to the opening up of marine areas and stated that the outlook for the year was most satisfactory. The report was adopted and satisfaction was expressed at the operations of the year.

The following were re-appointed directors: J. Walter Allison, Robert F. Harris, Thos. Cantley, Harvey Graham, Hon. Robert Jaffray, Hon. L. Melvin Jones, Jas. C. McGregor, G. F. McKay, John MacNab, Hon. J. S. Pitts, Robert Reford and Geo. Stairs.

R. E. Harris, K.C., was re-elected president, and Hon. J. H. McGregor, vice-president; J. H. McGregor and F. H. Oxley were re-appointed auditors.

The following now constitute the official staff of the Nova Scotia Steel & Coal Co's coal department: T. J. Brown, General Superintendent; John Johnstone, Coal Mining Superintendent and Manager of Queen Pit; R. C. Brown, Manager Sydney No. 1; G. Greenwell, Manager No. 3.

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The Globe Refining Company contemplate an increase of their plant at their graphite mines of North Elmsley, Ont. This company now owns a refinery located at Port Elmsley, close to the C.P.R., where they have a water power said to be about 200 h.p. Ten or twelve men are now employed, and an excellent quality of graphite is reported to have been found.

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THE CONSOLIDATED MINING & SMELTING COMPANY.—An interesting official report of this company is at hand. The paid-up capital is $4,698,888, and the authorized capital $5,500,000. The directors are: W. D. Matthews, president; George Sumner (Montreal), vice-president; E. B. Osler, Chas. R. Hosmer, H. S. Osler and W. L. Matthews. W. H. Aldridge, Trail, B.C., is managing director of the combine, which comprises a consolidation of the St. Eugene, War Eagle, Centre Star, Trail Smelter and Rossland Power Co.

CENTRE STAR.—Since the report of 1904, 111,841 tons of ore have been shipped, having a gross value of $11.28 per ton, or a total value of $1,261,390.01. The net amount received by the company for this ore, after deducting all freight, smelter, refining and marketing charges, was $503,476.31, or an average of $5.39 per ton. The ore showing in the mine promises to yield over 100,000 tons ore of $10 gross value, which does not include the ore being opened up on the tenth level. The mine is now shipping about 9,000 tons of ore monthly, averaging about $10 per ton gross value.

WAR EAGLE.—Shipped in 1905, 60,860 tons, valued at $690,269. Net return to company, $317,775. The mine is shipping 5,000 tons per month of $10 ore.

ST. EUGENE.—In 1905 yielded a gross product of $1,820,011, or $52.93 per ton. Net return was $1,232,893.

TRAIL SMELTER.—In 1906 treated 240,000 tons of ore, producing $806,658 silver, $1,708,257 gold, $563,249 of copper, and $397,580 of lead.

CONSOLIDATED COMPANY.—The Consolidated Company started with a cash working capital of $596,669.57, which is invested in ores and products in process of treatment and in transit. The company has a liquid asset in the shape of fuel, fluxes and supplies, valued at $202,220.43. Deducting operating, development and construction expenses from the net receipts from ore shipment, as above, the net profits of these properties (including the profits of the smelter) during 1905, were over $700,000, and it is expected that the company will do at least as well during the year 1906. Due to the consolidation of the properties and to the larger tonnage being handled, much lower grade ore can be profitably treated than formerly.

It is notable that the lower portions of the workings of the Centre Star and War Eagle are looking well, and are certain to yield a large and valuable tonnage of ore.

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THE DOMINION COAL COMPANY, LTD.—The report of this company, presented at its annual meeting on March 1st, showed that the output of 1905 was 3,189,657 tons as compared with 3,923,522 tons for 1904. The general business of the company during 1905 was well up to the standard of 1904, but the largely increased requirements of the Dominion Iron & Steel Company necessitated an increased output from the mines, and as the contract with that company is not at present a remunerative one, the average price realized from sales in 1905 was consequently less than in 1904. The surplus earnings, not providing for interest on bonds, preferred stock, dividends, etc., have been added to the company's general surplus. The total amount expended during the year 1905 on capital account, including the purchase of steel cars, is $497,605.19. The company's financial position has greatly improved during the year 1905. Five million dollars of five per cent. bonds have been substituted for $2,435,000.00 of six per cent. bonds, $2,380,000.00 time notes and $3,000,000.00 of seven per cent. preferred stock has been substituted for a like amount of eight per cent. These changes will effect a large saving in fixed charges.

The company has laid before its employees a scheme for the purchase of their homes on the instalment plan, and it is expected that this will be largely taken advantage of in May by the commission. It is thought that the workmen will thereby gain in becoming owners of their houses, and the company are securing a more permanent body of employees in consequence. The directors elected were: Lord Strathcona, Sir W. C. Van Horne, Messrs. R. B. Angus, James Ross, J. R. Wilson, F. L. Wanklin, The Hon. Geo. A. Cox, Mr. W. D. Matthews, The Hon. David McKeen, W. B. Ross, K.C., Mr. F. F. Dimock and Mr. F. S. Pearson.

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At the recent annual meeting of the Wellman-Seaver-Morgan Company of Cleveland, Ohio, the office of general manager, which has been vacant since the death last June of Mr. Charles H. Wellman, was filled by the election of Mr. S. H. Pitkin, whose present title will be first vice-president and general manager. Otherwise no changes were made in the officers of the company.

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A meeting of the bondholders of the Port Hood Colliery Company was held at Montreal, March 31st, and it was arranged that a reorganization of the company should take place. Among those present at the meeting were Mr. James Terrill, Halifax, solicitor for the company; Mr. D. F. McLean, mayor of Port Hood, and Robert J. Bell, manager.

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## MINING MEN AND AFFAIRS.

Mr. J. E. Hardman, a mining engineer, is at present in the South Atlantic States, on professional business. He is expected to return about the middle of April.

Mr. H. C. Symmes, Mechanical Inspector of the Department of Mines of the Transvaal, who has just completed a six months furlough in Canada, set out on his return trip to Johannesburg on the 25th ulto. Mr. Symmes is a Canadian by birth, a graduate of McGill University, and has been a resident in South Africa ever since the war, during which he served with distinction in the Royal Canadian Artillery.

Mr. A. P. Low, Director of the Geological Survey of Canada, delivered a lecture to the members of the Canadian Club at the St. Lawrence Hall, Monday evening, April 2nd, on the subject of "the Resources of the Artic Region and the Navigation of Hudson's Bay."

It is reported that Colonel Conrad, of Windy Arm, Alaska, who has been until recently at Toronto, but who left there a few days ago, has succeeded in his mission of disposing of his property to a Toronto syndicate. Rumor has it that Mr. William Mackenzie, president of the Canadian Northern, and of the Toronto Railway Company, is the chief representative in the syndicate, and that the amount involved is five million dollars. The property in question consists of ten claims on Windy Arm near White Horse, and was originally bought by a Seattle syndicate for $160,000.

Mr. James McEvoy, C.E., geologist of the Crow's Nest Coal Co., is now chief engineer as well having been appointed to succeed Mr. H. B. Wright, C.E. who has left the service of the company.

W. G. Tretheway, so well known in connection with Cobalt silver developments, was recently called to British Columbia by the serious illness of his father.

Prof. W. G. Miller, of the Ontario Bureau of Mines, is publishing a book, the title of which will be, Minerals and how they Occur.

As a result of meetings recently held in Toronto a new industry for the manufacture of soda ash is to be established near Sandwich, in the county of Essex, where some 50 or 60 acres of salt lands and 10 acres of limestone have been secured. A company composed of British, United States and Canadian capitalists is being formed, with a capital of $1,000,000. Considerable preliminary work has already been done. The government is being asked to increase the duty on imported soda ash, but consumers are strongly opposed.

The ore shipped from the Cobalt mining camp during 1905, is stated to have aggregated 2144 tons, of the value of $1,448,524. These figures are likely to be far exceeded this year. The value last year was largely reduced by the fact that little or nothing was received for the Cobalt, nickel and arsenic which the ore contained.

Hon. Mr. Foy, attorney general for Ontario, has introduced a bill which will place mining companies on the same footing as other joint stock companies.

Some very good bricks have just been taken out of the Sultana mine from ore which runs over $7 a ton on the plates, besides the concentrates. A very large body of this ore has been found, which continues across the Sultana property. Arrangements are being made to work the adjoining properties, but the matter has not taken very definite shape yet.

A deposit of high grade copper was found some time ago on the Temagami Forest Reserve. The vein, which is supposed to be about 12 feet wide, has been traced for a quarter of a mile. Some development work has been done under permit, but there is a difficulty as to the pine timber. Affidavits have been fyled to the effect that the timber would not be injured, and the government is being asked to deal with it.

The statement made by a Toronto publication that the United States Steel Corporation has definitely decided to erect works in Canada is premature. After looking carefully into the conditions they have decided that the cost of building is too great at present to justify the erection of works in Canada.

The township of Coleman, in which Cobalt is situated, has been organized municipally and will have its local Board of Health to deal with the sanitary questions which always arise in a new mining camp. A sanitary inspector has been appointed to assist the local authorities.

The Savage-Cobalt Mining Co. finds like the other mines which have gone down some distance, that their ore body increases in value as they go down. Their shaft is now down about 70 feet and their main vein has widened twice in that distance being now between five and six inches. The ore continues to hold its value. There was for a time considerable difficulty with water, but since a large pump and other machinery was installed there has been no further trouble. This company claims to have ten distinct veins on two acres of their claim, with 40 acres not yet prospected.

New finds of Cobalt ore are said to have been made at Montreal River, but the ore does not carry the quantity of silver which is found in the township of Coleman, though the veins are wider. In the township of Bucke, which adjoins Coleman, several discoveries have been made, the richest being on what is known as the McBride property, N.W. ¼ of the S ½ of lot 14, concession 2. The Green Claim adjoining the McBride and the Leith claim, on the shore of Lake Temiskaming, are also promising. Prospecting in Bucke is very difficult, most of the

Huronian rock being covered with drift. On the McBride claim as opened up the ore is much corroded and the conditions of its occurrence are similar to those at Kerr Lake.

Thomas A. Edison, the great inventor, has an agent on the ground at Cobalt, buying cobalt at 35 cents a pound. Mr. Edison will use it in connection with a new storage battery. As the price fell off last year to a mere nominal figure, the world's consumption being small, the discovery of a new use, with enhanced price, is of great importance.

The Crow's Nest Coal Co. has declared its usual quarterly dividend of 2½ per cent. for the first quarter of the current year. The directors have under consideration a plan for the re-organization of the company, so as to bring its nominal capital more in line with the actual value of the company's holdings. It is probable a special meeting of the shareholders will be called to consider the proposal.

The Temagami Iron Mining Co. has been formed to work the iron deposit at Lake Temagami in which T. S. Caldwell, M.P.; Sir William Mulock and D. O'Connor have each a one-third interest.

An Order-in-Council adds a new clause to the Ontario Mining regulations. It is as follows:—"For filing any agreement, caution of other document, except a transfer, affecting or purporting to affect any mining claim already recorded, the party filing the same shall pay the inspector of the division a fee of two dollars ($2.00) for every claim mentioned or described therein."

The Huron Oil Producers, a company which controls oil territory at Petrolia, recently obtained a charter. A meeting for organization will probably be held in Toronto in April.

A company has been formed to take over and operate the Tretheway mine at Cobalt. W. G. Tretheway, the present owner, will retain enough of the stock to give him a controlling interest.

A number of charters which have been applied for in connection with Cobalt companies are being held over by the Ontario Government till the bill introduced by Mr. Hoyle has been considered and disposed of. This bill is intended to protect the public against wild cat schemes, and if anything can be done in that direction it will be a good move. Some of the companies on whose behalf glowing prospectuses have been issued are nothing but stock jobbing schemes to rob a too confiding public.

Some interesting experiments have been made at Toronto at to the heating properties of different kinds of coal, with a view to greater economy in the city's supply of fuel. Recent tests show that some classes of coal produce seven per cent. more units of heat than others. Property Commissioner Harris has recommended that in future tests be applied to coal furnished to the city under contract.

Hon. A. J. Matheson, provincial treasurer, recently received a cable despatch from the manager of the London branch of the Bank of Montreal, saying that the Rothschilds had made a payment of £100 a ton on a trial shipment of 20 tons of Cobalt ore sent through the Department of Lands and Mines. The experiments made by this wealthy firm with these ores are proving highly satisfactory, and there is no doubt a market for them is opening up in England and on the continent.

Dr. Haanel, superintendent of mines for Canada, gave an account of the experiments made at Sault Ste. Marie in the electrical smelting of iron, before the Canadian Club in Toronto, on March 12. The experiments were carried on from the middle of February till March 5. Although the manufacture of iron by electricity had been successfully accomplished in Europe there were several points which could not be settled there. The experiments at the Sault proved that magnetite could be successfully smelted, as well as hematite; that ore with considerable sulphur content can be made into pig iron of marketable value; that charcoal can be substituted for coke; that ferro-nickel pig can be produced practically free from sulphur from roasted nickeliferous pyrrhotite, and that pyrite cinders, now a waste product, can be turned into pig iron. Much interest is taken in this subject in Toronto, and Dr. Haanel was cordially thanked for his most interesting address.

Toronto parties who have been over the ground report that operations have been resumed on the White Bear mine at Rossland and that the outlook is promising. While in the main, development work will be done for some months, ore shipments will be made from time to time. A new 400 h.p. motor is doing good work driving the air compressor. The company has been re-organized, with a capital of $1,000,000, in shares of 10 cents each. An assessment of 2 cents per share was made to provide a working fund, one cent of which has been called in. White Bear is close to the famous Le Roi property.

Col. J. H. Conrad and his mine manager, Mr. Singer, who have been in Toronto and other eastern cities for some time, have returned to the Pacific Coast. Satisfactory financial arrangements have been completed for the vigorous prosecution of work at the mines on Windy Arm, in which Col. Conrad, who has had wide practical experience is interested.

The copper property in the township of Thompson, district of Algoma, has been acquired by the Northern Ontario Copper Co., which has its head office at Sault Ste. Marie. A drill, hoist and other machinery has been installed and development work is progressing. A shaft has been put down 30 feet and high grade ore exposed, which is of such a character as to be easily smelted.

At the Ideal Gold mine near Dryden, Ont., the Charlton-Wallace Improved Stamp Mill now operating there shows good values. This mill is a combination of stamping and grinding. A new experiment, at least in that section, has been made in roasting the ore before milling. This makes it crush more easily.

The Imperial Plaster Co., of Toronto, which has plaster beds at Cayuga, has installed a crushing plant at that place. The rock after being crushed, is brought to their mill in Toronto to be further treated.

In consequence of the present high price of arsenic, it is rumored that the mine at Deloro, which has been closed down for some time, is to be re-opened.

A report that silver has been found in the township of Belmont, near Havelock, is an old story revived. The presence of silver has long been suspected, but whether there is a deposit of importance, or not, is quite a different story.

The Cobalt ores may be rich but there are mines of other minerals of greater value in Ontario. From the Smith & Lacey Mica Mine, near Sydenham, belonging to the United States General Electrical Co., about $2,000,000 worth of mica has been taken from an area of about one acre, and the mine is still being worked.

The McKinnon & Darragh mine, one of the most valuable of the silver-cobalt mines in the township of Coleman, has been sold to E. B. Chapin and associates of Toronto. The figure is said to be in the neighborhood of $700,000.

Determined action is being taken by the Ontario Government to keep prospectors off the Gillies limits at Cobalt till the timber is removed, which is to be done on the mineralized portion by October 1st, and until a policy in dealing with the limit is decided on. A sufficient number of constables will be employed to keep prospectors off.

Mr. S. J. Ritchie, of Akron, Ohio, during a recent visit to Toronto, expressed himself as being much impressed with the value of certain deposits of granite, marble and sodalite in the northern part of the county of Hastings, and easily accessible by railway. He thinks there is little occasion to use brick for important buildings when such beautiful and durable stone is within easy reach. The sodalite is a beautiful blue and takes a high polish. It is admirably adapted for interior finish. The deposits are being worked to a limited extent under the direction of Thomas Morrison, an Aberdeen man of considerable experience.

Two hundred more mining leases have been cancelled within the past month for non-payment of rent. They covered properties in the districts of Rainy River north, Rainy River south, Thunder Bay, Algoma and Nipissing, and several in the County of Hastings.

The Canadian Pacific Railway is, it is understood, about to extend its lines to Cobalt and other points in Northern Ontario, so as to secure a share of the immense business which is sure to follow mining developments at Cobalt, as well as the tourist business to the Temagami district. The junction with the main line will probably be Sturgeon Falls.

The reduction works at Hamilton, about to be established in what was formerly the Hoepfner refinery, will be carried on under the name of the North American Cobalt Refining Co., with a capital of $1,000,000. Among those interested are L. H. Timmins and W. G. Tretheway, who have given their names to two of the richest mines at Cobalt. John McMartin, of Cornwall, who has large interests at Cobalt, is also one of the Company.

A deputation from the Ontario Clay Products Manufacturing Association recently waited upon the Ontario Government asking that a school for instruction in clay working be established on lines somewhat similar to those in England and Germany. It is suggested that this might be done in connection with the School of Mines at Kingston. There are about 3,500 persons employed in this industry in Ontario.

Large quantities of mining machinery are being taken into Cobalt and installed at the mines ready for this season's operations. The Rothschild Cobalt Co. has ordered an engine, boiler, pump and other equipment, development work to the depth of 57 feet on their main shaft having disclosed the existence of a number of veins of ore. Compressors are being installed at the Drummond and Jacobs mines. The latter has been shipping from 25 to 30 tons a month to New York. One shipment realized $57,000.

A private palace car is making trips between Toronto and Cobalt for the accommodation of parties who wish to investigate with the view of making investments. A number of parties have gone in this way to inspect the Silver Leaf and other properties.

A Winnipeg man who visited the Cobalt district in 1904 was induced to invest $750 in the stock of the Hudson Bay and Temiskaming Mining Co., receiving 1,000 shares at 75 cents. He has just been paid a dividend of $2,000 and his stock is now quoted at $64 a share, even a higher price being asked by holders. All who invest in Cobalt mining stock must not expect such results. This is one of the companies which got in on the ground floor and secured several valuable properties.

The question of the export of natural gas is likely to come before the Ontario Legislature at its present session in such form as to lead to the hope that it will be further curtailed. In 1904 the export to Buffalo from the Welland and Haldimand gas fields is stated to have reached upwards of 1,250,000,000 cubic feet, equivalent in hard coal, with gas at 30 cents, to $450,000.

Strong pressure has been brought to bear on the Ontario Government to grant a liquor license at Cobalt, but so far they have refused to yield. Under the mining regulations the sale of liquor is prohibited within five miles of a working mine.

Considerable interest is attached to the fact that the best ore yet found at the Timmins or La Rose Mine at Cobalt has been taken out at the bottom of the 200 foot level. High grade silver was found away from the vein altogether in the country rock. Five hundred feet of drifting at the 90 foot level also shows good values. Drifting has been commenced at the 200 foot level. This goes to show that the values at Cobalt are not confined to the surface as was at one time feared.

## IMPORTANT MINING SUIT.

Mr. Justice Mabee has given judgment in a case involving the right to a very valuable property at Cobalt, which came up at the Toronto non-jury assizes about a month ago, and on which judgment was reserved. The history of the case is as follows. Three men—Murdoch, McLeod, Donald Crawford and Thomas Crawford—arranged in 1904 to go prospecting in the Cobalt silver region. Thomas Crawford was taken ill and the other two men continued the work. While in the woods they met with one John McLeod, who joined their party. The latter located a claim, and it was understood that each of the above was to have a one-fourth interest. The patent was taken out in the name of Thomas Crawford. Without the knowledge or consent of the others he subsequently, for $200 cash and one-fourth of the mineral which should be taken out, sold to Thomas E. Lawson, a mining engineer and prospector, who entered into possession and has since worked the mine. Action was brought in the Court to have the sale by Thos. Crawford to Lawson set aside and for an injunction to restrain the defendant Lawson from working the mine. There were really two actions which were consolidated, Thomas Crawford denying that John McLeod had any rights. The judge holds that there was co-ownership by the two Crawfords and the two McLeods and that each is entitled to a fourth interest, and he sets aside the sale to Lawson, who must also account for the silver taken out while he worked the mine. He further holds that Lawson did not know when he purchased that Thos. Crawford held merely as a trustee, and is therefore innocent of fraud, as alleged by plaintiffs. The day before he bought however he discovered a rich vein, of which he did not tell, but Murdoch, McLeod and Donald Crawford heard of it and refused to recognize the sale. The property is said to be worth $1,000,000. Another suit is pending between Lawson and Thomas Crawford.

Dominion and Nova Scotia Steel share-holders will be interested in the motion brought up at Ottawa by Mr. Conmee for a renewal of a further period of bonuses hitherto granted on the products of Canadian iron and steel mills. These bonuses will lapse shortly unless steps are taken to revive them. The "Toronto News" points out that the present bounties paid by the Government are three in number: (1) That on pig iron; (2) that on the same pig iron converted into steel ingots; (3) that on certain finished articles made from the steel ingots. For 1905 the bounty on pig iron was $1.50 a ton, on ingots, $2.25 per ton, on steel rails, $2.25 per ton, on structural steel $1.65 per ton. On finished steel products the total bounty ran from about $4 to $6 per ton. Mr. Conmee's motion carries a rider, providing that the bounties shall be paid only on products of ore mined in Canada or in another British colony and not on foreign ores, as at present. This restriction would not affect the Dominion Iron and Steel Company or the Nova Scotia Steel Company, which get most of their ores from Newfoundland, but it would work to the disadvantage of the Lake Superior Corporation, which obtains most of its ores from the United States. It is proposed to make up for this to the Superior Company by getting the Government to remit the duty upon coal coked in Canada.

The following are the latest returns for the month of March, of the lead shipments from the Hall mines:

| Mine | Ore | Lead |
|---|---|---|
| Alice | 25,586 | 16,145 |
| Arlington, Slocan | 45,244 | 3,755 |
| Arlington, Erie | 236,768 | 7,457 |
| Emerald | 41,206 | 26,660 |
| Hewitt | 38,107 | 1,715 |
| Lorna Doone | 87,458 | 7,319 |
| Majestic | 36,743 | 25,610 |
| Mammoth | 19,233 | 5,533 |
| Mountain Boomer | 43,939 | 3,955 |
| Pioneer | 39,215 | 1,176 |
| Reco | 84,788 | 38,512 |
| Ruth | 40,369 | 9,406 |
| St. Eugene | 1,961,480 | 1,028,925 |
| Silver Cup | 49,766 | 6,071 |
| Skylark | 41,549 | 3,739 |
| Standard | 79,549 | 44,052 |
| Sunshine | 83,000 | 36,188 |
| Whitewater | 81,855 | 47 552 |
| Wilcox | 62,105 | 4,812 |
| Ymir | 186,164 | 17,797 |
| Total | 3,284,124 | 1,336,379 |

Of the total 571 pounds of lead from the St. Eugene belonged to February's shipment.

A recent report from Cobalt says:

One of the biggest deals in mining property in this district that has taken place along the line has just been consummated in the sale of the Nova Scotia mine and Peterson's Lake, in all about 195 acres. The purchasers are Messrs. Jacobs, of the Jacobs mine, Stindler, of New York, Clarkson, of Hamilton; Jas. A. Ogilvie, of Montreal, and A. F. MacLaren, M.P. The price is $700,000. The Nova Scotia mine gives promise of great wealth. Peterson's Lake and Cart Lake, which adjoin, will be drained by the new owners to get at the silver in the bottom of the lakes.

The Ontario Gazette announces the granting of charters to the following companies. The concerns incorporated are the Montreal-Cobalt Mining Co., Limited, with a capital of $500,000, the Shakespeare Development Co., Limited, with a capital of $300,000; the Sterling Silver Cobalt Mining Co., Limited, with a capital of $600,000; the Florence Mining Co., Limited, with a capital of $100,000; the Silver City Mining Co., Limited, with a capital of $250,000; the Wonderland Silver Mining Co., Limited, with a capital of $250 000, and the Silver Land Development Co Limited, with a capital of $1,000,000. The Mines Publishing Co., Limited, capital $40,000, has also received a charter. It will establish its headquarters in Toronto and publish a periodical or newspaper dealing with mines and mining.

The Galt Malleable Iron Co., with a capital of $100,000, will manufacture and deal in iron and steel fittings, brass, copper and alluminum.

The Owen Sound Brick Co., Limited, capital $40,000, will carry on the erection of buildings, sidewalks, pavements, etc.

The Port Arthur Sand, Lime, Brick Co., Limited, capital $60,000, will deal in sand, lime, brick, cement, and other building material, and contractors' supplies.