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THE COAL-STEEL MERGER.

All things work together for good. Possibly this dictum needs no restricting clause. The foolish squabble between the Dominion Iron & Steel Company and the Dominion Coal Company has been the direct cause of the pending amalgamation of these two huge enterprises—a dramatic climax to the litigious burlesque.

The first newspaper rumours of the merger were received with incredulity. Gradually, however, it became evident that Mr. James Ross, president of Dominion Coal and the largest individual stockholder in both companies, was prepared to retire from his commanding position. Mr. Ross, in whom there is concentrated much more than one man's share of pluck and pugnacity, made his own terms. But before touching on these particulars it may be well to review the physical assets and the financial standing of both companies.

The Dominion Coal Company commenced operation in 1893. The company's property comprises the greater part of the rich Sydney, Cape Breton, coalfield, the area of which is about 250 square miles. It also holds other coal land in neighbouring districts, including twenty-five square miles of submarine coal areas near Point Aconi. An estimate of the coal contents of the Dominion Coal Company's lands, made six years ago, places the total at 1,435,360,000 tons. Nine collieries, several of which are among the best equipped coal mines on the continent, contribute to the production of about 3,500,000 tons per annum—nearly half the total production of Canada. The company operates about 100 miles of railway, which is amply provided with rolling stock. It also owns a half interest in the Sydney and Glace Bay Electric Railway.

In addition to its complete establishments in the Glace Bay district, the Dominion Coal Company owns a system of loading piers at Sydney, Glace Bay, and Louisburg harbours, a fleet of ten colliers, a wrecking plant, and large modern discharging plants at St. John, N.B., and at Three Rivers, Quebec, and Montreal. The company also employs between 15 and 20 foreign-owned steamers.

The market area over which the output of the Dominion Coal Company is distributed embraces eastern Canada as far as Montreal, the island of Newfoundland to the east, and Boston to the south. Shipments are occasionally made to the West Indies. The collieries are ideally situated as regards ocean trade. Their position is, and will remain, commanding.

Ground was broken at Sydney, N.S., for the works of the Dominion Iron & Steel Company on August 10th, 1899. The winter and spring of 1901 saw the completion of the works as originally designed, comprising 400

by-product coke ovens, four blast furnaces, and ten open-hearth steel furnaces, together with the necessary accessory equipment.

The construction period, 1899 to 1902, was marked by prodigal expenditure. So reckless, indeed, was the outlay of funds that the company was in a very critical condition when, in the spring of 1903, the administration was changed and the management placed in the hands of Mr. Graham Fraser, with whom was associated his son, Mr. J. Dix Fraser. Radical economies were now effected, large additions were made to the plant, and, principally through the practical common-sense of Mr. Fraser, the enterprise was put on a sound footing. The additions to the steel plant made it possible to enter the Canadian market, and the Dominion Steel Company became what it is to-day, a Canadian industry.

The present plant, which is constantly being enlarged, consists principally of 500 by-product coke ovens, four blast furnaces, two Bessemer converters, one hot metal mixer, ten open-hearth steel furnaces, one blowing mill, one continuous billet mill, one rail mill, one rod mill. Subsidiary plants for the manufacture of chemicals and cement have been erected on the company's ground by other interests.

The history of the relations of the Dominion Steel Company to the Dominion Coal Company has been referred to frequently in these columns. It is sufficient to state here that until the reorganization of 1903 the Steel Company held a vague contract with Dominion Coal for "an assured supply of coal, on favourable terms and for a long period of time, for the use and benefit of" the Steel Company. By the terms of this contract the Steel Company had the right to lease and operate the Coal Company's properties, should it decide to do so within a certain specified time. A new and more reasonable agreement was entered into in 1903, whereby the Dominion Steel obtained suitable fuel on much more advantageous terms. The interpretation of this latter agreement was the crux of the litigation lately settled.

Previous to 1902 the Dominion Iron & Steel Company's bonded indebtedness was \$8,000,000; its preferred stock, \$5,000,000, and its common, \$15,000,000—a total of \$28,000,000. At that time the Dominion Coal Company's capital liabilities were as follows: Common stock, \$15,000,000; preferred stock, \$3,000,000; first mortgage bonds, \$2,801,500; total, \$20,801,500.

During 1902 the common stock of Dominion Iron & Steel was increased by \$5,000,000, and second mortgage bond issue of \$3,000,000 was made. Of the bond issue one-half was taken up at par by the directors.

The legal victory in its dispute with Dominion Coal put Dominion Steel, temporarily at least, in a fair position. In a later issue we shall examine this position more closely.

The Dominion Iron & Steel Company's total stock and bond issue stands now at \$34,368,833. Its gross earning capacity is about \$3,000,000 per year.

The Dominion Coal Company's total stock and bond issue is \$23,000,000. In earning capacity it far exceeds the Steel Company. Its administration is most efficient, its plant thoroughly efficient, and its departments highly organized.

The above rough sketch is designed merely to give our readers a conception of the magnitude of the two members of the proposed merger.

Of the merger, provided there is no injection of water, Canadians will approve. Undoubtedly it should facilitate the business of both concerns.

It is appropriate, however, to ask a leading question: Can the Coal Company, which has incurred heavy bonded indebtedness to insure a certain output the profits from which will meet present fixed charges, at the same time set aside a fund from its lessened earnings for the redemption of these bonds? Can it, further, provide out of these same earnings for the costly development of new mines?

It is only fair to ask these questions. Modern financiers have a characteristic tendency to ignore the underlying physical difference between mining and manufacturing. Mining is a venture in which money is made by the destruction of assets. Countless billions of tons of coal are worthless unless they can be mined at a net profit.

RECENT COLLIERY DISASTERS.

The folly of using naked lights in coal mines continues to be exemplified by explosions and fires, both on this side of the Atlantic and on the other, attended by a wicked waste of human life. The newspaper despatches do not give a very clear idea of what actually happened at the appalling catastrophe in Illinois, but it is beyond a doubt that the fire originated through the criminally careless use of naked lights underground. The loss of 30 lives at the Darren colliery of the Rhymney Steel Company in Wales on the 29th of October is referred to in the Western Mail as follows:—

"Comparatively little damage was done to the workings, and to those who have a long experience of the Darren colliery the cause of the explosion is quite inexplicable. As a house coal colliery it has always been looked upon as the safest of pits, no gas having ever been detected there. In proof of this it may be stated that naked lights were used, and not safety lamps. The theory which finds most favour among experts and experienced miners is that through a rather heavy fall a quantity of gas was released, and this, being ignited by one of the naked lights, caused the explosion."

We may assume, therefore, that if safety lamps had been in use the disaster would not have occurred. It may also be safely assumed that when the mine is re-started safety lamps will be used.

The Darren explosion was marked by heroism of a kind remarkable even in the long roll of brave deeds that have attended colliery disasters in Britain. No less than five men gave their lives for their fellows in an unavailing attempt at rescue, and eight others were brought to bank in an unconscious state. The manager, the underground manager, and three other officials comprised the group of heroes who died in the work of rescue. The whole account of this disaster is such as to stir the blood and to make us feel that "gallant Wales" is still the mother of brave sons.

The other matter that is exemplified by these two disasters is the proper use of oxygen breathing apparatus. These devices were brought into use at both places. At Darren the rescue corps from the Aberamen Station arrived too late for the work of rescue. The explosion occurred at 4 a.m., and not until evening did the apparatus arrive at the colliery. But had trained men with proper equipment been on the scene at Darren when the blast occurred, the tale of rescue might not have been so gloomy. In saying this we would carefully guard against any suggestion of minimizing the work done by the rescuers. They gave their lives, and no man can do more than that. But brave men should not be permitted to imperil themselves amongst the deadly gases that follow a mine explosion, when science has provided a remedy.

At the Cherry mine, so far as one can learn, the breathing apparatus of the U. S. Geological Survey station has been used to good effect in preparing the way for the firemen and restoring the ventilation. Here again, however, had the apparatus been immediately available with a sufficient number of trained men, life might have been saved. Of this feature more exact details will enable a better judgment.

The following extract from a letter written by the superintendent instructor of the Aberamen Station is pertinent. He writes:—

"After the dead bodies were brought up on Saturday morning [at Darren] I received another wire at Deri, requesting us to go at once to Penrhewceber with our apparatus, as the pit was on fire and all the men below. So we hurried away to this place, and reached there early on Saturday morning, where we did some very good work. The fire had got up above the archwork, and seeing that we had a lengthy task before us, I arranged that the brigade should work in relays, to enable the men to get some rest. By Tuesday morning we had the fire practically out, and the men had worked well indeed. Once again the Draeger helmet proved a great success. I may mention that with the experience we have had, an apparatus without a helmet would have been of no use whatever. The helmets protected our faces from the steam given off."

At another colliery in England an outburst of gas

occurred in the workings, and the mine was cleared of the accumulation by men wearing helmets. Had this mine not been using safety lamps the helmets might have been required for a sadder task.

The points we wish to make are, first, that safety lamps should be used in all coal mines whether they are reputed "gassy" or not. Most of the dreadful explosions that have occurred in recent years have been at mines with a reputation for "safety." The Courrieres Mine, the Darr, the Monagahela, and the Cherry Mine, all were mines with a reputation for "safety." The use of naked lights is foolish and wicked.

The second point is that breathing apparatus for rescue work and fire-fighting in mines is valuable if it is immediately available. It may be compared exactly to other fire-fighting equipment. The usefulness of a fire brigade, everyone knows, depends more upon the rapidity with which a call can be answered than upon anything else. So with mine rescue apparatus.

Another interesting feature of the Darren explosion was the use of oxygen in reviving unconscious persons suffering from poisoning by fumes. One of the rescuers, a doctor, lay in the after-damp for over five hours, and he was given up for dead. When he was brought to the surface oxygen was administered, and after a long interval, the doctor regained consciousness, and was last reported as progressing favourably.

THE GEOLOGICAL SURVEY AND PARLIAMENT

The work of any government department, to produce adequate results, must not be subject to extraneous interruptions nor to undue political influence. Ideally, political influence should be entirely absent.

The Geological Survey, under its present administration, has been effectively removed from the sphere of partisan interference. In accomplishing this, both the Minister and the Director have shown a fine disregard of "pull" and "privileges." Comment and commendation are superfluous. The situation speaks for itself.

The warmest admirer of the Survey will not claim that it is perfect. There are manifest weaknesses and discrepancies in the organization. But these weaknesses and discrepancies are not inherent. They arise altogether from the fact that the Survey is crippled financially. Its total appropriation has always been insufficient. Every year the demands upon the Survey have increased. Every year has seen the appropriation become more and more inadequate.

Now, there are two fundamental essentials without which the Survey would rapidly lose all meaning. First, its staff must be composed of capable, specially trained, professional workers. Men of the proper

type are hard to secure, and harder to retain. The salaries paid by the Survey are very much smaller than those offered by private corporations. Hence the only inducements that the Survey can offer are the honorable standing and the professional distinction that accrue to its servants. Without these inducements only the riff-raff of the profession could be engaged. Political office-seekers and their champions, if given any encouragement, could readily deprive the Survey of all chance of retaining first-class men.

The second desideration is a corollary of the first. Briefly, it is imperative that the Survey continue to enjoy the fullest confidence of mining men and investors. Without this confidence it would be out of the question for the Survey to attempt much of its most important work. Free access to mines and to records is necessary. This cannot be demanded. It is given only when private corporations know that confidences will not be betrayed.

At present the staff of the Survey is composed of men who rank with the best in any corresponding body anywhere. To a remarkable degree their reports are economic. The whole point of view of the Survey is coloured by the needs of the mineral industries. The officers of the Survey are active members of the Canadian Mining Institute. They are constantly in touch with mining problems.

It is also unqualifiedly true that the Survey enjoys the implicit confidence of the mining fraternity. This is a precious asset, an asset that must be guarded with utmost care. An irresponsible utterance in the House of Commons, baseless, irreparable criticism of a disappointed grafter, can do damage.

In short, the Survey has struggled and is struggling against almost insuperable obstacles. In spite of this it has been brought to a state of high efficiency.

What is least needed, what would most effectually injure the whole fabric of the Survey's credit, is hostile attention from members of Parliament. On the other hand, intelligent inspection will always be welcomed. And intelligent inspection of the Survey's work and methods will convince any impartial person that it is organically wholesome, clean and vigorous.

The Survey is doing its duty. Parliament has not done, is not doing, its duty in respect of the Survey.

THE COALFIELDS AND A CANADIAN NAVY.

The question of a Canadian Navy has evoked many varied expressions of opinion in the public press of late, but one thing on which everybody should agree is the vulnerability of our shores to attack by an unfriendly nation. Probably at no place on the eastern seaboard of Canada could an enemy do more damage in a shorter time than in that bit of our coast that lies between Louisburg and the Great Bras d'Or Entrance on either side of Sydney Harbour. Viewed from the three-mile limit at sea on a clear day, the Sydney coalfield presents

a striking picture, for between the old Gowrie mine and the new No. 3 Colliery of the Nova Scotia Steel & Coal Co. one can count over a dozen columns of smoke, each of which indicates a flourishing colliery, representing in each instance a capital expenditure of from \$250,000 to \$2,000,000. The spectator may recognize the tall chimney of No. 6 Colliery, the imposing bulk of No. 2 bankhead, the smoke of the new collieries at Lingan, and the typically English appearance of Old Sydney Mines No. 1.

Every one of these mines is within easy range of the batteries of a modern battleship, and half an hour's good practice with 12-inch guns would suffice to set every mine on fire and do irreparable damage. An enemy who desired to effect an occupation of these mines would not, of course, perpetrate such wholesale damage, but the enemy who fears the vengeance of a swiftly following British squadron will certainly choose this exposed and valuable outpost of Canada as one where a bombardment would serve the double purpose of working terrific destruction and of crippling the national coal supply. Summer after summer the residents of Sydney see the warships of foreign nations lie at anchor in Sydney Harbour, and in the piping times of peace their presence adds to the picturesqueness of a magnificent and spacious harbour. But in time of war, with a hostile "Dreadnought" in the offing and the British fleet at grips anywhere from Kiel to Vladivostok, what could the harbourmaster of Sydney do? He would be a foolish admiral that attacked the fortress of Halifax when the unprotected port of Sydney offered him a place to coal and refit, and nothing to say nay except the laughable equipment of the local militia artillery. The shareholders of the Dominion Steel and Coal Corporation need scarcely debate with themselves the advisability of a Canadian contribution to the naval expense of the Empire. The fleet that guards the Medway and the Solent guards also the dividends of Coal and Steel, and the coal supply on which the industrial activities of the eastern half of this Dominion chiefly depend.

STABLE STARCH SOLUTION FOR VOLUMETRIC ANALYSIS.

One of the messy little troubles against which the metallurgical chemist must contend is the difficulty of making up a clear starch solution. The following formula, devised by Mr. A. H. Low, does not deteriorate, and remains clear, giving a satisfactory indication of the end-point in the iodide copper assay: After making up and filtering a cold saturated solution of commercial sodium chloride in distilled water, take 500 c.c., add 100 c.c. of 80 per cent. acetic acid and 2 grains of starch; Mix cold. Boil until nearly clear, or about two minutes. The starch is now entirely dissolved, and no filtering or settling is required. The starch may be used when cool.

REPORT ON THE WHITEHORSE COPPER BELT YUKON TERRITORY

By R. G. McConnell.

Issued by the Geological Survey Branch, Department of Mines, Ottawa—Abstract Prepared for the
Canadian Mining Journal.

Historical.

The history of the Whitehorse copper belt dates back to the early Klondike rush. Discoveries of copper croppings are reported to have been made by miners on their way to Dawson in the summer of 1897. The discoverers were hunting at the time, and the croppings were not located.

The credit of staking the first claim is due to Jack McIntyre, who located the Copper King, July 6, 1898. The Ora, a neighbouring claim, was staked by John Hanly on the same day. Later in the same year the Anaconda was staked by W. A. Puckett, and the Big and Little Chief by Wm. McTaggart and Andrew Oleson. In the following year the district was pretty thoroughly prospected on the surface, and most of the important claims, including the Pueblo, Best Chance, Arctic Chief, Grafter, Valerie, War Eagle, and numerous others, were discovered and staked.

In 1899, trails were constructed to several of the claims from Whitehorse, and development work was commenced on the Copper King, Anaconda, and Pueblo. Among the noteworthy events of that year was the bonding of the Pueblo, and a group of adjoining claims, to the British America Corporation. The bond was thrown up in 1901, after the completion of 235 feet of sinking and drifting, through what has since proved to be a lean, if not the leanest portion of the lode. No further mining was attempted on this claim until 1906.

The early development on the Copper King was carried out by McIntyre and Granger, the owners, and consisted in sinking on various surface croppings. In 1900 a small shipment of ore, the first from the district, was made from this claim. The shipment was made up of nine tons of rich bornite ore, and is stated to have yielded 46.40 per cent. of copper. A second shipment of 460 tons of high grade ore was made in 1903.

Other claims on which serious attempts at development were made in the early days of the camp are the Arctic Chief, Anaconda, Valerie, and Grafter. Work on the large magnetite ore body of the Arctic Chief was commenced in 1902, and has been prosecuted at intervals ever since. A shipment of 170 tons of selected ore was made in 1904. A small shipment was also made from the Valerie in 1903, the only ore so far from the southern portion of the camp. The early Grafter workings consisted of about 200 feet of sinking and drifting, and those on the Anaconda of about 300 feet of drifting.

Little progress was made during the year 1904-5, and the work done was practically limited to that required to hold the various claims. The rising price of copper in 1906 revived interest in the camp, and a number of the most promising claims were sold or bonded to individuals or companies. During the past season active development work was in progress on the Pueblo, Grafter, Arctic Chief, Best Chance, Copper

King, War Eagle, and Valerie, and small amounts of exploratory work were done on a number of other claims extending all along the belt.

The total amount of development work so far done in the district, including that of the past season, does not exceed 3,500 feet, and the total shipments to various coast smelters aggregate about 4,000 tons. This slow progress in a camp containing so many favourable showings is remarkable, and is attributed mainly to delay in providing proper transportation facilities. Most of the important mines are situated at distances of from four to seven miles from the present terminus of the White Pass Railway at Whitehorse, and are connected with it by wagon roads constructed by the territorial government. The transportation charges to Whitehorse by wagon amount to from \$3 to \$4 per ton, and from Whitehorse by rail and steamer to the various coast smelters to \$6 per ton. The large iron ore bodies on which the camp principally depends, are all comparatively low grade, averaging about four per cent. in copper, and the margin of profit on the ores under present conditions is small.

A spur line from the main line of the White Pass Railway has now been located along a portion of the copper belt, connecting closely with the principal mines, and cheaper transportation in the immediate future is assured. A large tonnage, probably half a million tons, is in sight at the various mines, as a result of recent development work, and extensive shipments are contemplated when the spur is completed.

Situation and Communication.

The Whitehorse copper belt is situated in the southern part of the Yukon Territory, about 45 miles north of the British Columbia boundary, and extends along the valley of the Lewes River—the principal feeder of the Yukon—for a distance of about 12 miles. The town of Whitehorse, the distributing point of the district, is distant 110 miles from Skagway, at the head of Lynn Canal, one of the numerous west coast fiords. Easy communication with the coast is afforded by a well-built narrow-gauge railway, constructed across the Coast range to Lake Bennett in 1898-9 to facilitate transportation to the Klondike. In 1899-1900 the road was extended down Lake Bennett to Carcross, where it leaves the present waterway, and follows a wide parallel valley, now occupied for some distance by the Watson River, to Dugdale. Here it rejoins the Lewes Valley, and continues down it to the present terminus at Whitehorse, a mile below the Whitehorse Rapids.

Whitehorse, in addition to being the terminus of the railway from the coast, is also the head of navigation on the Yukon. In the summer season, lasting about five months, steamers sail regularly for Dawson, a distance of 450 miles, connecting there with larger steamers, which descend to the sea, a distance of 1,572 miles. In

the winter season communication is kept up by means of stages.

Topography.

The main feature in the topography of the district is the great valley of the Lewes River. Opposite Whitehorse the valley has a width, from base to base of the enclosing hills, of fully four miles. It is bordered on the east by Canyon Mountain, a long symmetrical limestone ridge, rising to a height of 2,500 feet above the valley bottom, and 4,730 feet above the sea. The western boundary is more broken, and consists, from south to north, of the Golden Horn, a prominent peak 5,400 feet in height; a wide irregular ridge culminating in Mount McIntyre,* 5,200 feet, and Mount Haeckel, 5,318 feet in height. These elevations are separated by wide drift-filled depressions, extending across the range.

The central portion of the old pre-glacial valley is floored with silts and boulder clays, and through these the Lewes has cut the narrow, winding secondary valley, about 200 feet in depth, in which it now flows.

The surface of the old valley rises gradually from the edges of the secondary valley to an elevation of about 600 feet at the bases of the enclosing ridges. It is rough and exceedingly varied in character. Small plains underlaid by silt alternate with rolling boulder clay hills and ridges, and these in turn are replaced at many points by areas of low, hummocky, granite hills; and near Hoodoo Creek by small cliff-bordered basalt plateaus. Short terraces occur frequently, but do not form continuous conspicuous lines along the valley.

A feature of the old valley bottom is the number of small canyon-like valleys, from fifty to a hundred feet or more in depth, which incise its rocky floor in all directions. Some of these carry the present drainage from the hills, while others are waterless, or enclose small drainless lakes, and were evidently carved out by temporary Pleistocene streams.

The streams of the district, with the exception of the Lewes River, are all small. The most important are Wolf, Hoodoo, McIntyre, and Porter Creeks. The derangement of the drainage system during the glacial period, and the partial deflection of the streams from their old courses, is illustrated by the varied character of their valleys. These are sunk through drift, and are wide and irregular where the pre-glacial channels are followed, and after leaving them become narrow rocky gorges.

The Lewes River, like the smaller streams, failed in places to regain its old channel after the disappearance of the ice. Above Whitehorse it swings to the west, away from its old course, and has sunk a new channel, several miles in length, through the basalt sheet which here underlies the drift. Miles Canyon, and the Whitehorse Rapids, with the intervening stretch of rapid water, are the results of this deviation. Above, and below these obstructions to its navigation, the Lewes widens out, and flows tranquilly along a valley excavated entirely in drift.

Forest.

The wide bottom lands of the Lewes Valley, in the vicinity of Whitehorse, and the lower slopes of the bordering ridges, are clothed everywhere, except on a few dry hillsides and where fires have passed, with an

*Named after Jack McIntyre, the first claim-holder in the district. It has been called Mt. Granger, but this name is used by Mr. Cairnes to designate a mountain near Coal Lake, only a few miles away.

almost continuous and moderately dense forest growth. Ascending the slopes the trees become dwarfed and scattered, at an elevation of 1,700 feet above the river, or 3,800 feet above the sea, and 500 feet higher up cease completely. The upper slopes of the higher peaks and ridges are bare.

Timber for mining purposes is plentiful at present, notwithstanding the numerous destructive fires which have ravaged the district, and the supply in the immediate vicinity of most of the principal claims is ample for some years to come. When this becomes exhausted, the needs of the camp can easily be supplied from the forested valleys of the Upper Lewes and its tributaries.

Waterpower.

The Lewes River, four miles above Whitehorse, contracts and flows rapidly through Miles Canyon. The canyon has a length of 3,000 feet. Below it the river widens out, but continues swift down to the Whitehorse Rapids, distant 2.75 miles from the head of the canyon. The fall of the river in the canyon is 16.2 feet, in the Whitehorse Rapids 9.5 feet, and in the whole stretch of rapid water 49 feet. Additional fall, if necessary, can easily be obtained by damming the river at the head of the canyon. Its width here is about 90 feet, and it is enclosed between nearly vertical basalt walls.

The Lewes River, according to measurements made by Mr. A. J. Beaudette, territorial mining engineer, has a flow at this point of about 135,000 miner's inches at ordinary stages of the water, and with even a moderate head, is capable of furnishing a large horsepower.

A second possible source of water is from Fish Lake, a sheet of water six or seven miles in length, situated in a high valley west of Mount McIntyre, at an elevation of about 1,450 feet above Whitehorse. Fish Lake discharges at present into the Takhini River. The pre-glacial outlet probably followed the depression between Mount McIntyre and Mount Haeckel, leading into the Lewes Valley; now drained by a branch of Porter Creek. The elevation of this pass, measured roughly with the aneroid, is less than that of the lake. The outlet of Fish Lake has a steep declination, and in the early summer months is a large, swift stream. Later on, the flow decreases rapidly, and at the end of September does not exceed 1,500 miner's inches. A large constant supply from this source can only be obtained by impounding the spring floods in the lake.

The streams crossing the Lewes Valley from the bordering mountain ranges, with the possible exception of Wolf Creek, are all too small to be used for power purposes.

Mining Conditions.

The Whitehorse ores at present are shipped for treatment to the various coast smelters. Transportation charges from the mines to the smelters by wagon, rail, and steamer, amount to from \$8 to \$10 a ton. These charges, as stated in a previous page, will be materially reduced when the branch line along the belt from the White Pass Railway is completed. The ruling smelter charges for the siliceous ores are \$1.50 per ton, with a deduction of 1.3 per cent. of copper for loss. The iron ores, with a high excess of iron, receive more favourable treatment.

Wages in the district are not much higher than in British Columbia. Hand miners receive from \$3.50 to \$4 per day with board for eight hours' work, labourers \$3.50 for ten hours, carpenters and blacksmiths, \$4 to \$5, and engineers \$5 to \$6 per day. Supplies of all

kinds are expensive, owing to the high inward freight rates of from \$50 to \$60 and upwards per ton.

Mining expenses are variable, and depend upon the character of the ore body and accessibility to Whitehorse. With the exception of pumps and steam hoists, no machinery has so far been installed. The altered garnetized rock usually encountered is hard, but breaks readily. Drifting with hand drills usually costs about \$15 per foot, and sinking from \$30 to \$40 per foot. The total cost of ore extraction in the large iron masses is not expected to exceed \$1 per ton.

Climate.

The climate at Whitehorse, notwithstanding the high latitude of 60° 45' N., is not unfavourable for mining operations. The summer weather is dry, seldom excessively hot, and is hardly surpassed anywhere. The winter season, lasting from November to April, is cold, sometimes extremely so, the thermometer occasionally dropping to 60° or more below zero. These cold spells are, however, exceptional, never last long, and do not seriously interfere with outside work. The ordinary winter temperatures of from zero to 40° below are not unpleasant, and entail no hardships when properly prepared for.

Economic Geology—General Characteristics of Ore Deposits—Distribution.

The copper belt, as determined by present discoveries, extends along the valley of the Lewes River, from a point east of Dugdale, on the White Pass Railway, northwestward to the base of Mount Haeckel, a distance of about twelve miles. The width of the belt seldom exceeds a mile, and in places is confined to a single line. The distribution of the discoveries along the belt is exceedingly irregular. The croppings follow a series of limestone areas enclosed in granite, or lying between granite and porphyrite. Where the limestone is absent the belt is practically barren; and considerable stretches of it otherwise favourable, such as that extending from the Spring Creek to the Pueblo claim, a distance of three and a half miles, are hopelessly buried beneath heavy accumulations of drift.

Ore Bearing Formations.

The rock formations of the district consist, in order of age, of limestone, porphyrites, granites and granodiorites, an extensive system of porphyrite dikes, and finally, basalts. Of these only the limestones and granitic intrusives are important economically. The principal ore bodies now being developed occur in the limestone, close to or adjoining the granite. Numerous discoveries have also been made in the granite, often at considerable distances from the limestone. The limited work done on these has not so far disclosed ore bodies of commercial value. The constituent minerals and general character of the ore bodies in the two formations are similar.

Copper minerals seldom develop in the porphyrites, but are not altogether unknown. The porphyrites are often closely interbanded with the limestones; and when this occurs in an altered area, both rocks are sometimes affected. The mineralization of the porphyrites is usually limited to a narrow zone, a few inches in width, bordering the limestone.

Principal Minerals.

The principal economic minerals of the district are the two copper sulphides, bornite, and chalcopyrite.

Tetrahedite occurs at the Arctic Chief, and small bunches of chalcocite at the Best Chance, and other places. Copper minerals resulting from the oxidation of the sulphides are conspicuous at all the workings, but, except at the Pueblo, are seldom important as ores. They include the two copper carbonates, malachite and azurite, the red and black oxides cuprite and malaconite, and the silicate chrysocolla. The cuprite is occasionally associated with small grains of native copper.

The iron sulphides are not abundant and nowhere form large masses. Scattered grains of pyrite occur in the granites, altered limestones, and more frequently in the porphyrites, but are rarely found in connection with the ore bodies. Small quantities of pyrrhotite occur at the Arctic Chief. It was not observed elsewhere.

The iron oxides, magnetite and hematite, on the other hand, are widely distributed, and both occur in large masses. Magnetite is especially abundant, and is seldom absent from the mineralized areas. Lenses of this mineral, ranging in size from a few inches to 360 feet in length, are found all along the belt, mostly in the altered limestones, but also occasionally in the altered granites. Hematite is less common. It occurs in large tabular crystals at a number of the showings, and is the principal mineral in the great Pueblo lode.

Other metallic minerals of less frequent occurrence are arsenical pyrites, stibnite, galena, sphalerite, and molybdenite. Gold and silver in some quantity occur in all the ores. The values range from traces up to several dollars per ton. Gold is occasionally found native.

The principal non-metallic minerals accompanying the ores are garnet (andradite), augite, tremolite, actinolite, epidote, calcite, clinocllore, serpentine, and quartz. Of these, garnet, augite, calcite, and tremolite, are the most abundant. Quartz is sparingly distributed and seldom occurs in quantity.

Ore Bodies.

The ore bodies fall into two classes—those in which the copper minerals are associated with magnetite and hematite, and those in which various silicates, principally garnet, augite and tremolite, are the chief gangue minerals.

The magnetite ore bodies are numerous, and occur enclosed completely in altered limestone, along the limestone contact, and in a few instances, in areas of altered granite. The largest bodies so far discovered are the Best Chance, 360 feet in length; the Arctic Chief, 230 feet, and the Little Chief, 100 feet. The magnetite masses are always sprinkled more or less plentifully throughout with grains and small masses of bornite and chalcopyrite. The two sulphides occur, both separately and intergrown, and are of the same age as the enclosing magnetite. The copper percentage varies greatly in different parts of the same lode, the general average approximating four per cent. The gold and silver are negligible in some of the ore bodies and important in others.

Besides the copper minerals, serpentine, calcite, clinocllore and other secondary minerals, are often associated with the magnetite, and rarely pyrrhotite and sphalerite.

Hematite masses are much less common than magnetite, only one large body being known. This is the Pueblo lode, on Porter Creek. The upper explored portion has developed altogether in limestone. Granite outcrops in the vicinity, but its contact with the limestone is concealed by drift. It differs from the mag-

netite ore bodies principally in the greater oxidation of the copper minerals. It is more porous and the original sulphides or sulphide have been largely converted by surface waters into carbonates, oxides, and silicates. Some chalcopyrite survives in portions of the lode. No bornite has been found.

Showings characterized by a garnet-augite-tremolite gangue are numerous wherever the lime-granite contact is exposed. They vary in size from a sprinkling of copper minerals to considerable lenses of shipping ore, such as those developed on the Grafter, Copper King, War Eagle and Valerie. All the important ore bodies of this class, so far discovered, occur in the limestone, close to the granite, and are often separated from the granite by a zone of more or less completely replaced limestone. The valuable minerals are similar to those in the iron masses, and consist mostly of bornite and chalcopyrite, carrying small quantities of gold and silver. At the Valerie, bornite is absent, and the chalcopyrite is associated with mispickel, the only known occurrence of this mineral in the camp.

The ore bodies of this class are occasionally tabular in shape, and have the appearance of following particular limestone beds; but in most cases the outlines are very irregular. The Copper King and Valerie lodes are short and blunt, while that on the Grafter, as shown in the present workings, is shaped like a horseshoe, and partially encircles a core of unreplaced limestone. The copper minerals at the Grafter and Copper King stop rather abruptly against a marble foot-wall; but as a rule they have no definite limit, and extend in diminishing quantities for some distance beyond the valuable portions of the lode. In some instances, as on the Anaconda, the ore alternates with bands of limestone, and limestone replaced by garnet and augite.

None of the ore bodies has so far been followed to a greater depth than 100 feet, and the question of downward extension has not been decided practically. At the limited depths reached, some of the lodes show increased and others decreased volumes, while the character of the ore remains unchanged. Contact replacement deposits, the class to which these belong, are apt to be bunchy, and somewhat uncertain; but theoretically may descend as long as the limestone lasts. They are dependent on the limestone, and the deposits formed in the larger areas will probably prove more permanent than those in the small inclusions. The latter are themselves liable to be cut off a short distance below the surface.

The copper percentage in the siliceous ores is higher as a rule than in the iron ores, those shipped up to the present time probably averaging over eight per cent. The precious metal contents are moderate, seldom exceeding \$3 per ton.

The following analyses of the Arctic Chief magnetite ore and of siliceous ores from the Grafter, War Eagle and Valerie, are furnished by Mr. Robert Smart, territorial assayer, Whitehorse, Yukon Territory:—

	Arctic Chief.	War Eagle.	Grafter.	Valerie.
Gold, oz. per ton.....	0.21	0.05	0.05	0.075
Silver, oz. per ton.....	1.20	3.30	1.55	1.05
Copper, percentage...	3.21	8.80	7.90	12.90
Iron, " " " " " " " "	45.50	4.40	7.12	6.39
Alumina, " " " " " " " "	12.08	...	3.88	1.95
Magnesia, " " " " " " " "	6.71	3.00	...	5.65
Lime, " " " " " " " "	0.20	23.50	21.84	44.36
Silica, " " " " " " " "	9.67	55.80	56.01	23.91
Sulphur,, " " " " " " " "	2.53	6.60	2.78	4.21

Oxidation.

The ore bodies come to the surface practically unaltered, the gossan capping having disappeared during the glacial period. The copper minerals in the dense magnetite masses are slightly oxidized on exposed surfaces along the sides down to the lowest depth reached, and following occasional partings, but the percentage affected is small. The hematite masses, as represented by the Pueblo lode have suffered more. While the iron shows little change, the copper sulphides, down to a depth of 100 feet at least, are largely replaced by carbonates and other derivative minerals.

The oxidation of the siliceous ores varies with the gangue, but is nowhere extensive. It is greatest where the sulphides, as rarely happens, are enclosed in limestone, and decreases as the proportion of limestone lessens. Where the gangue is composed of a compact mass of secondary minerals, little alteration is noticeable, except on the immediate surface.

Classification.

The Whitehorse copper ores possess all the characters distinguishing ordinary contact metamorphic deposits. They occur mostly in metamorphic limestone close to or in direct contact with the granite or granodiorite which altered it. Veins, with the exception of occasional thin seams evidently of secondary origin, are unknown. The ore bodies are irregular in outline, are occasionally banded, and vary in size from small lenticles a few inches across—often completely enclosed in limestone—to masses measuring hundreds of feet in length. The constituent minerals are those that everywhere characterize contact deposits. The common ore minerals are magnetite, hematite, bornite and chalcopyrite, and those less frequently found: tetrahedrite, chalcocite, molybdenite, mispickel, galena, stibnite, pyrrhotite, pyrite, zinc blende and rarely free gold. The gangue minerals include garnet, augite, tremolite, actinolite, epidote, scapolite, quartz, and calcite. The minerals, both metallic and non-metallic, were deposited metasomatically in the limestone and granite and, with trifling exceptions, are products of one period of mineralization.

There is one important point, however, in which the deposits in question differ somewhat from the published descriptions of other members of this class, viz., in the intense and widespread mineralization of the intrusive itself. While the large aggregates of metallic minerals occur in the limestone or along the contact, numerous small bodies and scattered grains are frequently found wholly enclosed in granite, often at a considerable distance from the limestone. Instances of this occur at the Pueblo No. 5, Whitehorse, Keewenaw, and other claims. At the Best Chance large grains of chalcopyrite occur in granite, which microscopically show little alteration.

The development of non-metallic minerals in the granite is probably greater than in the limestone, and the areas affected are wider and more extensive. At the Arctic Chief the granitic rocks are well mineralized for a distance of 400 feet back from the lime contact.

The minerals found in the granite are similar to those in the limestone, although the proportions are somewhat different. The most important are the brown lime-iron garnet andradite, augite, and green epidote. At a number of points both rocks are wholly replaced where they meet, and the original contact usually sharply defined is completely obscured. It is

represented by a compact mass of secondary minerals, which fade into granite on the one side, and limestone on the other. The transition from wholly altered to unaltered rock is usually more abrupt in the limestone than in the granite.

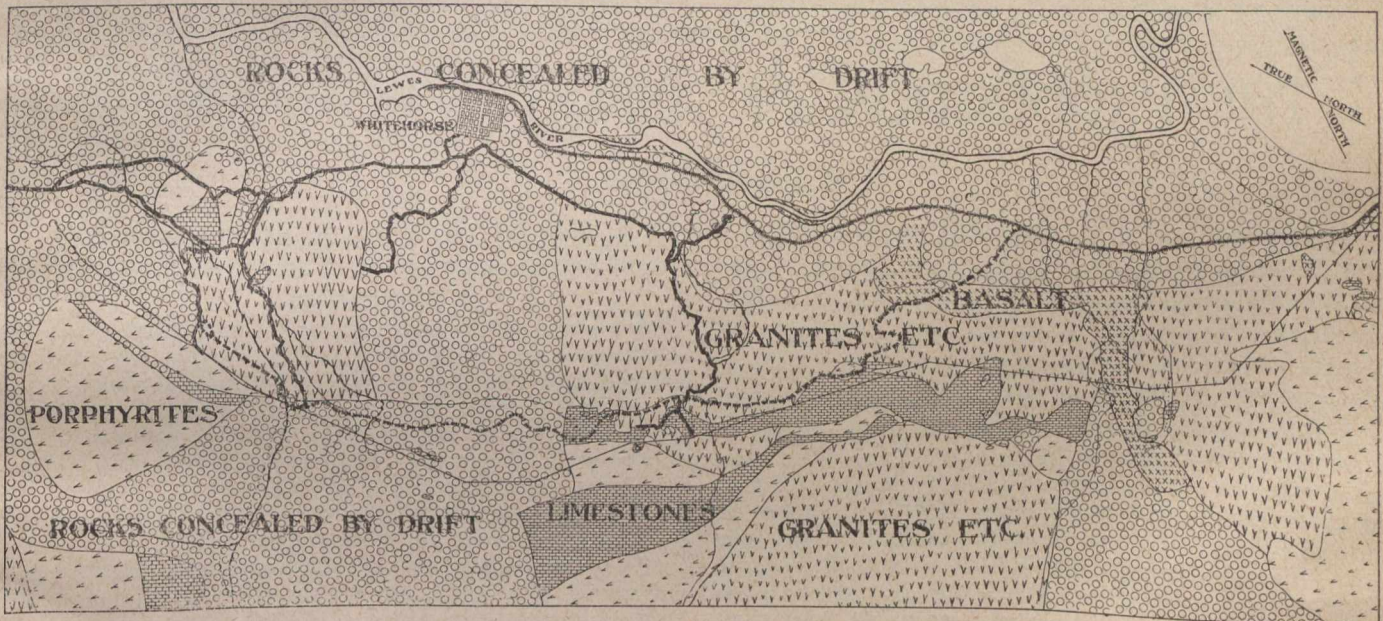
The origin of contact deposits, such as these described, has recently been thoroughly discussed by Lindgren, Vogt, Weed, Kemp, and others, and the general conclusion reached, that they are directly due to the passage of gaseous or liquid emanations, laden with the requisite materials from a cooling, but still liquid intrusive magma into the bordering sedimentary, is now generally accepted. In most cases described the migration of material was lateral and the ore deposits formed in the sedimentary before the adjoining magma solidified. The extension and simultaneous mineralization of both the intruding and intruded rocks in the Whitehorse district can hardly be explained except by assuming that the movement was upward, and took place after the former hardened to some depth. The conditions indicate that both the porous limestone and the jointed granite furnished channels for the ascending solutions.

The behaviour of the aplitic dykes is also signifi-

Geology.

The Arctic Chief ore body is strictly a contact deposit between limestone, and a granitoid rock of variable composition, but mostly a hornblende granite. It is situated on the west side of a long irregular limestone bay, penetrating the granite area in a northerly direction. The limestones enclosed in the bay are similar to those along other portions of the copper belt. They are homogeneous crystalline rocks, white to greyish in colour, and as a rule remarkably free from inclusions and impurities, except near the contact with the intrusive. They have been welded into solid masses in places, but over most of the area the bedding is even and regular.

The bordering intrusive, in the vicinity of the ore body, is an altered quartz diorite, loaded with secondary minerals, among which garnet, augite, epidote, calcite, chalcopyrite, and magnetite are conspicuous. The dioritic phase is local, and the diorites pass towards the west and north into hornblende granites, and the sections show a further transition, at one point, into hornblende syenite.



cant in this connection. They are not abundant, but the few examples seen in the mineralized areas all show more or less alteration. Granite dykes, apophyses from the main granite area, traverse both the Little Chief and Pueblo iron lodes. In both instances the dyke material is now largely replaced; in the former by magnetite, and in the latter by hematite. The later porphyrite dykes occasionally found cutting the ore bodies have not been affected.

Description of Some of the Principal Mines and Prospects—Claims in the Central Part of the District—The Arctic Chief.

The Arctic Chief is situated near the centre of the copper belt, at an elevation of 922 feet above Whitehorse, and 3,012 above the sea. A wagon road, 7.1 miles in length, connects it with the present railway terminus at Whitehorse. It was staked July 12, 1899, by Capt. John Irving, of Victoria, B.C. During the past season it was under bond to the Arctic Chief Copper Mines Company, with headquarters at Spokane, Wash., U.S.A.

The granites near the Arctic Chief ore body are exceptionally strongly mineralized. The affected area has a length of 1,000 feet, following the limestone contact, and a width of 400 feet. The mineralization is not uniform, and gradually diminishes away from the ore body. Where most intense, the original rocks are almost entirely replaced by alternating bands and masses of garnet, and a green augitic rock, classed as pyroxenite. The highly altered areas are often clearly traceable into unmistakable granites, holding scattered crystals, and masses of garnet and epidote, and farther away into the unaltered variety.

The principal secondary minerals present are, garnet, augite, epidote, magnetite associated with bornite and chalcopyrite, actinolite, and seapolite. Epidote, while not occurring in such quantities as garnet, is found over a wider area. Magnetite occurs in small and large lenses, and is widely distributed in individual grains. Pink seapolite is conspicuous in places, but is not quantitatively important.

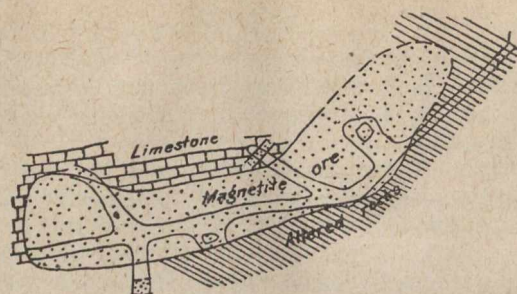
A few small inclusions of crystalline limestone occur in the altered granitic area, and may have influenced

its mineralization. They contain the same secondary minerals as the granite, but in somewhat different proportions. Brown andradite is the chief mineral in both rocks, while epidote is relatively less abundant in the limestones than in the granite.

A number of large dykes occur in the vicinity of the Arctic Chief lode, cutting sharply across both limestone and altered granite. They were intruded after the formation of the ore bodies, and had no effect on the mineralization of the region.

Development.

The Arctic Chief ore body outcrops on rising ground, and has been opened up by means of a tunnel. Development work commenced in 1902, but has proceeded slowly. The present owners are making a systematic attempt to define the limits of the ore body. The principal workings consist of a tunnel, 230 feet in length, with short cross-cuts at intervals to the walls of the lode. The tunnel, with the exception of the first 65 feet, follows ore throughout. A shaft has been sunk near the centre of the ore body, to a depth of 50 feet below



OUTLINE OF ARCTIC CHIEF ORE BODY ON MAIN LEVEL

the main level; and an upraise to the surface, 65 feet in length has just been completed. The lower part of the shaft is in altered diorite, and some drifting was done from the foot of it during the past season; to determine the character of the ore body at that level. The drifting was not extensive enough to give positive results.

(To be continued.)

THE PRODUCTION OF ASBESTOS IN CANADA

By John McLeish, B.A.

Asbestos is mined in Canada in the Eastern Townships, Province of Quebec, at Black Lake, Thetford, East Broughton and Danville. Other occurrences of the mineral have been noted, and some shipments were at one time made from the Township of Denholm, in the county of Wright, north of the city of Ottawa, but the first-mentioned districts are the only localities in which mining is at present being carried on. The mining of asbestos in this region dates from about 1878, and statistics of production since 1880 are shown in tables following. The value of the annual output has grown from less than \$25,000 in 1880 to over \$2,573,000 in 1908, so that next to coal this is now one of the most important of non-metallic mineral products, and supplies a very large proportion of the world's demand. A special report on this subject has been published by this

branch, though now unfortunately out of print. A revised edition is, however, in course of preparation.

Production.

A portion of the output is sufficiently high grade to be shipped as crude; the greater part, however, is crushed and the fibre extracted by special machinery. A uniform system of classification has not yet been adopted by the operating companies, but for statistical purposes the shipments have been classified on a valuation basis, the crude being divided into two classes and the mill fibre into three grades; the short fibred, asbestic, and sand, being separately classified.

The total shipments in 1908 aggregated 90,773 tons valued at \$2,573,335, as compared with shipments in 1907 of 90,426 tons valued at \$2,505,042, the shipments in 1908 being the largest both in tonnage and value yet recorded. Details are given in Table I.

ASBESTOS.—TABLE 1.

Production by Classes, Calendar Years 1907 and 1908.

	1907.			1908		
	Short Tons.	Value.	Per ton.	Short Tons.	Value.	Per ton.
		\$	\$ cts.		\$	\$ cts.
Crude, No. 1.....	1,419	374,275	263 76	857½	257,752	300 59
" 2.....	2,908	456,357	156 93	2,488	411,480	165 38
Mill Stock, No. 1.....	3,675	300,925	81 88	5,282½	425,448	80 54
" " 2.....	43,821	1,247,078	28 46	45,545½	1,345,750	29 33
" " 3.....	10,307	106,132	10 30	12,374½	114,931	9 29
Total asbestos.....	62,130	2,484,767	39 99	66,548	2,555,361	38 40
Total asbestic.....	28,296	20,275	0 72	24,225	17,974	0 74
Grand total.....	90,426	2,505,042		90,773	2,573,335	

While the average prices in each class are given in the above, the classification is based approximately on the following maximum and minimum prices per ton:—

Range of Prices of Asbestos During the Years 1907-8.

	1907.		1908.	
	\$ c.	\$ c.	\$ c.	\$ c.
Crude, No. 1.....	225 00	to 300 00	267 00	to 350 00
" 2.....	100 00	" 200 00	75 00	" 225 00
Mill Stock, No. 1.....	57 00	" 163 00	60 00	" 100 00
" " 2.....	18 00	" 50 00	20 00	" 50 00
" " 3.....	8 00	" 15 00	5 00	" 13 00
Asbestic.....	0 50	" 2 00	0 35	" 1 16

Although the total tonnage shipped in 1908 was only 347 tons in excess of the 1907 shipments, it will be seen that the amount of crude shipped in 1908, despite a higher average price, was less than the 1907 crude shipments by 981 tons. The fibre shipments on the other hand were 5,399 greater in 1908, and brought a higher average return per ton of \$1.22. The asbestic shipments in 1908 were 4,071 less than in 1907.

In Table 2, following, the production of crude asbestos and mill stock since 1903 is separately shown. The statistics indicate that during the past six years there has been only a slight increase in the quantity shipped as crude, although the average price has nearly doubled; while on the other hand the shipments of mill stock have increased over 125 per cent. in the same time, with an increase of over 50 per cent. in the average price per ton obtained.

ASBESTOS.—TABLE 2.

Annual Production of Crude and Mill Stock 1903-1908.

Calendar Year.	CRUDE			MILL STOCK.		
	Short Tons.	Value.	Per ton.	Short Tons.	Value.	Per ton.
		\$	\$ cts.		\$	\$ cts.
1903.....	3,134	361,867	115 46	27,995	554,021	19 79
1904.....	4,410	534,874	121 28	31,201	678,628	21 75
1905.....	3,767	472,859	125 53	46,902	1,013,500	21 61
1906.....	3,841	635,345	165 41	56,920	1,401,083	24 61
1907.....	4,327	830,632	191 97	57,803	1,654,135	28 62
1908.....	3,345½	669,232	200 04	63,202	1,886,129	29 84

Table 3 shows the total shipments of asbestos and asbestic separately for each year since 1880.

demand, the Canadian output of asbestos finds a wide distribution.

Exports and Imports.

Supplying as it does the greater part of the world's

During the twelve months ending March 31, 1908, exports were made as follows:—

Countries.	Tons.	Value.	Countries.	Tons.	Value.
		\$			\$
Great Britain.....	5,347	237,152	Italy.....	814	21,678
Belgium.....	3,372	86,871	Japan.....	97	3,177
France.....	2,332	50,612	United States.....	46,846	1,322,890
Germany.....	225	8,195	Total.....	59,033	1,730,575

Exports to Great Britain, United States, Germany and other countries during the past six calendar years

are shown in Table 4, and total exports each year since 1892 in Table 5.

ASBESTOS.—TABLE 3.

Annual Production since 1880.

Calendar Year.	ASBESTOS.			ASBESTIC.		
	Short Tons.	Value.	Per ton.	Short Tons.	Value.	Per ton.
		\$	\$ cts.		\$	\$ cts.
1880 (a)	380	24,700	65 00			
1881 (a)	540	35,100	65 00			
1882 (a)	810	52,650	65 00			
1883 (a)	955	68,750	71 99			
1884 (a)	1,141	75,097	65 82			
1885 (a)	2,440	142,441	58 38			
1886 (a)	3,458	206,251	59 64			
1887	4,619	226,976	48 92			
1888	4,404	255,007	57 90			
1889	6,113	426,554	69 78			
1890	9,860	1,260,240	127 81			
1891	9,279	999,878	107 76			
1892	6,082	390,462	64 20			
1893	6,331	310,156	86 81			
1894	7,630	420,825	55 15			
1895	8,756	368,175	42 05			
1896	10,892	423,066	38 84	1,358	6,790	5 00
1897	13,202	399,528	29 99	17,240	45,840	2 66
1898	16,124	475,131	29 47	7,661	16,066	2 10
1899	17,790	468,635	26 34	7,746	17,214	2 22
1900	21,621	729,836	33 76	7,520	18,545	2 47
1901	32,892	1,248,645	37 96	7,325	11,114	1 52
1902	30,219	1,126,688	37 28	10,197	21,631	2 20
1903	31,129	915,888	29 42	10,548	13,869	1 31
1904	35,611	1,213,502	34 08	12,854	12,850	1 00
1905	50,669	1,486,359	29 33	17,594	16,900	0 96
1906	60,761	2,036,428	33 52	21,424	23,715	1 11
1907	62,130	2,484,767	39 99	28,296	20,275	0 72
1908	66,548	2,555,361	38 40	24,225	17,974	0 74

(a) Figures of export taken as production.

ASBESTOS.—TABLE 4.

Exports of Canadian Asbestos by Countries 1903-1908.

Calendar Year.	TO GREAT BRITAIN.		TO UNITED STATES.		TO GERMANY.		TO OTHER COUNTRIES.		TOTAL EXPORTS.		Average per ton.
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	
		\$		\$		\$		\$		\$	
1903	2,743	40,120	24,252	714,781	1,429	25,150	3,356	110,982	31,780	891,033	28 04
1904	6,602	210,175	25,957	762,300	2,463	94,141	2,250	94,271	37,272	1,160,887	31 15
1905	9,731	305,056	29,696	811,080	2,969	100,061	4,635	169,918	47,031	1,386,115	29 47
1906	9,435	318,313	39,767	1,058,513	3,654	82,117	6,998	230,314	59,854	1,689,257	28 22
1907	8,432	200,909	44,861	1,312,582	225	8,195	6,235	147,613	56,753	1,669,299	29 41
1908	5,221	288,290	50,503	1,314,337	341	9,470	5,145	230,666	61,210	1,842,763	30 11

ASBESTOS.—TABLE 5.

Annual Exports, Calendar Years 1892-1908.

Calendar Year.	Tons.	Value.	Value per ton.	Calendar Year.	Tons.	Value.	Value per ton.
		\$	\$ cts.			\$	\$ cts.
1892	5,380	373,103	69 35	1901	32,269	1,069,918	33 16
1893	5,917	338,707	57 24	1902	31,074	995,071	32 02
1894	7,987	477,837	59 82	1903	31,780	891,033	28 04
1895	7,442	421,690	56 66	1904	37,272	1,160,887	31 14
1896	11,842	567,967	47 96	1905	47,031	1,386,115	29 47
1897	15,570	473,274	30 40	1906	59,854	1,689,257	28 22
1898	15,346	494,012	32 19	1907	56,753	1,669,299	29 41
1899	17,883	473,148	26 46	1908	61,210	1,842,763	30 11
1900	16,993	693,105	39 61				

Although the chief source for the raw material, Canada does not as yet manufacture all the asbestos goods required for home consumption. There is, therefore, a considerable importation of asbestos goods under the

import classification "Asbestos in any form other than crude and all manufactures of," the duty being 25 per cent. The annual value of the imports is shown in Table 6.

ASBESTOS.—TABLE 6.

Imports Fiscal Years 1885-1908.

Fiscal Year.	Value.	Fiscal Year.	Value.	Fiscal Year.	Value.
	\$		\$		\$
1885.....	674	1893.....	19,181	1901.....	50,829
1886.....	6,831	1894.....	20,021	1902.....	52,464
1887.....	7,836	1895.....	26,094	1903.....	75,465
1888.....	8,793	1896.....	23,900	1904.....	83,827
1889.....	9,943	1897.....	19,032	1905.....	116,836
1890.....	13,250	1898.....	26,389	1906.....	137,974
1891.....	13,298	1899.....	32,607	1907 (9 months) ..	127,509
1892.....	14,090	1900.....	43,455	*1908.....	190,980

* Asbestos in any form other than crude, and all manufactures of. Duty 25 per cent.

Outside of Canada the chief asbestos producing country is Russia, whose output in 1907 is reported as 9,356 metric tons. The United States, Cape Colony and

Cyprus are also producers, though the quantity is not important.

Table 7 shows the principal productions since 1902.

ASBESTOS.—TABLE 7.

World's Production 1902-1908 in Metric Tons, (2204.6 lbs.).

	1902.	1903.	1904.	1905.	1906.	1907.	1908.
Canada (b).....	27,414	28,240	32,306	45,967	55,122	56,364	60,372
United States (c).....	912	805	1,343	2,820	1,538	592	849
Russia (e).....	4,507	5,624	7,502	7,266	9,201	(a) 9,356	*
Cape Colony (e)	(g) 41	(g) 276	373	454	473	548	*
Cyprus (e).....					(g) 19	(g) 89	*

* Figures not available.
 (a) Provisional. (b) Mines Branch, Ottawa. (c) United States, Geological Survey.
 (e) Home Office, London. (g) Exported.

The following is a list of the principal producing companies in Canada:—

List of Operators.

- Dominion Asbestos Co., Ltd., Montreal, 415 Merchants Bank building.
- Standard Asbestos Co., Ltd., Montreal, 415 Merchants Bank building.
- Union Asbestos Mines, Calmon, Que.
- Johnston's Asbestos Co., Ltd., Thetford Mines, Que.
- Bell Asbestos Mines, Thetford Mines, Que.
- Beaver Asbestos Co., Thetford Mines, Que.
- King Asbestos Mines, Thetford Mines, Que.
- The Asbestos and Asbestic Co., Ltd., Asbestos, Que.
- Broughton Asbestos Fibre Co., East Broughton Sta., Que.
- The Quebec Asbestos Co., Sherbrooke, Que.
- Eastern Townships Asbestos Co., East Broughton Sta., Que.
- British Canadian Asbestos Co., Ltd., Black Lake, Que.
- Companies Prospecting or Expecting to Operate.
- Megantic Mining Co., Montreal, 88 McGill St.
- W. H. Lambly, Inverness, Que.
- Brompton Lake Asbestos Co., Montreal, 17 Victoria Square.

- The Asbestos Mining & Manufacturing Co., Sherbrooke, Que.
- Boston Asbestos Co., Ltd., East Broughton Sta., Que.
- Robertson Asbestos Mining Co., Drummondville, Que.
- The Ling Asbestos Co., East Broughton Sta., Que.
- The Thetford Asbestos & Exploration Co., Thetford, Que.
- The Imperial Asbestos Co., Montreal, Que.
- La Sompagnie d'Amiante Champlain, Quebec, 81 Rue St. Pierre.

The Engineering and Mining Journal, November 20, 1909.—Kenneth S. Gunterman contributes an article entitled "Mining Coal in Southern Colorado" to this number. He describes the mine and plant of the Carbon Coal and Coke Company. The coal mined is a good coking fuel, but high in ash—23 per cent. It, therefore, requires washing. The seams worked are from 3 feet to 7 feet thick. Much bone coal is encountered. The double-entry, room-and-pillar method of mining is practised. Over 90 per cent. of the coal is recovered in mining. The coal is crushed, washed, and delivered to bee-hive ovens. Four Covington coke-drawing machines are in commission. Each pulls 48 ovens per shift. The coke yield is over 72 per cent. This heavy yield is largely attributable to the use of the coke-drawing machines.

EIGHTEENTH ANNUAL REPORT OF THE ONTARIO BUREAU OF MINES, 1909

[Editor's Note.—The Eighteenth Annual Report of the Ontario Bureau of Mines has made its belated appearance. We are informed—and because of our own sufferings we readily accept the explanation—that the unspeakable printer is solely to blame. This being the case, it is surely possible for the Bureau to expedite matters by issuing the report in separate sections. Not only would this give the public the benefit of more timely service, but it would induce greater interest in each of the various special papers that make up the volume. For instance, the Statistical Review, an admirable piece of work, would lose nothing by being published as a separate. We hope that the Bureau will see its way clear to act upon this hint.]

The Eighteenth Report presents the usual summary review of the mining industry of the Province, along with a continuation of the series of reports on the iron ranges of northern and northwestern Ontario. Dr. A. P. Coleman, Dr. E. S. Moore, and Mr. R. C. Allen are the writers. Mr. M. B. Baker gives an account of his exploration of the region adjacent to Lake Abitibi, and, lastly, Dr. A. P. Coleman describes Lake Ojibway, the Last of the Great Glacial Lakes, and outlines his views on the Classification and Nomenclature of the Drift of Ontario.

Space permits notice only of the first section, the Statistical Review, by Deputy Minister Thos. W. Gibson.

Statistical Review—Abstract of Mr. T. W. Gibson's Annual Resume.

The mineral output of Ontario in 1908 is valued by the Bureau at \$25,637,617, as compared with \$25,019,373 in 1907. The low price of silver affected not only the value but the output of that metal. The metallic products, principally silver, pig iron, nickel, and copper, furnished 65 per cent. of the total value, the non-metallic substances 35 per cent. Of the latter the most important were Portland cement, bricks, natural gas, petroleum, stone, salt, and lime, in the order named. For the first time the value of the natural gas produced was greater than that of petroleum, the former being nearly one million dollars, while the latter was but little over seven hundred thousand dollars. The production of the former is steadily increasing, and of the latter declining.

The itemized tabular statement of mineral production has already appeared in the Canadian Mining Journal. It may, therefore, be omitted here. A few remarks upon certain fluctuations will be all that is necessary.

Of the metallic products, silver was by far the most important, the output being 19,444,400 ounces, valued at \$9,136,830. This is an increase in value over 1907, of \$2,978,959. Next in value comes pig iron, \$490,839, followed by nickel, \$1,866,059, and copper, \$1,071,140. Gold stands at the modest figure of \$60,337.

Cement, valued at \$2,417,769; brick, \$1,575,875; natural gas, \$988,616, and petroleum, \$703,773, are the outstanding items in non-metallic production.

The metallic mineral production was responsible for the employment of 6,834 men, who were paid a total of \$4,770,044 in wages. The corresponding figures for the

non-metallic mineral industries are 8,355 men, and \$3,088,223 wages. The relatively small figure for total wages in this latter instance is mainly due, no doubt, to the fact that many of the non-metallic mineral industries furnish employment only for part of the year.

Basis of Statistical Values.—Mr. Gibson again draws attention to the divergent methods employed by the mining department of the Dominion Government and the several Provinces. The Mines Branch, Ottawa, gives the Ontario production of nickel as 9,572 tons. The Bureau places it at 10,175 tons. In the former case the yield from the Cobalt region is not included; in the latter it is. Yet the Mines Branch values the 1908 nickel output at \$8,231,538; while the Bureau's valuation is only \$1,866,059. The explanation lies in the fact that the Mines Branch values the nickel contents of the mattes produced by the Sudbury smelters at the average price of refined nickel in New York; while the Bureau's figures represent the value of the nickel in the form of matte at the point of production, as given by the producers. Conflicting methods also obtain as regards pig iron.

Moreover, as the Mines Branch gives the figures for Canada only, and not for the individual Provinces, inspection of these figures, so far as the metalliferous products of Ontario are concerned, would lead to a mistaken idea of Ontario's position, especially as all of the nickel and nearly all of the silver produced in the Dominion come from this Province. It may be noted, also, that the Mines Branch values the non-metallic products at the mine or point of shipment.

Applying the methods used by the Mines Branch, the value of the metallic products of Ontario for 1908 would be \$22,330,062, instead of \$16,754,986. The total value of mineral production would therefore, amount to \$31,212,693, or \$6,193,320 more than the Bureau's returns indicate.

Gold.

The number of companies producing gold last year was seven. These were Imperial Gold Mines (Laurentian mine,) Lepage Gold Mining Company (Grace mine, Michipicoten), Grace Mining Company (Eagle Lake), Cleveland Gold Mining Company, Empire Mining and Milling Company, Crystal Gold Mining and Milling Company, and the Golden Reed Mining Company. Most of these carried on operations intermittently and on a small scale, the principal producers being the Imperial, Lepage, and Cleveland companies. The total production of bullion was 3,465 ounces valued at \$60,337.

Interest in the gold districts of Sturgeon Lake and Lower Seine River was stimulated by promising finds in both places, the discoveries in the latter being at Glenorchy, about 40 miles east of Fort Frances, near many gold properties which were actively worked ten or twelve years ago, but have since been abandoned. All the eastern Ontario mines were idle, and of the Larder Lake companies none are yet steadily milling ore.

Silver.

Though Cobalt is not the only, it is the chief, source of silver in Ontario at the present time, the mines of that

region producing an overwhelming proportion of the total yield. Other contributions were from the Port Arthur district, where one or two silver mines were operated during the year, and from the bullion produced at some of the gold mines. The total yield was 19,444,400 ounces, of which the mines of Cobalt produced 19,437,875 ounces, being an increase over the output in 1907 of 94 per cent. Ontario is now third in rank among the silver producing communities of the world, Mexico heading the list, and the United States coming second. The world's production in 1908 is placed at 183,800,000 ounces, so that Ontario's share of the output was about 11 per cent.

The course of prices for silver during the year was unsatisfactory. In New York the average in January per fine ounce was 55.678 cents; it rose in February to 56 cents, then fell steadily until August, when the average was 51.683 cents. September saw a slight rally to 51,720 cents, but a further decline set in, and the year closed with an average for December of 48,769 cents, the average for the twelve months being 52,864 cents per ounce. Notwithstanding the fall in price, the margin of profit is still large, some of the Cobalt mines that have published their cost sheets alleging their ability to produce silver at 7½ to 20 7/8 cents per ounce.

The Producing Mines.—There were thirty producing mines at Cobalt in 1908, the following list giving their names in the order of production: Nipissing, O'Brien, La Rose, Crown Reserve, Kerr Lake, Coniagas, Temiskaming and Hudson Bay, Temiskaming, Buffalo, Drummond, Trethewey, McKinley-Darragh-Savage, Cobalt Silver Queen, City of Cobalt, Standard Cobalt, Right of Way, Silver Leaf, King Edward, Cobalt Townsite, Nova Scotia. Other shippers were Foster Cobalt, Silver Cliff, Chambers-Ferland, Cobalt Lake, Peterson Lake, Nancy Helen, Provincial, Keeley, Colonial, Casey Cobalt. The most notable addition to the productive mines during the year was the Crown Reserve. This mine was opened up on that part of the bed of Kerr Lake sold by tender by the Government of the Province in January, 1907, the price paid being \$178,500 together with a royalty of 10 per cent. on the value of the output at the pit's mouth. A large vein, rich even for Cobalt, was struck during development work, and the Crown Reserve was a heavy shipper of high-grade ore during the year.

The quantity of ore and concentrates shipped out of the Cobalt camp in 1908 was 25,624 tons. Of this 24,487 tons was ore and 1,137 tons concentrates. The ore averaged 736 ounces per ton, and the concentrates 1,244 ounces. Only the poorer classes of ore, such as will not pay to ship, are subjected to concentration. This is evident from the fact that in order to obtain 1,185 tons of concentrates—the total production—50,997 tons of ore and rock were put through the concentrating plants, being in the proportion of 43 tons of ore to one ton of concentrates. The silver recovered was about 28 ounces per ton of material treated, but the loss in the tailings would raise the average contents of the rock a little above this point.

As in former years, the bulk of the ore, so far as tonnage is concerned, was exported to the United States, where there is a demand, particularly from the smelters of Denver, Colorado, for the silicious low-grade ores of Cobalt for mixture with the sulphide concentrates resulting from the mill treatment of the gold and silver ores of Cripple Creek and Creede. Some

shipments to the United States were of high grade, but the gross value of the ores treated in Canadian smelters was almost three times the value of those exported. The value per ton of the shipments to the United States was about \$120, while that of the ores refined at home was about \$825. The distribution of the output of the Cobalt mines for 1908 is given by the T. & N. O. Railway Commission as follows:—

	Tons.	Per cent.
Canada	7,401.14	29.18
Great Britain	222.08	.88
Germany	229.46	1.18
United States	17,439.42	68.76

The total value of the output of silver from the beginning of mining operations in the Cobalt camp to the end of 1908 amounts to \$20,428,710. This was yielded by 46,912 tons of ore, aggregating 36,105,788 ounces and averaging 769 ounces; and 1,137 tons of concentrates, aggregating 1,415,395 ounces, and averaging 1,244 per ton. The average silver content per ton of ore for the five years of operation is:—

1904	1,309 ounces
1905	1,143 “
1906	1,013 “
1907	677 “
1908	736 “

Total Silver Production of Ontario.—An attempt has been made to ascertain the entire yield of silver in Ontario up to the present time. The statistics of production while the Silver Islet mine, and later the mines on the mainland in the Port Arthur region, were being worked, were not officially collected, and it is difficult now to reconstruct them with exactness, as the figures of the output of individual properties given or referred to in the reports of the Geological Survey of Canada and the Bureau of Mines are incomplete, and in some instances contradictory.

The greater part of the silver so far obtained in the Lake Superior region has come from the Silver Islet mine. This deposit was discovered in 1868, and operations were begun in September, 1870, finally ceasing in 1884. The output is valued by different authorities at sums varying from \$3,000,000 up to \$4,500,000. Mr. E. D. Ingall tabulates the production year by year, showing it to have had a total value of \$3,047,532.04, but adopts the statement of Mr. Richard Trethewey, superintendent of the mine when it closed, that the total value of silver produced from the commencement to the close of operations was \$3,250,000. Mr. A. Blue, late Director of the Bureau of Mines, says the mine “yielded in all from first to last \$3,500,000.”

From several gentlemen, interested in mining, whose experience and recollection cover the productive periods of the Lake Superior silver region, and who had good opportunities of learning the facts, figures of production from the mines on the mainland have been obtained, differing as to individual properties, but agreeing closely in the total. Statement No. 1 is furnished by Mr. W. A. Preston, M.P.P.; statement No. 2 by Mr. F. S. Wiley:—

Statement No. 1.

Beaver mine	\$550,000
Silver Mountain, East and West End	500,000
Badger and Porcupine	300,000
Rabbit Mountain	50,000
Thunder Bay mine	20,000
Shuniah mine	50,000

3 A and Beck mine.....	10,000
Jarvis Mining Company.....	40,000
Total	\$1,520,000

Statement No. 2.

Beaver mine	\$700,000
Silver Mountain, East End.....	30,000
Silver Mountain, West End.....	300,000
Badger and Porcupine	500,000
Other properties	50,000
Total	\$1,580,000

The price of silver from 1882 to 1890, when the bulk of the production from these mines was made, fell from \$1.136 per ounce in the former year to \$0.935 in 1889 and to \$1.046 in 1890. The average during the period would be about \$1.035 per ounce. Applying this price to the smaller of the above estimates, we have 1,468,599 ounces as the quantity obtained up to the closing of the mines in 1893. One or two of the Lake Superior mines, notably Silver Mountain West End, have been worked in a more or less desultory way since that time, beginning in 1898, the output from 1898 to 1903, according to returns made to the Bureau of Mines, being 617,433 ounces valued at \$365,681.

We can now sum up as follows:—

	Oz. silver.	Value.
Silver Islet mine.....	2,662,509	\$3,250,000
Mainland group, to 1893.....	1,468,599	1,520,000
Mainland group, 1894 to 1903 inc.	617,433	365,681
Production previous to opening of Cobalt mines.....	4,748,541	\$5,135,681
Production subsequent to open- ing of Cobalt mines.....	37,586,970	20,468,751
Total production to 31st December, 1908 ...	42,335,511	\$25,604,432

Refining Plants and Concentrators.—There were three reduction plants in Ontario treating ore from the mines of Cobalt last year, namely, those of the Canadian Copper Company at Copper Cliff, the Deloro Mining and Reduction Company at Deloro, and the Coniagas Reduction Company at Thorold. Through these works there were passed an aggregate of 6,958 tons of ore containing 11,658,008 ounces of silver, of which 8,972,958 fine ounces were recovered, the remainder, 2,685,050 ounces, being contained in the speiss product reserved or exported for further treatment. This does not include the operations of the Nipissing Reduction Company or the Muggley Concentrators, Limited, at Cobalt, which carried on a concentrating business only, shipping the product to smelters for refining. The number of workmen employed at these various plants was 247, and the wages paid \$172,675.

The following companies have installed concentrating mills which were in operation during the year: Buffalo Mines Company, Coniagas Mines, Standard Cobalt Mines, King Edward Cobalt mines; and in addition to these there were custom plants owned and operated by the Northern Customs Concentrators (formerly Muggley Concentrators), and the Nipissing Reduction Company. There were also under construction concentrating mills at the Colonial, McKinley-Darragh-Savage, Nova Scotia and O'Brien mines.

Ore Purchasers.—Ore purchasers were somewhat

more numerous in 1908 than in 1907. The American Smelting and Refining Company, New York, bought numerous consignments both for its Perth Amboy, N.J., and Denver, Col., works; the Pennsylvania Smelting Company of Pittsburg, Penn., whose plant is at Carnegie, Penn., also bought considerable ore, while the Balbach Smelting and Refining Company of Newark, N.J., and the United States Metal and Refining Company of Chrome, N.J., were occasionally in the market for high grade material. The Canadian Copper Company, Copper Cliff, Ontario, bought a large part of the high grade output of the camp. The Deloro Mining and Reduction Company, of Deloro, Ontario, while running mainly on the more valuable ores of the O'Brien mine, also bought and treated high class ores from other properties. The Coniagas Reduction Company at Thorold, Ontario, confined itself to the ores and concentrates of the Coniagas mine. The consolidated Mining and Smelting Company of Trail, B.C., took a few carloads. Beer, Sondheimer Company of Hamburg, Germany, purchased several lots of rich ore, and the Anglo-French Nickel Company of Swansea, Wales, a few consignments of silver-free cobalt ore.

Arsenic, Nickel, Cobalt.—The elements other than silver in the ores of the Cobalt camp are at present of comparatively little value, at any rate to the miners of the ore. Arsenic is no longer paid for by ore-buyers, and nickel is regarded as an impurity warranting the imposition of a penalty if in excess of the cobalt contents.

Cobalt itself is also much less valuable since the mines of this district were opened. The world's demand for cobalt oxide is in the neighbourhood of 275 or 300 (short) tons per annum, while the product of the Cobalt mines, if all converted into oxide, would amount to upwards of 1,500 tons per annum. In 1907 the ruling rate was \$2.50 per pound, but successive reductions have brought the price down to about a dollar per pound, with prospect of a still lower level. In such circumstances it was but natural that the value of cobalt in the ore should also fall, and as a matter of fact for the greater part of the cobalt contained in the ore shipments of 1908, the mine-owners received nothing at all. Even for silver-free cobalt ore the price has been reduced, and now ranges from 25 to 45 cents per pound, according to the proportion of the cobalt contents upwards from eight per cent.

Labour Employed.—The number of men employed in the silver mines of Cobalt, including all those engaged in the works for the reduction of the ores at Copper Cliff, Deloro and Thorold was 2,414, and the amount paid out in wages \$2,159,055. Of these 1,089 were underground workers and 1,325 above ground.

There were no labour strikes or troubles in Cobalt during 1908.

Dividend-Paying Mines.—Cobalt has given rise to a vast number of mushroom mining companies, so-called, whose operations were for the most part carried on in the advertising columns of the city newspapers rather than among the rocks of the mining field itself; yet the amount paid out as dividends or profits to the shareholders of the producing companies has not only been very large in itself, but as compared with the value of the output has represented an unusual degree of profit. Fifteen companies have paid out as dividends \$8,313,461.54, and the list does not include the O'Brien and Drummond mines, the former of which is a partnership concern, and the latter a close corporation. Reckoning these two among the dividend-payers,

it will be found that the total returns or profits divided have been very little if at all short of \$10,000,000. The aggregate value of the production of the Cobalt camp has been \$20,962,942. Of this, as the table shows, almost fifty per cent. has been paid out as dividends.

New Silver Fields.—The search for other Cobalts has led to the discovery of silver in South Lorrain and in several districts in the valley of Montreal River and its branches. The broad geological features of the Cobalt area are repeated in these various regions, though there are somewhat marked differences in the relationships of the silver-bearing veins to the rock formation in the new fields as compared with the original one. In South Lorrain several promising properties are under development and in the Elk Lake, Miller Lake and Gowganda districts the discoveries been such as to warrant the hope that the deposits will prove remunerative.

In no case, however, has development proceeded sufficiently far to enable a positive statement to be made. In Gowganda the finds of native silver on the surface of the veins have been of remarkable quality, but on the whole the silver occurrences seem to be more irregular and of smaller proportions than those which have given Cobalt its pre-eminence among the silver camps of the world.

It is to be remembered, however, that the Cobalt deposits, though a natural, hardly constitute a fair standard of comparison. The fact is, that had Cobalt remained undiscovered, the new finds at Elk Lake, Miller Lake and Gowganda would have been regarded as phenomenal. The minerals found are those of Cobalt—silver, smaltite and niccolite.

Nickel.—The mattes produced from the nickel-copper ores of the Sudbury region in 1908 contained 9,563 tons of nickel, while in the ores raised in the cobalt-silver mines, it is estimated there were 612 tons of nickel. The total quantity of nickel raised in the Province last year was therefore 10,175 tons, though a money value is given only to the Sudbury product, that from Cobalt being a negligible quantity in this respect, and for a large part probably never entering into consumption in the arts. The aggregate yield of nickel was 797 tons less, and the output of the Sudbury deposits 1,039 tons, less than in 1907. The smaller production was due to the slackening of operations in the Sudbury field, the general depression in business leading to a falling-off in the demand. The value placed upon the nickel contents of the Sudbury mattes by the producers was \$1,866,059.

The Canadian Copper Company carries on mining and smelting on an extensive scale, and makes the larger part of the matte product. Last year it extracted from the Creighton mine 222,497 tons of ore, and from the Crean Hill 118,066 tons. The deposits at Copper Cliff, Stobie and other mines were not drawn upon. This company has a modern and very efficient plant, its smelters being situated at Copper Cliff.

The Mond Nickel Company's mines are situated in Denison and Garson townships, and its works at Victoria Mines, in the former. Like the Canadian Copper Company, it produces Bessemer matte of say 80 per cent. metallic contents, which is exported to Clydach, Wales, for refining by the Mond nickel carbonyl process. In 1908 the Mond Company raised 39,189 tons of ore from Victoria No. 1 mine, and 29,799 tons from the Garson mine.

The Dominion Nickel Copper Company, formed to exploit some large nickel ore deposits in the northern range, has not yet begun operations in the field.

A New Nickel Area.—An interesting and possibly important discovery was made during the year 1908, being of a deposit of pyrrhotite carrying nickel in apparently workable, even high proportions, outside of the recognized nickel-bearing areas of the Province. Hitherto, all known nickel bodies of economic consequence have been confined to the Sudbury field, and while occurrences of nickeliferous pyrrhotite have been noted in other parts of Ontario, they have invariably proven to be too low in nickel to be classed as ore. In the township of Dundonald, near the boundary of Clergue, on lot 1, concession three, a prospector named Alexander Kelso staked out several claims on a body of pyrrhotite carrying as high as 11.46 per cent.

There has been again a reduction in the valuation placed upon nickel contents of the Bessemer matte produced by the mining companies. In 1906 the value was estimated at an average of 17.8 cents per pound. In 1907, 10.7 cents per pound, and last year it fell to 9.75 cents per pound. The quotations for refined nickel in 1908 in New York averaged about 43 cents per pound, as against 45 cents per pound in 1907.

In the smelting of the ore into matte the consumption of coke at the nickel works was 64,868 tons valued at \$485,219, and the quantity of wood required for roasting the ore was 29,467 cords worth \$89,121. For the most part the machinery in the mines and smelting plants is now operated by electrical energy, generated by the Canadian Copper Company at High Falls, Spanish River, and by the Mond Nickel Company at Wabageshik Falls on the Vermilion. There is undoubtedly some loss of the metals in roasting and smelting the ores, but without making allowance for such losses, the ore put through the furnaces last year contained 2.65 per cent. of nickel and 2.08 per cent. of copper as compared with 2.95 per cent. nickel and 1.95 per cent. copper in 1907.

Copper.—The nickel-copper ores of Sudbury constitute the main source of the copper obtained in Ontario, and these deposits being worked primarily for their nickel contents, the production of copper from year to year depends more upon the demand for nickel than for copper itself. Consequently, the low level of copper prices during the past year—the average in the New York markets being 13,208 cents per pound, as compared with 20,004 cents per pound in 1907,—had little effect upon the output of the metal in this Province. In fact, the production of 1908 was greater than that of 1907. This was in part due to the higher average copper contents of the ores smelted in the Sudbury furnaces as compared with the previous year; but the increase in the copper output would have been still greater had prices ruled high, for the non-nickeliferous copper deposits of the north shore of Lake Huron and elsewhere were for the most part allowed to remain unworked during 1908. Practically, only one of these mines, the Hermina, raised any ore at all last year. The total production of copper was 7,561 tons, worth \$1,071,140, of which all but 60 tons was taken from the nickel-copper ores of the Sudbury field.

Iron Ores.—There were four iron mines from which ore was raised and shipped last year, namely, the Helen mine, Moose Mountain, Mineral Range and Wilbur. The first two are in northern, the last two in eastern Ontario. The total output was 216,177 tons valued at \$574,839, as compared with 205,295 tons worth \$482,

532 in 1907, an increase of 10,882 tons in weight and \$92,307 in value. Of the shipments, 166,231 tons was hematite and 49,946 tons magnetite.

Pig Iron and Steel.—Of the seven blast furnaces in the Province, five were in full campaign during 1908, namely, two belonging to the Algoma Steel Company, Sault Ste. Marie, two to the Hamilton Steel and Iron Company at Hamilton, and one to the Canada Iron Furnace Company at Midland; one, that of the Deseronto Iron Company at Deseronto, was in operation for a brief space only, while one, the property of the Atikokan Iron Company at Port Arthur, was idle throughout the year. The total production of pig iron was 271,656 tons valued at \$4,390,839, a falling off of 14,560 tons in weight and \$326,018 in value as compared with 1907. Steel rails to the extent of 126,775 tons, worth \$3,353,078, were made by the Algoma Steel and Iron Company and the Ontario Iron and Steel Company, Welland, amounting to 45,333 tons and valued at \$1,044,004.

The Electro-Metals Company, Welland, is operating a plant for the manufacture of ferro-silicon and other ferro compounds.

Mr. J. W. Evans M.E., of Belleville, who has for some time been experimenting in the production of steel from iron ore by the electric process, writes that in September, 1905, he obtained the first steel made directly from Canadian ores in the electric furnace. This was in the form of steel buttons made in a crucible. Since that time he had produced mild steel of good quality from Coe Hill ore, containing 68.01 per cent. of iron and 1.01 per cent. of sulphur, and from Bowen mine ore carrying 45.17 per cent. of iron and 7.44 per cent. of titanium. At the date of his letter, 7th June, 1909, Mr. Evans was using ore from the Orton mine, which assayed 52 per cent. of iron, 8 per cent. of titanium and a small amount of nickel, and in one and a half hours from the time the ore was placed in the furnace he obtained steel bars weighing over two pounds. The steel from Coe Hill ore contained from a trace to .04 per cent. of silicon, .08 to .17 per cent. of sulphur and .05 to .07 per cent. of carbon; from Bowen mine ore, silicon .05 to 2.31 per cent., titanium none to 1.02 per cent. and carbon .51 to .87 per cent. Mr. Evans remarks that in order to retain the titanium in the steel he had to reduce the proportion of lime in charge, which raised the amount of silicon. In his furnaces he employed a combination of the reflected arc and immersed electrodes as being more economical of electrical energy.

Following are details of the operations at the blast furnaces and steel works during 1908:

Ontario ore smelted tons	170,215
Foreign ore smelted tons	342,747
Scale and mill cinder tons	12,523
Limestone for flux tons	179,741
Coke for fuel tons	322,817
Value of do \$	1,479,083
Pig iron product tons	271,656
Value of do \$	4,390,839
Steel product tons	172,108
Value of do \$	4,397,082
Workmen employed No.	1,807
Wages paid \$	1,001,893

The proportion of domestic ore charged into the blast furnaces rose from 23.6 per cent. in 1907 to 33.1 per cent. in 1908. Much the larger part of the ore raised from the mines of Ontario last year was shipped to furnaces in the Province although it was not all smelted within the year.

The record of the pig iron and steel manufacturing industry of Ontario during the last year is shown in the following table:

Ontario ore smelted tons	170,215
Foreign ore smelted tons	342,747
Steel tons	172,108
Coke tons	322,817
Charcoal bush.	.....
Pig iron tons	271,656
Value of pig iron \$	4,390,839
Steel tons	172,108
Value of steel \$	4,397,082

Arsenic.—The arsenical deposits of Ontario are numerous and extensive. For the most part they consist of arsenopyrite, which as in the case of the ores of the county of Hastings, often carries values in gold. As a matter of fact, the only arsenic at present being made in Ontario is refined from the ores of the Cobalt camp, and is therefore, like a large proportion of the arsenic made throughout the world, in reality a bye-product.

There were obtained at the reduction works at Copper Cliff, Deloro and Thorold from silver-cobalt ores last year, a total of 702 tons of refined white arsenic, having a value of \$40,373, or say 2.87 cents per pound. In addition, it is estimated that there were 2,970 tons of arsenic contained in the ores which were exported for treatment. Doubtless a large proportion of this arsenic, if not the whole, is recovered in the various plants where the ores are refined, and eventually finds its way to market. The mine owners of Cobalt, however, get nothing for arsenic contents of their ores, and no figures of value are set opposite these exports of crude arsenic in the tables of production given in this report. In 1907 the quantity of white arsenic recovered was 348 1-2 tons, and the value as returned to the Bureau was \$40,104.

Iron Pyrites.—The iron pyrites industry of Ontario is developing. In 1905 the product of the mines was 7,325 tons, in 1907 15,755 tons, and in 1908 20,970 tons valued at \$69,980. The larger part of the output is shipped to the United States, but a considerable portion is utilized in the manufacture of sulphuric acid at Sulphide, Hastings County, where the Nickols Chemical Company have an extensive plant.

The producing companies in 1908 were the Northern Pyrites Company, the Nichols Chemical Company, the Northland Mining Company, and the Lake Superior Corporation. The first-named concern made a few trial shipments from their large pyrite bodies at Lake Minnitakie, having been afforded an outlet for their product by the completion of the branch line of the Grand Trunk Pacific Railway from Fort William. This company has made large preparations for business and expects to ship extensively to the American market in 1909. The Nichols Chemical Company's mine is at Sulphide in proximity to their acid works; the Lake Superior Corporation exported a small quantity of the granular pyrite found in the Helen iron mine at Michipicoten, and the Northland Mining Company has for some time been working a deposit near Rib Lake in the Temagami Forest Reserve.

The Lake Superior Corporation has large deposits of pyrite in the neighbourhood of Goudreau Lake, southwest of Missanabie on the Canadian Pacific Railway, which have not yet been worked, except for testing purposes.

Mica.—From the mica mines of the Province there were raised and shipped last year 368 tons of rough-cobbed amber mica the value of which was returned to

the Bureau as \$73,586. This is a decrease from 1907, when the output was 456 tons, worth \$82,929.

The principal producers were the Loughborough Mining Company, whose output is utilized by the General Electrical Company, and the Dominion Improvement and Development Company. The mines of the former are in the counties of Frontenac and Perth, and of the latter in the county of Perth.

Salt.—There is no rock salt mined in Ontario, the product being entirely the result of the evaporation of brine pumped up from the wells. These are situated on the shores of Lakes Huron and St. Clair, where immense deposits occur in the limestones of the Onondaga formation.

In 1908 the output of the wells was reported to the Bureau as 79,112 tons, valued at \$488,330, an increase over the product of 1907, when it was 62,806 tons, worth \$432,936. The chief operators were the Canadian Salt Company, with works at Windsor and Sandwich, and the Empire Salt Company of Sarnia.

Petroleum.—The petroleum wells of southwestern Ontario yielded in 1908, 18,479,547 Imperial gallons of crude oil, valued at \$703,773.

The falling-off as compared with the previous year was serious, being not less than 33 per cent. on the output of 1907. Part of the decrease may be explained by the gradual diminution in the yield of the wells of Lambton County field. The Petrolea and Oil Springs and Bothwell districts have been producing oil for upwards of forty years and the average production per well is now extremely small, being not over eight or nine gallons per day. It is only the large number of wells, and the economy in management which long experience has taught the operators, that enables Lambton County to be reckoned among the oil-producing regions to-day.

Scrutiny of the figures, showing the production of oil from the various districts, reveals the fact that the decline in yield of the more recent of the oil fields, namely, those in the County of Kent, has been proportionately greater than in the older sections. Whether this comparative rapidity of diminution will continue to characterize the production from Tilbury East and Romney, or whether the fluctuation is of a temporary character and will be compensated by the opening up of fresh pools from time to time, must remain for the future to show.

A statement of the production by districts, kindly furnished by Mr. W. J. Harvey, supervisor of the bounty paid by the Dominion Government on crude petroleum produced in Canada, and covering the last three years, shows the rapid increase and decrease of yield in the new fields, and also the decrease in the older ones:

Field	Production	Production	Production
	1906	1907	1908
	Bbl.	Bbl.	Bbl.
Lambton	377,286	304,212	265,368
Tilbury and Romney	106,992	411,588	201,283
Bothwell	44,827	42,727	39,228
Leamington	39,652	6,133	9,334
Dutton	19,376	14,977	13,743
Thamesville	175	237	.....
Comber	651	.....	.....
Total	588,962	779,876	528,959

The first strike of oil in the Tilbury field was made in December, 1905, the second producing well was drilled in March, 1906, and the third in the following month.

In Romney oil was struck about the close of 1906, and by the beginning of March, 1907, there were seven producing wells, several of which came in with a yield of over 1,000 barrels each per day. In July, 1907, the Tilbury and Romney wells were in full flow, making about 35,000 barrels of oil, while in November, 1908, seventeen months later, the production had fallen to about 12,000 barrels. As will be seen by the figures given above, the yield in the new field rose from 106,992 barrels in 1906 to 411,588 barrels in 1907, falling to less than half the latter quantity in 1908. Of the total decrease from 1907 to 1908, 250,917 barrels, Tilbury and Romney were responsible for 210,305 barrels and Lambton for 38,844. In other words, while the falling-off in Lambton in 1907 compared with 1906 was 19 per cent., and in 1908 compared with 1907, 12 per cent., the drop in Tilbury and Romney from 1907 to 1908 was 51 per cent.

Petroleum Prices and Products.—The price of crude petroleum in the oil fields of Ontario is regulated by the price paid by the Imperial Oil Company at its various receiving stations. It may cost the producer five to twenty cents a barrel to deliver it, so that the price is not a net one to him. There were practically no fluctuations during the year. The price delivered to the Imperial Company for nearly the first three months was \$1.34 per barrel, and for the remainder of the year \$1.44 per barrel; the average price therefore for the Petrolea district was \$1.41½ per barrel. At producers' tanks in the Tilbury field the price was \$1.17 per barrel from 1st January to 15th March, and from 15th March to 31st December \$1.27 per barrel. These prices of course do not include the Dominion Government bounty of 51½ cents per barrel. A barrel contains 35 Imperial gallons.

There are two petroleum refineries in the Province, owned and operated respectively by the Imperial Oil Company, Sarnia, and the Canadian Oil Refining Company, Petrolea. Together, these companies distilled 44,675,120 gallons of crude in 1908, so that the domestic product was equal to only 53 per cent. of the total quantity distilled. The remainder was of course imported from the United States.

Natural Gas.

While the production of petroleum declined, the yield of the allied combustible, natural gas, underwent a decided expansion, and for the first time in the statistical history of the mineral industry of the Province, the value of the natural gas product was greater than that of petroleum, the figures for 1908 being petroleum \$703,773, natural gas \$988,616. The increase in 1908 over 1907 was \$242,117, or 32.4 per cent.

There are three fields in which natural gas is produced in quantity, (1) Welland County, (2) Haldimand County, to which must now be added Norfolk, (3) Essex and Kent. The Welland field produced gas to the value of \$343,560 or 34.8 per cent. of the whole, the Haldimand field \$535,182 or 54 per cent., and Essex and Kent \$109,874 or 11.2 per cent. In 1907 the proportions respectively were 46, 44 and 10 per cent. Haldimand has now taken the lead, and the prospects are for a still further increase in the production of this district.

Minor Products.

Among the lesser items on the list of mineral products of Ontario, apatite or phosphate of lime figures in 1908 for the first time in many years, some 881 tons having been raised of a value of \$7,048. The greater part of the output was shipped to Buckingham, Quebec, for

the manufacture of phosphorus for the English market, but part was manufactured into fertilizer at Smith's Falls, Ontario. Prices are higher in England than in Canada, and next season producers intend to export to that country. The competition of the cheaper and lower grade phosphates of the southern States has for a long time shut out the richer but more expensive product of Ontario and Quebec.

Corundum, owing to the stoppage of production on the part of the Canada Corundum Company, which has hitherto been the largest producer, shows a considerable falling-off as compared with recent years. This company's business in 1908 consisted mainly in marketing the stock of grain corundum on hand, little fresh rock being raised from the mines.

A plant for the grinding of tale has been erected in Madoc, Hastings County, by Messrs. Geo. H. Gillespie & Co., and began operations in September, 1908. It has a capacity of 400 tons per annum, the product being ground tale of three grades, namely, No. A1 (200 mesh), No. 1 (180-mesh), and No. 2, 3 per cent. retention on 180-mesh. Grade A1 is used by the makers of talcum powder and similar articles, No. 1 by soap makers, tanners and leather manufacturers, and No. 2 by the paper trade and in foundry facings. The product sells at the works at \$20 and \$25 per ton for No. A1, and \$15 to \$18 per ton for No. 1, including price of barrels, or \$7 per ton for No. 2, including sacks. The bulk of the product grades No. 2.

Revenue for the Year.

The total receipts on account of mining revenue for 1908 were \$549,178.94, apparently a heavy decrease as compared with those for 1907, when the amount was \$1,731,720.72. It must be borne in mind, however, that the income for 1907 was swelled by two items of an unusual character, paid in on account of the purchase of the beds of Cobalt and Kerr Lakes, and amounting together to \$1,155,000. Excluding this sum, the revenue for 1908 was only \$27,541.78 less than that for 1907. The items are as follows:—

1. Sales of mining land.....	\$23,445	30
2. Leases of mining land.....	20,611	81
3. Licenses, permits and recording fees.....	137,730	20
4. Mining royalties.....	218,071	96
5. Supplementary Revenue Act.....	125,078	06
6. Provincial Mine.....	12,592	90
7. Diamond drills.....	11,286	11
8. Assay Office, Belleville.....	362	60
Total.....	\$549,178	94

Mining Royalties.

The details of item 4, mining royalties \$218,071.96, are as follows:—

O'Brien Mine.....	\$109,915	31
Crown Reserve Mine.....	29,257	85
Temiskaming & Hudson Bay Mine.....	78,898	80

Total.....\$218,071 96

The O'Brien mine pays to the Crown twenty-five per cent. of the value of the shipments of ore, the consignments being valued at the pit's mouth. The agreement between the owners of the mine and the Crown exempts the latter from any part of the cost of underground work, or hoisting the ore, etc., but in calculating the royalty the surface expenses, such as sorting the ore, haulage and freight, etc., are to be deducted. The difficulty of proportioning exactly these expenses between the parties has led to a modification of the agreement,

by which practically the same rate or royalty is payable, while the deductions are more easily and certainly arrived at. A method of computing the royalty on concentrates is also provided. Up to the end of 1908 the O'Brien mine had contributed in all royalties amounting to \$332,860.37.

The arrangement with the Temiskaming & Hudson Bay Mining Company is somewhat different. It provides for the payment to the Crown of a net royalty of fifteen per cent. on the receipts from sales of ore. The amount paid in by this company last year included royalty on past shipments as well as those made in 1908.

In the case of the Crown Reserve mine, the royalty, which is at the rate of ten per cent. on the value of the ore at the pit's mouth, is really part of the purchase price of the property. The history of the sale of this parcel of land by the Crown is interesting. Part of the bed of Kerr Lake, in the Township of Coleman, which had not been staked out or claimed, as no vein was known to exist upon it, was offered for sale by tender in December, 1906. The highest bid was \$52,000, which was not considered sufficient. Tenders were again asked for, and the condition was added that a royalty of ten per cent. should be paid on the value of the ore. The highest offer received in response to the second advertisement was \$178,500, which was accepted. A rich vein was struck in developing the mine, and the Crown will probably receive at least as much by way of royalty as the original price.

There are several other properties charged with payment of royalty direct to the Department of Lands, Forests and Mines, exclusive of those which contribute royalties to the Temiskaming and Northern Ontario Railway Commission. They include the Hargrave locations, 25 per cent., Chambers-Ferland properties, 25 per cent., and Scully claims, 10 per cent. None of these paid anything in 1908, but the Chambers-Ferland Company will be a contributor in 1909.

The total receipts from mining royalties up to the end of 1908 were as follows:—

O'Brien Mine.....	\$332,860	37
Crown Reserve Mine.....	29,257	85
Temiskaming & Hudson Bay Mine.....	78,898	80
Total.....	\$441,017	02

CANADIAN PATENTS.

121580. E. H. Meyer and J. Stilleson, Niagara Falls Centre., Ont., preparation of nitrogen compounds.

121594. A. C. Campbell, Asheville, N.C., coal washers and ore concentrators.

121606. J. Gayley, New York City, tape moisteners.

121621. O. Kjellberg, Kvillegatan, Sweden, methods of electric welding, brazing and soldering.

121624. B. R. and M. J. Lyster, Whitefield, N.H., appliance for the distillation of wood alcohol and other products.

121656. J. Stilleson, Niagara Falls Centre, Ont., preparation of lime nitrogen.

121674. L. L. Knox, Ben Avon, Pa., furnaces, Keystone Furnace Construction Co.

121676. J. T. Greenway, Malvern, Australia, separation of metallic sulphides from sulphide ores, Potter's Sulphide Ore Treatment Co.

121691. H. Roberts, Pittsburg, Pa., appliance for coating metal.

Fetherstonhaugh & Co.

PNEUMATIC VERSUS ELECTRIC DRILLS IN MINING SERVICE

By Frank C. Perkins.

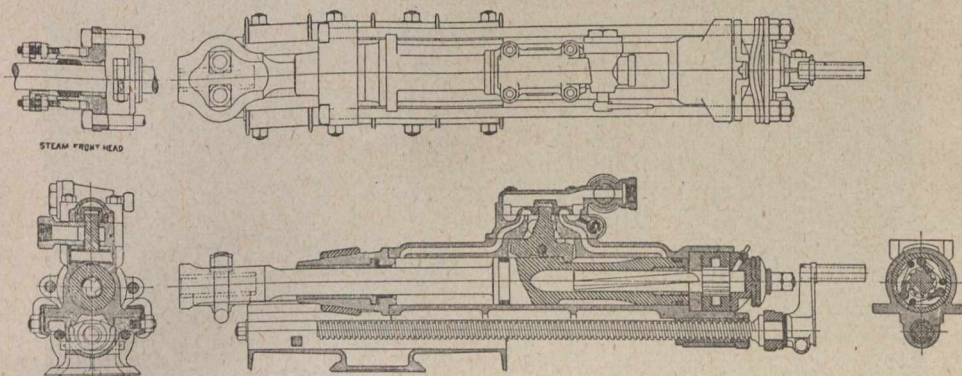


Fig 1.

The wonderful development of electric power transmission and electrically driven labour-saving devices has caused compressed air apparatus of various types, such as pneumatic hoists and compressed air locomotives, to be replaced by electric motor-driven machines very largely. The pneumatic rock drill and pneumatic hammer and rivetter used in mining and structural work, however, have successfully met electric competi-

tion. The reason pneumatic rock drills, pneumatic hammers and riveters have held their own, and are now more extensively employed than ever before, is without doubt on account of their many advantages, the compact construction and the development of more economical and efficient means of producing compressed air power.

In mining service and in the construction of tunnels and foundations for large buildings the pneumatic rock drill is reliable, economical and rapid in operation. The exhaust air from the mining pneumatic rock drill aids in the ventilation and it is claimed has little to fear from the competition of the electric drills.

The accompanying drawing, Fig. 1, shows the details of construction of a modern American pneumatic rock drill of the Chicago type in which the valve motion is of the "tappet" or "positive" motion design.

The tappet or rocker is forged from high-grade tool steel, accurately machined and hardened where it comes in contact with the piston and valve; it operates on a straight pin made from tool steel, working in renewable hardened steel bushings. To hold the pin in position endwise and also prevent leakage through bushings, steel plates are provided. These are let into the side

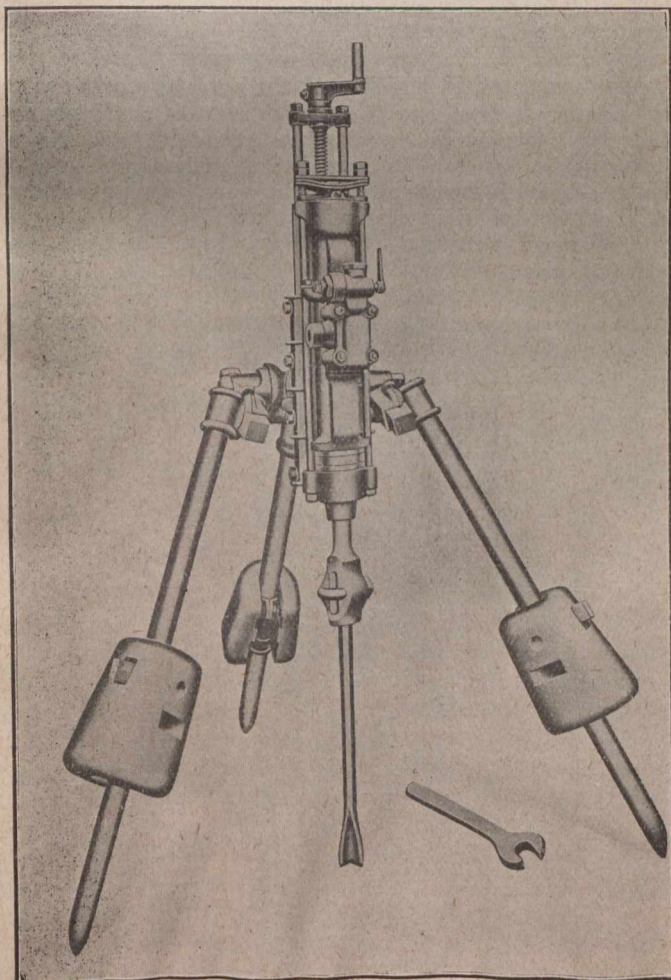


Fig. 2.

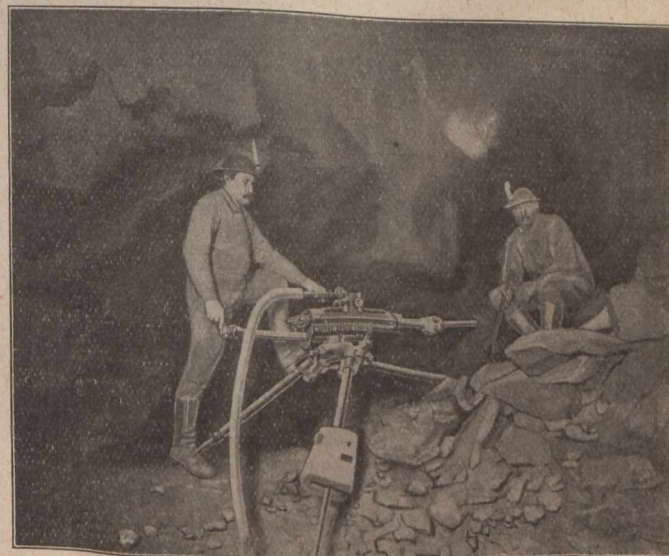


Fig. 3.



Fig. 4.

walls of the cylinder and locked in position by the under face of the valve seat.

It will be noted that the valve is of the lightest possible section consistent with strength. A chamber is provided in the valve seat to form an oil reservoir for the lubrication of the drill and a wicking leads the oil from the reservoir into a port of the valve seat. The pulsation of the operating fluid provided for continuous lubrication.

It will be noted that the cylinder is extended and is also provided with a boss or lug for the feed nut. It may be stated that piston rod and chuck are forged in one piece from high-carbon steel, and then put through an elaborate process of oil treatment and annealing which toughens and increases the tensile strength 25 to 30 per cent. Piston rings are made

up in two pieces, from special high-grade steel accurately machined, and are held to walls of cylinder by steel springs.

An important feature of this pneumatic drill is that the rotating mechanism is arranged to slip or release should the steel become bound in a hole while drilling in seamy or loose rock.

In mining and other service owing to the diversity of conditions under which and the various positions in which a rock drill has to operate, several holding devices have become recognized as standard, and these, owing to the nature of the service, must be simple, rigid, easily adjustable and of as light construction as possible, consistent with strength required.

The accompanying illustration, Fig. 2, shows the form of tripod used, while Fig. 3 shows the method of



Fig. 5.

operation. Wherever conditions will permit its use, the tripod is the mounting most largely used for rock drills, because of its ready adaptability to rough surfaces, its easy and very varied range of adjustment, its great strength and rigidity.

The accompanying illustrations, Figs. 4 and 5, show the use of the column, shaft bar or stoping bar, the former with single screw and the latter with double screw at the base. The illustration, Fig. 5, shows the double screw column and pneumatic drill in service at Ishpeming, Michigan, at the Cleveland Cliff Mines.

The column, either single or double screw, with its arm, clamp and safety clamp has a field of its own in tunneling, shaft sinking, stoping or drifting, and is of equal importance with the tripod as a rock drill mounting. The column can be made up to any desired length, but the usual lengths are six and eight feet, measured with the screws run clear in. It is made up of a heavy piece of tubing capped on its upper end, and provided with a foot piece suitable either for a single or double screw and the screws have a range of 6 to 12 inches, depending on the size of the column.

It may be stated that a drill may be mounted directly on a column or on the column arm, which gives a great range of adjustability. A safety clamp is provided and is fastened on the column under the swinging arm. This sustains the weight of the arm when loose and allows it to be safely swung into any desired position.

In mining work or in tunnel or shaft construction there is always employed wood blocking, not less than three inches thick, interposed between cap of column and wall, and between screws of foot block and wall. This provides for a secure and elastic fastening. All single screw columns are provided with a locking cap, which is constructed to securely clamp the jack screw, preventing it from loosening under the jar of operation.

The quarry bar or open-cut channeler is another style of rock drill mounting which was developed for quarry work, particularly in getting out "dimension stone," this problem calling for a portable apparatus which would drill a series of holes close together and "in line," and then be used to break down the walls between the holes, with a minimum of labour and time to make the necessary changes.

It is maintained that besides having a recognized place as a labour-saving device in quarry work, it also is largely used in open-cut contract work for "channeling" the sides of the cut, a class of work to which it is very well adapted.

CORRESPONDENCE.

Editor Canadian Mining Journal:

Sir,—Before discussing Prof. A. P. Coleman's letter regarding the glacial origin of the Lower Huronian conglomerate at Cobalt, it might be well to concisely state both sides of the question. The facts for and against the proposition are briefly the following:—

For: (1) The presence in the conglomerate of pebbles whose scratches and markings are similar to those found in recent boulder clay. (2) The presence of large boulders (supposedly miles away from their source) in the fine-grained greywacke. (3) The widespread occurrence of the conglomerate. (4) Its similarity to the South African Dwyka. (5) Its general resemblance to Pleistocene boulder clay.

Against: (1) The conglomerates have not been

found resting on a glaciated basement. If Coleman attributes a glacial origin to the Lower Huronian conglomerates of the Lake Superior region, the absence of a glaciated basement there is significant, because this area has been studied in great detail by the United States geologists. (2) The scratched stones already discovered are known to occur in a very small area—a few acres, in fact. (3) Over widespread regions the fragments making up the lower part of the conglomerate have resulted from the breaking down of the adjacent rock. This much, at any rate, has not been transported by ice. (4) The scratched pebbles may have been produced by other causes. (For years the scratched pebbles in an English conglomerate were thought to represent glacial action. Recent studies have shown the scratches to have been produced by movement on talus slopes.) (5) The large boulders in the conglomerate may have been transported by agencies other than ice.

There is another point in regard to this question which needs consideration. If we recall the succession in the original Huronian area, it will be remembered that the Lower and Middle Huronian are both present. But each of these latter groups has lithologically similar conglomerates, except that the Upper group carries limestone fragments. Therefore the arguments for a glacial origin of one group apply equally well to the other. The logical question readily follows: Would Prof. Coleman have two distinct pre-Cambrian glacial periods? So far as I know, he has never discussed this aspect of the problem, and yet it would appear that such a question must be faced, especially since the stratigraphical position of the Cobalt conglomerate is tentative. It would consequently be interesting to have a definite list of those localities whose conglomerates are considered by Prof. Coleman to be glacial in origin.

In regard to the large granite or other boulders in the conglomerate "miles away from any known source," it is well to remember that in spite of their source being unknown, they may nevertheless have come very short distances indeed. In other words, we cannot tell what rocks underlie these boulder conglomerates, except where the contacts are actually seen.

Prof. Coleman's comparison of the boulder clay at Toronto is not an apt one, for the reason that the underlying rocks are comparatively soft shales and limestones. It is not to be expected that such materials would be so likely to show a glaciated basement. But the hard granites, limestones and cherts which everywhere underlie the Huronian conglomerate present an entirely different proposition.

If it is true that "the real test of glacial action is to be found in boulder clay and the glaciated stones in it," it is also true that Cobalt is the only place where these scratched stones have been found. But in spite of this fact, Prof. Coleman gives a glacial origin to "the thousands of square miles of boulder conglomerate in northern Canada reaching from Chibougamou to Lake Winnipeg."

It cannot be said that the suggestion of Van Hise regarding the finding of a glaciated basement ignores the fact "that near the edge of a glaciated area where the thickness of the ice is not great, the ice sheet often moves for miles over loose materials without ever reaching the rock surface beneath." It need not, surely, be pointed out to Prof. Coleman that these conditions are not widespread, and that an ice sheet that could leave such enormous masses of boulder clay as he believes

have been left, would certainly produce in many areas a perfect glaciated surface.

From the miner's point of view it matters little if the Cobalt conglomerate be of glacial origin. Moreover, there is nothing particularly original about the idea of a glacial period in pre-Cambrian times. Such an origin was considered many years ago for the Torridonian sandstones and conglomerates in Scotland. And five years ago we see from the following sentence (first edition Cobalt report, page 48) that Miller also had this theory in mind. "In the present state of our knowledge we have little warrant for claiming that the granite boulders, often two or three feet or more in diameter and distant a couple of miles from exposure of the rock, indicate glacial conditions during Lower Huronian times, although we have no proof to the contrary." But since then it is frankly admitted that the finding of pebbles, the scratches on which many glacial men think have been caused by ice, is of much interest. Nevertheless, the reasons why too great stress should not be placed on this point have already been pointed out.

Incidentally, it may be remarked that two of the most eminent glacial geologists—Chamberlain and Salisbury—have seen the Cobalt conglomerates. I am not aware that they are in accord with Prof. Coleman's sweeping conclusions.

Finally, the gist of the matter, with many of those whose opinions Prof. Coleman flippantly classes as "off-hand," will remain as it was—we look for a glaciated basement, and until that is discovered I repeat the statement that the subject will remain an open question.

Yours, etc.,

CYRIL W. KNIGHT.

Toronto, Nov. 23, 1909.

PERSONAL AND GENERAL.

Mr. Clifford Smith, mining engineer, was in Toronto recently.

Mr. Boyd Magee has resigned the management of the Keeley mine and has opened offices in Toronto and Haileybury, as consulting mining engineer. Mr. Magee has had valuable experience in the development of mining properties, especially in the Cobalt region.

Mr. E. Jacobs, Secretary of the Western Branch of the Canadian Mining Institute, is in Nelson, B.C. Mr. Jacobs will probably remain in the Boundary region until January next.

Mr. C. H. Macnutt has assumed the general management of the Poderosa Mining Co, Ltd, in Chile.

Mr. J. M. Turnbull recently examined various mining prospects on the Queen Charlotte Islands, Swanson Bay, and the Portland Canal district on behalf of the Consolidated Mining and Smelting Company.

Mr. J. J. Harpell will return from England to Toronto for a short stay early in January.

Mr. Martin Nordegg leaves shortly for Germany. He will be absent for three months.

Mr. Howells Frechette, of the Mines Branch, Ottawa, passed through Toronto on his way to Ottawa last week.

Mr. R. B. Lamb, consulting mining engineer, passed through Toronto, on November 24. Mr. Lamb is associated with the C. L. Constant Company, 42 Broadway, New York.

Mr. J. E. McEvoy is in Victoria.

Mr. A. B. Willmott has returned from a professional visit to British Columbia.

Mr. E. A. Collins, B.Sc., president and general manager of the Vermilion River Copper Company, Massey, Ont., was married on November 24th to Miss Maud Walsh, of Kingston, Ont. Mr. and Mrs Collins have our best wishes.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Glace Bay.—The Glace Bay Gazette, in its issue of the 17th November, had a thoughtful editorial on the present aspect of international and national trades unionism in Canada, called forth by the contemptuous references to Canadian nationalism which have characterized the speeches of the delegates to the American Federation of Labour Convention recently held in Toronto. The Gazette justly comments on the apparent loss of national self-respect which has been displayed by the applause given to reflections on our national aspirations made during the speeches of delegates from the United States. A Mr. Jerome Jones, of Atlanta, Georgia, referred to the national movement in Canadian trades unionism as "a national plague, which must soon be eradicated," and another delegate, a Canadian this time, mentioned several Canadian unions, notably the P. W. A. of Nova Scotia, as unions "which did not know enough to keep quiet" before the great ones from the United States who are trying to run our national affairs. The comment of the Gazette editorial on these treasonable utterances is so pertinent that we quote it in full:—

"The way we are building up a nation in Canada is attracting the attention of the world. We have established a system of government, a trade policy and an industrial system, without reference to American ideals. We are working out stupendous

problems in transportation without any American assistance. In fact, in all phases of national life we have learned to stand on our feet. If the trade unionists of Canada, or any considerable section of them, intend to step out from this national march of progress and submit to American domination, it will be the worse for trade unionism in Canada, for the time is not far distant when Canada will be populous enough and powerful enough so that her people will not submit to foreign dictation in their industrial life.

"At all events, if a large proportion of the organized workmen of Canada have definitely decided to abandon national aspirations and allow themselves to be swallowed by the unionism of the United States, even though it masquerades as international, they should, we think, have at least enough self-respect to insist upon the Americans using inoffensive language while in the swallowing act."

The foregoing, we feel sure, expresses the opinion of that portion of the Canadian population in which are bound up the fairest hopes of this Dominion, although it may not meet with the complete approval of those little Canadians whose mental calibre is too small to appreciate the destiny of their own country.

Glace Bay, Nov. 20.—The U. M. W. A. Strike.—Continuing the figures for the strike period into the month of November,

the Dominion Coal Company's production shows the following progression:—

	Output.	Average daily Output.
July	136,000	4,200
August	154,000	5,900
September	180,000	7,200
October	205,000	8,200
November 1 to 15	108,000	8,700

The highest daily output since the strike was obtained on the 11th November, when 9,770 tons was raised. The average daily output for the second week of the month was over 9,000 tons. The Hub Colliery (No. 7), which has been idle since the strike commenced, resumed operations about the 21st of the month, and with this mine producing it is probable the output will reach the 10,000 ton mark during the closing week of the month. This steady progression tells its own tale. No. 6 is now the only colliery that is not working.

ONTARIO.

Cobalt, Nov. 20.—The new gold discoveries up in Porcupine Lake have been creating a great deal of excitement, and many prospectors have gone in to try and locate ground in this new territory. Some of the veins found are very extensive, and in several places free gold in considerable quantities is showing. A government engineer was sent up to look over the district and report on the discoveries that had been made, and another engineer will shortly be sent up to make a more complete examination than was possible in the first instance. The report states that the gold is found in milky quartz veins, the country rock being of schistose structure. Among the claims reported on are those of R. Bruce, in Tisdale Township, where the discoveries consist of a series of quartz veins varying in width up to 18 inches. They have been stripped for a short distance, and on the contact of one of the veins with the country rock free gold can be seen. It is stated that these claims have been sold to Messrs. Drummond & Dobie for ten thousand dollars. The largest vein so far found in the district was seen on the Wilson property. This vein has been traced for over 400 feet, and at one point it appeared to be over 100 feet in width. So far no work has been done in this section to prove up the veins, but it is understood that the parties who purchased the Bruce claims are sending in a force of men to develop their holdings. Another sale has also been negotiated whereby Herbert Fade sold four claims in Tisdale Township to an eastern company for twenty thousand dollars.

A short time ago the dynamite thaw house at the King Edward mine blew up, and although the concussion was severe and was felt for miles around, no serious damage was done. The electric current, however, was cut off at some of the mines for some time.

The White Reserve mine in the Maple Mountain district has started work again under new management. The mines were shut down a few months ago, largely on account of internal troubles among the directorate, and not on account of the physical condition of the mine. A short time before operations were suspended, a shipment of eight tons of ore was made, which assayed 4,280 ounces to the ton. The mine is fully equipped, and operations will be carried on steadily.

The concentrator at the Buffalo mine is now running by electric power brought from the plant being installed at Hound Chutes. The equipment supplying this power is, however, only a small temporary unit, and the main plant will not be in a position to deliver power for some time to come. The cyanide plant in operation at that property has been very successful, and the first shipment of bullion from the camp has been made from their mill. It amounts to thirty thousand ounces, representing a recovery of 80 per cent. from 8-ounce tailings. The company estimates that this plant will mean a saving of about five thou-

sand ounces per month. The consumption of cyanide is much less than was estimated.

Nipissing has completed surface prospecting for this season, and during that time one hundred men have been employed, and have run about 33 miles of trenches. This is the greatest amount of surface work that has yet been done for one year on this property. The results obtained have been very satisfactory, and altogether about 24 new veins have been discovered. Some of these are among the most important that have yet been found. One of the main veins is numbered No. 122, and a new shaft-house and ore-house are being erected on Nipissing hill, from which it will be worked. This vein was cut on the 80-foot level, and already about 300 feet of underground work has been done on it. On the surface it has been traced for over 800 feet, and carries high grade ore. These 24 new veins do not include the discoveries that have been made by underground development.

The first shipment from the district of North Cobalt since the Green-Meehan ceased shipping about two years ago has been made by the North Cobalt Mining Company. The shipment consists of about ten tons of high grade ore, which has been taken from the vein discovered some time ago. This property is controlled by the Jacobs Exploration Co.

One of the most important sales in the Gowganda district for this season was concluded a short time ago, when the Crawford property, which adjoins the Reeves-Dobie, was sold for one hundred thousand dollars.

Crown Reserve has declared its regular dividend of 6 per cent., with a 9 per cent. bonus, and an additional 10 per cent., making a total of 25 per cent. for the last quarter of 1909. This company only commenced to pay dividends in 1908, when they paid 4 per cent. in July of that year. When this last quarter's dividend has been paid for 1909 the Crown Reserve will have paid a total for the year of 70 per cent. on their issued capital, and since they started paying dividends a total of 90 per cent. For 1909 this represents a disimbursement of \$1,291,109.

The T. & H. B. has declared another dividend of 300 per cent.

The Muggley Concentrator is now being run by electric power supplied by the Cobalt Power Co. The mill has recently been enlarged, and will now have a capacity of 135 tons of ore per day. A contract was made some time ago with the La Rose for treating their dump, and this will be run through at the rate of about one hundred tons a day. At the present time the concentrator is treating ore from the La Rose, Silver Queen, Right of Way and City of Cobalt.

A new discovery has been made on the Little Nipissing property on Peterson Lake.

The annual report of the City of Cobalt Mining Co. has been issued, and states that during the year a total of 739 tons of ore, representing 456,091 ounces of silver, were shipped. The City of Cobalt is now in a much better position than it was a few months ago, due largely to the development in the Huronian slates, in which have been found large bodies of high grade ore. It is interesting to note that the T. & N. O. Commission has been paid \$69,772 in royalties, and that \$17,000 is still due them.

The Harmon Mining Co. has completed negotiations for the Peverley lease, which adjoins the Ophir property, and a force of men will be started to work in a short time to prospect the property. This same company is negotiating for several claims in the new gold fields, and if these are secured, active work will be started at once.

The accumulation of ore underground at the McKinley-Darragh has necessitated the cutting off of several of the drills, as there is enough ore in the mine to supply the mill, which is treating about 80 tons a day. The capacity of the mill is being increased to about 120 tons a day, and it will soon be completed. The mill, however, cannot be started on its increased capacity until the power is ready for delivery. Development work at the Savage is restricted on account of the same lack of power. This property has shown up very well during the past year, and

preparations are being made to carry on the work on a larger scale than formerly. The new shaft at the Savage has been connected up with the old No. 3 shaft at the 75-foot level. On the main vein a drift has been run for about 260 feet, high grade ore showing in the drift practically all the way. Another vein containing some silver has been found on the surface, and as soon as mining operations can be started a cross-cut will be run from No. 2 vein to cut it.

The Temiskaming mine is now doing practically all its work on the lower level, and exceedingly good results are being obtained. The work on the 300-foot level on the main vein has shown up some of the richest ore that has yet been found on the property. In places the vein is 12 inches wide, carrying high values in silver. No. 2 vein on the same level has been developed for over 100 feet with corresponding values. The wall rock is also well mineralized, which will give a large quantity of milling ore. The main shaft is now down 340 feet, and a winze is being sunk from the 300-foot level midway between No. 1 and No. 2 shaft. Shipments from this property will be restricted until the new concentrator is in operation. The Beaver property in the same section is getting good values, and it is understood that a shipment of high grade ore will be made in a few days. The Shamrock property has opened up several veins on the 200-foot level, some of which show good values in silver. This property is one of several operated by the Jacobs Exploration Co.

One of the largest deals in the South Lorrain district was consummated a short time ago, when a syndicate concluded the purchase of the Newman claim, which is situated a short distance from the Wetlauffer mine. One of the best discoveries in that section was made on this property recently, where a vein carrying good quantities of silver was traced on the surface for over 300 feet.

The Trinity Cobalt Mining Co., situated on the northeast side of Cross Lake, has been sold for twelve thousand dollars. Most of the property lies under water. A small plant was installed and a shaft sunk for about 70 feet. This property was started as a wildcat, and the shaft was sunk for its entire distance through clay. The company formerly operating this property got into financial difficulties, and work was stopped some time ago.

At the annual meeting of the Trethewey Company the directors declared a dividend of 15 per cent., making a total of 25 per cent. for the year.

Since Cobalt Lake has been working under its new management very encouraging results have been obtained. A few days ago a new vein was opened up. Where encountered it showed about 30 inches of mineralized area, and carried considerable quantities of high grade ore. It is important to note that the new discovery was made on the 190-foot level in the slate underlying the conglomerate.

It has been announced that the Argyle mine, which was closed down on account of litigation, will resume operations in December, and the shaft will be continued to the 300-foot level as rapidly as possible, and from that point cross-cuts will be run to pick up the veins that are known to exist. The court proceedings have been settled, and the property has been sold for \$37,000. It is understood that \$25,000 will be spent on development work, and that an entirely new plant will be installed. When work was closed down several good showings had been found.

The St. Lawrence Cobalt has ordered a small plant for its claim on Greenstone Island, on Sasaginaga Lake, and will recommence work. This company is capitalized at \$1,500,000, and has its headquarters in Buffalo.

The Temagami Reserve Mining Co. has acquired control of the Floyd and the Gavin Hamilton. The former is in West Coleman, and the latter situated in the Elk Lake district. Considerable work has been done on the Gavin Hamilton, and the shaft has been sunk for over 100 feet.

It is understood that a change has been effected in the control of the Cobalt Central, and that new interests now control the property. The old management has come in for considerable criticism on account of the fact that they have never issued a complete financial statement of the company's affairs. It is stated that the concentrator was built by money advanced by Nivens & Son who have been interested in the property for several years, and it is said that this indebtedness has been as high as \$160,000.

Although the new gold finds in the Porcupine Lake have diverted attention from the gold district in Beatty and Munro Townships, there is a good deal of work being done in this section. The fissures in which the gold occurs are running from 8 to 10 feet wide, and in these are many stringers of quartz which carry the values. The Painkiller Lake Co. now has a shaft down on the vein over 50 feet. On the surface this vein was only 18 inches wide, but at the bottom of the shaft it is now over 7 feet wide. All through are scattered stringers carrying high values in gold. Considerable work is also being done by the Treadwell Co., and good showings have been reported. The work done on the six Hyland claims has been productive of favourable results, and a larger force of men will be sent in to open up the properties. There will be a good winter road into this section, and during the winter one or two plants will probably be installed.

The main excitement in Cobalt during the past couple of weeks has been the sale of the Gillies Limit lots. This section has come in for a great deal of attention on account of the good finds made on the Young-O'Brien, Waldman, and York-O'Brien. These companies are rapidly developing their holdings, and the results obtained are largely responsible for the much greater interest displayed in the last sale. During the time since the announcement of the sale was made the Limit has been crowded with prospectors. There were several properties on which there were fairly good showings, which were expected to bring large returns, but the result of the sale has far exceeded expectations. Of the fifty-five lots offered for sale, 761 acres were sold for an aggregate of \$362,786, and the price per lot averaged \$9,810. As was expected, the bids were not very high in the western portion offered for sale, and from A64 to A81 lots were not disposed of. These prices are very greatly in advance of any bid at the former sale. The highest price paid was for A53, which brought \$35,100. The list of successful tenderers is as follows:—

A46, Grant, \$10,300; A47, B. Sawyer, \$7,355; A48, Fraser & Ogilvie, \$26,230; A49, S. D. Madden, \$7,600; A50, Ross, \$6,500; A51, B. Sawyer, \$16,667; A52, B. Glidden, \$7,300; A53, Fraser & Ogilvie, \$35,100; A54, R. Glidden, \$25,100; A55, A. Pierce, \$12,500; A56, McLaughlin, \$22,000; A57, A. J. Young, \$3,284; A58, Burrows, \$8,885; A59, A. Pierce, \$12,600; A60, A. Pierce, \$12,300; A62, Winch, \$3,250; A63, Deville, \$2,100; A64, Deville, \$2,900; A81, Beaumont, \$12,000; A82, Beaumont, \$7,220; A83, Ross, \$3,500; A84, A. J. Young, \$2,015; A85, Roberts, \$2,119; A86, A. Pierce, \$7,000; A87, A. Pierce, \$12,600; A88, Roberts, \$2,470; A89, Curry, \$2,750; A90, Bell, \$9,779; A91, A. Oakley, \$26,556; A92, Beaumont, \$12,110; A93, Beaumont, \$7,220; A95, Boyd, \$2,992; A96, Barnet, \$5,960; A97, Waldman, \$4,728; A98, Fraser & Ogilvie, \$2,000; A99, Waldman, \$2,000; A100, Russell, \$4,100.

Kenora.—One of the latest reports in this district to cause excitement is the rumour that the original operators of the Mikado mine on the Lake of the Woods were misled as to, or misjudged, the strike and dip of the lode and sank their incline shaft right through the auriferous belt into the black trap. The strike of the main lode is northwest and southeast from the shafthouse, the dip being towards the east. The incline shaft was sunk almost due north, and from the report received it would seem that it passes through the wall of the main lode about the 240-foot level into the black trap. Drifting was then begun, but was pushed west instead of east; so that the main lode was

not again located, and men were withdrawn from this drift and stoping was carried on from these levels, which were in the main lode; that is to say, above the 240-foot level, where the shaft passed the wall of the lode.

Major Vereker and Capt. Machin, M.P.P., have just returned from making a careful investigation of the property, and they both express themselves as being in favour of this view of the situation. The difference between the strike of the lode and the direction of the shaft taken into consideration with the dip of the lode to the east, would make this report seem reasonable, and would, moreover, account for the former report of the vein pinching out, for as the incline shaft approached the wall of the lode, which, by the way, is very indistinct and difficult to locate, it would naturally cut off a wedge-shaped area of the lode and give an appearance in the shaft of a gradual pinching out of the vein matter.

The prospector coming into the Lake of the Woods district with intent to pursue his calling can equip himself in Kenora for his trip for a reasonable expenditure. His outfit, consisting of the following items can be purchased in town for the listed prices:—

6 x 8 Tent	\$5.00
2 Pair blankets	7.00
1 16-foot canoe (second-hand)	35.00
Pack sack	3.50
Compass	1.00
Prospector's pick	1.00
Fry pan .....	.35
2 Pots .....	.60
Fishing Tackle .....	.90
Axe	1.00
22 Rifle	8.00

If, in addition, the prospector decides to carry dynamite, he may purchase it from either of two companies in town, the Hamilton Powder Co. or the Ontario Powder Co. His steel will cost him 10½ cents per lb., striking hammer 12 cents per lb.; Bellows, 28-inch, \$9.00; bellows, 24-inch, \$5.50; anvil, \$5; shovel, \$1.25. It is almost unnecessary, however, for the prospector to carry dynamite, because no matter where he may be in this district, it is almost always merely a short canoe trip to some point where powder can be obtained.

The openness and adaptability of this country for prospecting can only be fully realized by those who in other districts have had to pack their stuff mile after mile through rough country, where the undergrowth tears the packs off their backs rather than let them through. Here in this district the Lake of the Woods and the adjacent bodies of water have such a number of arms extending into land that the prospector can always make camp on the lake shore and avoid the heavy packing so universal in other districts.

Moreover, if not satisfied with the Lake of the Woods as an arena for his activities, he can paddle into Shoal Lake, from there into Indian Bay, up the Falcon River into Falcon Lake, portage from Falcon Lake into either High Lake, Little High Lake or by means of two small lakes into West Hawk. From West Hawk Lake he can portage into Star Lake or Cross Lake to the westward, or Long Pine Lake to the east. From Long Pine a half mile portage takes him to Macara Lake, heading north, and from the eastern end of Long Pine he can portage to Harvey Lake. A creek connects Harvey Lake with Whitefish; a portage, and two small lakes and a creek connect Whitefish to Malachi Lake. To the east of Malachi we come to Duck Lake; after traversing this lake we portage into Pelican Pouch, where there is the division point of the two routes returning to Kenora, one striking the Winnipeg River, after traversing Lakes Catherine and Culloden, which has two terribly long portages; the other reaches Keewatin two miles from Kenora, after traversing Pickerel, Greenwater, Rosina, Bell, Lulu and Middle Lakes. At Keewatin a 200-yard portage places the pros-

pector once more on the Lake of the Woods, where he can paddle into Kenora after a round trip of 150 miles, where his longest portage has been two miles, but the greater number of his portages have been under a quarter of a mile. With regard to the prospecting already done in this district, I may say that hardly any prospecting at all has been done on this Falcon River route, with the exception of Star Lake, whose western shores have been fairly well gone over; in fact, this district has received but scant attention from the prospector, in spite of the remarkably good showing of those few claims which have been located in this West Hawk area.

BRITISH COLUMBIA.

Roseland.—Ore shipments from this camp during the past couple of weeks have been averaging about 5,500 tons per week. The shipments from the Le Roi 2, Ltd., are running in the neighbourhood of 450 tons of \$23 ore per week, and particular interest attaches at this time to the shipments from the Le Roi mine, which are said to be of a grade of ore that will average \$60 and over per ton in gold. The Le Roi for the week ending October 30th shipped 735 tons of this class of ore. At present the product of the Le Roi mine is being treated at the Consolidated smelter at Trail, B.C., the tonnage not being great enough to warrant the resumption of work at the company's own smelter at Northport. It is generally understood, however, that if the new finds of ore in the portions of the Le Roi mine now undergoing development prove on further investigation to be extensive and sufficiently rich, then the company will start up the Northport smelter. By the time this came about there is no doubt that the Velvet-Portland lessees would be in a position to send a steady tonnage to the Northport smelter, to say nothing of several Washington copper mines that would be glad to contribute custom ores. One of the diamond drills has been taken from the depths of the Le Roi, as a number of minor strikes have been made that the management feel should be drifted on before anything else is done. More machine drills have been added to the working force, and the other two diamond drills are running steadily.

With the advent of cold weather the hopes of the lessees of the smaller mines around this district have fallen somewhat, and work has been discontinued in the South Belt. The Blue Bird Mining Co. has not followed out its intention of doing development work to depth on the rich ledge recently opened up on its property. It is to be hoped that this enterprise will not be dropped, for upon development work in the lower levels depends the future of the South Belt, where several rich surface veins have been worked in a small way for years. The opinion has been expressed by several eminent engineers that good mines will be found some day in this debatable district.

The Boundary.—The ore shipments from this district lately have been record-breakers in the history of the Boundary copper section, and indicate the marked progress that has been made in the copper mining situation here during the past eighteen months, despite the many disadvantages that the local companies have had to contend with, such as the low price of copper, strikes in the coal fields, car shortages, etc. For the week ending October 23, the Granby Phoenix mines shipped 27,573 tons, the heaviest shipments in the history of the mines, and exceeding the February high-record mark of this year by over 2,000 tons. During the week ending October 30th the Mother Lode mine of the B. C. Copper Co. shipped 11,572 tons, making a new high record. The Oro Denoro mine of the same company has been shipping as high as 1,200 tons per week, and shipments from the Snowshoe property, controlled by the Consolidated, have crept up to the 5,050 mark. Seven of the enlarged furnaces are working at the Grand Forks smelter, treating nearly 26,500 tons of Granby ore per week. At this rate of treatment, if it is maintained, it looks as though the prophesy of the Granby management, that they would make copper this year at

a figure lower than 10c per lb., would be fulfilled at the end of the current fiscal year.

It will be remembered that when the Dominion Copper property was first offered for sale that the Granby, B. C. Copper and Consolidated Companies considered acquiring it, and rumour had it that a figure of over \$300,000 had been offered for the property, but was refused. At the sheriff's sale in Vancouver the property was sold for \$261,500. There were no bidders outside of the New York men who had a representative present. Why no other bids? Probably we can guess. There may have been a master mind behind the whole affair. By a little aerial mining legerdemain the old shareholders were shaken off. The new concern was organized, and now the B. C. Copper practically acquires control of that property by securing 132,000 of the 250,000 shares of stock, paying for it with about 80,000 shares of its own stock and the balance cash. That's surely cheaper than \$300,000! Again, a prominent New York copper capitalist secures a seat on the directorate of the B. C. Copper Co. He practically controls New Dominion Copper. Then two of the B. C. Copper officers secure seats on the Board of the Dominion Co. It is announced, also, that one of the big copper syndicates in New York is interested in both B. C. Copper and New Dominion Copper. When prices were low these men bought heavily of B. C. Copper. It is still being picked off the local market, and there is little or no New Dominion Copper offered. It looks as though the New York syndicate saw a chance to get a couple

of good low-grade copper properties at a bargain by a little skillful work—and got them. We take off our hat to the master mind behind, and watch the chessmen to see what next move the hand from the cloud will make.

At the present time the three furnaces of the B. C. Copper Co. are working full force smelting nearly 2,000 tons of Mother Lode and Oro Denoro ore per day. The smelting facilities at the Greenwood smelter will be enlarged, however, before long. This will be necessitated by an arrangement to treat ore from the New Dominion mines and by shipments from mines of the B. C. Copper Co. that will be opened up by the new spur or branch of the Canadian Pacific from Hartford Junction to Wellington camp, where this company owns the Jackpot group, and has a good tonnage of ore awaiting shipment. The president of the B. C. Copper Co. states that with the increased amount of ore treated, and with the added smelter facilities the company can make copper for less than nine cents per pound. While this may be necessary, in order to make any kind of a profit on Dominion ore we would point out that the Granby Co., which has every facility, and is at present treating close to 4,000 tons per day, were only able to cut their cost to 10c for the year ending June 30th, 1909, and which was only .0024 lower than for the previous year. The Granby ought to reduce their 10c cost this year, however, and no doubt will do so unless some labour or fuel trouble interferes. This cost figure covers mining, smelting, converting and marketing, with gold and silver deducted.

GENERAL MINING NEWS.

NOVA SCOTIA.

Halifax.—The conspiracy case, arising out of charges brought by the U. M. W. A. against Nova Scotia coal operators, particularly the Dominion Coal Co., has been postponed to November 30th.

Sydney.—In order to meet the demands for raw material which the enlargement of their plant now in progress will entail, the Dominion Steel Co. has decided to place an order in England for two 10,000-ton steamers for delivery about a year hence. The new steamers will be specially designed for carrying ore from Wabana mines to the plant at Sydney.

ONTARIO.

Ottawa.—The appropriation for the fiscal year 1910-11 for the Geological Survey are as follows: For explorations and surveys, \$140,000; for publication of reports, maps, etc., \$75,000; for purchase of books, instruments, laboratory apparatus, etc., \$40,000; to pay for specimens for Victoria Museum, \$10,000; for temporary, technical, and clerical assistance, \$2,000. The total is \$267,000, an increase of \$27,000 over 1909-10. The Mines Branch appropriation is \$79,500, which is \$2,000 less than the appropriation for the current year.

ALBERTA.

Frank, Alta., Nov. 10.—With the ratification in Frank of the reorganization of the Canadian-American Coal & Coke Company, what is probably the most important deal in relation to coal mining in Western Canada will have been consummated, as it will bring into the coal industry of this country the most eminent coal mining man of France as well as a number of other French financiers of almost equal prominence and importance.

The head of the new concern will be M. Maurice Tilloy, of Paris, President of the d'Ostercourt mines of France, Director in the Mines de Lens of France, and member of what is known

as the Collieries Committee of France, which formulates the laws providing regulations for coal mines in that country.

Associated with M. Tilloy as officers and directors of the new company will be: First Vice President, O. L. Liegeart, President of the old Canadian-American company; Second Vice-President, Baron de Bellicize, Director of the Schwitz Bank of Paris; Treasurer, General G. C. Avon; additional Directors, Felix Colomer, Consulting Engineer of the old company; Jacques Bernard, Director of the Sultanats of Haut-Oubanghi, a French syndicate trading in Africa, also Director of the Franco-Nerlandais of Culture and Trade, a bank of Paris; Leon Clerc, Director of one of the largest oceanic transportation companies of France, with headquarters at Havre, and S. W. Gebo, one of the founders of the Canadian-American company, who will be managing director.

With the final consummation of the reorganization the old Canadian-American Company passes out of existence even as to name, as the new company is known as the Canadian Consolidated Coal Company. The capital is reduced by \$500,000, the old company having being capitalized at \$2,500,000, while the capital stock of the reorganized company is approximately \$2,000,000. The company is being incorporated in England, with head offices in London, and is capitalized at 400,000 pounds, with 80,000 shares at par value of 5 pounds each.

In the allotment of stock under the reorganization the shareholders of the Canadian-American Company receive one share of the new stock for 10 shares of the old, leaving 30,000 shares of treasury stock, or \$75,000 subscribed and paid in, to be devoted to the improvement and further development of the company's property here. Of this \$750,000 cash now in the treasury, \$180,000 is to be devoted to new work, \$140,000 to liquidation of the outstanding liabilities of the old company and \$220,000 to reimbursements of the bonds of the old company leaving a working capital of 7,210,000.

The reorganization has already taken place and only awaits

formal ratification by the shareholders of the Canadian-American Company. This will occur at the stockholders' meeting to be held in Frank Monday, when virtually the whole of the stock of the old company will be voted in approval of the new deal.

Alfred Muller, general manager of the Canadian-American Company, and who was appointed liquidator of the concern, will be the general manager of the reorganized company.

One item in the new work planned is the building of a battery of 200 coke ovens. They will be of the new Belgian type of oven, except as to four which will be the Solvay-Copie by-product ovens, from which will be obtained tar for the manufacture of briquettes, and the gas from which will be used under the boilers of the power plant.

Another will be the erection of a new steel tippie at the present shaft with a handling capacity of 2000 tons in eight hours, and over which the entire output from the various openings will be handled. The tippie will have a modern screen rig and only the various grades of screened coal will go to the market, while the slack will go direct to the coke ovens, which will have a capacity of 500 tons of coke a day.

Another item will be the installation of an electric plant to supply power for operating the old mine, the new tippie and the company's sawmill, while another will be the building of a \$60,000 sanatorium building at the sulphur springs owned by the company at the western limits of the village.

The foundation for a 100 foot extension to the power house are now in progress for the accommodation of additional boilers, the electric plant and compressed air plant. The foundations are practically completed and will be ready for the installation of two boilers of 250 horsepower each, which are expected to arrive by December 1. The air compressor and a 500 kilowatt generator are expected to follow within a few weeks and will be installed the first of the year. The other improvements determined upon will be proceeded with at the opening of the spring.

In connection with the plans for further development of the coal measures, as soon as the compressed air plant is ready for service, the sinking of a slope on the old working seam will be started, and from this two large seams, one to the East and one to the west of the present working seam, will be opened. Later in the year, according to the plans, the sinking of a new shaft will be started and a new system of haulage installed, probably that of gasoline engines.

It is the expectation of General Manager Muller that by the expiration of 1910 the company will be in the market with an output of anywhere from 1500 to 2000 tons of coal and 500 tons of coke a day.

BRITISH COLUMBIA.

Greenwood, B.C.—Work on the coal property west of Midway, owned by the Boundary Mining Company, has been going on interruptedly since September 1 with very gratifying results. Some surface work has been done prior to that date and a number of showings were located. A shaft was then sunk to a depth of sixteen feet, cutting through the coal seam, which was about five feet in thickness at that point, to a sandstone bedrock. From this point the seam was followed for sixty-five feet. This shaft was intended for prospecting only, and proved the continuance of the seam to depth between clean and well defined walls.

At the present time work is being done on a tunnel from the flat below the bluff where the shaft was sunk. The tunnel will crosscut the coal seam at a depth approximating 150 feet and will open an enormous area from which coal may be taken by drifting. The mouth of the tunnel is about thirty-five feet above the level of the Canadian Pacific tracks, so that the handling and shipping of the product may be done over a gravity tramway.

The company has secured options on over 1,000 acres of land in the vicinity where the surface indications and the formations point to the presence of coal. It has also staked three square miles to the west of its present holdings, on which it will secure a lease from the government. Arrangements are now being made to secure a drilling outfit to prospect this extensive area. The location of the present workings is on land owned by the company, comprising 500 acres and including some very valuable ground along the Kettle River.

In addition to the coal activity in this locality, it is learned that the Ingraham Creek timber limits are to start immediately upon the erection of a mill, which they expect to have in operation before summer. They have taken an option on ten acres of land owned by the Boundary Mining and Exploration Company, which they propose to use as a site.

Vancouver—Reports from the Portland Canal Mine state that the ore cut by No. 3 tunnel shows up well in native silver.

MINING NEWS OF THE WORLD.

ONTARIO.

Cobalt.—The following extracts from a letter issued by President Carson, of the Crown Reserve, are of interest:—

Mr. Cohen, our manager, has not sold out his holdings in Crown Reserve to myself nor to anyone else, but has still a very substantial holding of stock in our company.

Work has not been stopped on the main or Carson vein, but is progressing as usual.

Our shipments have not fallen off. We have during the whole of this year shipped two cars of high-grade ore per month, and from seven to ten cars of low-grade ore per month. Our shipments so far this month consist of one car of high-grade ore, one shipment of bullion, and four cars of low-grade ore.

The main vein over the 100-foot level is not half stoped out, nor is the one at the 200-foot level of very inferior grade. Our values keep very rich at the 200-foot level, and we are quite satisfied with the prospects of our property.

The statement that we have not been able to find any bonanza deposits emanating from the Kerr Lake property may or may not be true, but one fact is true, namely, that we have

cut vein No. 15 assaying 4,031 ounces, vein No. 16 assaying 4,396 ounces, vein No. 17 assaying 4,336 ounces, vein No. 18 assaying 8,528 ounces, vein No. 21 assaying 2,225 ounces, and vein No. 24 assaying 6,480 ounces, the whole in our cross-cut to the north of the Kerr Lake line.

We have \$7,000,000 worth of ore blocked out on our main vein down to the 200-foot level. We also know that we have ore in vein No. 14 assaying 12,895 ounces, and in the six veins named in paragraph five a very large asset in addition to our main vein.

We have never been bothered in any shape or form with water in our mine; in no place are our workings in the slightest danger, and our main ore body can be extracted absolutely to its roof, for the very simple and satisfying fact that nearly the whole of it is in absolutely dry land.

Finally I would say that the directors of the Crown Reserve Company have never used their property or holdings for stock jobbing purposes. Our mine has been run honestly in the interests of our shareholders. We are one of the few mines in Cobalt who issue a quarterly statement of our workings to our

shareholders, and these statements are also accompanied by maps showing our surface and underground workings. We have in charge of our property an able and capable engineer, who has the full confidence of such an eminent and disinterested expert as the gentleman who has not sufficient confidence in himself to write his article over his own name, but who hides himself under the name of the celebrated mining town of Cobalt.

UNITED STATES.

California.

A suit is pending in the oil districts of Kern County. The point to be decided is whether the filing of a mineral claim on oil land does or does not give the locator any preference right to possession in advance of the actual discovery of oil. If the decision is in the negative, the ground will be open for all to explore, priority of discovery being the only advantage.

Utah.

The Denver & Rio Grande Railway has acquired much new equipment, including eight new Mallet compound locomotives, to handle the increased output of ore from Bingham.

Montana.

Butte Coalition has declared its first dividend since December, 1907. At that date a dividend of 15 cents per share was paid. The present dividend is at the rate of 25 cents per share.

GREAT BRITAIN.

It is reported that the Buenos Ayres and Rosario Railways have placed orders for 200,000 tons of large coal with the Standard and Lewis Merthyr Coal Companies for delivery over the whole of next year at 15s 10½d per ton f.o.b., or about 2s per ton above the figures paid last year. It is also stated that one of the largest Admiralty coal collieries has just concluded negotiations for the supply of half a million tons of large coals at a price slightly under 16s 9d f.o.b. The figures obtained in all cases are considered decidedly good.

The workmen's side of the Welsh Coal Conciliation Board on November 1st formally notified the owners' side of a demand for an advance of 2½ per cent. in the wages of the miners in the Associated Collieries as from 1st December next. Wages now stand at 47½ per cent. above the standard rates of December, 1879. The statutory meeting of the Conciliation Board to consider this application will be held on Wednesday, 10th November.

The Middlesbrough Customs return of iron and steel shipments from the Tees ports during October shows the best month's trade this year owing to the demand from America for Cleveland pig-iron. The total shipments of pig-iron were 115,900 tons, exclusive of about 12,000 tons from the Cleveland port of Skinningrove, and 19,780 tons went to the United States and 9,019 tons to Canada. The inquiries in the market on American account give promise of increasing trade across the Atlantic. The other best over-sea customers for pig-iron were: Germany, 12,009 tons; Italy, 10,851 tons; Sweden, 7,973 tons, and Japan, 5,397 tons.

The exports of manufactured iron and steel, mainly railway material, galvanized sheets and joists, were: Manufactured iron, 9,589 tons, and steel, 43,464 tons. Argentina took 7,183 tons, Canada 3,459 tons, Cape Colony 7,938 tons, Natal 2,733 tons, Portuguese East Africa 1,562 tons, South Nigeria 1,731 tons, Egypt 419 tons, India, 7,100 tons, Japan, 1,764 tons, New South Wales 1,017 tons, South Australia 2,760 tons, Victoria 773 tons.

MEXICO.

An option on the Santa Gertrudis silver mine, Pachuca, has been obtained by the Camp Bird Company. The Santa Gertrudis has two reduction plants. At one the Boss system of amalgamation is installed; at the other the Patio process. The

ore carries 5 grammes gold and about 60 ounces silver. About \$8,000,000 worth of ore is in sight.

SOUTH AFRICA.

Johannesburg.—The annual meeting of the Johannesburg Consolidated Investment Company was held on November 2nd, Mr. Charles Marx being in the chair. The net profit on the year's operations after allowing for depreciation and writings-off is £478,000. The amount carried forward after deduction of the 10 per cent. dividend already declared and paid is £162,000, including £79,000 brought forward from the last account. The balance-sheet reflects assets of £5,464,000 and liabilities to the public £707,000, the surplus of assets being \$4,757,000, of which £1,639,000 is regarded as liquid. The aggregate market value of the shareholdings is estimated at the date of the meeting to be £1,500,000 in excess of the book value. The Municipal Council valuation of the real estate exceeds the book value by £500,000. The aggregate value of the gold won during the financial year by the producing mines of the group was £2,274,000, and of the dividends distributed £680,000. The average working costs show a further reduction, which would have been greater but for the shortage in native labour, an improvement in which is expected. Good results are anticipated from the company's large interests in the Consolidated Langlaagte Mines, Ltd., the Randfontein Deep, Ltd., and the Van Ryn Deep, Ltd., the finances of which mines have now been placed on a satisfactory footing. The position of the Johannesburg Consolidated Investment Company, Ltd., is regarded as exceptionally strong, and the statement as the best ever presented to the shareholders. The maintenance of regular dividends is anticipated.

Sympathetic reference was made by the chairman to the impending unification of South Africa, which was confidently expected to further general prosperity.

The report and accounts were unanimously adopted, and a special general meeting approved and adopted the amended articles of association as submitted.

Johannesburg.—Mr. C. Waldie Pearson, chairman of the Western Rand Estates, presiding at the annual meeting, severely criticised the authorities for refusing to make retrospective the clauses under the new Gold Law relative to the allocation of discoverers' rights as a reward for exploration by boring operations. Investigation of the position, however, goes to show that the company has been generously treated and has secured 2,540 mynpacht claims.

It is understood that two tenders have been received by the Government for leasing the two claim areas on the farm Modderfontein recently offered by the Government. One is stated to be on behalf of a syndicate of London capitalists in which the Consolidated Mines Selection Company is reported to be interested. The Government's decision on the offers is expected in about a fortnight.

The recent developments in the Village Deep on the main reef leader at the 18th level show a value of 23 dwts. over 45 inches.

Several quarterly reports are now available. The City Deep shows a development of 291,284 tons, averaging 8 dwts. The Bantjes Consolidated's payable development gives 86,005 tons, averaging 9½ dwts. The subsidiaries of the Consolidated Gold Fields, Ltd., show a depletion of 340,000 tons in their reserve owing to scarcity of native labour available for development purposes.

NEW ZEALAND.

Wellington.—The output of gold in New Zealand during the month of October amounted to 49,906 ozs. valued at £198,366, as compared with 31,026 ozs. valued at £124,015, for the corresponding month of last year.

The output of silver during October was 153,167 ozs., valued at £15,281, as compared with 131,343 ozs., valued at £13,204, during October, 1908.

AUSTRALIA.

Sydney.—A general strike of waterside union workers is threatened in sympathy with the strike of the Federated Coal and Shale Workers of Australia. Many of the collieries have been closed. It is doubtful if the men can finance the strike.

Sydney.—The gold yield of New South Wales during October amounted to 25,212 ozs., valued at £94,210, as compared with 24,788 ozs., valued at £93,272, during October, 1908. The yield for the ten months was 201,870 ozs., valued at £735,285.

Perth.—Following is the wording of cable announcing to the Great Boulder Perseverance Gold Mining Company the destruction of its plant:—

“At 1.30 fire started in main engine room. Following items destroyed: Air compressor building, engine room, Griffin Mills building and ore bins. Partially destroyed: Boiler house, dynamo house, buildings containing furnaces. Believe that fire is under control. Telegraphing to you later.”

The secretary states that the mine is fully insured.

Perth, W.A., Nov. 10.—Fire is raging in the surface workings of the Great Boulder Perseverance mine. The damage is estimated at £300,000. The adjacent mines have suspended operations and are concentrating their water supply on the fire.

Later.—It is now believed that the damage done by the fire at the Great Boulder Perseverance mine will not amount to more than £50,000.

Sydney, Nov. 10.—The men at four southern collieries have struck. Coal is selling at 50s a ton and the price of firewood has advanced 50 per cent. The proprietors declare that they will not confer with the men’s representatives under threat.

Thousands of men have been rendered idle in other industries. The northern strikers have decided to picket the mines and thus to prevent repairs or baling. Great damage will be done as the result.

The P. & O. Steamship Company is prepared to import large supplies of coal from Japan.

The men at three additional southern mines have struck, and work is now going on at only three southern mines.

The Broken Hill miners have voted £\$1,000 to the strike fund and recommend a levy of 3s 6d per member weekly.

Sydney, Nov. 10.—Replying to a question in the Legislative Assembly to-day, Mr. Wade, the Prime Minister, said that the Government regretted the miners’ strike, which would involve countless people in Australia, unless threatened developments were modified. The Government was greatly impressed with the gravity of the situation and alive to its obligations. The question was, could a method be devised by which the parties concerned could in the public and their own interests adjust the grievances, existing or alleged, by giving time for the employment of peaceful methods? He did not suppose that the Industrial Disputes Act was lifeless. In view of a possible immediate conference, it would be unwise to set the criminal law in motion, but if a determination to force war upon the community were manifested, the Government would without hesitation do its legal duty. The Prime Minister proceeded to appeal to the northern and southern colliers to retrace their steps, and to the western miners not to jeopardize the prospects of the expected award by the Wages Board upon their claims. He urged the waterside labourers not to break existing agreements, and reminded all that the power of outraged public opinion was greater even than that of Parliament. When the public came to realize that they had been victimized and made to suffer for unsubstantial grievances which could be redressed peacefully they would rise in their power and majesty and insist that public interests stood above all others. The strike, he continued, might paralyze the whole of the transport service of the Commonwealth, including the carriage of the wool and wheat harvests, and prevent food supplies—even milk for the children—from reaching the people. In conclusion, Mr. Wade appealed to the public to exercise patience and have confidence in the Government, which would perform its duty, being determined to favour no section, but to vindicate the people’s rights.

Mr. McGowan declared that the Labour Party was in full accord with the Government’s decision to allow the parties to confer together.

Melbourne, Nov. 10.—Owing to the coal strike, the interstate shipping companies have substantially increased their freight charges and fares, and are considering the question of laying up many of their passenger steamers at an early date.

STATISTICS AND RETURNS

The Nova Scotia Steel Company’s output of coal during 1909 will be about 800,000 tons, while ore will total about 450,000 tons. President Harris states that the company has made contracts for the sale of ore in 1910 to the extent of about 300,000 tons. He states that the submarine areas are being steadily worked, and that the “faults” encountered have not been serious.

COBALT ORE SHIPMENTS.

The following are the shipments from the Cobalt camp for the week ending November 19th, and those from January 1st, 1909, to date:—

	Nov. 19 Ore in lbs.	Since Jan. 1. Ore in lbs.
Buffalo	52,193	998,891
Carnegie	63,410
Chambers-Ferland	961,010
City of Cobalt	100,122
Cobalt Lake	141,340
Cobalt Central	731,327

Coniagas	84,905	1,441,420
Crown Reserve	185,605	5,418,209
Drummond	70,000	1,452,100
Foster .....	.....	187,800
Hudson Bay .....	.....	1,166,485
Kerr Lake	120,160	2,186,651
King Edward	49,282	233,022
La Rose	185,641	12,168,270
McKinley-Dar.	106,926	1,936,632
Nipissing	132,595	11,406,421
North Cobalt .....	.....	40,000
Nova Scotia .....	.....	480,810
Nancy Helen .....	.....	124,700
Peterson Lake .....	.....	324,040
O’Brien .....	.....	2,599,160
Right of Way	61,503	2,726,090
Silver Queen .....	.....	684,844
Silver Cliff .....	.....	241,820
Stewart, H. J. ....	.....	62,392
Timiskaming	60,000	1,746,060
Tretheway .....	.....	1,818,323

Ore shipments to Nov. 19 from Jan. 1, are 52,441,349 pounds, or 26,220 tons. Total shipments for week ending Nov. 19 are 1,109,530 pounds, or 554 tons.

SOUTHEASTERN B.C.

Ore shipments and Smelter Receipts for Week ending Nov. 6th.

Nelson.—Appended are the ore shipments and smelter receipts in detail of Southeastern British Columbia for the week ending November 6th:

ORE SHIPMENTS.

Boundary—	Week.	Year.
Granby	25,775	857,947
Snowshoe	5,700	128,955
Motherlode	11,264	255,910
Oro Denoro	750	5,963
Other mines		664
Total	43,489	1,249,439
Rossland—		
Centre Star	3,313	150,850
Le Roi No. 2.....	532	26,381
Le Roi No. 2 (milled)	260	11,280
Le Roi	445	10,382
Other mines		260
Total	4,560	199,153
Slocan-Kootenay—		
Queen (milled)	420	18,270
Granite Poorman (milled).....	250	10,850
Whitewater Deep	700	30,600
Kootenay Belle	70	3,050
Second Relief	145	6,310
Nuggett	110	4,790
Bluebell	900	39,200
Silver King	163	2,814
St. Eugene	167	18,062
Queen	30	554
Granite-Poorman	28	283
Yankee Girl	35	2,308
Van Roi	20	799
North Star	172	2,334
Whitewater	59	1,323
Enterprise	20	28
Cork	22	427
Ruth	120	978
Other mines		18,501
Total	3,431	161,481

The total shipments for the week were 51,480 tons, and for the year up to date 1,610,073 tons.

B.C. ORE SHIPMENTS.

Following is the tonnage of ore shipped from the mines of Rossland for the week ending November 13th, and for the year to date:—

Mine.	Week.	Year.
Centre Star.....	3,500	150,705
Le Roi Two	525	21,090
Le Roi	35	8,345
Hattie Brown		14
Blue Bird		40
O.K.		13
I.X.L.		14
Totals	4,060	180,221

SMELTER RECEIPTS.

Granby, Grand Forks	25,765	858,397
Consolidated, Trail	10,846	353,505
B. C. Copper Co., Greenwood.....	12,014	261,873
Le Roi, Northport		12,761
Total	48,625	1,486,536

TORONTO MARKETS.

Metals.

Nov. 25—(Quotations from Canada Metal Co., Toronto.)

Spelter, 6 1-2 cents per lb.
 Lead, 3.75 cents per lb.
 Antimony, 8 1-2 to 9 1-2 cents per lb.
 Tin, 32 1-2 cents per lb. (very active).
 Copper, casting, 14 cents per lb.
 Electrolytic, 14 cents per lb.
 Ingot Brass, 9 to 12 cents per lb.
 Lake Copper, 14.50 (copper market very active).

Nov. 25—Pig Iron—(Quotations from Drummond, McCall Co.)

Summerlee, No. 1, \$24.00 (f.o.b. Toronto).
 Summerlee, No. 2, \$23.50 (f.o.b. Toronto).
 Midland, No. 1, \$21.00 (f.o.b. furnace).
 Coal Anthracite, \$5.50 to \$6.75.
 Bituminous, \$3.50 to \$4.50 for 1 1-4 inch lump.

Coke.

Nov. 23—Connellsville coke (f.o.b. ovens).

Furnace coke, prompt, \$2.90 per ton.
 Foundry coke, prompt, \$3.00 to \$3.25 per ton.

Nov. 23—Tin (Straits), 31.35 cents.

Copper, prime Lake, 13.75 cents.
 Lead, 4.40 cents.
 Electrolytic copper, 13.50 to 13.62 1-2 cents.
 Copper wire, 15.00 cents.
 Spelter, 6.42 1-2 cents.
 Sheet zinc, 8.50 cents.
 Antimony, Cookson's 8.37 1-2 cents.
 Aluminium, 23 to 24.00 cents.
 Nickel 40.00 to 49.00 cents.
 Platinum, \$29.50 to \$33.25 per oz.
 Bismuth, \$1.75 per lb.
 Quicksilver, \$51.00 to \$52.00 per 75-lb. flask.

SILVER PRICES.

		New York.	London.
		cents.	pence.
Nov.	9	50 $\frac{3}{4}$	23 $\frac{3}{8}$
"	10	50 $\frac{5}{8}$	23 5-16
"	11	50 $\frac{3}{4}$	23 $\frac{3}{8}$
"	12	50 $\frac{3}{4}$	23 $\frac{3}{8}$
"	13	50 $\frac{3}{4}$	23 $\frac{3}{8}$
"	15	50 $\frac{1}{2}$	23 $\frac{1}{4}$
"	16	50 $\frac{5}{8}$	23 5-16
"	17	50 $\frac{3}{4}$	23 $\frac{3}{8}$
"	18	50 $\frac{5}{8}$	23 5-16
"	19	50 $\frac{3}{4}$	23 $\frac{3}{8}$
"	20	50 $\frac{3}{4}$	23 $\frac{3}{8}$
"	22	50 $\frac{3}{4}$	23 $\frac{3}{8}$
"	23	50 $\frac{3}{4}$	23 $\frac{3}{8}$
"	24	50 $\frac{3}{4}$	23 $\frac{3}{8}$

During the month of October the Tye smelter ran 10 days, treating 2,850 tons of ore, producing a total of 279 tons of matte.

During October the Josie mine, Le Roi No. 2, shipped 2,380 tons of ore. Receipts from smelter were \$37,068 for 2,140 tons of ore, and \$2,103 for 75 tons of concentrates.