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THE ONTARIO REPORT

The twenty-first Annual Report of the Ontario Bureau of Mines, 1911, dated 1912, has just been received. The most final compliment that can be paid to this publication is that it is better than those that have been published before.

The Statistical Review by Mr. Thos. W. Gibson, Deputy Minister of Mines, covers the main facts of mineral production in the Province. It is noteworthy that at present 70 per cent. of all the mineral output falls under the category metalliferous. The total value of the mineral output is placed at \$41,976,797. This implies an increase of 87 per cent. during six years. But while both classes of products were almost on a parity five years ago, now the metalliferous products out-value the non-metalliferous by much more than two to one.

Here we may quote Mr. Gibson's own words: "While the past year was not one of sensational discoveries or the opening up of new and important mineral fields, it was one of steady progress and active production. The silver mines of Cobalt touched high-water mark, the nickel-copper deposits of Sudbury were but little behind their output of 1910 (the largest yet), the natural gas fields yielded nearly 50 per cent. more than last year, the blast furnaces turned out more pig iron, the brick and tile yards more brick and tile, the quarries more stone, and the long list of lesser industries, concerned in the production of other materials were, in general, more busily engaged. At least one promising mineral area has been revealed by the untiring prospector—that at West Shining Tree Lake . . . For the first time in the Province [also] mercury was recognized . . . Tungsten [also] was discovered in the form of scheelite by Mr. A. G. Burrows."

Ontario has a tremendous lead on all the other Provinces. In 1911 its mineral production was valued at \$41,976,797. For 1912, the figure, according to the best authorities, will be about \$45,000,000; which is practically 40 per cent. of the whole Dominion's output. It is in accord with the direction of modern progress that Ontario is adding to the staff of its Bureau of Mines. That Bureau has already distinguished servants. Its aim appears to be in the right and proper direction. The only possibly fair criticism is that it needs more mining officials.

The Annual Report includes several reports of utmost interest. Two have appeared in these columns. The list covers pretty well the whole of Ontario. Swastika is written up. The Lake of the Woods, Manitou and Dryden, Cripple Creek, and West Shining Tree are

not neglected. The geology of Detroit river area is described. The water powers of the region northeast of Cobalt are dealt with. Mining accidents are thoroughly tabulated and classified by the Inspector, Mr. E. T. Corkill. Statistics are given in revised form by Mr. Gibson. And the whole report appears in commendable externals.

The only change that the appreciative critic can fairly suggest is that the report is half a year late. This may be, probably is, due to the printer. The printing shop is the sump of all blame, and the origin of all delays. Yet we believe that it would be worth an effort to bring this and all similar documents out on time.

THE WABANA MINES DURING 1912

A prosperous year has been 1912 for the Nova Scotia Steel & Coal Company. The output of iron ore from the company's Wabana, (Bell Island), was 564,000 long tons. Much attention was devoted to the submarine mines, although the land areas were consistently worked. The submarine developments included the construction of storage pockets and of transportation facilities, also the installation of several centrifugal pumps, an electric shovel, and electric hoists. The tonnage was thus so increased the daily output was brought up to 1,100 tons. A new concrete and steel machine shop was erected and equipped, also a dry-house with hot and cold running water, to accommodate 500 men. So successful was the dry-house that a considerable extension was deemed necessary.

The new shipping plant at the pier side of the yard comprises tiple, storage pocket with elevating machinery, conveyor pier, and all modern accessories. The total storage capacity is now 70,000 tons. Thus two conveyors are operated simultaneously, giving a combined loading capacity of more than 5,000 tons per hour.

The Nova Scotia Steel & Coal Company is the highest type of progressive, modern, and efficient Canadian enterprise. It is a credit to Nova Scotia and to the Dominion at large.

THE HAWTHORNE CASE

Whatever the merits or demerits of the Hawthorne outfit, several facts emerge from the legal proceedings that have already been conducted. It is, for instance, a pitiful sight to view the son of Nathaniel Hawthorne under criminal indictment. It is also pitiful to have read the absurdly inflated correspondence that was issued in the name of the several corporations. It is not for us to assign motives, nor is it for us to allocate blame. It is, however, quite obvious that the expert witnesses called by the prosecution told the truth as they knew it. Therefore it is distressing in the extreme to note that no effort has been made to meet the facts adduced by these witnesses. Every effort was made by the defence to discredit reputable men; not one

argument was advanced to controvert the statements of the witnesses.

This, of course, is in accordance with the anomalous legal procedure of United States and Canadian courts. It appears to be quite impossible to try any offender on his own merits. The consoling fact is that the trial judge, in this case, is quite beyond reproach.

Let the outcome of the Hawthorne case be what it may, there will remain little inducement for any inspired promoter to attempt similar flotations in the future.

EDITORIAL NOTES

The rumour of an enormous merger of all Canadian steel companies with certain United States concerns has been emphatically denied by a representative of the Dominion Steel Corporation.

The United States Mint sold during 1912, \$38,000,000 of gold bars in the United States and Canada. In the two countries the consumption of new gold represented about \$35,000,000; about one-third of the world's total.

The output of gold in the United States during 1911 was smaller than it has been for five years. The value was \$91,700,000, less by \$5,200,000 than the value of 1911's output. Silver, however, crept up to about \$38,000,000, which is the highest figure attained in twenty years.

The proposed erection of a large iron, steel, and steel products plant at Sandwich, Ont., by the United States Steel Corporation is most significant. The Corporation owns 1,500 acres of land on the Canadian side of the Detroit river. This includes about one mile and a half of water frontage.

According to the last Dominion census, the value of capital represented by Canadian industries increased 276.19 per cent. during the period 1890-1910. Salaries and wages of employees showed an increase of 204.17 per cent. during the same period, while the total value of products went up 216.24 per cent.

A practical knowledge of mining is a decided advantage in farming. Dynamite is used extensively by American farmers. Low percentage dynamites are customarily employed. While there are many opportunities for utilizing explosives on the farm, the most important are such as blowing tree-planting holes, tree stump blasting, and ditching. For fruit tree planting, the dynamited hole is incomparably superior to the dug hole, as, in the former, the sub-soil is thoroughly broken up, thus giving ample space for the roots to establish themselves.

FIELD WORK CARRIED ON BY THE GEOLOGICAL SURVEY DURING 1912

(Written for the Canadian Mining Journal.)

During the summer of 1912, the Geological Survey placed in the field over 40 independent and semi-independent geological parties. Special lines of investigation such as those in connection with the coal resources of Canada and the clay and shale deposits, involved field work over the whole country. The detailed study of the economic possibilities and the general geological structure of various special areas was continued as in previous years. A number of parties were engaged both in the east and west in exploratory work. A considerable portion of the field work of several officers was devoted to making preparation for the various excursions to be held in connection with the International Geological Congress which meets in Canada in 1913 for the first time and which, it is hoped, will prove of great importance to the country as a whole.

Besides the geological parties, five topographical parties were placed in the field in an endeavour to provide accurate topographical maps so necessary for the proper study of the geology of various districts. The value of such maps for many other purposes has long been appreciated.

As a part of its functions, the Geological Survey also carried on special investigation in connection with natural history and the various branches of anthropology.

During the summer of 1912 the field work was completed in connection with the making of a trans-Cordilleran geological section along the main line of the Canadian Pacific Railway. This important piece of work was commenced in 1911 and has been carried out under the general supervision of Mr. R. A. Daly. It is the third nearly or quite complete section of the Cordillera so far made. The first, along the 40th parallel of latitude, from the Great Plains in Colorado to the summit of the Sierra Nevada in California, was run about forty years ago by a United States Government party under Clarence King. The second, along the 49th parallel, from the Great Plains to the Pacific, was made under the direction of the Canadian Commissioner of the International Boundary Commission (1901-7); by his courtesy, the report will soon be issued in reprint form as Memoir No. 38 of the Geological Survey.

In order to hasten the completion of the study of the section along the line of the Canadian Pacific Railway, a number of field parties were engaged during 1912, on this work. Mr. J. A. Allan, in continuation of his work of the previous year, completed the section from Banff to Golden. Mr. R. A. Daly studied the geology along the railway route in the Selkirk Mountains and the Purcell mountain system. This was in continuation of the work already performed in 1911, and amongst other results obtained, the structure of the Purcells, hitherto unknown in the part north of Windermere, was worked out. Mr. C. W. Drysdale was engaged in the study of that portion of the section between Six Mile Point on Kamloops Lake and Lytton, while Mr. B. Rose made a special examination of an area about the west end of Kamloops Lake. Mr. Charles Camsell and Mr. N. L. Bowen studied the section along the railway line from Lytton to Vancouver.

The study of another geological section of prime importance, namely that along the Yukon-Alaska international boundary from the crossing of Yukon River

northward to the Arctic, was also complete in 1912. This work was performed in co-operation with the United States Geological Survey which undertook to map the geology between Porcupine River and the Arctic Ocean, while the remaining portion from Porcupine River southward to Yukon River was undertaken by the Canadian Geological Survey. Mr. D. D. Cairns completed in 1912 the geological mapping of this southern part.

Mr. R. G. McConnell made a special examination of the geological section through the Coast Range from Prince Rupert to Aldermere. He also spent a short time examining some of the gold-bearing quartz deposits that are being developed on Princess Royal Island and spent a longer period of time on Texada Island in connection with the recent mining developments there taking place.

Mr. C. H. Clapp engaged in field work on Vancouver Island, geologically surveying the area represented by the Sooke and Duncan map sheets. Certain bodies of gabbro in this general district carry copper sulphide deposits of prospective importance. The recent study of the field has led to the important discovery that there are a greater number of these gabbro bodies than hitherto supposed. Mr. Clapp also spent some time on Graham Island gathering information concerning the recent developments of the coal measures of the island. It was found that the coal, while of excellent quality, occurs in much smaller basins that was previously thought.

Mr. G. S. Malloch continued his examination of the Groundhog coal basin. The dimensions of the field are, roughly, 30 miles by 45 miles, but the coal-bearing horizon has been removed by erosion from a considerable portion of this area. Mr. Charles Camsell, besides engaging in the study of the section of the Cordilleras along the main line of the Canadian Pacific Railway, also studied a general section from Midway to Spences Bridge. An examination was made of the gold-copper deposits of Kruger Mountain at the southern end of Okanagan Valley, and of the gold-copper deposits on Independence Mountain in the range between Keremeos and Twenty Mile Creeks, Similkameen district. Mr. Camsell made a brief study of the copper deposits at Copper Mountain, Similkameen district, where the British Columbia Copper Company has been for the last year carrying out important development work. The result of this work has been to prove the existence of large deposits of low grade copper ore, which, if they can be successfully treated, will mean that a new and important copper producing field will soon be opened up. A brief study was also made of the Tertiary coal-bearing rocks of White Lake in Okanagan Valley.

Mr. A. M. Bateman made a preliminary examination of the economic resources of the Bridge River district. In this district, mining work is being carried on in the Cadwallader Creek section, where the gold-bearing veins, though small, are persistent and their gold content is sufficiently high to justify mining of the ore on a commercial basis. Mr. Bateman also made an exploratory trip from Lillooet to Chilko Lake. As a result of this trip, the eastern border of the Coast Range batholith, which is in many places an important mineral zone,

was outlined and the bordering strata were found to be of lower Cretaceous age instead of Palaeozoic, as previously supposed.

Mr. H. Ries, while continuing his study of the clay and shale deposits of British Columbia, made examinations along the Columbia River Valley from Golden southward and from Revelstoke northward. In both districts, deposits of clay or shale, which can be utilized for common and pressed brick and perhaps for other classes of products, were found. A study was also made of the shales of the Nanaimo series on the east coast of Vancouver Island.

Mr. S. J. Schofield made an examination of the part of East Kootenay lying south of the Crown's Nest branch of the C.P.R. and between Kootenay River and Kootenay Lake. The mineral-bearing belt, containing the St. Eugene, Aurora and Society Girl ore deposits, was outlined southwards to the international boundary.

Mr. D. B. Dowling visited a number of the principal coal areas both in Eastern and Western Canada in order to obtain the necessary information to enable him to make a review of the coal fields of Canada.

Mr. W. W. Leach made a detailed examination of an area about Blairmore, which includes practically all the producing mines of the bituminous coal fields on the Alberta side of Crow's Nest Pass.

Mr. J. D. Mackenzie made an examination of the district lying immediately south of the Blairmore map-area. This area includes most of the foothills between the valleys of south fork of Oldman River and Pincher Creek. In it lies the southward extension of the coal areas of the Blairmore district.

Mr. E. S. Moore carried on an exploration in the Pre-Cambrian region lying east of the southern part of Lake Winnipeg, partly in Manitoba and partly in Ontario.

Mr. C. R. Stauffer completed his studies in connection with the Devonian strata of the peninsula of Southwestern Ontario. This work is of importance in connection with the general problems of the extensive oil and natural gas districts of Ontario. This field of endeavour was further supplemented by the work of Mr. M. Y. Williams, who devoted some time to the study of the Hamilton formation (Devonian) of Lambton County. He was, however, mainly engaged in stratigraphical and palaeontological studies on the Silurian sections of Manitoulin Island.

Mr. W. A. Johnston continued topographical and geological field work in the neighbourhood of Lake Simcoe. An area of about 1,200 square miles surrounding Lake Simcoe has now been accurately mapped on a scale of one mile to one inch with 20-foot contours.

Mr. W. H. Collins continued and almost completed a detailed geological reconnaissance of the Onaping map-area lying to the north of the Sudbury district.

Mr. M. E. Wilson made a geological reconnaissance in northwestern Quebec of a belt of country extending from Lake Kipawa via Grand Lake Victoria to the headwaters of Nottaway River.

Mr. H. C. Cooke explored the headwaters of Broadback River between Lake Evans and Lake Mistassini, in northern Quebec.

Mr. R. Harvie examined a geological section across Brome County, Quebec, from Lake Memphremagog westward to Sweetsburg in order to obtain more knowledge concerning the general relations of the older formations. It was hoped, among other results, to ascertain what connection, if any, existed between the copper deposits of Missisquoi Valley and those of the belt found in Sutton, Brome, Stukely and Ely Townships to

the west. The subject is of present importance, owing to a renewal of interest in copper mining throughout the general district.

Mr. J. Keele made an examination of various clay and shale deposits in the Province of Quebec and in part of New Brunswick. The principal part of the season was spent in the region adjacent to the St. Lawrence River between Montreal and the City of Quebec, a field containing one of the largest markets for clay wares in Canada.

Mr. W. A. Bell completed his work on the Joggins section of Nova Scotia. This is one of the standard Carboniferous sections of the Maritime Provinces and the elucidation of the various problems there presented are of direct economic value in connection with the development of various coal areas in the region.

Mr. E. R. Faribault continued the geological mapping of the gold-bearing series of the southern portion of Queens and Lunenburg Counties, Nova Scotia.

Besides the various field parties listed above, engaged in field work of direct economic importance, others took up various problems whose scientific importance and indirect economic value can hardly be over-estimated. In Nova Scotia, Mr. J. E. Hyde engaged in palaeontological work on the Carboniferous strata, paying particular attention to the Sydney field. Mr. W. J. Wright studied various problems in connection with the eruptive rocks of the gold field of southwestern Nova Scotia in an attempt to add to the sum of knowledge relating to the origin of the gold-bearing and tungsten-bearing ores.

In Western Canada, Mr. E. M. Kindle engaged in the study of the Palaeozoic section of northern Manitoba. Mr. A. McLean carried on palaeontological work in southern Manitoba. Mr. C. H. Sternberg made collections of vertebrate fossils from the Edmonton formation in the vicinity of Munson, Alberta. Mr. C. D. Walcott engaged in work on the Cambrian system of the Yellowhead Pass.

The field work performed during 1912 by the Topographical Division of the Geological Survey, was as follows:

Mr. K. S. Chipman commenced topographical work in the Windermere district. The map, when completed, will include the Columbia Valley from Dutch Creek to Number Two Creek and the country to the west for a distance of about 25 miles.

Mr. W. E. Lawson engaged in work in Lillooet district. The topographical map will include a greater part of Bridge River district and the headwaters of Eldorado Creek.

Mr. D. A. Nichols prepared a detailed topographical map of the iron ranges on Texada Island, and also a map of a portion of the northern end of the island.

Mr. B. R. Mackay completed the mapping of the Blairmore area. This map includes all the towns between Coleman and Burmis on the Crow's Nest branch of the C.P.R. and covers the areas in which the principal coal mines are operating.

In New Brunswick, Mr. A. C. T. Sheppard completed a sheet in the neighbourhood of St. John City. This map includes the City of St. John and the Towns of Rothesay and Lorneville. The map will be published on a scale of about 1 mile to 1 inch, with 20-foot contour intervals.

The various topographical maps, when completed, will indicate all cultural features such as roads, railways and buildings, in black; all lakes, streams, etc., in blue; while relief will be shown by contour lines in brown. The maps can be used for a variety of purposes and should prove very useful.

REVIEW OF OPERATIONS AT THE DOME MINE, SOUTH PORCUPINE

Written specially for the Canadian Mining Journal.

During the past year, wonderful progress has been made throughout the whole of the Porcupine camp, and at no place has this been more noticeable than at the Dome mine. Following the fire of July, 1911, considerable time was lost in getting in materials, so that a large portion of the heavy construction work had to be performed in the dead of winter, with the temperature often many degrees below zero.

At the beginning of the year, following the appointment of Mr. W. W. Mein as consulting engineer, several radical changes were made in the crushing stations, and also in the mine development plans, so that the real work of the company may be considered to have started at that time.

Mine.

The ore body consists of a large mineralized zone, in which occur lenses of ore, but the values are so distributed that the whole deposit may be worked with very little sorting. So far, all the work has been done by open-cut methods, and what sorting is necessary is accomplished by cleaning out the stope and then shooting down the waste rock which is trammed out separately.

During the first part of the year, development work was largely confined to the 45-foot level. This was necessary on account of the lack of power and for the purpose of bringing the mine to the producing stage as rapidly as possible.

Raises were put up at intervals, and at the bottom of the raises, chutes or boxes were built. These chutes were built sufficiently strong to permit of blasting large pieces which sometimes get into them. All the mining is open-cut work, the ore being broken into the raises, which are kept full so that large blocks may be sand-blasted at the surface. The actual breaking of the ore is done by hammer drills and a duty of about 50 tons per man per day of 9 hours is attained.

The broken ore is drawn from the bottom of the raises into 16 cubic feet V-shaped side dumping cars, and the tramping is done by mules.

As soon as possible, the development work on the 100-foot level was completed and raises put up to connect with those on the 45-foot level. On account of the greater lift, fewer raises are necessary.

An interesting feature of this property is the incline from the crusher station to the 100-foot level. This did away with the necessity of hoisting the ore through a vertical shaft and tramping it to the crushers, and while serving to develop the west end of the property, is remarkable for its simplicity and the ease and economy with which the tonnage is handled.

The breaking of ore, tramping, hoisting and crushing is all done on the day shift.

Crusher Station.

The ore is hauled up the incline in trips of four to six cars, and is dumped direct into a No. 7½ gyratory crusher. The broken rock falls on a conveyor belt and is elevated to a pair of No. 3 gyratory crushers, first passing over a grizzly which takes out any material which will pass through an inch ring. This undersize and broken rock from the No. 3 crushers which will

pass through a two-inch ring, falls on a second belt conveyor which carries it to the mill bins. The advantage of this method is that both sets of crushers are on the ground so that the construction work is very simple and the crushers are always on a solid foundation.

Mill.

The mill was designed and erected by the Merrill Metallurgical Company and has fully borne out the promises made for it. It is a steel and concrete structure, covered with two layers of corrugated iron between which was placed a layer of hair felt to provide an insulating material and permit of economically heating the building.

The ore from the 1,600 ton bins is crushed through 12-mesh by 40 stamps of 1,250 pounds each, the pulp passing over the primary amalgamating plates to four Dorr classifiers. These primary plates are to be discarded as the scouring action of the coarse pulp prevents efficient amalgamation. From the classifiers, the slimes pass over a second set of amalgamating plates and then direct to the Dorr thickeners, the coarse sand going back to the tube mills. The product from the tube mills is pumped back to the classifiers, this process being continuous. From the Dorr thickeners, the pulp is elevated to four Pachuca air agitation tanks 40 feet high by 8 feet in diameter, the cyanide being added at the elevator boot. From these tanks, the pulp passes two Dorr thickeners and then to a mechanical agitator which is used solely to prevent the solids settling before they are sent to the presses. These presses are Merrill pressure filters, and have been found to be most satisfactory for this class of ore. The presses discharge into Dorr thickeners, where some of the water is saved and is used again as wash water.

The precipitation takes place in Merrill zinc dust presses, the resulting product being treated first in a small blast furnace with litharge. The lead bullion is then cupelled, the product being remelted in an old-heated tilting furnace.

The mill is efficient, and ore extraction of 97 per cent. is attained. Of the total gold recovered, about 60 per cent. is obtained from the amalgamating plates.

The treatment of this ore does not present any metallurgical difficulties, the only troubles being of a mechanical nature. The stamps have a duty of 10 tons per day, but the tube mill and press capacity is only 350 tons per day. A new tube mill and filter press are being installed and, when these are in operation, the mill should treat 400 tons daily.

Company Organization.

The organization is divided into different departments, each department having its separate head. The lines of distinction are clearly drawn, there is no overlapping of authority, and each head is directly responsible for the work of his own department.

The sub-divisions are as follows:

Mill Superintendent, who has charge of the mill and assay office.

Mine Superintendent, who has charge of the mine.

Mechanical Engineer, who has charge of all surface labor, power house, machine shop, boiler shop, black-

smith shops, all repair work, construction work, electricians and mechanical draughtsmen.

Mine Engineer, who has charge of surveying, sampling and diamond drilling and geological work, and who is responsible for the proper compilation of data regarding ore reserves, etc.

Chief Clerk, who has charge of the accounting and time-keeping departments and of stores.

Steward, who has charge of the bunk houses, mess houses, clubs and company store.

All these departments are directly responsible to the general superintendent, and in this way the maximum of efficiency is obtained.

The Canadian Mining & Exploration Company, at the head of which is Mr. W. W. Mein, has been appointed consulting engineers.

The property is well equipped with machine and repair shops, and has a plant of sufficient capacity to generate power for all purposes. Hydro-electric power from Waweatin Falls will, however, be available in a short time, and when this is in use, costs will be materially reduced. Brick buildings for the accommodation of the men and the staff have been constructed, and a very complete hospital is also available.

PROGRESS ON THE METALLURGY OF COPPER DURING 1911.

Written for the Canadian Mining Journal by George A. Guess.*

Copper metallurgy during the year 1912 has been stimulated by a steadily increasing price for copper. The price of the metal had remained low since the slump in 1907 until December, 1911, when it began to recover and during the present year it has steadily increased from fourteen cents in January to seventeen cents in June, remaining slightly above that figure for the balance of the year. This increased price of copper enhances the value of the output for 1912 over the year 1911 upwards of \$50,000,000.

The present year has seen a growth of reverberatory furnace rather than blast furnace smelting. The increasing tonnages of concentrates, particularly in the southwest, have demanded the construction of more reverberatory furnaces. The time has gone by for the smelting of this fine material in blast furnaces. The new reverberatory plant of the Ray Consolidated at Hayden, Arizona, was in commission in May, and will handle the product from their large concentrators. The smelter at Humboldt, which consists largely of reverberatories, resumed operations in February. The Copper Queen put two oil-fired reverberatories in operation during the year, after spending some time investigating other methods of handling fines. The new plant of the Calumet and Arizona at Douglas will have four large reverberatories. The fact is realized that fine ore is a detriment to blast furnace operations, taking more coke, running more slowly, and producing quantities of flue dust. The practice, therefore, of screening blast furnace ores is becoming general. These fines, together with the flue dust, are smelted in reverberatories where their quantity is sufficient to justify such a furnace or sintered for blast furnace treatment when the tonnage is small. The Canadian Copper Co. at Copper Cliff has during the year added two large reverberatories to their smelting plant. These handle fines and flue dust and converter slag. On account of the basicity of the charge these large reverberatories have a hearth and side walls of basic brick. These are the first reverberatories to be designed and built for the burning of pulverized coal. Previous experiments in firing reverberatories with pulverized coal have been adaptations to existing construction.

Reverberatory furnaces show little change in construction. The limit of size appears to have been reached. The front of the furnace is now, however,

Professor of Metallurgy, University of Toronto.

usually built straight into the flue. The skimming is done at the side near the front.

For roasting sulphide fines for reverberatory smelting the Macdougall type of roaster continues in favour. Larger sizes, however, are being used and the rabble arms have been speeded up to twice their former speed resulting in greatly increased capacity. Roasting furnaces that have been developed in the sulphuric acid industry have entered the field of copper smelting. Herreshoff furnaces are being installed at the C. & A. at Douglas. Wedge furnaces have been put in at Braden, Copper Cliff and other places. Bedding of the charge that has proved advantageous to blast furnace operations is being adopted for fines for reverberatory smelting, and should result in greater uniformity of work and capacity, in their operation. The handling of the Miami concentrates (which consist of silica, copper, and sulphur, with practically no iron) continues to be a unique as well as successful operation. These concentrates are treated at Cananea and are blown into the converters. The construction of a suitable dust chamber for the converter gases has been found necessary.

The Canadian Consolidated Co. at Trail has changed the practice of granulating and roasting the low grade copper matte, high in gold values, and is smelting it direct with silicious ores in the blast furnace. A wide blast furnace has been developed at Great Falls. This is 84 inches wide at the tuyeres and in cross section looks like an early form of iron blast furnace. The upper tier of jackets conveying at the top. By using a slotted tuyere 3 in. x 11 in. with the long axis vertical 120 square inches of tuyere area are obtained per foot of furnace length. This is about three times the tuyere area of an ordinary blast furnace. Blast furnaces 72 inches wide at the tuyeres give improved running at Cerro de Pasco. The new blast furnace plant of the Mason Valley mines was blown in early in January.

Very considerable strides have been made in the development of basic converting during the year. The use of a basic lined converter is now almost universal. The long barrel form of the Peirce-Smith up to 37 feet in length as at Copper Cliff, has been the general form installed until this year when the form developed at Great Falls has found tremendous favour and has been installed generally in the southwest at Cananea, at the Copper Queen, and at the C. & A. at Douglas. This

form is a development of the Parrot type of converter, and has been formed to give astonishingly long life to a lining over 12,000 tons of copper have been made from one lining. The charges on this form are smaller and are finished on each shift. The Peirce-Smith takes a big charge, and twenty-four hours or longer to finish. The size of the tuyeres has been increased and their number doubled, fifteen one-inch tuyeres being increased to 34, 1/3-inch tuyeres for a 12-foot diameter converter. In addition to the two large types, many plants have lined their old acid shells with magnesite brick and are using these very successfully.

The neutralization of smelter smoke has made little progress throughout the year. The Balaklala smelter in which the Cottrell process was installed, remains closed. The Mammoth smelter at Kennet, where the Sprague process (neutralization of sulphuric anhydride with zinc oxide and baghousing the gases) has been installed, is in operation; but a new association of Shasta county farmers was formed in December to renew the fight against the smelting company. The Thiogen process of Prof. Young is still in the experimental stage. Experiments have been conducted at the Penn Smelter at Campo Seco, Cal. This process reduces the oxides of sulphur to metallic sulphur by means of volatile hydrocarbons. The two smelters in Tennessee continue to produce sulphuric acid. The output of the Tennessee Copper Co. exceeds 500 tons of 60 deg. Beaume acid per day. Despite this production of acid the company was not free from claims for smoke damage. It would appear, therefore, to be an almost impossible matter to protect vegetation from damage by smelter smoke even when the location of the plant makes it possible to manufacture from it sulphuric acid and find a market for the acid. Unfortunately, Canada has a very limited market for sulphuric acid. The average daily production of acid in Canada does not

exceed 75 tons; whereas the production in the United States is upwards of 10,000 tons per day. Fortunately in Canada we hear very little complaint against the smelters on account of smoke. The smoke is recognized as a necessary evil. The short-sighted policy pursued in California has resulted in the permanent closing of some plants that afforded the only market the farmers had. They then tried to undo the damage they had done by urging the resumption of smelting operations.

The last few years has seen wonderful tonnages of low grade copper ores handled in wet concentration plants, particularly in Utah and Arizona. The extraction is, however, extremely low, being more often under 70 per cent. than over. This tremendous waste has turned attention to wet methods of treating low grade copper ores. Although there has not been any great progress made during the year, there are at the present time a great many companies investigating various processes. In fact, all the larger copper companies in the United States are experimenting for the wet treatment of their low grade ores. The Anaconda Company has been investigating the Bradley process. The Copper Queen has two men who have spent much time in copper leaching experiments investigating their possibilities. The Braden Copper Co. is experimenting in the leaching with sulphuric acid made from the roasting of their concentrates.

It is quite likely that the next two years will see some new developments in the hydrometallurgy of copper. Nothing new has been given out during the year regarding the progress made by the Bradley process in treating the Anaconda slime accumulation. Such has been found extremely difficult to do anything with, and if Mr. Bradley can work out the successful treatment of slime he will find many applications for his process.

THE COAL TRADE OF NOVA SCOTIA IN 1912.

A Resume by F. W. Gray.

The year 1912 presented no outstanding features of interest concerning the coal mines of Nova Scotia, with the notable exceptions of the increase in production and a large capital expenditure on new mines and equipment.

As far as can be estimated at the time of writing, the coal output of the Province will approximate 6,900,000 tons, an increase over 1911 of 650,000 tons.

Cape Breton mined 5,650,000 tons, or 82 per cent. of the entire tonnage. The combined output of the collieries controlled by the two large Cape Breton companies, the Dominion Coal Company and the Nova Scotia Steel & Coal Company, accounts for 5,770,000 tons, or 84 per cent. of the provincial output. The Dominion Coal Company's collieries in Cape Breton and on the mainland put out a total of 4,934,000 tons, or 72 per cent. of the entire Nova Scotian output.

The whole, and more, of the total increase in outputs over 1911 has come from the properties operated by the Dominion Coal Company, who exceeded the 1911 production by 683,000 tons, comparing with the total provincial increase of 650,000 tons.

Considering the large capital expenditure that has been made on coal mines in Nova Scotia, the increase in production is not any greater than it should be, and

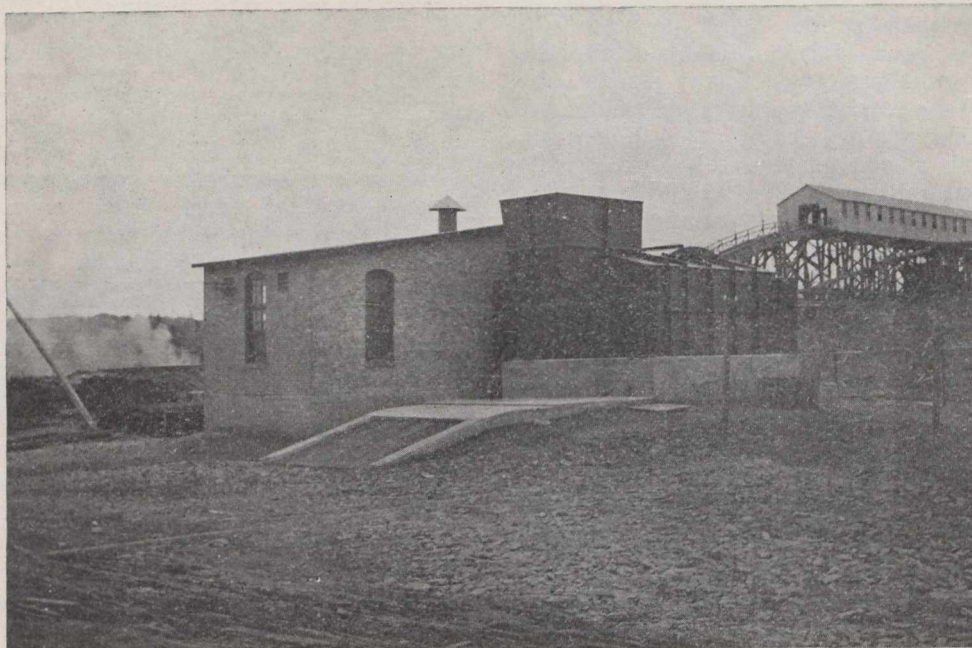
if a comparison is made with the United States the insignificant character of the increase becomes plain. On the authority of the "Coal Trade Journal" the coal production of the United States in 1912 was 540,000,000 tons, being 40,000,000 tons greater than the high mark of 1910. The mere increase in the United States output is, therefore, almost four times greater than the entire annual coal output of Canada.

It does not appear probable that 1913 will see any very remarkable rise in the outputs of the Province. It may be anticipated that the Dominion Coal Company will again provide the greater portion of the additional tonnage, and the Acadia Coal Company will probably reap the benefit of their large capital outlay in 1911 and 1912. The development of the new openings which it is understood are projected at the mines of the Nova Scotia Steel & Coal Company, and by the Inverness Coal & Railway Company at Inverness, will not add greatly to production until 1914.

The general prosperity of the coal trade during 1912 was helped by the coal shortage occasioned by the English coal strike and the anthracite strike in the United States. In the spring there was a brisk demand for bunker coal, and a good deal of Nova Scotian coal found its way into ports usually supplied from British

mines. The steady growth of manufacturing concerns around Montreal, and the opening up of the eastern sections of the new transcontinental lines is creating a healthy demand for soft coal in the natural market of Nova Scotia.

are only approximately correct, accurate tonnages not being available at the time of writing. There is much ambiguity about figures of Nova Scotian coal outputs, as some returns deal only with sales, and others follow the Government year which ends on September 30th.



Walker ventilating fan and fire-proof House—Dominion No. 14 Colliery.

There were no accidents during the year involving serious loss of life. So far as it is possible to ascertain the fatality rate will be less than that of 1911, probably about 2.5 per thousand employed.

The Commission appointed by the Nova Scotia Government to investigate the flooding of the Port Hood Colliery completed its work during the year, and it is expected that the report will be made public when the Provincial Legislature assembles in the spring. There have been no new developments in this matter during the year.

The Morien Colliery, previously operated by the North Atlantic Collieries Company, was dismantled and abandoned during the summer of 1912.

The Broughton Colliery, situated near the fringe of the Morien Basin of the Sydney coalfield, about three miles from No. 21 colliery of the Dominion Coal Company, and owned by the Cape Breton Coal, Iron & Railway Company, has been idle since 1907. At the present time some activity is being shown, and it is understood a coal-shipping pier is to be erected on Mira Bay, and a railway branch of four miles in length is to be constructed connecting this pier with the mine.

The promoters and officers of the Cape Breton Coal, Iron & Railway Company are all reputable Englishmen connected with coal mining in Great Britain, and are themselves largely interested financially. The prospectus of the Company as advertised in England was decidedly roseate, and if the results therein forecasted are obtained, it will surprise disinterested local mining men, who are in a position to judge from their own experience. Under the circumstances, the writer prefers not to hazard a prediction as to whether the Broughton mine will become an important factor in coal production in 1913, or not.

Following is a tabulation of the outputs of the principal operating companies in Nova Scotia. The figures

	Outputs 1911 Tons 2240 lbs.	Outputs 1912 Tons 2240 lbs.
Dominion Coal Company—		
Glace Bay mines	3,985,000	4,514,000
Springhill mines	266,000	420,000
Nova Scotia Steel & Coal Co..	780,000	842,000
Acadia Coal Company	370,000	433,000
Intercolonial Coal Company ..	263,000	236,000
Inverness Coal Company ...	291,000	280,000
Maritime Coal Company	160,000	120,000
Colonial Coal Company	30,000	35,000
Others	105,000	50,000
	6,250,000	6,930,000

The Nova Scotia Steel & Coal Company exceeded their 1911 tonnage by 62,000 tons. The output therefore comes back to the same level as in 1910. This company have not made any important additions to their colliery equipment during the year, but it is understood a new shaft is projected in the near future.

The Acadia Coal Company increased its output to 433,000 tons, although, during the concluding months of the year the operations of the company have been hindered by disagreement with the workmen as to hours of work on Saturdays.

During the year the new central power plant at the Allan shaft was completed, which is intended ultimately to provide electric drive for both the Allan shaft and the rejuvenated Albion mine. At this last named colliery a new steel bank-head has been erected and a complete electric equipment, including fan, compressors, screening plant and underground pumps. At the Allan shaft a high-duty steam-driven hoisting engine is being installed, with which it is expected to hoist four-deck cages from No. 1 shaft.

A full description of the new equipment of the Acadia Coal Company was given in the special Nova Scotia

edition of this Journal, as was also a detailed account of the Nova Scotia Steel & Coal Company's coal mines, so that it is unnecessary to say more in this article.

The Acadia Coal Company has carried out extensive diamond drill prospecting during the year, having put down bores over 2,000 feet in depth. The company is also unwatering the Ford seam and energetically developing its properties in general.

The Intercolonial Coal Company show a small falling off in their output. The management hope, however, to recoup the decrease in 1913.

The output of the Inverness Coal Company shows a decrease of 12,000 tons, which was partly caused by labour troubles. A Conciliation Board was appointed by the Government to consider and adjust these complaints, which was done in a manner satisfactory to all concerned. It is the intention of the management to instal a new and more powerful hoisting engine. The coal has now to be hauled a distance of 6,000 feet from the deep and the present engine is too light for the work. It is expected to have the new engine ready for work against the opening of navigation in the spring. In the near future the management intends to sink a slope on the 13-foot seam, which overlies the 7-foot seam now being worked.

The Maritime Coal Company produced less coal than in 1911, and they have added no new equipment.

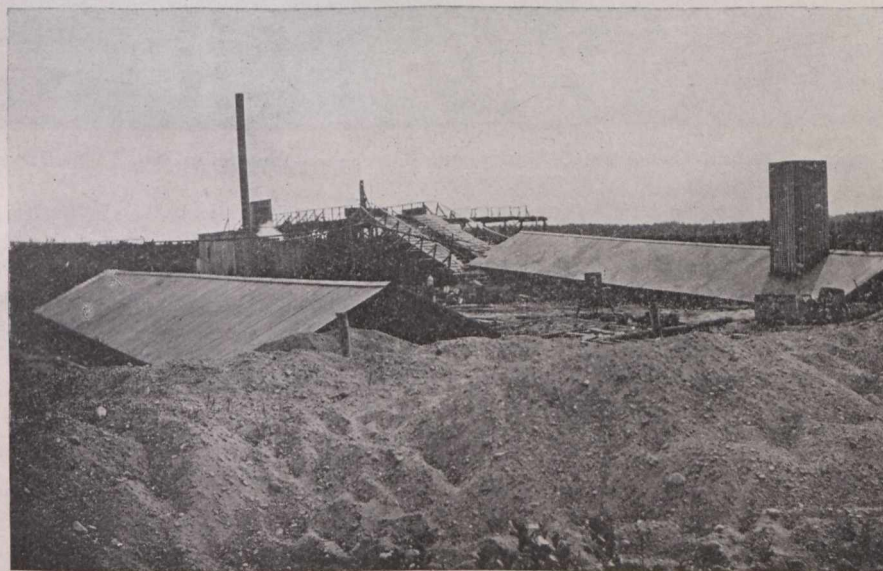
Mention may also be made of the Colonial Coal Company, whose mine is situated between North Sydney and Sydney Mines. This company, although only operating on a small scale, has introduced a commendable innovation in a briquetting plant. The coal produced by this company's mine would not stand exposure to the weather or transportation, and quickly became slacky. To get over this difficulty, the management decided to briquet the coal, and they have succeeded in producing a product which has met with considerable local demand. It will not be surprising to hear of some of the larger coal companies in Nova Scotia

goose egg, hard and polished, and capable of standing transportation.

The Dominion Coal Company had a particularly successful year. The output of the Glace Bay collieries was approximately 4,514,000 tons, comparing with 3,984,749 tons in 1911, an increase of 530,000 tons. Following is a comparison of the outputs by collieries:

	1911 (tons)	1912 (tons)
No. 1	577,405	585,000
2	755,879	818,000
3	171,473	131,000
4	392,727	425,000
5	324,511	267,000
6	254,975	275,000
7	194,539	202,000
8	178,824	155,000
9	408,869	431,000
10	183,992	216,000
12	281,407	330,000
14	184,544	321,000
15	40,292	148,000
16	17,963	131,000
21	17,391	58,000
22 . . . . .	.....	221,000
	<hr/>	<hr/>
	3,984,749	4,514,000

No 1 colliery had the largest output since 1902, the year immediately preceding the fire that occurred in this mine. Nos. 2, 6, 7, 9 and 10 collieries all produced the largest tonnage in any year. The most striking increases, however, are naturally in the new mines of the Waterford district, and at Birch Grove. The combined increase of the Waterford collieries over 1911 amounts to 410,000 tons, and the Birch Grove collieries, of course, show much larger tonnages. The major portion of the Coal Company's increase over 1911—ninety per cent. to be exact—comes from the new collieries 12 to 22 inclusive. The only collieries showing a decrease are Nos. 3, 5 and 8, these three mines being old



Slopes and temporary Bankhead arrangements—Dominion No. 22 Colliery.

following the example of the Colonial Coal Company. The modern briquetting plant is a great advance over the old-fashioned machine, which produced a large "brick," to consolidate which it was necessary to use an undue quantity of pitch. The plant of the Colonial Coal Company turns out a briquette about the size of a

collieries approaching the stage of small production preceding exhaustion. Old mines, however, like King Charles, are often a long time a dying. A point of interest in connection with the older collieries of the Dominion Coal Company is that they are all on the upper and thicker seams first attacked, so that the plant

and shafts can be utilized for the mining of the lower seams, as yet practically virgin.

The Coal Company has made very large additions to their equipment during 1912. As these were described by the writer in more or less detail in the special Nova Scotia edition of the Journal, published in September, a brief recapitulation will suffice.

At No. 2 colliery a large Walker ventilating fan, with adequate concreted surface airways was installed. This fan is to be used only as a spare or emergency fan, and is entirely additional to the ordinary ventilating machinery of the mine.

No. 14 colliery was provided with a permanent electric coal hoist, already fully described in the columns of this Journal. Since installation the hoist has worked continuously and satisfactorily.

At No. 15 colliery the permanent bank-head was completed, together with all the surface erections. The permanent coal hoist will be installed next spring, and like No. 14 hoist, will be electrically operated.

hoist and colliery buildings were all completed. The construction of the bank-head at No. 22 colliery is proceeding, and this colliery will be equipped to the full producing stage in 1913.

It is also probable that the Coal Company will reopen the Emery seam near the present No. 3 colliery. Slopes were driven here from the outcrop of the Emery seam in 1899 for a length of 1,600 feet, and were temporarily abandoned in 1901. The existing plant and bank-head at No. 3 colliery will be utilized for the reopened slopes, to which the name of Dominion No. 11 colliery will be given.

By the early summer of 1913 the Coal Company expects to have sixteen collieries in full operation, with complete equipment, and to have Nos. 11 and 17 collieries well under way.

Unless the unforeseen intervenes, the outputs and shipments of the Coal Company in 1913 should be even larger than they were in 1912. The mines will work steadily all through the winter, so far as the weather



Mouths of Slopes, Compressor House and Bankhead—Dominion No. 21 Colliery.

The erection of the colliery buildings is proceeding at No. 16, and brick is being used instead of wood, a commendable departure. Although this colliery is producing up to one thousand tons daily, the equipment is as yet of the most temporary character. The permanent bank-head is under construction and will be completed in the early summer of next year.

An electric power transmission line has been run to the site of the old Victoria mine, which it is the intention of the company to unwater and re-open for work as soon as possible. Electrically driven centrifugal pumps are being set up at the present time. The work of rehabilitating the underground workings will be proceeded with as the water in the mine is lowered. This colliery was closed by the Coal Company in 1897, and in that year produced over 100,000 tons. It is expected that it will be possible to obtain a considerable output from the workings quickly, as the territory will not require to be developed as in the case of an entirely new mine. The coal taken from the Old Victoria slopes had an excellent reputation for quality.

At No. 21 colliery, the permanent bank-head, coal

permits, and a larger quantity of coal will be stocked during the season of closed navigation than in any previous winter season. Although it is not considered good form to prophesy regarding coal outputs, it is not unreasonable to anticipate an output from the Coal Company's Glace Bay mines of from 4,700,000 to 4,800,000 tons during 1913.

A new electric generating station to serve the Waterford collieries has been partly completed, the first electrical unit having been installed. The Bettington boilers are under steam, and power is being generated to supplement the current generated at the No. 2 power house.

In the Waterford and Birch Grove districts the company has made large expenditures on dwelling house accommodation for its work people, and has also installed extensive water systems for supplying the collieries, for fire protection, and the domestic requirements of the colliery towns. The company is also supplying electric light and power to the large population that has been attracted by the mining developments.

At Sydney a Baum coal washer was completed and put into operation, and reinforced concrete storage hoppers are being constructed to hold 6,000 tons of washed slack. They will be completed in the spring.

The new coal-shipping pier at Sydney is completed, except for the fittings, and will be ready to ship coal when navigation opens in the spring.

The increased output of the company has necessitated large additions to the rolling stock and motive power of the Sydney & Louisburg Railway, and the construction of additional branch lines and sidings, and passenger and freight accommodation. Extensions have been made to the car repair shops, machine shop, mine car shops, etc., and a large brick building has been provided for safe storage of patterns, the company's stock being both extensive and peculiar, and of course very valuable.

The Springhill mines steadily improved in outputs throughout the year, producing about 420,000 tons, compared with 266,000 tons in 1911.

The output for December was lessened by a fire that occurred in the No. 2 mine on Christmas Eve. The district affected by the fire was speedily isolated by concrete stoppings, and it is expected that mining operations in the No. 2 mine will have been resumed early in the New Year.

During the year the only additions to the existing equipment were a miners' wash house and a rescue station, equipped with the regulation Draeger apparatus and accessories.

Diamond drill prospecting has been carried along for some time past, and in all probability a new slope will be opened out early in 1913.

The Dominion Coal Company Employees' Benefit Society is becoming an important organization, and reflects the great expansion of the Coal Company's operations. The society was inaugurated in July, 1910, with a membership of under 7,000, and at the close of 1912 the membership numbered 11,120 persons. The income of the society in 1912 was approximately \$144,000, \$63,000 being contributed by the company, \$11,500 by the Government of Nova Scotia, and \$6,250 from interest on investments.

The expenditure totalled \$98,600, of which amount \$69,000 was paid out for weekly indemnity for disability caused by sickness and accident. For death claims \$7,600 has been paid, and to widows and children \$16,700, making a total paid out to dependents of deceased members of \$24,300. At the end of the year there were dependent on the funds of the society, 86 widows and 293 children, an increase from the end of 1911 of 33 widows and 55 children.

The year was a disastrous one to shipping engaged in the coal trade. The "Bonavista," after a long career in carrying coal and passengers, became a total wreck in the Bay of Fundy.

The "Isleworth" was lost in the drift ice off the Nova Scotia coast in the spring, and the "Helvetia" was sunk in a collision with an "Empress" steamer in the St. Lawrence.

The "Gladstone" went aground below Quebec and was badly damaged. In none of these accidents was there any loss of life.

The "Morien" left Louisburg for Newfoundland in the middle of November and was lost with all hands, it is presumed, off Placentia Bay. A collision occurred between two "Black Diamond" boats in Sydney Harbor, which caused the loss of five lives.

Among publications of the year bearing on coal mining in the Province may be mentioned the report of

Dean Fernow, of Toronto University, on "Forest Conditions of Nova Scotia." This report is the result of a reconnaissance survey of the Province, the expense having been defrayed by the Government of Nova Scotia, who allowed the report to be made public at the request of the Commission of Conservation. The supply of pit timber is becoming one of the problems of mining, even in Nova Scotia, and Dr. Fernow's report contains matter of considerable significance to colliery owners. Dr. Fernow states the forest resources of Scotia are "in danger of exhaustion within the next two decades," although they are capable under proper management "of forever producing, by annual increment, as interest, at least twice as much as is now being cut from capital stock."

The report corrects some popular misconceptions as to the rate of growth of forest trees, and points out that from 140 to 150 years is required to grow trees suitable for lumbering. One-fourth of the forest-area of the Province is semi-barren of commercial trees because of repeated fires, and under the most favourable conditions of planting and exclusion of fires, these barrens could not be made to produce a marketable forest under at least one hundred years.

It is to be expected that Dr. Fernow's recommendations will lead to a more intelligent forestry policy in Nova Scotia, a matter in which the co-operation of the mining societies and colliery companies could doubtless be usefully enlisted.

Accompanying the report is the only small-sized colored geological map of Nova Scotia the writer has yet seen. If a similar map were to accompany the Nova Scotia Mines Report, soon to be issued, it would be much appreciated.

Another publication containing a great amount of valuable data regarding Nova Scotian coals is "An Investigation of the Coals of Canada," prepared under the direction of Dr. Porter of McGill University, and published by the Government at Ottawa. Three out of six volumes are already issued. The work is encyclopaedic in its scope, and is strikingly illustrated.

The visit of the delegates to the International Geological Congress promised for the summer of 1913 is looked forward to with considerable interest, and it goes without saying these gentlemen will receive a warm welcome, and in addition will find many points of interest in our coal strata exposures and in methods of coal extraction in Nova Scotia.

WAGES PAID IN ALBERTAN COLLIERIES.

From Annual Report of Department of Public Works.

The scale of wages paid in the Province at the end of the year 1911 shows increases over the wages paid in previous years.

The general wage schedule now being paid for day labour is as follows:

	Outside Wages.	Per day.	Hours.
Fire bosses	.....\$110.00 to \$115.00	per month	
Bottom man	\$2.89	10
Slate pickers, boys	1.37	10
Slate pickers, men	2.47	10
Car oilers, men	2.47	10
Car oilers, boys	1.65	10
Tally boys	1.37	10
Teamsters	2.89	10
Blacksmith	3.85	10
Blacksmith's helpers	2.90	10

Power house engineers	3.85	12
Power house engineers	3.40	8
Fan men	2.90	12
Hoisting engineers	3.20	8
Hoisting engineers	3.78	10
Hoisting engineers	4.40	12
Tail rope engineers	3.63	8
Tail rope engineers	3.85	10
Endless rope engineers	3.30	10
Box car loader engineer	3.40	10
Tipple engineer	3.40	10
Screen engine tender	2.65	10
Locomotive engineer	3.40	10
Locomotive switchman	3.00	10
Fireman	2.89	8
Fireman	3.85	12
Fireman's helper	2.65	10
Railway car helper	2.60	10
Tipple dumper, man	2.89	10
Tipple dumper's helpers	2.64	10
Tipple dumper, boy	1.65	10
Top cagers	2.64	10
Car repairer	3.40	10
Car repairer's helper	2.90	10
Breaker engineer	3.40	10
Fan fireman	3.40	12
Lampman (depending upon number of lamps and skill of man)	\$2.47 to 2.89	8
Lampman (depending upon number of lamps and skill of man)	\$2.47 to 3.40	12
Machinists	\$3.40 to 3.85	10
Machinists' helper	2.90	10
Ashman	2.50	10
Ashman	2.89	12
Wiper, man	2.89	12
Coupler, man	2.47	10
Coupler, boy	1.65	10
Breaker oiler	2.89	11
Washer or tipple oiler	2.89	11
Breaker picker boss	2.89	10
Timber framer	3.40	10
Timber sawyer	2.64	10
Box car shoveler	2.89	10
Breaker platform boss	2.89	10
Breaker platform men	2.60	10
Breaker screen men	2.47	10
Rock bank men	2.47	10
Dirt bank men	2.47	10
Finisher after box car loader	2.47	10
All other outdoor labour	2.47	10

Bee Hive Coke Ovens.

Levelling and drawing (6½ ton charge), per oven	\$1.00
Levelling and drawing (5-ton charge), per oven	.80
Loading into box or open cars (over 200 tons per month), per ton	.17
Loading into box or open cars (less than 200 tons per month), per ton	.16

Per day. Hours.

Steam locomotive engineer	\$3.40	10
Motorman	3.18	10
Larryman	2.47	10
Plasterers	2.47	10
Carters and cleaners	2.47	10
All other labour	2.47	10

Belgian Coke Ovens.

Ram engine man	3.40	10
Chargers	2.89	10
Clayers	2.89	10
Drawers	2.89	10
Loaders	2.60	10

Briquette Plant.

Engineer	3.86	12
Briquetter	3.97	12
Briquetter's helper	3.40	12
Tar Melter	2.89	12
Labourers	2.89	12

Inside Wages

Shotlighter	3.30	8
Bratticemen	3.30	8
Bratticeman's helper	2.75	8
Timberman	3.30	8
Timberman's helper	2.75	8
Tracklayers	3.30	2
Tracklayer's helper	2.75	8
Motorman	3.05	8
Motorman's helper	2.75	8
Locomotive engineer	3.05	8
Locomotive switchman	2.75	8
Drivers	3.03	8
Drivers, wet places	3.30	8
Drivers, spike team	3.50	8
Couplers, men	2.75	8
Couplers, boys	1.65	8
Switch boys	\$1.37 to 1.65	8
Door boys	1.10	8
Rope riders	3.03	8
Main and tail rope riders	3.30	8
Pushers	2.75	8
Buckers	2.75	8
Loaders	2.75	8
Miners	3.30	8
Miners, wet places	3.75	8
Rock miners	3.75	8
Timber handlers	3.03	8
Labourers	2.75	8
Cagers, slope and incline	2.75	8
Cagers, shaft	3.30	8
Machinemen	3.75	8
Machinemen's helper	3.30	8
Pumpmen	2.75	8
Pumpmen (A. R. & I. Co.)	3.20	8
Hoistmen	\$3.03 to 3.30	8
Drivers, boys	\$1.65 to 2.75	8
Grippers	2.75	8
Grippers, boys	\$1.65 to 2.75	8
Pipe fitter's helpers	2.75	8
Pick carriers	\$1.35 to 2.75	8
Clutchmen	3.30	8
Rollermen	2.75	8

Miners on contract average from \$3.50 to \$6.00 per day of eight hours.

With the number of railways which are now being built and also those that are projected in all parts of the Province, the future of the coal trade for both steam and domestic coal can now be looked forward to with confidence, and although the output is increasing rapidly, the market appears to be increasing as rapidly. These new railways are not only the means of bringing new settlers into the Province, but are also the means of allowing coal to be transported to those districts where before it could not be obtained.

THE YEAR IN ONTARIO.

By Thos. W. Gibson, Deputy Minister of Mines.

The year 1912 was probably the best that the mining industry in Ontario has yet seen. Not only have all the active mining camps been operating steadily and at a high rate of production, but in what is perhaps the most important camp of all—the Sudbury Nickel region—development work has revealed large reserves of ore, previously not known to exist.

Metalliferous mining has come to be so largely predominant in Ontario that the condition of this branch determines the condition of the industry as a whole, hence it is satisfactory to be able to say that in all the five metals which the mines of the Province yield in quantity, namely—silver, gold, iron, copper, and nickel, the situation and outlook has never been better.

SILVER.

The mines of Cobalt may have reached their apogee, but they are still yielding about one-seventh of the world's production. In 1911, the output was 31,500,000 ounces, worth sixteen million dollars. In 1912, the figures when compiled will probably show a decrease in production of a million or a million and a half ounces, but this falling off is more than compensated for by a larger return for the year's yield, which was worth two and one-half or two and three-quarter millions of dollars more than in 1911, the average price of silver having gone up to a little over seven and one-half cents per ounce as compared with that year. Thus on a lessened output the dividend paying companies have been put in a position to make a larger distribution of profits.

The natural effect has been to stimulate interest in the Cobalt camp, and this effect has been increased by several interesting developments. One of these was the location by the Seneca-Superior Company of a first-class vein carrying high grade ore in the bottom of Cart lake. This lake occupies a depression in the conglomerate, here say 300 feet thick, and the vein was found by a cross-cut which was being driven across the lake bed. The property is held by the Seneca-Superior Company upon a lease from the owners, the Peterson Lake Company. A striking of rich ore by the Casey Cobalt mine on an outlier of conglomerate, some fourteen or fifteen miles away from Cobalt proper, shows the potentiality of that formation and the advisability of searching every square yard of it. Another event of some importance is the finding of good ore by the Beaver mine in the diabase underlying the Keewatin, though actual quantities have not yet been proven.

The history of any mining camp, so far as individual properties are concerned, is usually a checkered one; some mines improve with age, others pass quickly. The Nipissing, with its over-shadowing area, retains the lead in production; the Coniagas, with an occasional carload of rich ore and its steady outpour of concentrating rock, is followed closely by the La Rose, the oldest mine in the camp, by McKinley-Darragh-Savage, whose career has been one of striking success, and by the Crown Reserve whose little patch of 22 acres beneath the waters of Kerr lake, has been a veritable cave of riches. Buffalo maintains its position well, and the re-erudescence of Cobalt Township was one of the features of the year. Temiskaming and Beaver, taken to-

gether, upheld the credit of southeastern Coleman, and Cobalt Lake reduced its output, and so, materially, did O'Brien, while Hudson Bay, in the extreme north of Coleman, slackened its pace. Trethewey also fell off, and Right of Way produced but little. In South Lorrain, Wetlaufer did fairly well, and in Gowganda, Miller Lake-O'Brien continued production from its veins in the diabase, and Mann Mines also began to yield. Millerett has been treating chiefly low grade ore.

The camp is making large strides in refining the ores on the spot. The Nipissing mill for high grade ore scored a decided success in metallurgical practice. With separate plants for treating high grade and low grade ore nothing now leaves the Nipissing except in the form of bullion. This is also practically the case with the Buffalo, and concentrating plants for low grade ore are numerous. One effect of this tendency is to cut down the shipments of ore and concentrates by rail, but it is all in the direction of larger profits.

An event of moment was the construction of the Temiskaming & Northern Ontario branch railway from Earlton to Elk lake. This has given a noticeable impetus to the development of a number of properties in that district, including the Donaldson (purchased by the Beaver Company), Beacon, Hitchcock, etc.

There were no labour troubles at Cobalt during the year, and little difficulty with hydraulic power.

GOLD.

The Porcupine camp came into production during 1912, 40 stamps being in operation at the Dome mine, and 40 at the Hollinger. Smaller contributors were the McIntyre and Vipond. The yield of gold for the year was about two million dollars. A little of this came from mines in other districts, principally the St. Anthony at Sturgeon Lake, and the Cordova in Hastings county, but the bulk was from Porcupine. Interest is naturally great in the Hollinger mine, which began the payment of dividends in November, announcing the intention of making a distribution of profits every four weeks. No. 1 vein, which showed at the 100-foot level, a length of 1,000 feet, with a width of 8 feet, and \$31.54 of gold per ton, has been developed for a length of 839 feet. At the 200-foot level, where the width is 6.7 feet, it shows contents of \$45.74 per ton. This vein has been developed for 63 feet at No. 3 level, at which point it had a value of \$8.40 per ton. Under date of October 5th, General Manager P. A. Robbins, reported that up to that time 20,444 tons of ore from development, partly made up of waste rock inadvertently included from drifting and sinking, had been milled, and had shown an average value of \$19.70 per ton. Ore from stopes to the extent of 5,777 tons had been treated and had shown an average value of \$37.89 per ton. The average value of all ore removed from the mine up to that time was \$23.69 per ton, established by treating 26,221 tons of ore. The mill has been a success, inasmuch as while designed to handle 300 tons of ore per day, from 450 to 500 tons can be put through. Extraction from \$30.00 ore is 97 per cent.

Details have not yet been published as to the results at Dome, but it may be surmised that these have been satisfactory. Work here is entirely open cut, and schist as well as quartz is put through the mill.

Progress at Porcupine was impeded by a labor strike which broke out about the middle of November. The men refused to accept the proposed cut in wages which the mine owners claimed was justified by the reduction of living expenses consequent upon the introduction of the railway, and which left the scale at higher than the Cobalt rate. The close of the year saw the strike still unsettled, but apparently with a large number of miners leaving the camp and the fortunes of war in favour of the mine owners. The camp has at present a capacity of about 100 stamps, which will be added to during 1913, and a substantial production of bullion may be looked for.

The other gold districts, such as Swastika, Munro, Larder Lake, etc., witnessed considerable activity during the year, but in none of them has production yet been established on a permanent basis.

IRON.

1912 was not conspicuous by a large production of iron ore, the Helen mine at Michipicoten being practically the only shipping mine. Developments of significance, however, were in progress on other properties, notably at Moose Mountain and Magpie. At the former, a Gröndal concentration plant has been installed and is now practically in readiness to make shipments of briquettes containing 63 per cent. iron, and within the Bessemer limit for phosphorus and sulphur. At Magpie, a roasting equipment is nearing completion, costing perhaps \$1,000,000. The object of the process is to eliminate the sulphur and carbon dioxide from the ore, which is largely sideritic. It is to be hoped these pioneer processes will justify themselves by their results, and so show the way for the utilization of the large bodies of low grade iron ore, chiefly magnetite, which exist in northern and northwestern Ontario.

NICKEL AND COPPER.

The nickel mines of Sudbury now easily dominate the production of this metal for the world. Extensive boring by the diamond drill were made during the year, which show that the bodies of ore yet to be mined are very large. The Canadian Copper Company has proven the Froot, or No. 3 Mine, to contain many millions of tons, and though the nickel contents are not so high as at Creighton, the quantity of ore is said to be greater. It is stated that this company contemplates the enlargement of its mining and smelting operations to an extent that will enable it to handle 5,000 tons of ore per day. The Canadian Copper Company's existing smelting facilities were improved by the substitution of basic for acid converters and the introduction of reverberatory furnaces. The Mond Company had drills on the Froot Extension, and found the Froot orebody to cross their line at a depth of 600 feet. This company's new smelter at Coniston will be ready for operation in 1913. The Dominion Nickel Copper Company purchased the old Murray mine, formerly owned by the Vivians, who worked it for a number of years, since when it has been idle. This company has also bought the Gertrude and Elsie mines, owned by the Lake Superior Corporation. On the Murray, it placed seven diamond drills at work, and it is said that some

six million tons of ore have been located about 400 yards west of the old workings. The company has moved the site of its proposed smelter from the Northern Nickel range to Snider township, so as to be closer to its new mines. On the T. & N. O. Railway, the Alexo Nickel mine, whose ore is similar to that of Sudbury, shipped several thousand tons to the Mond smelter at Victoria Mines. The output of nickel for 1912 will be about 21,000 tons, much the largest production ever made.

Copper in Ontario is really a by-product of nickel, and its production increase or decreases with that of the latter metal. In 1912, the yield was about 11,000 tons, a record quantity. The sulphide mines of the north shore are at present idle, notwithstanding the high price of copper. Some prospecting was done on low grade bodies of copper ore near Dane, on the Temiskaming & Northern Ontario Railway.

NON-METALS.

Southwestern Ontario yields petroleum, natural gas and salt. The petroleum wells are declining in yield year by year, and the production will certainly be less than in 1911, when it was 10,000,000 gallons. There will be an increase of ten or fifteen per cent. in the output of natural gas, as compared with 1911. The salt industry expands slowly, and has an output of about half a million dollars in value per annum. Gypsum also continues to be raised in the valley of the Grand River, but the production is not large, although stimulated to some extent by the requirements for the manufacture of Portland cement, now being made in increasing quantities. The cement industry originated with the marl deposits of Addington and Grey counties, but the tendency of recent years has been to substitute solid limestone for marl, as being cheaper and yielding a cement not inferior in quality. The production of iron pyrites promises to become important. Its chief use is in the manufacture of sulphuric acid, of which large quantities are required in the manufacturing and chemical industries. There are a number of deposits in eastern Ontario, but the largest known bodies are in the northwestern portion of the province, one of which, on Lake Minnitakie, near the Grand Trunk Pacific Railway, is now under operation. Feldspar, graphite, talc, corundum, mica, and other mineral substances continue to be raised and treated in varying quantity from year to year, and the production of these in 1912 was about normal. Building operations were active in the cities during the year, and called for large quantities of brick, stone, and lime. Fortunately the raw materials for all three exist in almost unlimited quantity, and the production was very brisk. The quarries of Bancroft yield marble of great variety of shades and markings, quite equal to almost any demand for construction and decorative purposes. As by-products of silver mining, white arsenic and the oxides of cobalt and nickel are produced in large quantities. The cobalt trade of the world is now practically supplied from the ores of the Cobalt camp.

The value of the mineral production of the province for the year 1912, computed at the point and in the form produced, will be in the neighborhood of \$45,000,000.

BOOK REVIEWS.

Cyanide Practice in Mexico—By Ferdinand McCann—199 pages—39 illustrations and 2 folding plates—Cloth—6 x 9 in.—\$2 postpaid—Published by the Mining and Scientific Press, San Francisco—1912—For sale by the Canadian Mining Journal, Toronto.

Although in most part a series of extracts from a volume written some time ago in Spanish by Mr. McCann, there is sufficient original matter in this little book to give it distinctiveness and freshness.

Short preliminary pages are followed by descriptions of cyanide practice at eleven important Mexican plants, such as El Oro, Guanajuato Consolidated, Esperanza, etc. Mr. D. L. H. Forbes, now of Toronto, and Mr. Bernard McDonald contribute a chapter each.

The five concluding chapters take up, respectively, cyanide practice in small mills, continuous cyanide treatment in connection with the Pachnea tank, cyanidation in pan-amalgamation mills without change in the machinery, precipitation on metallic zinc, and treatment of cyanide precipitates.

Mr. McCann has paid especial attention to the cyanidation of silver ores; in fact, his book is the best source of reference that we have seen on this important subject. The illustrations include the flow-sheets of many typical mills.

Coal—Its Composition, Analysis, Utilization, and Valuation—By E. E. Somermeier, Professor of Metallurgy, Ohio State University—175 pages—Illustrated—Board covers—Price \$2.—Published by McGraw-Hill Book Company, New York—1912—For sale by the Canadian Mining Journal.

It is unfortunate that the first prefatory page of "Coal" contains an inexcusable grammatical blunder. Prof. Somermeier deliberately uses the phrase "this data." Both author and publisher are to blame for this solecism.

The purpose of "Coal" is to throw into readable shape material concerning the physical and chemical qualities of coal, and concerning, also, its uses. The chapter headings give an idea of the ground covered. They are: Composition and Heating Value, Chemical Analysis, Sampling, Methods of Analysis, Determining the Calorific Value, Summary of Chemical Records, Improvement of Coal by Washing, Purchase of Coal under Specifications, Flue Gas Analysis, and Analytical Tables. The tables include a comparison of the composition and heating value of air, dried wood, peat, lignite, bituminous coals, semi-bituminous, and anthracite. This is followed by a lengthy tabulation of the composition of typical coals from all over the United States. No Canadian fuels are touched upon. In the chapter on specification purchase, we note that the city of Toronto's standard is quoted. Here 13,000 B.T.U. is taken as a basis, with 10 per cent. ash, 2 per cent. moisture, and 1½ per cent. sulphur. Coals that do not come up to these specifications may be accepted or rejected; but, if accepted, the price is adjusted to the actual calorific value of the fuel.

"Coal" should prove a useful book, although its treatment is rather slight than otherwise.

Building Stones and Clay Products—A Handbook for Architects—By Heinrich Ries, Ph.D.—8vo, XIII 415 pages—Fully illustrated—Cloth cover—Price \$3.—Published by John Wiles & Son, New York, 1912—For sale by the Canadian Mining Journal.

Dr. Ries is too well known to the Canadian public and to Canadian mining men to need an introduction. He has made himself a world-recognized authority on economic geology, and has devoted much time to special research in ceramics and clay products generally. Thus the reader can accept his latest book with the comfortable assurance that it is as sound and modern as it can be.

The possibilities of Canadian building stones and clay products have too long been neglected. This fact has been recognized by our Dominion Mines Branch, and that organization is collecting and distributing much valuable information. Obviously, Dr. Ries' volume has made a timely appearance. Though designed primarily for the architect, the mining man will find a fund of helpful and suggestive information within its covers.

The sequence of subjects dealt with is as follows: After treating rock minerals and rocks, and the properties of building stone, Dr. Ries takes up granites, gneisses, sandstones, limestones, marbles, slates, and serpentine. He then proceeds to discuss the properties of clay, building brick, architectural terra cotta, structural hollow-ware, roofing tile, wall and floor tile, sewer pipe, and sanitary ware.

A sufficient geological and technical glossary is appended.

The paper used is of excellent quality, the type is clear, and the general make-up is up to high standard that one expects from John Wiley & Sons.

Introduction to the Study of Minerals—A Combined Text-book and Pocket Manual—By Austin Flint Rogers, Ph.D.—522 pages—Illustrated—Soft cover—Price \$4.—Published by McGraw-Hill Book Company—1912—For sale by the Canadian Mining Journal.

Dr. Rogers has sought to combine in this volume the class text-book and the field hand-book. This is a laudable object, inasmuch as it obviates duplication and saves expense.

Apart from the usual information, there are several distinctive features in the book. For instance, there are descriptions of the optical and microscopic properties of crushed fragments, cleavage flakes, and recrystallized products. There are also number lists of the paragenetic varieties of each mineral.

A select bibliography and a glossary add to the value of the book. The determinative section is carefully compiled. The arrangement of symbols and abbreviations is good.

ATLIN MINING DIVISION, BRITISH COLUMBIA

The following information concerning last year's mining operations in Atlin mining division, British Columbia, has been obtained from sources believed to be dependable.

Owing to the unusual shortage of water for gravel-washing purposes, not nearly so much placer mining was done as would have under less unfavourable conditions in this respect. Notwithstanding this drawback, it is expected the quantity of gold recovered will be found to have been greater than that reported as the yield in 1911—possibly to the extent of 25 per cent. increase. This, however, will not be definitely ascertainable until the returns shall all be in.

Placer mining was done on various streams, as follows: On Pine, Spruce, McKee, Birch, Boulder, Ruby, Wright, Otter, Wilson, Lincoln, and Davenport creeks, and on O'Donnell river.

On Pine Creek.

On Pine creek, the North Columbia Gold Mining Company, under the management of Mr. J. M. Ruffner, operated throughout the season at a disadvantage, owing to not being able to use as much water as was required, notwithstanding that it had the reservoir of Surprise lake to draw from. At no time in 1912 was it practicable to flush out the creek channel and thus get rid of the tailing, in consequence of which the recovery of gold was on the whole less than in the 1911 season, although in one of the pits the yield was better than ever before. In the season before, the company employed a varying number of men, sixty having been the maximum at any one time, and from six to fifteen monitors, mostly of large size, were used during the season; corresponding particulars for 1912 have not yet been received, but it is understood the season was an active one and results fairly satisfactory under the circumstances.

On Spruce Creek.

Operations on Spruce creek in both 1910 and 1911 seasons gave employment to about seventy men; more than half of this number were individual miners. In 1912, however, fewer properties were worked, yet, this notwithstanding, it is thought there was in the last mentioned year an increase in the quantity of gold recovered.

On Ruby Creek.

The Placer Gold Mines Company, with Mr. T. M. Daulton as manager, has been operating on Ruby creek several seasons. Prior to 1912 much development work was done, chiefly in hydraulicking a channel down to bed-rock, working up-stream on grade. During the time this work was in progress the production of gold was small from this creek, but last season there was a substantial increase. Toward the close of the season rich ground was worked; this was previously known to exist here, but it was never before reached by hydraulic operations. It may be expected that next season a further increase in production of gold will take place on this creek.

On Several Other Creeks.

Lack of water caused a marked decrease on several other creeks of those mentioned earlier. It was expected that much dead-work done on Birch creek in 1911 would have led to a good showing being made in 1912, but this expectation was not realized. On Boulder creek in past years the Societe Miniere de la Colombie Britannique has done much dead-work searching

for a deep-gravel paystreak, but results have not yet proved satisfactory. The Pittsburg-British Gold Company—the Hamshaw property—has been operating on McKee creek for several years, but no information is available concerning this organization's work in 1912. Wright creek in recent years has had only a few individual miners working on it. The Otter Creek Development Company's leases are on the upper part of Otter creek, and those of the Maluin Syndicate on the lower; both companies have done much development and prepared for washing a lot of gravel, but they appear to have had a disappointing season in 1912. Wilson creek has been worked by a few individual miners; the 1912 results from operations on this stream were small. On Lincoln and Davenport creeks and O'Donnell river last seasons work was entirely of a prospective nature; results were encouraging, however, and good returns in the future are looked for. The Canadian-Alaska Exploration Company, with Mr. Robert McKee as manager, has done much work on O'Donnell river, preparatory to installing either a steam shovel or a dredging plant, prospects having been adjusted good enough to warrant the provision of facilities for handling a large quantity of gravel.

New Discoveries.

A discovery of rich gravel was made on O'Donnell river, on one of the benches, but there was not sufficient prospecting done before the close of the season to determine whether its extent was considerable or only small.

Late in the season a number of locations were made on Burdette creek, a tributary of O'Donnell river. This creek is a new one on the list of those on which gold has been found. Other tributaries of that river also had attention, and locations were made on them, so that indications point to activity in placer mining on these various streams next season.

New discoveries were also reported to have been made, just before the close of the season, on creeks tributary to Teslin lake, and a number of individual claims have been located there. The gold shown as having been found on these creeks is very coarse and clean and of high quality. These discoveries are also in Atlin mining division.

Quartz Mining Near Atlin.

Very little was done in 1912 in connection with quartz mining in Atlin division—not much more than the work requisite to keep the claims in good standing, excepting on the Engineer or Northern Partnership group and the Ben M'Chree group, both situated on Taku arm. On the former more than thirty men were employed throughout the season, prospecting and developing, and with surprising results, suggesting that the possibilities of this property are beyond the most sanguine expectations of the original holders. The latter group, which is situated at the extreme south end of Taku arm, was acquired during 1912 by some British capitalists, who have done considerable prospecting work, and made arrangements for construction of an aerial tramway, and the provision of other facilities for development and exploitation, from which important results are expected.

In Rainy Hollow country nothing was done beyond the necessary assessment work on claims not yet Crown granted. The chief reason for this was that most of the properties had been bonded early in the season to

representatives of capital. Meanwhile the owners developments, but those to whom the claims had been bonded did not get so far as to commence mining work.

Another View of the Position.

From another source the following has been received:

A general review of work done on the creeks around Atlin during the 1912 season shows that there was greater activity and better results last season than for any corresponding period during several preceding years; also, that the prospects for the coming season are excellent.

Among quartz properties, the Engineer group is opening up marvellously, and there is no longer any doubt of the great value of this property. Lawson's group has also passed the probation stage, and is now regarded as being among the certainties as a paying mine. The Ben M'Chree continues to please its holders, who are preparing to next season also develop in a systematic manner the White Moose property. The work done on these properties in 1912 has shown the great mineral value stored up in this district, and has

demonstrated that there may be expected many years of greater activity in mining here than the most sanguine have been looking for.

Much prospecting was done during the 1912 season, and just at its close W. Shea, an old prospector, reported having found rich gold on one of the benches of O'Donnell river. Since then other reports have been received, with the result that the benches along that river have been staked for miles, in claims and leases.

Some Indians, too, have come in and recorded discovery claims on four creeks south of Tesline lake, and have stated that they found placer gold on these at depths varying from one foot to four feet. They assert that gold can be found in all the creeks at the depth of the shovel, and they are showing faith in their discoveries by taking out miners' licenses and staking for themselves and family connections. White men have been listening intently to their stories (late in November), and already the pathfinders are on their way to the new field. Without doubt Atlin division will have a mild rush next spring, and will again rank as one of the live mining camps of the North.

COLLIERY EXAMINATIONS

Abstract from the Annual Report of the Department of Public Works, Province of Alberta.

The number of candidates who presented themselves for examination during the year 1911, shows a considerable increase over the previous year, and with the steadily increasing number of mine officials qualifying each year, there should soon be no difficulty in securing a sufficient number of certified persons to fill all official positions at the mines.

The following are the questions set at the mine managers' examination held at Frank, Banff and Edmonton on September 13th, 14th and 15th, 1911:

Mine Manager's Examination.

Paper No. 1. Time allowed, one and a half hours.

Candidates must obtain 70 per cent. of the allotted marks to pass.

Coal Mines. Act.

1. State the provisions of The Coal Mines Act as to—
 - (a) Inspection of workings;
 - (b) Safety lamps;
 - (c) Ventilation. (15)
2. Describe briefly the duties of (a) a Mine Manager, and (b) a Pit Boss, as laid down by The Coal Mines Act. (10)
3. What are the provisions of The Coal Mines Act
4. State the rule as to the examination of a mine by the workmen, and say why, in your opinion, this rule is not more generally taken advantage of.
5. What are the provisions of The Coal Mines Act with regard to manholes? Are manholes required on a self-acting incline 90 yards long, on which workmen regarding Check-weighmen? (6)
- are forbidden to travel, there being a separate travelling road? (10)
6. What accidents should be reported to the District Inspector of Mines, and to the Minister of Public Works; and what are the provisions as to the reports? (9)
7. State briefly the provisions of the Act with regard to the use and handling of explosives in mines. (14)

8. What annual returns have to be made by the owner, agent or manager? (7)

9. State briefly the provisions of the Act regarding "shafts" and "outlets." (10)

10. State the provisions of the Act with regard to the fencing of—

(a) Places not in use;

(b) Shafts. (11)

Mine Manager's Examination.

Paper No. 2. Time allowed, two and a half hours.

Candidates must obtain 70 per cent. of the allotted marks to pass.

Gases and Shot-Firing.

1. State what gases are given off as the result of spontaneous combustion, and discuss fully their properties. (11)
2. The quantity of air passing into a mine, measured on the intake, is 115,000 cubic feet per minute, the temperature being 65 degrees F. If the quantity measured on the return of the same air-current is 118,500 cubic feet per minute, and the temperature at this point is 72 degrees F., what per cent. of mine gases is present in the return current as it leaves the mine? (10)
3. Give your opinion as to the propagation of flame in mine explosions and discuss the different methods which are adopted for arresting the same. (9)
4. What is afterdamp, and what would be the composition of the afterdamp resulting from an explosion of firedamp containing a large quantity of air; and what would it likely be if the firedamp contained a small quantity of air? (10)
5. Explain (a) the principle features of the safety lamp, (b) the effect of the several illuminants used, and (c) state what principles control or determine the dimensions of safety lamps. (10)
6. (a) State the different kinds of explosives used in mines in the Province. (b) Give your views as to

the best kind of explosives adapted to the various conditions. (c) State your views as to the best methods of handling and caring for explosives. (d) State the methods in use for drilling holes for explosives, and what suggestions you would make, if any, for improvement in such methods. (12)

7. The air current in a certain mine is charged with marsh gas to the extent of 3 per cent., when the water gauge reading is 2.5 inches. What would be the percentage of gas in the current if it became necessary to reduce the speed of the fan till the water gauge gave a reading of only 1 inch? (10)

8. Describe the principle and practice of electric blasting. What are the dangers of shot-firing in a dry and duty mine; and what precautions would you take in performing this work? (11)

9. What do you understand by the term "diffusion of gases" and what instances do you know that appear contrary to that principle? (7)

10. Describe the safety lamp, giving an explanation why it is considered and called a safety lamp. Name the different types of safety lamps with which you are familiar. State which lamp you prefer for the use of a miner, and which for the use of a fire boss, giving reasons. (10)

Mine Manager's Examination.

Paper No. 3. Time allowed, three and a half hours.
Candidates must obtain 70 per cent. of the allotted marks to pass.

Ventilation.

1. What observations and data are required to determine the quantity of air circulating in a mine, and the efficiency of the ventilating appliances? (10)

2. Name the three main qualities of a ventilating fan, and show how, having regard to the thickness of seam and the length of airways, you would determine the type and size of fan to be used. (9)

3. A current of 30,000 cubic feet of air per minute is split into two airways, A and B. Split A is 5 ft. x 8 ft. and 10,000 feet long. If split B is 5 ft. x 7 ft., what length must it be to take one-half the air, no regulators being used? (10)

4. A fan 16 ft. x 8 ft., running at a speed of 100 revolutions per minute, produces 125,000 cubic feet of air under a water gauge of 2 inches, at a certain mine; what would be the required speed of this fan and the water gauge to produce a circulation of 150,000 cubic feet of air per minute in the same mine? (11)

5. State to what extent the air current in a mine can be split keeping in view the efficient ventilation of the working places. What advantages are obtained by splitting air currents over a single continuous current, in ventilating a mine? Compare the advantages and disadvantages of the different means of producing ventilation in mines with respect to their safety, effectiveness and economy. (14)

6. If 15,000 cubic feet of air per minute pass along an airway 6 ft. high by 5 ft. wide and 1,600 feet long, what will the quantity be when the length is increased to 2,500 feet, the pressure remaining the same? (8)

7. What is a water gauge, a barometer, and a hyrometer; and for what purposes are they used in connection with mining? (9)

8. The temperature in a mine being 63 degrees F. the velocity of the air current 345 feet per minute, and the size of the airway 6 ft. 6 ins. by 8 ft. 3 ins., what weight of air is travelling per minute? (9)

9. How would you increase the volume of air in a mine without increasing the power? (6)

10. Make a neat sketch of pillar and room workings for a mine employing 145 men. Show number of workmen in each district, course of ventilation, showing air splits and crossings, stoppings, doors and regulators. Give size of return airway, also quantity of air in each split. (14)

Mine Manager's Examination.

Paper No. 4. Time allowed, four hours.
Candidates must obtain 60 per cent. of the allotted marks to pass.

Practical Work.

1. Describe with sketches the different methods with which you are familiar, of extracting pillars having due regard to the greatest degree of safety to the miners and the recovery of the largest percentage of the coal. (10)

2. Describe some form of coal cutting machine with which you are familiar, and state in what seams they are to be preferred to manual labour, having regard to the thickness of coal, nature of roof and pavement. (9)

3. Describe how you would arrange your men and material for retimbering an engine haulage road without interfering with the traffic on it which occupies eight out of the twenty-four hours. It is 10 feet wide and 6 feet high within the existing timbers. The upright and crown-trees are 2 feet apart and there are to be no trees in the centre of the road. Sketch side and end views, showing how you would place the new timber in relation to the old, and if you would take out the old which is supposed to have some strength left in it. The roof is composed of 5 feet of soft shale up to a 6 feet bed of sandstone. When in your opinion is the proper time to prop such a roof for a haulage road with permanent timber, immediately on being worked or later on? (11)

4. Describe two systems of working coal with which you are acquainted, and state under what circumstances as to thickness of the seam, nature of the coal, and state of the roof and pavement, you would adopt one in preference to the other, always keeping in view the working of the coal in the easiest and cheapest manner, consistent with the safety of the men and the production of the greatest amount of lump coal. (12)

5. What chemical and geological features are there in and adjacent to a coal seam which make it susceptible to spontaneous combustion? (7)

6. Describe the general principles of a breathing apparatus for rescue work in mines and discuss the favourable and unfavourable features of such an invention. (8)

7. A hole 1½ inches in diameter is bored into old workings containing water. The head of water is 66 feet, and length of bore hole is 25 feet. How many gallons of water will be discharged per minute at the orifice? (7)

8. What are the dangers of the presence of coal dust underground and how may they be mitigated? Describe some of the precautions that you would take to guard against accidents therefrom. (12)

9. Describe fully some method by which you would sink a large rectangular shaft through heavily watered quicksand, and state what are the limits, if any, to the use of the method which you describe. (12)

10. Suppose you are opening up a new mine in a flat seam; what would determine the kind and size of fan you would equip your mine with, and whether you would open up with a double or triple entry system,

which would you use for intake, and which for return airway? Where would you place your fan and what precautions would you take to preserve it in case of an explosion? (12)

Mine Manager's Examination.

Paper No. 5. Time allowed, three and a half hours. Candidates must obtain 60 per cent. of the allotted marks to pass.

Machinery.

1. Explain what is meant by each of the terms: "Heating Surface," "Steam Room," "Atmospheric Pressure" and "Latent Heat." (8)

2. Enumerate the different causes of incrustation in a steam boiler. What kind of incrustation does the most harm to a boiler and in what manner may it cause an explosion? (7)

3. In a slope which is 900 feet in length and has an average pitch of 30 degrees, the quantity of water accumulating is 250,000 gallons per day. Give the size of the pumps and the required speed of the same to remove this water by pumping 8 hours per day? (10)

4. What thickness should a cast iron pipe 6 inches in diameter be made to have a bursting pressure of 4,000 pounds per square inch? (6)

5. What size of haulage engine would be required to haul an output of 100 tons per hour up an incline 1,000 yards in length, with a gradient of 1 in 6? (9)

6. A compound, triple-expansion, three-cylinder engine takes steam from boilers at 192 pounds absolute pressure, and exhausts at 3 pounds absolute; what is the total number of expansions in the steam, and what number of expansions takes place in each cylinder? Give also the cut-off and the relative areas necessary in order to equalize the work of each cylinder. (10)

7. To what use is electricity applied in the operation of coal mines? What are the advantages and disadvantages of using electricity for power or other purposes? State the conditions under which you would recommend the use of electricity for power in mines. What dangers are attendant on its use and what precautions should be taken to insure safety to those employed in the mine? (11)

8. What size of rope should be used to hoist 4,000 pounds of coal at one time? The car, cage and rope weighing 3,500 pounds. (5)

9. Describe fully—

(a) An appliance for the prevention of overwinding in shafts;

(b) An automatic arrangement of cut-off for winding engines. (8)

10. Describe any form of compound (2 stage) air compressor. When using a large number of drills underground, what precautions would you take and how would you arrange matters so as to make the most efficient and economical use of the compressed air at your disposal? (9)

11. Describe fully, with sketches—

(a) How a detaching hook should be connected to the cage;

(b) Two methods of capping a steel wire rope;

(c) The precautions to be taken in order to see that a detaching hook is always in a safe and good working order. (10)

12. (a) What is a safe voltage to use in a mine for electric haulage? (b) If the generators are producing a 500-volt current what is necessary to be done to re-

tain the same power but reduce the voltage to 250 volts? (10)

Mine Manager's Examination.

Paper No. 6. Time allowed, four hours. Candidates must obtain 60 per cent. of the allotted marks to pass.

Levelling.

1. Describe fully the ordinary process of levelling, stating any precautions required to ensure accuracy. (10)

2. Give a page from an imaginary level book, showing at least eight readings obtained by two settings of the instrument. (18)

3. Work out and plot the section which you have given in question 2, to any convention scale. Mark on the profile the number and elevation of each station. (16)

4. What is the average grade from the point of starting to the finish of the level, in question 2? Show grade by line drawn on profile. (11)

5. Suppose you are required to take levels along an underground roadway in order to plot a section showing both roof and floor, state what instruments you would use and how you would proceed. (11)

6. What are the benefits, present and future, of having the levels of main roads put on colliery plans? (9)

7. How would you proceed to level along an inclined road, which is 3 ft. 9 ins. high and inclined at an angle of 44 degrees? (11)

8. Describe an engineer's level and say how you would determine if the instrument is in proper adjustment. (14)

Mine Manager's Examination.

Paper No. 7. Time allowed, three and a half hours. Candidates must obtain 60 per cent. of the allotted marks to pass.

Surveying and Mapping.

1. Explain the terms diurnal variation, dip, declination and secular variation of the magnetic needle. (9)

2. What are the requirements of The Coal Mines Act as to working plants for mines? What further information should they afford in addition to what is legally required? (11)

3. Calculate by sines and cosines the bearing and length of the closing line of the following traverse:

Station.	Azimuth.	Distance.
0 to 1.....	31 degs. 28 mins.....	87 feet.
1 to 2.....	351 " 35 "	138 "
2 to 3.....	276 " 15 "	168 "
3 to 4.....	149 " 25 "	103 "
4 to 5.....	69 " 15 "	63 "
5 to 6.....	221 " 15 "	137 "
6 to 7.....	111 " 13 "	91 "
7 to 8.....	49 " 40 "	53 "

(12)

4. Plot the traverse given in question 3 on a scale of 50 ft. to 1 inch and draw the closing line from Station 0 to Station 8. (16)

5. Give a general description of the theodolite and explain the method in which you would use it in making an underground survey. (9)

6. Describe the true meridian as compared with the magnetic meridian. How does the adoption of the latter affect plans made from compass observations and added to as in mine plans from year to year? (10)

7. How would you proceed to put up sights in a room, the course of the entry being given as N. 86 deg. E. and the rooms to be turned to the left, and to make with the entry an angle of 72 degrees? (12)

8. In the case of a mine with only one shaft, which is vertical and where there is iron, which cannot be

removed, in every part, explain how to connect the underground with the surface survey. (9)

9. Give sketch and dimensions of a mine car to hold 2,500 pounds of screened coal after there is 42 per cent. of screenings taken out of the car. The coal is to be loaded one foot above the car. The specific gravity of the coal is 1.25. (12)

COAL MINES BRANCH OF THE PROVINCE OF ALBERTA

From the Annual Report (1911) of the Department of Public Works.

It will be noted from the following tables that the output for the year 1911 shows a decrease of 1,342,193 tons below the year 1910. This is due to the fact that operations were discontinued in all the large mines in the southern part of the Province owing to a strike which extended for a period of practically eight months.

	Output Alta. & Sask.	Output Alta.
1901	346,649	.....
1902	510,674	.....
1903	622,939	.....
1904	782,931	.....
1905	.....	811,228
1906	.....	1,385,000
1907	.....	1,834,745
1908	.....	1,845,000
1909	.....	1,845,000
1909	.....	2,174,329
1910	.....	3,036,757
1911	.....	1,694,564

The above figures show that there has been a decrease of 44.19 per cent. below the 1910 output.

Classification of Output of Coal in Alberta During the Year 1911.

	Tons.
Lignite coal	964,700
Bituminous coal	649,745
Anthracite coal	80,119
Coal used in coke production	61,591
Coke produced	35,984
Briquettes produced	48,200

The above table shows that there has been an increase of 9.87 per cent. over the output of lignite coal for the year 1910, and decreases of 65.74 per cent. of bituminous, and 69.39 per cent. for anthracite coal below the outputs for the year 1910.

The following table indicates how the bituminous coal outputs from the different districts in the Province were disposed of:

Tons of 2,000 lbs.	Crow's Nest	Pass. Calgary.	Lethbridge.	Edmonton.	Total.
Sold for consumption in Alberta	309,512	88,609	.....	10,619	408,740
Sold for consumption in other Provinces	64,354	113	.....	.....	64,467
Sold for export to the United States	36,016	.....	.....	.....	36,016
Total sales	409,882	88,722	.....	10,619	509,223
Used in making coke	61,591	.....	.....	.....	61,591
Used under colliery boilers	41,433	9,377	.....	3,500	54,310
To stock	15,213	174	.....	9,234	24,621
Total	528,119	98,273	.....	23,353	649,745

The following table indicates how the anthracite coal and briquette outputs of the Province were disposed of:

Tons of 2,000 lbs.	Calgary District.	Coal.	Briquettes.
Sold for consumption in Alberta	25,677	23,965	.....
Sold for consumption in other Provinces	5,705	23,981	.....
Sold for export to the United States	.....	.....	30
Total sales	31,382	47,946	.....
Used under colliery boilers	10,878	224	.....
Used in making briquettes	37,859	.....	.....
Total	80,119	48,200	.....

The following table indicates how the lignite coal outputs from the different districts in the Province were disposed of:

Tons of 2,000 lbs.	Crow's Nest Pass.	Calgary.	Lethbridge.	Edmonton.	Total.
Sold for consumption in Alberta	213	55,196	181,092	377,745	614,033
Sold for consumption in other Provinces	6,937	166,386	70,038	243,361
Sold for export to the United States	4,578	.....	4,587
Total sales	62,133	352,055	447,783	861,981
Used under colliery boilers	4,116	51,752	13,533	69,401
Slack	1,392	7,979	23,947	33,318
Total output	67,641	411,796	485,263	964,700

The following table indicates how the output of coke For colliery use 463 was disposed of:

Tons of 2,000 lbs.	Total output	36,216
Sold for consumption in Alberta	213	
Sold for consumption in other Provinces.....	27,669	
Sold for exports to the United States	7,871	
Total sales	35,753	

The Crow's Nest Pass is the only district in the Province in which coke is produced.

The following summary shows the total sales of coal, briquettes and coke of the Province:

	Tons of 2,000 lbs.			Total.
	Sold in Alta.	Sold other Provs.	Sold U.S.	
Bituminous coal	408,740	64,467	36,016	509,223
Anthracite coal	25,677	5,705	.....	31,382
Lignite coal	614,033	243,361	4,587	861,981
Total sales	1,048,450	313,533	40,603	1,402,586
Briquettes.....	23,965	23,981	30	47,976
Coke	213	27,689	7,871	35,753

The following table shows the classification of persons employed above and below ground in bituminous fields:

Average Number Employed.	Crow's Nest.		Calgary.		Edmonton.		Total.	
	A.	B.	A.	B.	A.	B.	A.	B.
Supervision and clerical assistance	80	63	8	16	5	4	93	83
Miners and helpers .....	..	829	..	268	..	43	..	1140
Mechanics or skilled labour	170	47	22	10	14	2	206	59
Other employees	420	421	69	115	33	2	522	538
Total	670	1360	99	409	52	51	821	1820

The following summary shows the classification of persons employed above and below ground in the lignite fields:

Average Number Employed.	Calgary.		Lethbridge.		Edmonton.		Total	
	A.	B.	A.	B.	A.	B.	A.	B.
Supervision and clerical assistance	17	15	56	46	68	51	141	112
Miners and helpers .....	..	112	..	1287	..	684	..	2083
Mechanics or skilled labour	20	4	145	26	80	19	245	49
Other employees	26	5	360	161	288	78	674	244
Total	63	136	561	1520	436	832	1060	2488

The following table shows the classification of persons employed above and below ground in the bituminous, anthracite, and lignite fields:

Average Number Employed.	Bituminous.		Anthracite.		Lignite.		Total.	
	A.	B.	A.	B.	A.	B.	A.	B.
Supervision and clerical assistance	93	83	12	8	141	112	246	203
Miners and helpers .....	..	1140	..	150	..	2083	..	3373
Mechanics or skilled labour	206	59	9	1	245	49	460	109
Other employees	522	538	270	50	674	244	1466	832
Total	821	1820	291	209	1060	2488	2172	4517

	Gross Tons.	Men.	Tons per man.	Under.	Tons per man under.
1906 .. .	1,358,000	2,800	494	2,000	692
1907 .. .	1,834,745	3,600	509	2,700	679
1908 .. .	1,845,000	3,780	488	2,681	688
1909 .. .	2,174,329	5,207	417	3,893	*566
1910 .. .	3,036,757	5,818	504	4,090	742
1911 .. .	1,694,564	6,689	253	4,517	**375

*During the year 1909, a strike affecting all the larger mines in the Province lasted for a period of three months.

**During the year 1911, a strike affecting all the larger mines in the Province lasted for a period of eight months.

Summary of Statistics.

Number of mines at present in operation .. .	224
Number of new mines opened in 1911 .. .	68
Number of mines abandoned in 1911 .. .	26
Number of tons of coal mined in 1911 .. .	1,694,564
Number of tons of coke produced in 1911 .. .	35,984
Number of tons of briquettes produced .. .	48,200
Average number of persons employed inside mines .. .	4,517
Average number of persons employed outside mines .. .	2,172
Average number of persons employed inside the mines during December, 1911 .. .	4,734
Average number of persons employed outside the mines during December, 1911 .. .	2,312
Number of separate accidents causing loss of life .. .	6
Number of deaths caused by accidents inside the mines .. .	7
Number of deaths caused by accidents outside the mines .. .	29
Number of serious accidents inside the mines .. .	3
Number of serious accidents outside the mines .. .	38
Number of slight accidents inside the mines .. .	7
Number of slight accidents outside the mines .. .	19
Number of mine managers' certificates issued .. .	21
Number of pit boss certificates issued .. .	51
Number of fire boss certificates issued .. .	51

Explosives.

The following tables showing the quantity of the various kinds of explosives used during the year in mines, the estimated number of shots fired, the methods of firing them and the number of miss-fires recorded, have been compiled from returns furnished by the mine owners:

Quantity of Explosives Used in Lbs.

Name of Explosive.	Crow's Nest Pass.	Lethbridge.	Calgary.	Edmonton.	Total.
Black powder .. .	124,647	38,658	128,026	291,331	
Monobel .. .	109,067	9,794	22,607	11,890	153,358
Samsonite .. .	3,800	2,544	6,344		
Dynamite .. .	16,588	12,532	5,636	13,128	47,884
Total .. .	129,455	146,973	69,445	153,044	498,917

Estimated Number of Shots Fired.

	Fuse			Total.	
	Electric.	igniter.	Lamp.		
Crow's Nest Pass .. .	13,125	46,499	32,148	4,238	96,010
Lethbridge .. .	12,456	9,250	12,000	98,009	131,715
Calgary .. .	18,850	10,800	5,000	29,917	64,567
Edmonton .. .	5,464	4,143	6,514	91,597	107,718
Total .. .	49,895	70,692	55,662	223,761	400,010

Number of Miss-Fire Shots Recorded.

District.	By Elec-		Total.
	tricity.	By Fuse.	
Crow's Nest Pass .. .	66	517	583
Lethbridge .. .	177	268	445
Calgary .. .	80	183	263
Edmonton .. .	..	326	326
Total .. .	323	1,294	1,617

No statistics are available as to the causes of the miss-fires.

WORK OF THE MINES BRANCH OF THE DEPARTMENT OF MINES, OTTAWA, DURING THE YEAR 1912

(Written for the Canadian Mining Journal.)

The official Summary Report reviewing the work of the Mines Branch for the calendar year 1912 is, at the present time, in course of preparation. Meanwhile, the following resume of the work undertaken during the past year may be of immediate interest.

The functions of the Mines Branch consist not only in the compilation and publication of statistical data relative to the mineral industry of Canada, but in inviting the attention of foreign, as well as local, capital to the great possibilities presented by the development of our mines, our quarries and other mineral resources. The purpose is, in a word, to aid in every possible, legitimate manner, the development of our mineral deposits.

The official programme of the work of the Mines Branch for the past year was, to a considerable extent,

a continuation of work previously begun. Such a condition is but natural when the wide extent of the field to be covered is taken into consideration. Thus, for example, investigations dealing with wide spread branches of the mining industry, such as the winning of building and ornamental stones, and the development of the iron, copper and gypsum deposits of the Dominion, are all matters of very considerable magnitude. At the same time the work of the past year has also been marked by the inception of certain new investigations.

Investigations of Iron Ore Deposits.—The systematic investigation of the iron ore deposits of Canada carried on during the last seven years by the Mines Branch was continued during 1912 by Mr. E. Lindeman, assisted by Mr. A. H. A. Robinson, Mr. W. M. Morrison and

Mr. W. H. Davies. A detailed examination was made of the iron ore deposits in the vicinity of Sellwood, Ontario. This investigation included a study of the geological features of the iron ore deposits, the taking of representative samples of the ores, and the making of topographic and magnetometric surveys of the iron ore range. The results of this investigation will be published in bulletin form at an early date.

Division of Chemistry.—Mr. F. G. Wait, Chief of the Chemical Division, reports that the laboratories have been working up to their fullest capacity during the year. Considerable progress has been made in the construction and fitting of the new laboratories in the remodelled office building on Sussex Street. It is hoped that these new and much more commodious quarters will be ready for occupancy early in the coming year. The working strength of the staff of chemists has been increased by the appointment of Mr. N. L. Turner, lately of the Bureau of Mines for Ontario, who comes to the Mines Branch with experience in other fields and in the same character of work as he will be called upon to carry on here.

Division of Mineral Resources and Statistics.—The annual collection of statistics of the mineral production of Canada was undertaken by the Division of Mineral Resources and Statistics under the direction of Mr. John McLeish, and a preliminary report of the mineral production for 1911 was issued on March 5th, 1912. Subsequently the final report was sent to press, the following advance chapters being also issued as separate bulletins: "A General Summary of the Mineral Production of Canada during 1911;" "The Production of Copper, Lead, Nickel, Silver, Zinc and other Metals;" "Iron and Steel;" "Coal and Coke," and "Cement, Lime, Clay-Products, Stone and Other Structural Materials."

This division is now engaged in the preparation of statistics of production for the calendar year 1912, in the carrying out of which work the active co-operation of all operators is earnestly requested.

The calendar year 1911 showed a decrease in the total value of the mineral production from that of 1910, but exceeded all other previous years. Although as yet it is too early to forecast the probable production for 1912, it appears probable that this will equal, if not exceed, that for 1910. This is especially so in view of the great advance that took place in the price of metals early in the year. Probably the most important event of the year was the advent of the Porcupine Camp as an active gold producer.

During November, Mr. C. T. Cartwright spent some time in Eastern Ontario and in Quebec, gathering information in connection with the work of the Statistics Division.

Division of Metalliferous Deposits.—Dr. A. W. G. Wilson was occupied during nearly the whole of the first half of the year in writing and revising his report on Pyrites and Its Uses. This report is now in press and it is hoped that it will be ready for distribution about the end of January. On the completion of the Pyrites report, he resumed work on the report on the Copper Mining and Smelting Industries of Canada. The mass of material now available for this report has made it necessary to divide it into two sections which will be issued separately—one dealing with the mining end of the industry, the other with the smelting end. Towards the close of the year, Dr. Wilson spent about two months in the field for the purpose of revising the

descriptive sections of these reports and bringing them up to date.

Division of Non-Metalliferous Deposits.—Mr. Freehette was engaged in collecting data from manufacturers throughout Canada concerning the minerals and mineral products used by them, special attention being given to the quantity, quality and source of present supply. The ultimate object of this investigation is to encourage the use of Canadian minerals by pointing out to the producers the requirements of the market and also the form in which the minerals should be prepared to best meet the needs of the various industries in which they are employed.

The work involved by the above investigation was commenced in 1911, during which year the required information was secured in the Provinces of Ontario and Quebec. During 1912 the scope of the enquiry was extended so as to include the remaining provinces of the Dominion.

Mr. Hugh S. de Schmid was, during the field season of 1912, engaged in a further investigation of the phosphate and feldspar deposits of the Dominion. The information thus acquired will be incorporated in a monograph upon these minerals which will be published by the Mines Branch in due course.

The districts visited included Parry Sound, where a mill has recently been erected for the purpose of grinding feldspar; Frontenac and Lanark Counties in Ontario, and the Lievre phosphate district in the Province of Quebec. The feldspar deposit situated in Manicouagan Bay on the lower St. Lawrence was also examined, as well as the mica-bearing permatites on Pied des Monts and Bergeronnes.

Mr. L. Heber Cole was, during the first seven months of the year, engaged in the compilation of data previously gathered in connection with his investigation of the gypsum and salt industries of Canada. Early in August Mr. Cole left Ottawa in order to complete his examination of certain deposits of gypsum in Manitoba and in Nova Scotia. The information obtained during the past two seasons will appear in the form of a revised edition of the monograph on Gypsum, issued by the Mines Branch in 1910.

Ore Dressing and Metallurgical Division.—During the first part of the year, the testing laboratory was operated for the experimental magnetic separation of ores received from Seven Islands Bay, Que., and from Bessemer and Childs mines in Ontario. A small sample of ore from Carter, West Virginia, which was submitted by Mr. J. W. Evans, Belleville, Ontario, was also tested in a similar manner.

Mr. George C. Mackenzie, Chief of the Division, devoted the entire field season to a detailed examination of the deposits of magnetic iron sands which occur at Natashkwan on the lower St. Lawrence. In carrying out this work, Mr. Mackenzie made use of an Empire drill and equipment. Mr. Ransom, Assistant Engineer, was, during this time, occupied in dismantling the old testing laboratory and in preparing plans for the new laboratory now nearing completion.

During the past fall the installation of machinery for the new testing laboratory was commenced. This new installation, occupying a building 75 x 50 feet, will, when completed, include the necessary equipment for experimental ore dressing either on a large or on a small scale. It will also have sufficient operative elasticity to permit of the investigation of the majority of problems encountered in dressing Canadian ores. For information concerning conditions under which such

tests are undertaken, application should be made to Dr. Eugene Haanel, Director of Mines.

Fuels and Fuel-Testing Division.—The staff carrying on the investigations at the fuel-testing station has remained unchanged during the past year. Mr. B. F. Haanel is chief of the division; Mr. J. Blizzard, technical engineer; Mr. E. Stansfield, engineering chemist, and Mr. A. W. Mantle, mechanic.

During the earlier part of the year, the testing of peat fuel in the Korting gas producer was continued, special attention being given to the elimination of the tar fog found in the raw gas. A tar separator, designed by Mr. B. F. Haanel, was finally introduced and has given admirable results. A trial run was also conducted, using a Saskatchewan lignite in the Westinghouse, double zone, suction producer. The same producer, using peat fuel, also gave entirely satisfactory results.

During the fall, the results of certain investigations conducted by this Division appeared in the form of a report prepared by Mr. B. F. Haanel and entitled, "The Utilization of Peat Fuel for the Production of Power."

During the latter part of the year, the testing work of the Division was suspended, owing to necessary alterations to the present building and to the fact that an addition is being added to the fuel-testing plant. This addition was necessitated chiefly through the increasing requirements of the ore concentrating laboratory, but the increased accommodation will also add greatly to the efficiency of the work of the Fuel-Testing Division. Suitable accommodation is also being provided for the chemist of the Division, while a machine shop and adequate storage is also being arranged for. The space previously occupied by the ore concentrating equipment is now available for the installation of a steam boiler for testing purposes.

During the year, Mr. B. F. Haanel investigated conditions affecting power production in the west, and also presented scientific papers before the annual meeting of the American Peat Society and before the Eighth International Congress of Applied Chemistry. Mr. Haanel and Mr. Blizzard are at present in Europe, investigating peat and other power gas-producers, including both the non-recovery and the by-product recovery type.

In addition to the chemical work involved by the various tests, Mr. Stansfield, as a member of a committee of the International Congress of Applied Chemistry, has also carried out a research determination of the moisture of peat tar. He has designed and constructed an electrically heated tar still and has designed the complete equipment of the new chemical laboratories now nearing completion.

In accordance with the policy of further extending the scope of the work of the Fuel-Testing Division, Mr. J. G. S. Hudson visited the coal producing centres of the Provinces of Alberta and Saskatchewan. As a consequence, arrangements were completed whereby large and representative samples of lignites and of semi-bituminous coals are being forwarded to the fuel testing station at Ottawa. The value of these various samples, and their adaptability for use in the gas producer, will be thoroughly investigated by experimental tests conducted on a commercial basis. In addition to these commercial samples, a large number of smaller samples, representing full sections of representative seams, were collected and will be analyzed in the laboratory of the Fuel-Testing Division.

Considerable data were also gathered at the various mines visited, and included sections by measurement

of the coal seams, notes relative to the character of roof and pavement, impurities of clay and shale contained in the seams, etc.

In choosing those coal mines from which samples should be taken, due consideration was given to such conditions as accessibility to markets, railroad facilities, and possible power requirements.

In addition, much information of a more general nature was gathered, including present consumption of coal for power purposes, list of existing power plants, present cost of developing power and mileage, and freight rates.

The carrying out of this work involved a personal inspection of all the larger coal mines in Saskatchewan, Alberta and British Columbia.

The possible future of peat as an asset of economic value to the Dominion, has, for several years, in the laboratory as well as in the field, been the subject of systematic investigation by the Mines Branch. The close of 1911 marked, however, the successful termination of this experimental work. Thereupon, a company, organized by Mr. J. M. Shuttleworth, of Brantford, Ont., petitioned the Government for permission to install at their own cost on the Government peat bog at Alfred a plant, in which the partial hand labour of the appliances used in our experimental plant would be replaced by machinery and power. This installation has now been completed, and, as a result, it is anticipated that the production of peat fuel on a commercial scale will be commenced in 1913.

During the field season of 1912, Mr. A. Anrep devoted his time wholly to a study of certain of the more important of the peat bogs situated in the Province of Quebec. The report on this work, which will be fully illustrated by maps and diagrams, is now being prepared for the press.

Explosives Division.—The Explosives Bill formulated by the Mines Branch in collaboration with the Justice Department, and which has for its object the regulation of the manufacture, importation and testing of explosives in Canada, was not reintroduced before the House of Commons during the session of 1911-12. The work of completing plans for the various building and equipment of the proposed explosives station at Ottawa was, however, continued. In furnishing detailed plans of the explosives testing station recently erected at Rotherham in Yorkshire, the Explosives Department of the Home Office of Great Britain has assisted very materially.

Special Investigations: Building and Ornamental Stones of Canada.—Professor W. A. Parks, of the University of Toronto, has continued his examination of the building and ornamental stones of Canada. This detailed investigation has, during the field season of 1912, been confined to the Province of Quebec. The results of this work will furnish not only descriptions of the different varieties of stone produced in the various localities, but also references to transportation facilities, and other conditions affecting production. There are, in various parts of Eastern Canada, a considerable number of quarries which were at one time large shippers, but which, owing to various causes, are at present lying idle. Professor Parks has, therefore, given special attention to a study of those circumstances which have adversely affected the stone working industry.

It is the intention of this Department to include in the present investigation all the Provinces of the Dominion, the data so gathered to constitute a monograph on the building and ornamental stones of Canada. It

is, moreover, anticipated that this work will prove of special value to builders, contractors, and others, by indicating those localities in which each particular variety of stone may be most readily obtained.

Volume I. of this report has already been issued, and contains a systematic description of the building and ornamental stones occurring in that part of Ontario lying south of the Ottawa and French Rivers.

Petroleum and Natural Gas Resources of Canada: Mr. F. G. Clapp and Mr. L. G. Huntley.—During a part of the field season of 1912, Mr. Frederick G. Clapp, assisted by Mr. L. G. Huntley, was engaged in the preparation of a report on the petroleum and natural gas resources of the Dominion of Canada. This report will outline the history of developments, status of production, stratigraphy, drilling methods, markets, methods of transportation, quality, utilization, and such other technical details as are necessary in exploiting these resources to best advantage. Such a report is necessary for an operator in one field who may wish to be informed regarding conditions or methods existing in some other field, and it is needed, furthermore, for a layman who may intend entering the petroleum or natural gas business or associated enterprises, and who may demand truthful information regarding conditions or methods in various parts of the Dominion.

Investigation of Metallurgical Problems of Economic Importance.—It is generally conceded that the phase of Mines Branch operations which may be described as original research work, constitutes one of the most important features of departmental activity. Questions, concerning the application of new methods of metallurgical treatment, and the discovery of new uses for our minerals themselves, are clearly of very real importance to the mining industry of the Dominion.

A single example of the practical results that may be anticipated from such research work, is presented in connection with the conditions which at present govern the marketing of Cobalt ores. In the past the smelters have refused to pay for the cobalt and nickel content, yet it would be surprising if cobalt could not be advantageously utilized in the production of many valuable alloys. It is obvious that other instances of a similar nature might also be cited.

Having in view, therefore, practical considerations of far-reaching importance, such as the above, the Mines Branch in 1910 took steps to further extend the scope of its technical activity. As a result, Dr. H. T. Kalmus was appointed to undertake a series of investigations on behalf of the Mines Branch, at the Research Laboratories of the School of Mining at Kingston. The following investigations may be instanced as exemplifying the character of the work that is being undertaken. An experimental investigation of the metal cobalt and its alloys; a study and report on the present status of the cobalt industry; an investigation of nickel—copper—cobalt—alloys. Such results as have been obtained up to the present time, will be referred to in the Summary Report for 1912.

Investigation of Processes for the Reduction of Refractory Zinc Ores.—In a previous Summary Report, the attention of the Government was called to the desirability of instituting an enquiry into modern processes for the extraction of zinc from refractory ores. At that time ample evidence, which need not be stated here, was presented, establishing the undoubted benefit that such an investigation, if successful, would bring

to the zinc mining industry of Canada, particularly in the Province of British Columbia.

Acting on this suggestion, a sum of money was voted by the Dominion Government in 1910 to be devoted to an investigation of processes for the reduction of refractory zinc ores; for making experiments and for any other purpose that may be deemed advisable for the promotion and manufacture in Canada of zinc and zinc products from Canadian ore.

During the greater part of 1911 and 1912, work in connection with this investigation has been conducted in the metallurgical laboratory of McGill University by a staff of metallurgists under the direction of Mr. W. R. Ingalls, of New York. While this work has not as yet developed a process that will be commercially applicable to the treatment of the zinc ores of Canada, the experiments have thrown much light upon the principles of furnace design. A report fully covering the results of the work of the past year will appear in the Summary Report for 1912.

Investigation of the Quartz Deposits of the Klondike District.—During the field season of 1912, Mr. T. A. MacLean was retained by the Mines Branch to undertake an economic investigation of the quartz deposits of the Klondike and adjoining districts in order to obtain a reliable estimate of the probable value of these deposits. Quartz veins in this part of the Yukon are plentiful, though frequently small and non-persistent, and occasionally very encouraging results have been obtained. With rare exceptions, however, it is not known, even approximately, what average amounts of gold the deposits in the different localities contain.

In order, therefore, to determine the most efficient and economical methods of treatment for the various ores, a petition was, early in 1912, presented to the Dominion Government by the Yukon Miners' Association, asking that a testing mill and a thoroughly equipped laboratory be established at Dawson. The quartz to be treated is practically all free milling.

Prior, however, to taking an action regarding the establishment of a testing mill, and also in order to obtain a fair general idea as to the gold content of the quartz, it was decided first of all to systematically sample the more important of the known occurrences, and also to endeavour to ascertain their probable lateral and vertical extent. This work was accordingly taken up by Mr. MacLean, and the results of his investigation will appear in the forthcoming Summary Report.

It should further be noted that in addition to such work as is referred to above, nearly every technical officer of the staff has been more or less occupied during the past season in gathering data which will be incorporated in the revised edition of the mining and metallurgical industry, now in course of preparation.

Draughting Division.—The staff of the Division is at present composed of a chief officer, two map compilers and one mechanical draughtsman.

The work assigned to this Division consists principally in the preparing of magnetometric survey and geological maps, the drawing of original plans in connection with the various mechanical plants, and the construction and drawing of original maps and diagrams used to illustrate reports.

During the past year, owing to the increase of work in this Division, the staff was increased by an additional draughtsman.

The following is a list of maps, diagrams and miscellaneous drawings prepared during the calendar year

1912. The name of the officer for whom they were prepared will be found in the margin.

Magnetometric maps.	12
Maps (geological and topographical)	46
Diagrams.	65
Miscellaneous, photos, etc.	145

Report Covering the Operations of the Dominion of Canada Assay Office, Vancouver, B.C., During the Year Ending December 31st, 1912.—There were during the year 527 deposits of gold bullion, requiring 597 melts and 597 assays, including the assembling and remelt-

ing of the individual deposits after purchase into bars weighing about 1,000 troy ounces each, and the assaying of same. The net value of the gold and silver contained in deposits was \$975,077.14.

In the Summary Report of the Mines Branch for 1911 attention was called to certain conditions which, up to the present time, have affected in an adverse manner the amount of bullion forwarded to the Dominion of Canada assay office at Vancouver. Suggested changes recently brought to the attention of this Department should, if adopted, add very considerably to the real value of this assay office.

PERSONAL AND GENERAL

Mr. Wm. Blakemore, of Victoria, B.C., has submitted to the Government of the province his report on the Doukhobor people resident in Kootenay and Boundary districts, to enquire into whose alleged non-observance of some of the provincial laws, and other matters, he was some time since appointed a special commissioner.

Mr. L. A. Bonner, of Barkerville, Cariboo district, B.C., was recently in Victoria prior to taking another trip to England.

An announcement made recently in British Columbia newspapers follows: "Mr. and Mrs. James McGregor, of Vancouver, announce the engagement of their second daughter, Lucy, to Mr. Charles M. Campbell, head mining engineer of the Granby mines at Phoenix. The marriage will take place January 7th." Charles McKinnon Campbell, B.Sc., B.A. (Manitoba), graduated in mining engineering at McGill in 1902. He has been with the Granby Consolidated Mining, Smelting and Power Co. more than half of the ten years that have since passed. In May, 1908, he read at a meeting of the Western Branch of the Canadian Mining Institute, held at Rossland, B.C., a very instructive paper on "Granby Mining Methods" (see C.M.I. Journal, Vol. XI, 1908), and has since done other valuable work for that branch. On Mr. O. B. Smith, jr., being appointed general superintendent of all the Granby Company's mines, Mr. Campbell was promoted to the position of superintendent of the company's mines at Phoenix. The responsibility of his position and the onerous nature of his duties will be apparent when it is mentioned that in 1912 the output of those mines was between 1,200,000 and 1,300,000 tons of ore.

Mr. W. G. Clark, foreman at the Payne mine, Slocan, B.C., who last autumn was seriously injured by an explosion in the deep-level adit, the driving of which he was superintending, is now out of the hospital. The sight of one of his eyes has been saved, but he has lost the other eye. He will probably return to Sandon, Slocan, in January.

Mr. G. B. Dean, superintendent of the Silver Ridge mine, near Three Forks, B.C., has returned to the Slocan from a visit to Spokane, Washington, U.S.A.

Mr. T. M. Daulton, manager of the Placer Gold Mines Co., operating on Ruby creek, Atlin, B.C., is spending the winter in Seattle, Washington.

Mr. W. J. Elmendorf has returned to Victoria, B.C., from Glacier creek, Portland Canal mining division, whence he went to ascertain the progress being made in driving a long deep-level adit on the property of the Portland Canal Tunnels, Ltd., of which company he is general manager.

Mr. George E. Farish, of New York, has again been giving attention to mining property in Sheep Creek camp, Nelson mining division, B.C.

Mr. W. E. Finch, manager for the Finch syndicate, which is operating under option of purchase the Idaho-Alamo group and other mines in Slocan district, British Columbia, spent the Christmas season in Spokane, Washington, with his family.

Mr. Alexander Grant, formerly manager of the Marble Bay mine, near Van Anda, Texada island, B.C., has been enjoying a visit to San Diego, California.

Mr. John Hopp, whose operations in the vicinity of Barkerville are on the largest scale of all of those who are hydraulic-mining for placer-gold in Cariboo district, B.C., is in Seattle, Washington, for the winter months, after having experienced an unusually dry and short gravel-washing season in Cariboo.

Mr. P. F. Horton is manager of the H. B. mine, situated near Salmo, Nelson mining division, British Columbia. Several hundred tons of lead ore, much of it carbonate, was shipped from this property to Trail last year. It is hoped the H. B. will be developed into a payable mine, after further development work shall have been done.

Arthur L. Ware, well known in the Kentucky and Tennessee coal fields as an engineer and machinery agent, has accepted a position with the Roberts & Schaefer Co. (engineers and contractors, Chicago), and will represent them in this territory. This company has for many years designed and built complete coal mining plants, coal washing plants, coal briquetting plants, and coating stations. For the present Mr. Ware will make his home in Jellico, Tennessee.

Mr. John Kirkup, for years gold commissioner for Trail Creek mining division, British Columbia, has been a resident of Rossland for nearly 18 years, having commenced his official duties as mining recorder and constable at that place in March, 1895. Later he was promoted to the office of provincial government agent and gold commissioner. Having applied lately for removal to coast, the government has arranged to transfer him to Alberni, Vancouver island, where he will be local government agent.

Mr. A. G. Larson, of Vancouver, B.C., went to Colorado to spend the Christmas holidays, and arranged to visit mining districts in that State and Montana before returning to British Columbia.

Mr. Chester F. Lee, of Seattle, Washington, a mining engineer, known to many in British Columbia, as well as the Northwestern States, is occupying part of his time in editing the Pacific Mining Journal, the publica-

tion of which monthly was commenced in Seattle last summer.

Mr. F. Chas. Merry, of Ferguson, Lardeau, B.C., for several years in charge of the Silver Cup and Nettie L. groups of mines, owned by the Ferguson Mines, Ltd., continues to superintend the development of those properties. The Silver Cup's output in 1912 was about 350 tons of ore, averaging more than 100 ozs. of silver to the ton, and between 35 and 40 per cent. lead. The ore also had an appreciable gold content.

Mr. E. C. Musgrave, who was superintendent of the Tye gold-copper mine, at Mt. Sicker, Vancouver island, B.C., during its days of substantial profit-earning, is again in Victoria, where he will remain for about six months before returning to Mexico to look after his important interests there.

Mr. E. Rammelmeyer, of Salt Lake City, Utah, has gone to Switzerland on a six months' holiday visit. In the days of considerable activity at the Emily Edith mine, in Four-Mile camp, near Silverton, Slocan lake, B.C., Mr. Rammelmeyer was manager for the British company then owning that property.

The provincial government have let a contract for the erection of a building at Nanaimo, British Columbia, for mine-rescue training purposes, Mr. J. D. Stewart has been appointed to take charge of that station and the mine-rescue apparatus there also owned by the government.

Mr. Luther Saville, formerly of Nanaimo, is now manager of the coal mine of the British Pacific Coal Company at Slate Chuck, on Graham island, of the Queen Charlotte group, British Columbia. He is the holder of a first-class certificate of competency under the British Columbia "Coal Mines Regulation Act, 1897." Mr. Alex. Faulds, who had been in charge, has returned to Vancouver.

Dr. G. L. Tanzer, formerly managing director of a company that operated under lease the Cornell and Copper Queen gold-copper mines, at the northern end of Texada island, B.C., has returned to Seattle, in which city in earlier years he had an assay office and chemical laboratory.

Among recent applicants for enrolment as members of the Canadian Mining Institute, was Mr. B. L. Thorne, of Hosmer, Crow's Nest Pass, B.C. Thorne is one of the Hosmer officials of the Coal Mines Branch of the Canadian Pacific Railway Department of Natural Resources, of which branch Mr. Lewis Stockett is general superintendent.

Mr. John Waldbeser, for several years directed the development of the Emerald, a lead property near Salmo, Nelson mining division. Eventually the Iron Mountain, Limited, was organized, with Mr. Waldbeser as manager, and this company continues to be the only one in that part of the division regularly shipping lead ore in considerable quantity to the Consolidated Mining and Smelting Co.'s smeltery at Trail, B.C. Its output for 1912 was approximately 1,700 tons of ore, containing about 1,300,000 lbs. of lead, and 2,200 ozs. of silver. Heavy roads and consequent bad hauling adversely affected shipment of ore during the last quarter of the year.

Mr. G. B. Webster, who for some time past has been associated with mining in Slocan district, British Columbia, recently left that province on a trip to Montreal and other places in Eastern Canada.

Mr. W. C. H. Wilson, of Greenwood, B.C., office manager there for the British Columbia Copper Co., has had two very anxious months in Spokane, Washington, where his wife has been very seriously ill during that period. At last accounts there was sufficient improvement in her condition to allow of her removal from the hospital.

Mr. G. M. Colvocaresses, 43 Exchange Place, New York, has recently examined mining properties in Eastern Ontario and in the Gowganda region.

Mr. W. F. Battersby, of the Dome mine, Porcupine, was in Toronto on the 9th and 10th inst.

Mr. H. B. Pickings, formerly Deputy Inspector of Mines for the Province of Nova Scotia, has opened an office in the Metropole Building, Halifax, N.S., where he will practice as a private mining engineer. Mr. Pickings has had long and valuable experience in all the mines of Nova Scotia, particularly in the metalliferous mines.

SPECIAL CORRESPONDENCE

COBALT AND SUBSIDIARY SILVER CAMPS.

The Year's Output.—So heavily did the Nipissing and the Buffalo ship in the last month of the past year that the original estimate of 30,000,000 ounces will probably be exceeded by half a million ounces. What this is worth depends entirely on whether the Dominion or the Provincial method of estimating is adopted. The Dominion takes the total production in ounces and multiplies by the average price of silver for the year. This gives over \$18,500,000. The Provincial Government allows three cents an ounce for loss in smelting and freight and treatment charges, or, in fact, what the company receives back for the product. This gives about \$17,800,000. According to the method of computation, this is either a million and a half or two million dollars more for the ore this year than last, notwithstanding the fact that less was produced. If it is said that the increased price in silver represented two-thirds of the wage bill of the Cobalt camp, it will be seen

what a very substantial increase this is. Moreover, it is gained without any sacrifice whatever.

The situation leaves shareholders in a very happy position. 1911 was the record year for dividends, and yet 1912 Cobalt investors will get about \$1,250,000 more in dividends declared and paid than the year before.

The record of the Cobalt camp is summarized in the following table:

1904	\$ 111,887
1905	1,360,503
1906	3,667,551
1907	6,155,391
1907	9,133,378
1909	12,461,576
1910	15,478,047
1911	15,949,019
1912 (est.)	17,500,000
Total	\$81,817,352

Gross value in market approximately \$87,000,000.

This year's dividends will total approximately \$8,500,000, which brings the total payments for the camp, including those regularly published, English corporations and close corporations, to about \$42,000,000. The dividends to January 1, 1912, were about \$33,500,000.

Less and less ore is being shipped. Twenty-six mines shipped 21,763 tons, a loss of 3,947 tons in comparison with 1911. The following table shows how the tonnage shipped has fallen down since 1910, in spite of the fact that the value of the output has increased:

Year.	Tonnage.
1904	158.55
1905	2,336.01
1906	5,836.59
1907	14,851.34
1908	25,405.35
1909	30,057.58
1910	34,710.29
1911	25,710.22

160,829.02

It is very difficult to obtain bullion figures until some time after the expiration of year, or rather it is easy to get them but hard to total them accurately. It will be seen by the table appended that the bullion shipments this year are a million ounces more than the total of the two years wherein silver bars have been shipped and the value is more than a million dollars greater.

Total for 1910	945,702.94	\$501,815.33
Total for 1911	3,772,920.00	2,012,428.95
Total for 1912	5,634,298.00	3,365,679.00
	\$10,352,920.94	\$5,879,924.28

Concentration first superseded the shipment of crude ore to the smelter and the Butters method of smelting the ore as first established at the Nipissing has accelerated the decline. The coming year will see very small tonnage of crude ore shipped from the camp while mechanical concentration will no more than hold its own. Cyanidation and concentration and cyanidation at the Nipissing, Buffalo, and Dominion Reduction Company will eventually be the standard method of handling the Cobalt ores. The riddle has been solved, as is evidenced by the fact that the Cobalt plant at Copper Cliff, which for years secured the lion's share of the high grade ore is shutting down as soon as existing contracts are finished and a clean-up can be made. The mine managers and companies now know that every cent there is to be made out of the ore they are getting; they have, in fact, eliminated the middleman, who in this instance happens to be the smelters.

There has been a most healthy and decided revival of interest in the camp. It was not found possible to inveigle the public into the game again; but syndicates of men who had a good surplus of income over expenditure have taken up nearly all the old prospects and they are being worked to-day. As the history of mining camps go, the Bailey, Casey Cobalt, Cobalt Central, Drummond, Foster, Green Meehan, King Edward, Nancy Helen, Kerry, Silver Bar, Silver Leaf, and Silver Queen, were astral shapes which no medium was capable of materializing according to the best expert opinion in the camp. Just to observe what honest and economical development has accomplished this year it is instructive to notice that the Bailey has a high grade orebody which has already yielded twenty tone of 2,000-ounce ore, and shows every evidence of persistence. The Casey Cobalt will produce a million ounces, and

has a million and a half ounces blocked out on one vein alone.

The Casey Cobalt has been a consistent shipper of concentrates in the last month of the year, and has already proved a profitable investment to the syndicate that purchased it from the old company.

The Drummond is now mining 25-ounce ore at a profit and sweetening it up with various streaks of high grade before this year not known to exist.

The old Kerry lease on Cart Lake (now the Seneca Superior) has opened up a vein which for 200 feet runs 4,000 ounces to the ton and has already produced 12 cars of ore, two of which were of high grade. This is practically the result of one year's work. If development continues in the same spirit for another twelve months there should be at least fully as much progress made. This is all gain; unsuspected treasure. Very few mine managers of the old dividend earning mines attempt to make more than the most tentative estimate of ore reserves. Those doing so have in the main found satisfactory results. The Coniagas, for instance, has mined over 14,000,000 ounces, repaid all its capital to shareholders, and still has 17,441,800 ounces in sight. Mr. R. P. Rogers prefers to allow 20 per cent. for possible overestimation and calls it 13,953,000 ounces.

The most significant fact in the Coniagas' annual report is that despite the fact that the mine produced last year 3,309,724 ounces, the company was able to report that "development of new orebodies during the year has exceeded the shipments by 1,400,000 ounces." The ore reserves were compiled as follows:

Ore reserves, October 31st, 1912, are estimated as follows:

	Ozs.
4,480 tons high grade ore at 3,000 ozs.	13,440,000
108,740 tons mill rock at 20 ozs.	2,174,800
37,800 tons broken rock on stulls in mine at 40 ozs.	1,512,000
10,500 tons mill rock in surface dumps at 30 ozs.	315,000
Total	17,441,800

Of the 30,500,000 ounces to be produced by the camp Nipissing contributed 4,700,000 ounces, or within a few thousand ounces of the total of last year. How the remainder of the principal mines performed can be seen from the following table:

Mine.	Gross production.	Dividend requirements.
Nipissing	\$2,850,000	\$1,800,000
Coniagas	*2,183,000	1,440,000
Crown Reserve	1,700,000	1,080,000
McKinley-Darragh	1,900,000	898,000
Buffalo	*1,351,150	320,000
Cobalt Townsite	1,119,207	400,000
La Rose	1,800,000	749,230
aO'Brien	797,500	.....
bT. & H. B.	561,992	.....
Cobalt Lake	580,000	310,000
Kerr Lake	1,086,044	600,000
cTrehewey	382,800	.....
Timiskaming	746,832	300,000
Beaver	464,000	240,000

*Gross production, estimated at 58c. smelter settlements.

aClose corporation.

bPays 300 per cent. about every two months.

cNo regular quarterly; paid 10 per cent. in 1912.

The eleventh day success of the Cobalt Townsite and the Casey Cobalt in the London market has created some excitement there that might be prejudicial to the sane and sober interests of the camp. It is well known that English firms actually engaged in mining are extremely well posted on the possibilities of the silver camp; but the English public can be stampeded as in the rubber boom. Anything more detrimental to the good name of the mining industry than such a stampede initiated on three-color scheme prospectuses can scarcely be imagined. There are indications that the English public are to be thrown the bait, but it is very doubtful if the fish will rise.

PORCUPINE, SWASTIKA AND OTHER GOLD AREAS.

In spite of the industrial dispute that cut a quarter of a million dollars from the production of the camp, Porcupine made good its promise of 1911, in the past year. There are still but two mines on a producing basis, but five or six other have made such good progress in ore reserves and development that it is almost certain that they will add something to the aggregate of the coming year.

Before the end of the present year it is probable that the following companies will either have mills built and producing, mills building or mills projected. The tonnage given is the maximum expected to be obtained during the year.

Daily Milling Capacity.

	Tons.
Dome	675
Hollinger	500
*McEaney	50
Vipond	100
*McIntyre	150
aJupiter	50
*Dome Lake	50
aThree Nations	50
aPearl Lake	100
aRea	50

*Under construction.
aPlanned.

HOLLINGER OUTLOOK.

The Hollinger Gold Mines Company is the only producing company in Porcupine that has opened its books to the public. The results they have obtained, therefore, are of the utmost value in estimating the future of the camp. Owing to the strike and the serious condition of disorganization it has caused it is probable that a normal month's work would equal the actual amount of progress made in November and December, but conceding them at two full months it is found that the Hollinger has made a profit of \$763,385 in five months.

Profit for five months	\$763,385
Dividends paid	270,000

This cannot be accounted a bad record for the first six months of actual operation.

To make the profit of \$550,000 up to the end of October, "20,444 tons of ore from development, partly made up of waste rock inadvertently included from drifting and sinking, have been milled and have shown an average value of \$19.70 per ton, 5,777 tons of ore from stopes have been treated and have shown an

average value of \$37.89 per ton. The average value of all ore removed from the mine to date is \$23.69 per ton, established by treating 26,221 tons in the original test mill and in the new mill."

The mill was expected to handle 300 tons per day. Actual operations have demonstrated that with forty stamps in operation 450 to 500 tons can be milled each day. Stamp capacity has been tested up to 12 tons, and the cyanide plant up to the equivalent of 600 tons per day. An extraction was made of 97 per cent. of \$30 ore.

That was the position of affairs previous to the time when 300 men walked out and left Mr. P. A. Robbins to get along as best he could. In his last report, issued with the third dividend, he says that as far as this mine is concerned, the strike is "broken." Since the strike commenced a profit of \$94,013 was made up to the end of the month. There is little doubt that upwards of \$100,000 profit will be made in December bringing the total for the year up to approximately \$860,000.

As to the future of the property, all the premises advanced in Mr. P. A. Robbins' report of last January have been justified. He then estimated a tonnage of 462,000, with gold contents of \$10,230,000. There is now more than that blocked out above the 200-foot level. A mile and a half of underground workings on eight veins had been accomplished before the strike began, and there are 41 veins on the property that carry ore of payable width and values.

DOMES PROBABILITIES.

The Dome has not seen fit to publish any figures yet. There is no secret that the mill is running well and making an extraction of 98 per cent., nor that development work has revealed extraordinary ore reserves, but as to the margin of profits in the quartz and schist they are stoping down, nothing has as yet been given out. In the mile and a quarter of development at the 60 and 100-foot level eight years' ore has been blocked out; eight years' supply, that is, if the mill were not enlarged. Between March 23 and November 1st the mill treated 65,000 tons. At the end of the year another tube mill and slime press were being installed in order to raise the capacity of the mill to 459 tons per day. This is by no means the extent of the ore reserves. Under what is known as the Golden Stairways vein the diamond drills report an orebody 365 feet wide, going to a depth of at least a thousand feet. There is little doubt that the Dome will increase the capacity of their mill very soon; and it is more probable that forty stamps will be added than merely twenty.

McINTYRE MILL.

The little McIntyre mill commenced to treat ore on the first of March, and by the first of November 11,200 tons had been put through. The returns have enabled the company to meet current operating and development expenses. The 300-foot level of the mine revealed an excellent body of ore, but the character of the ore had so changed from that milled from the upper levels that it was decided to build another mill, including cyanide treatment. This plant is designed to treat 150 tons per day, and should have almost been finished if the strike had not delayed operations.

PLENAURUM AND JUPITER.

The Plenaurem and Jupiter were making most satisfactory progress when the strike interfered with operations. The Jupiter was planning a mill and there is little doubt that the construction of one will commence

with the spring. On the Pienaurum a long drift connects the two shafts under Pearl Lake at the 200-foot level. It has intersected some eleven veins, many of which are very promising. On one of these a winze has been sunk some 60 or 70 feet, and it has demonstrated that there is little fear that the veins at the second level will not carry as good values as at the first. Until this second level is developed there will be no thought of a mill. When the strike had hindered work for some time on this property it was decided to allow the mine to stand idle until spring, rather than to be put to the expense and trouble of fighting the strike during the winter months.

PEARL LAKE PROPOSES A MILL.

It has just been announced that the syndicate now working the Pearl Lake mine will build a twenty-stamp mill upon the property. This decision was reached when the orebody was cut at the 400-foot level. The year will not be very old before the Rea is working again. A syndicate of moneyed men, whom Mr. John Redington represents in the North country, will erect a mill to treat the ore that is already in sight on the two upper levels and a vigorous attempt will be made to discover further lenses of good ore in the vein at the 300 and 400-foot levels. Other quartz bodies carrying good veins exposed on the surface, but as yet not developed at all, will also be opened up.

SCHUMACHER.

It is very probable, too, that something will be made of the Schumacher. Mr. Joe Houston has now taken charge of the development of that property. It has always been regarded as one of the best prospects of the camp, and Mr. Houston's reputation is enough to guarantee a vigorous and intelligent campaign of development.

McEANENY DEVELOPMENTS.

The McEaneny of the Crown Reserve is probably in a better position to calculate ore reserves than any property in the camp, excluding the Dome and the Hollinger. Starting the year with most discouraging prospects, there is now actually in sight three-quarters of a million dollars on one vein. A ten-stamp mill is being erected and stamps should be ready to drop in the second or third month of the year. Five stamps will be installed now; five more later on.

DOMELAKE PROGRESSES.

The most definite advance outside the Pearl Lake area has been at the Dome Lake mine, where a high grade orebody has been blocked out for several hundred feet above the 50-foot level. A ten-stamp mill is here being erected and should be in operation about the same time as the McEaneny.

DAVIDSON NEWS.

The fate of the Davidson is unknown; but the shareholders of the Crown Chartered do not appear to be ready to save it from the wreckage of the company. It and the Hughes-Porcupine are the only two properties that have made any progress in that portion of Whitney township and North Tisdale in which they are situated, last year. The Porcupine Lake (Hunter) have erected a plant and buildings after a careful testing of their veins with a diamond drill.

SWASTIKA.

There will be two mills at Swastika during the coming year, one at the Swastika and the other at the

Lucky Cross. At the lower levels the underground development of the Swastika has been disappointing. Very interesting from any point of view is the development of the Tough claims, near Kirkland lake. The vein, which has been developed, averaged not more than five inches on the surface; at a depth of ten feet it had widened to fourteen inches, with occasional bulges. All this ore was remarkably high grade and two shipments that have been made ran approximately \$400 to the ton.

BRITISH COLUMBIA.

The review of "Mining in British Columbia in 1912," which has already been printed in The Canadian Mining Journal, will have shown its readers that mining in the Province is, generally, in a satisfactory condition, and that the outlook is considered to be more favourable than for some years past.

The close of the year has seen activity the rule in the mining camps of the Province. The only labour difficulty at the present is that at the collieries of the Canadian Collieries (Dunsmuir), Limited, with mines at Extension and Cumberland, both districts on Vancouver Island. It is thought this trouble will be quite overcome shortly, for already the company has a fairly large number of men at work in some of its coal mines, and is making a production of coal up to about 1,000 tons a day. In Kootenay district a Board of Conciliation and Investigation is about to commence to look into the position in regard to the demand of the miners for increased pay; meanwhile, though, there is not any interruption of operations at the mines affected—some 20 in number.

IN AINSWORTH MINING DIVISION.

Mines in Ainsworth division that shipped ore during 1912 were as follows:

Bluebell.—The quantity of ore mined and milled during the second half of the year (the concentrator was not operated during the first half) was approximately 33,000 tons; concentrate shipped to Trail, more than 3,400 tons; metals recovered were, silver nearly 50,000 ounces, lead about 4,172,000 pounds. Development work done proved the continuance of the big orebody below the level of Kootenay Lake. A rise made from the lower level to the surface in 1912 gave the mine a new main shaft, which was equipped with head-frame, and double-drum hoist operated by compressed air. Sinking of the old shaft is again in progress, and as soon as possible new ground will be opened therefrom and connection be made with the new shaft. Additions to plant and equipment included a new crusher house with two Blake crushers in series, and a storage bin; Sullivan compressor with a capacity of about 1,500 cubic feet free air per minute; and minor changes in the concentrating plant.

No. 1 Mine.—This was operated by the Consolidated Company, which, up to the end of November, had received at its smeltery at Trail from this mine 524 tons of ore averaging about 96 ounces of silver to the ton and three per cent. lead.

Silver Hoard and Hope.—The former of these two is situated in the old Ainsworth camp; the latter is on Princess Creek and is worked by the Florence Mining Company. Particulars of the Silver Hoard cave have already been published in the Canadian Mining Jour-

nal; some 750 feet of development work was done on the property last year, and 202.4 tons (dry weight) of ore shipped, the metal contents of the ore having been 13,846 ounces of silver and 13,711 pounds of lead. In addition several hundred tons of lower-grade ore was set aside for treatment in the future. Of the Hope, little is known to the writer; in 1911 the Florence Mining Company undertook the work of driving a tunnel to gain a depth of 500 feet. In 1912 40 tons of ore was shipped to Trail; no information of work done has been received.

Whitewater and Vicinity.—Shippers were: The Whitewater mine, operated by J. L. Retallack & Company, about 1,100 tons of hand-picked ore, averaging about 75 ounces of silver to the ton and 35 per cent. lead; the Utica, stated to have shipped \$50,000 worth of ore; and the Panama, from which 61 tons of high-grade ore was sent to Trail.

NELSON MINING DIVISION.

Work is being continued at the Granite-Poorman gold mines, the Queen Victoria and Eureka copper mines, and the Molly Gibson and La France silver-lead mines, all situated in the northern part of this division. Of these, the Granite-Poorman group is having its ore milled, shipping to the Trail smeltery only the concentrate produced after the pulp has passed the amalgamating plates; the Queen Victoria shipped to the British Columbia Copper Company's works at Greenwood by the end of December about 1,000 tons of low-grade copper ore, that having been the output from the time production was commenced late in November, after this mine had been purchased by that company and work resumed at it; the Molly Gibson's output for the year was between 2,000 and 3,000 tons, much of it concentrate.

Concerning the Dundee, in Ymir camp—development work has been in almost continuous progress on this property for the past three years. The most important work done was that of driving a tunnel, starting from a point at the southwestern corner of the property, where recommended some years ago by Mr. Bernard MacDonald in his report, made after he had examined the Dundee. The main adit has been driven 1,851 feet, and there has been some later drifting to the extent of about 600 feet. In addition some 400 feet of diamond drilling has been done. By far the greater part of this work was cross-cutting in country rock, only the last 200 feet having been driving on the vein. In the course of the cross-cutting several showings of ore have been met with; these will be opened later. The present object is to continue the main drift until it shall be under the old shaft, which will involve driving nearly 500 feet farther. The drift is being advanced about 5 feet a day; when it shall be under the old shaft, raising will be undertaken and continued until connection shall be made with the old workings, which are down to a depth of 260 feet from the surface, and approximately 640 feet above the level of the long tunnel above-mentioned. This means that when the connection shall have been made, the mine will be opened to a depth of 900 feet from the surface.

No continuous bodies of ore have yet been found at the greater depth worked, but the vein is there, well defined and running on a similar course to that shown in the old shaft workings. The diamond-drill shows it

to be about 40 feet in width between walls. Some bunches and small streaks of ore were lately encountered, and it is expected that an ore shoot of considerable size will soon be entered. The drift has latterly been chiefly in quartz, heavily mineralized with iron pyrites and having small quantities of galena and zinc and some intrusive rock. A water-driven compressor supplies air for operating the machine drills used in drifting. No other work is planned for the time being—just to continue development along similar lines to those now being followed.

Other mines in Ymir camp are being worked, and still others about Salmo and Erie, and in Sheep Creek camp, of which some information will be given in the early future. Of these, the Yankee Girl, near Ymir, the Emerald, near Salmo, the Second Relief and Arlington, at Erie and the Queen and Motherlode in Sheep Creek camp, are the chief producing mines in the southern part of Nelson division.

ROSSLAND AND TRAIL.

While exact figures of production of Rossland mines are not yet available, it is known that the quantity of ore produced in 1912 in Trail Creek division, which includes Rossland camp, is approximately 240,000 tons, as compared with 254,000 tons in 1911. Information received to date makes it appear that the Centre Star group shipped 31,000 tons less ore in 1912, and that Le Roi No 2 Company's mines also show a decrease in quantity; on the other hand, Le Roi made a gain of about 25,000 tons. There must be some good reason for the decreases in output mentioned, since it is well known the Centre Star group has much ore in sight, for it was reported to shareholders in the Consolidated Mining and Smelting Company at the last annual meeting, held in October, that "our Rossland mines show an increase in the amount of ore developed, with, we believe, a higher average value." Le Roi No. 2 reported, for its fiscal year to September 30th last: "Beside the discoveries of numerous oreshoots in the better-known veins in the upper ground, the most important development is that of an orebody on the 1650 (Le Roi) level. This is the deepest ore known in our ground and is of good metal content, size and character, and augurs well for the future of this part of the property in depth. Development is in progress here."

The smaller shippers in Rossland camp did not as a whole come up to expectations in the matter of output, since together they made a decrease in quantity. However, the outlook for some of them—the Blue Bird and Phoenix particularly—is decidedly promising, in both cases much better than at the close of 1911.

The Inland Empire, situated in an outlying part of the division, in the mountains westward from Rossland camp, completed the installation of its 10-stamp mill and commenced crushing ore late in the year. While production was small, it is an advance to have got to the producing stage, especially as it is expected an output will be regularly maintained. The mine has been developed to a depth of 300 feet, and levels have been opened at 70, 140, 200 and 300 feet respectively. The ore is of such a character that the saving of gold on the amalgamating plates is light, most of the value being recovered in concentrate, which is smelted at Trail.

STATISTICS AND RETURNS

COBALT ORE SHIPMENTS

The ore shipments for the week and year to date are as follows in tons:

	Week	Year
	Dec. 27	to date
Bailey	20.00	41.57
Beaver		163.75
Casey Cobalt		255.15
City of Cobalt		914.99
Buffalo	59.70	1,163.54
Cobalt Lake	30.10	1,056.51
Cobalt Townsite	67.76	1,867.78
Chambers-Ferland		500.93
Coniagas		1,997.90
Crown Reserve	19.99	457.83
Drummond	30.07	449.84
Hudson Bay		662.85
Kerr Lake		743.05
La Rose	106.26	3,538.93
Lost and Found		27.80
McKinley-Darraugh		2,509.16
Nipissing	27.86	1,803.62
Penn. Canadian		97.90
O'Brien		411.43
Provincial		22.22
Right of Way		242.82
Temiskaming		958.66
Trethewey	27.01	577.05
Wettlaufer	50.00	487.21
Colonial	13.33	76.47
Dom. Red. Co.		119.41
Peterson Lake Seneca Superior).	41.16	391.75
Hargraves		47.35
Silver Queen		31.25
Totals	534.24	32,171.24

The bullion shipments of the week were the following:

	Ounces.	Value.
Nipissing	54,464.00	\$36,756.00
O'Brien	15,736.00	9,722.00
Buffalo	10,550.00	6,600.00
Miller Lake-O'Brien	946.00	788.00
	85,696.00	\$58,866.00

B. C. ORE SHIPMENTS

Exceeding the previous week ending December 28th, 1912, production by over 4,000 tons, the production of the mines in the Boundary district last week was 44,931 tons and brought the total for the year over the 2,000,000 ton mark for the first time in the history of the district.

Consolidated Company's Receipts.

	Week.	Year.
Sullivan	1,073	31,061
Emerald	68	1,614
Standard	307	9,212
Utica	22	960
Ferguson	27	311
Knob Hill	100	2,248
Queen	40	683
Centre Star	3,702	157,571
Le Roi No 2	265	25,100
Le Roi	1,669	45,581
Whitewater	29	1,088
United Copper	59	1,743
Yankee Girl	38	625
Ben Hur	106	975

Hudson Bay	80	879
Bluebell	160	3,571
Idaho-Alamo	40	88
Other mines	27,591
Total	7,785	319,901

Granby Smelter Receipts.

Granby	28,234	1,261,034
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B. C. Copper Company's Receipts.

Total	14,582	671,472
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Nelson.

Total	2,205	74,777
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Boundary.

Granby	28,234	1,261,034
Mother Lode	7,912	370,303
Rawhide	6,002	256,381
Napoleon	668	14,373
Knob Hill	100	2,248
United Copper	59	1,743
Ben Hur	106	975
Nickel Plate, milled	1,500	75,100
Jewel, milled	200	4,000
Other mines . . . . .	....	30,425

Lardau.

Ferguson	27	311
Other mines . . . . .	....	58

East Kootenay.

Monarch, milled	425	13,350
Sullivan	1,073	31,061
Other mines . . . . .	....	2,313
Total	1,098	46,724

Slocan and Ainsworth.

Standard, milled	400	17,800
Van Roi, milled	1,100	58,000
Bluebell, milled	1,200	27,700
Kilo, milled	100	600
Rambler-Cariboo, milled	300	1,000
Standard	307	9,212
Utica	22	960
Whitewater	29	1,088
Bluebell	160	3,571
Idaho-Alamo	40	88
Other mines	25,981
Total	3,658	148,000

Rossland.

Total	6,026	241,257
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SILVER PRICES.

	New York	London
	cents.	pence.
December 26	62½	
December 27	62¾	28½
December 28	62½	28½
December 30	62½	28½
December 31	62¾	29
January 2	63½	29½
January 3	63¾	29½
January 4	63¾	29¼
January 6	63¾	29½
January 7	63¾	29¾
January 8	63¾	29¾