British Columbian Mining—Rossland District

The traveling correspondent of the Financial Times, of London, Eng., writes the following about well known mines in this province:

An analysis of the 1906 production of Canadian metalliferous mines and deposits, excluding the Yukon, shows that British Columbia and Ontario were responsible, as hitherto for almost the entire yield. Both provinces recorded a substantial advance beyond the outputs for the preceeding year, owing principally to the contribution from Cobalt in the case of the eastern division, whilst the British Columbia increase reflected the greater productiveness of the Boundary copper district, associated with the exceptional prices ruling for its metals.

Owing to the lack of uniformity (particularly deplorable in these days of standardisation) in the statistical methods of the Geological Survey and Ontario Bureau of Mines, it is yet impossible to give fair comparisons between the two provinces, or to show the relation of their joint yield to the production of the Dominion. Taking the official figures of the provinces and the Dominion for 1906, metallic yields:

(Excluding Yukon)	1905.	1906.
British Columbia..	$16,149,464	$19,579,875
Ontario	10,201,010	13,179,162
	$26,350,474	$32,759,037
Canada	$28,823,630	$37,380,000

These figures only provide a fair basis for comparison of year with year, not division with division. The different systems of computation allow, in nickel alone, a discrepancy of about $5,000,000 in the valuation of the two departments. The Dominion bases its estimate on the value of the nickel as refined metal, although final metallurgical operations may be performed in U. S. A. or Wales; the Ontario Bureau more conservatively takes credit for the selling price of the products in the province.

Upon examining the British Columbian aggregate of $19,579,875; for last year (half the Dominion total) we find that about 70 per cent of the yield is attributable to the operations of six companies, namely: Le Roi (Rossland), Le Roi No. 2, (Rossland), Consolidated Mining and Smelting company of Canada (Rossland, Boundary, and Moyie), Granby Consolidated (Boundary), British Columbia Copper Company (Boundary). With its position and prospects of these premier concerns, upon whose future achievements the extent of British Columbia mining expansion materially depends, the following reports will almost exclusively deal. In other districts the most significant development today appears upon the coast, where the Britannia Copper Syndicate, a subsidiary of the Howe Sound Mining Company, of New York, is quietly preparing to deal with some 500 tons per day from its enormous low grade copper deposit situated 3,000 feet above Howe sound, north of Vancouver. A recent geological survey report confirms previous statements as to the vast bulk of the mineralized zone. The writer was permitted to visit the property and found the management completing the radical reconstruction of the formerly too hastily erected concentration plant. Owing to past metallurgical blunders little has been said of current progress. When the mine is regularly shipping to the Smelting works at Crofton, Vancouver island, (also controlled by the Howe Sound Company), and mechanical difficulties finally overcome, the directors will not improbably make a market for the stock. During the present stage of transition, in which reflects no particular glory upon their undertakings, they appear to consider a discreet reticence to be the wisest policy. Suffice it to note, from the technical standpoint, that the new equipment is designed upon the soundest principles to obviate former losses in slime following too great a dependence upon a large table and vanner plant by the introduction of more rational stage crushing and jigging. It is impossible to estimate exact values for a wide zone of the character held by the Britannia, and to some extent the grade will be regulated by extraneous circumstances. A yield of between 2 and 3 per cent copper, however, with small gold and silver values may be suggested.

Rossland Outlook

After many years of trouble and disappointment Rossland mining camp can now claim to have reached a stage in its existence promising to be marked by profits and dividends more reasonably commensurate with the metal yields and funds invested. This is assuredly not the first time that it has appeared reasonable to express similarly hopeful anticipations; the outlook has frequently in the past seemed as promising only to be shadowed by some new affliction. Labor troubles, mismanagement, administrative storms, more labor troubles—these have been the normal sequence of adversities through which the camp has been carried solely by the intrinsic value of its resources. At the present day there is nothing in the outlook calculated to fill one with enthusiasm. For the history of the field, so commonly repeating itself, with a record of a mere three million dollars in dividends out of a yield of 38 millions, would hold within bounds any save the most optimistic spirit. It must be recognized, however, that the situation is sounder than it has appeared for many years. Labor troubles at the Crow's Nest Collieries, upon which all the properties in this part of the province are dependent for the means of shipment to the smelters and of keeping the furnaces in blast have been settled for at least two years. There is an occasional shortage of miners at the camp itself, but, generally speaking the position is satisfactory. The last has been heard, it is to be hoped, of the financial disturbances affecting the treatment of the Le Roi product. In the mines deep level developments hve on the whole been good, whilst the amalgamation of the Centre Star, War Eagle, and Iron Mask has been followed by a scheme of underground combination and surface re-equipment (now completed), enabling a tonnage of 500 tons a day to be so economically handled through the shingle shaft.

In spite of the frequence of the disturbing influences, the annual yields of Rossland during the past eight years, have fluctuated within no wider limits than $3,200,000 and $4,650,000, whilst the 1899 declaration was practically the same as that for the past year of chequered operation. Smelting costs have been greatly reduced, with the obvious result that the unpayable ore of former years can be profitable exploited today. The circumstances will only be fully appreciated when work can be steadily undertaken. Returns for the past five years have been:

	Tons Shipped.	Value	Per Ton
1902	329,539	$4,274,352	$14.85
1903	360,786	4,255,958	11.80
1904	312,991	3,760,866	12.01
1905	330,618	3,672,828	11.10
1906	277,360	3,329,300	12.00

(The valuable contents today include about $8 or $9 in gold, the rest in copper and a little silver.)

From the first substantial shipment of ore to Trail in 1893 up to the end of May, 1907, the Rossland group has won $38,000,000 from about two and three-quarter million tons of ore, including the following:

	Tons (approximate)
Le Roi	1,405,000
Centre Star and War Eagle ..	958,000
Le Roi No. 2.	282,000

Other substantial contributors, though comparatively unimportant, have been the Jumbo, Iron Mask, Rossland-Kootenay, Rossland Great Western, White Bear and Splitzee.

The combination of favorable factors today characterizing the industrial outlook and the long series of misfortunes in the past assign greater interest to a discussion of prospective achievements than a review of previous showings, in which the profit aspect has proved so lamentably deficient. This glance at the future brings the investigator abruptly to the question of ore reserves and values, which is one, in Rossland, most difficult to determine, for the two reasons that the ore bodies of the camp are essentially irregular and ill-defined in their extent and limitations, and that, owing to the repeated falsity of former estimates, managers refuse to commit themselves to close statements. Rossland mines could never be submitted to valuation formulae based on actual profits in sight. The element of speculation appears to be keenly developed when such nice methods of reserve estimation are attempted. In their cursory annual report, the Consolidated Mining and Smelting Company did however, essay a few round number estimates—probably too safe to be of much significance. The Le Roi superintendent in the last statement, spoke of having "doubled" the reserve, whilst the Le Roi Two could only express the hope that features of greater regularity might some day make estimates "possible." This uniform cautiousness, reflecting the precariousness of mineral conditions and the creditable desire of those in control to avoid misrepresentation to any degree is unquestionably a discreet policy. But it is not one calculated to satisfy that embodiment of troublesome curiosity—the shareholder—who may hope, especially in regard to a fully-fledged gold field like Rossland, to form some idea of the prospective value of his holdings and of the extent to which the risks are reduced by proved resources. The irregularities of ore deposition and methods of exploitation (winzes are rarely carried between level and level) make it almost impossible, however, to advance confident predictions. Bodies will widen or pinch out between two levels and frequently it is hard to define any commercial wall. Good bodies of ore may be hidden behind an apparently clean wall, and in addition a multitude of dykes and faults add to the element of hazard. It is only safe to note that development is kept amply ahead of stope reserves, although deep level exploration has lately been checked for various reasons. The greatest depths attained in shaft or winze and the levels from which most ore is being taken are:

	Greatest Depth.	Bottom Stoping Depth.
Le Roi	1,750 ft.	1,050 ft.
Centre Star	1,980 ft.	1,500 ft.
Le Roi No. 2	830 ft.	500 ft.

The famous Le Roi is now regaining a state of normal equilibrium after the disturbing influences of the 1905 directorial rupture, which was indicated by a division of the company's ore between two smelters until April last, and the more recent coal miners' strikes of 1906 and the spring of this year. The Newport works, receiving the full output, will now be able to bring their costs to the economic minimum. The outstanding feature of the mine's development of late has been the opening up of the Black Bear claim beyond the great Josie dyke. Although the explorations by the superintendent, Mr. Larson, were only referred to with hopefulness in the annual report of the last financial year the section is now responsible for over half of the company's yield. The shoot has been proved on four levels. Work in the mine's bottom levels and in the main shaft has been temporarily checked by the need of certain retimbering in the shaft. A winze has been carried out to a depth of 1,750 ft., and the main shaft to 1,650 feet. When possible sinking will be continued and connection made between winze and shaft at the 1,650 ft. level. The most productive level today is the 950 ft. The 1,350 ft. level not having revealed values as high as those above, it is the more desirable that work be actively resumed in the sections with all speed. By reason of the erratic distribution of values, 1,350 ft. showings cannot be taken as a reliable guide to changing conditions. The War Eagle is the most abundantly traversed by faults and dykes on any mine on the field, but the Le Roi veins possess greater irregularity apart from the influences of these cross fractures. Working faces are reported to be in a condition to allow of the present rate of production, 400 tons per day, to be maintained without particular strain. The Le Roi is now testing the Spitzee group on the lower slope of the Red Mountain, which may eventually become a subsidiary source of supply of some import. The prospects of this subsidiary venture are little known.

Centre Star and War Eagle

The amalgamation of the Centre Star, War Eagle, Iron Mask, and other properties into the Consolidated Mining and Smelting company of Canada (capital $5,500,000) was a boon to the field, whose benefit is only now about to be experienced. Only by making these three properties into one mine could underground economy be thoroughly instituted and advantage taken of the steady production of a large tonnage. Very recently the Rossland members of this group will be outputting 500 tons per day, after a long run on curtailed tonnages. The Centre Star will continuing operations commenced on the 1,500 ft. level—which is the deepest in regular operation—have appeared eminently satisfactory in their showing. The shoots are such as will allow of at least four stopes to be carried with lower dimensions of 15 by 125 ft., 40 by 90 ft., 20 by 60 ft., and 10 by 95 ft. The 1,650 level development has not revealed similarly good widths and values, but the conditions prevailing along this single plane cannot be considered in an ominous light for reasons previously enumerated. The theory of secondary enrichment somewhere below the 2,000 ft. level—the elevation of the Columbia River—is given favorable support by many mining men of the district, but this pleasant hypothesis can only be advanced on general grounds. Apart from the good results on the 1,500 ft. level, in the Centre Star, the proving of the War Eagle vein below the eigth level, at which the flattening was revealed, down to the 14th level has opened up a valuable new stretch of territory; yet the appearance of the lode is such as to make its future possibilities a matter of great doubt. Even to the Rossland miner, the body seems erratic.

In the last annual report, ore reserves in the Centre Star and War Eagle (above the 8th level) were roughly computed at 154,000 tons. Since then shipment has amounted to a substantial tonnage, averaging 1,600 tons per week for the current half year, but development, at the rate of over 1,000 ft. per month, has brought reserves, I understand, to about 250,000 tons.

Josie Mine

The conservative and cautiously administered Le Roi No. 2 has been making steady progress on normal, uneventful lines. Development, carried on at the rate of 250 ft. per month, has resulted in the exposure of a narrow run of ore, not only promising to be more persistent than any hitherto known in the property, but even exceptional for the field. As explained at the last annual meeting, this gratifying development is upon the Hanscom vein at the 500 ft. level, which has been extended for a distance of 1,500 ft., of which about 900 ft. carries ore. The downward persistence of this long vein is still a problematical matter. Sinking on it has not been adequately performed. On the 700 and 800 ft. levels the search for the dip extension continues to be made, and stringers of ore have been discovered which may or may not be the representatives of the occurrence above. Driving will tell. At present the manager, Mr. Clemens Heyer, will not commit himself to an opinion as to the indication of permanence. Certainly, such a length of ore, narrow though it is, would be remarkable if unassociated with any considerable extent on the dip.

It is to be hoped that the exploration of the long streak proved in the 500 ft. level may result in the exposure of a deposit of such persistence as to set the company the spirit of confidence necessary for the instalment of more efficient plant, and the introduction of systems for the more economical handling of ore and supplies. For though it may not be possible for comparatively high grade properties to emulate its neighbors in the matter of big tonnages, London shareholders, perhaps with the bitter experiences of the Rossland ventures in mind, doubtless prefer to let good alone, rather than risk big capital expenditure benefits Rossland has been living too long in the future already. The time will come, however, when a more vigorous policy in deeper level development will have to be pursued.

General Aspect

The yields of the chief Rossland mines last year, greatly curtailed owing to various interruptions, were as follows:—

	Tons.
Le Roi	126,356
Centre Star	114,500
Le Roi 2 (shipped)	21,600
Le Roi 2 (milled)	10,500
Total	272,956

Very shortly these three mines should again be producing at the rate of at least 250,000 tons per annum, but it is impossible to predict a speedy return to the level of productiveness attained on the field of 1903, when 277,131 tons were shipped for a return of $4,631,280. Properties outside the Red Mountain trio are unlikely to materially affect the position in the near future, although the White Bear is regularly shipping in connection with a steady development policy and the Giant California is again being taken in hand by a powerful control. Probably the Jumbo will also be added to the list of neighboring contributors. In the past it has not been worked with a farsighted policy. There is good money behind the mine, and not improbably good ore in it.

In conclusion, it may be said that the prospects of Rossland are satisfactory today for the reason that it now appears possible for the leading mines to progress, under keen unemotional management, without check from further disturbances and trouble, not because of exceptional developments, not because of radical technical changes or successful innovations, but because its vital requirements—a spell of industrial quietude,—may now be satisfied.

Route of the Railway Line to Hudson Bay—Description of Country

The Dominion government in a report on the navigability of Hudson's straits also publishes a description of the country through which the proposed railway to the bay is planned. The description follows:

The country extending from the Pas to the Lower Saskatchewan to Split lake, where the Nelson river approaches nearest to the little Churchill, was explored last season by Mr. William McInnes of the geological survey. In his very instructive report he divides the country into three areas, the limestone of northern Manitoba, the archaean—a broken and rugged country stretching from the limestone to the "gently rolling, clay covered country" extending "from the valley of the Nelson river on the east to approximately W. Long. 99 degrees, 30, where the general elevation is in the vicinity of 900 feet above the sea." The northern boundary of "the clay basin" was not reached, but the Indians of the Burntwood river region agreed in saying that the Churchill river valley forms is most northerly extension. Mr. McInnes writes:

"The last of the three divisions, is, generally, well suited for cultivation, but throughout the first two the areas suitable for agriculture are of limited extent. No part of the region is prairie, though along some of the valleys, and here and there on the uplands, are found extensive hay marshes, with only occasional small clumps of willows, that, with drainage, would become virtually prairie lands.

"Though a wooded country throughout, there are but limited areas where the forest growth is of a size to be commercially of much value. There are no hard woods, the only diciduous trees that attain merchantable measurement being the canoe birch, the aspen and balsam poplars and the tamarac. Black spruce is the most abundant coniferous tree and grows to a size sufficient at least for pulp wood. Associated with tamarac, it covers all the more marshy tracts, giving way where the land becomes dryer, to white spruce, which is the timber tree of the region, and, on the dryest ridges, to Banksian pine. Forest fires have been widespread and most destructive throughout the whole region sparing only the very wet, muskeg areas and a few tracts isolated by surrounding water or marsh. In some places on the uplands the charred stumps were seen to indicate the passage of two consecutive fires at intervals of about 40 years. Most seem to have been due to carelessness on the part of native travelers, for violent storms with lightning are not of frequent occurrence, and during the whole summer but one trunk was noticed that had been shattered by lightning.

"Quartz veins are plentiful throughout the Keewatin belts, but with the exception of arsenical and iron pyrites and traces of copper, no valuable minerals were found in them, though their character, particularly were exposed on the Grassy river below Reed lake, was considered pomising enough for the occurrence of the minerals that are so often associated with these rocks. Palaeozoic limestones cover all the country between the Saskatchewan and an east and west line cutting the southern ends of Reed and Wekusko lakes. . . . The rocks are, as far as examined, magnesian, and are probably all dolomites. They occur in flat-lying or gently undulating beds, varying in thickness from six feet or more to quite thin and shaly, the latter occurring near the base and the heavy beds forming the mass of the formation. Many of the heavy beds are even grained and uniformly bedded, so that they can be readily taken out in blocks of even thickness and of any required size. Many of the low cliffs near the lakes are so situated as to be admirably adapted for quarrying."

Along the Nelson

As will be seen on reference to the map, Mr. McInnes' route ran from Lake Winnipeg via the Nelson river to Split lake and thence along the Burntwood river and File river and lake to Reed lake, across Wekusko lake to a point between the Grass and Burntwood rivers, back to Reed lake and thence along the chain of lakes to the Pas. Of the country along the Nelson, he writes:

"Between Lake Winnipeg and Split lake, a distance of about 225 miles, the (Nelson) river has a descent of approximately 270 feet. The current between the numerous lake expansions is generally swift, and upwards of a dozen falls and rapids occur, some of the former offering magnificent sites for water powers. The aggregate that could be generated along the river is enormous, as the amount of water passing over the various falls is very great. The volume of water can best be appreciated by a consideration of the extent of its drainage area, which embraces all the country westwards to the mountains, between the watershed of the Churchill and Athabaska to the north, and the Missouri on the south, and eastwards to the headwaters of the Albany river, and to within 50 miles of Lake Superior.

"Twenty-one miles down the river the Hudson's Bay company maintains a fur trading post known as Norway house, situated on a large island in Playgreen lake. Here Mr. McTavish, the chief factor, in charge of the district, cultivates a large garden where, on the 10th of June, peas, beans, beets and other vegetables were well started. Wheat has been successfully grown here as well as at Cross lake, further down the river. There are many tracts of land along the river suitable for cultivation . . . which alternate with glacial gravels and the bare rock surfaces devoid of any soil cover. The exposures at Cross lake are promising looking for the occurrence of gold, representing closely, as they do, the gold bearing strata of the district east of Lake of the Woods. They are cut by intruding masses of the same crushed granite with blue opalescent quartz, known locally in the eastern region as protogine. Below Cross lake no land is under cultivation until Split lake is reached, just north of latitude 56 degrees, where the postmaster for the Hudson's Bay company raises potatoes and the commoner garden vegetables. White and black spruce, tamarac, aspen, balsam poplar and white birch form the forest surrounding the lake, the deciduous trees for the most part growing only in a fringe along the immediate shores. Trees of suitable size for sawing into eight and 10 inch boards are found on the islands, along the stream valleys, and in places near the lake shores, but the general average size of the trees inland is smaller than this. Northwest of the Hudson's Bay company's post the country is generally low, swampy and intersected by a network of small lakes near Waskaiowaka lake, however, an extension northeasterly of the clay land of the lower Burntwood valley forms a comparatively dry ridge, along which a good route for a railway can probably be found to the valley of the Little Churchill."

The Burntwood River Country

The Burntwood river flows from the west into the long westerly bay at the southern end of the lake. Mr. McInnes thus describes the country:

"The shores of the bay into which the river flows are large, almost all along, low, round ledges of fine black and coarser white biotite gneiss striking east and west. The neighboring land is low, rising from the lake to a height of about 20 feet in a few chains, and then much more gradually to about 50 feet, with occasional ridges of 70 feet. The forest is rugged with second growth, mainly spruce and tamarac, varying in age from recent brule to 50 years.

"The water of the Burntwood carries in suspension more sediment than the main Nelson, so much as to be hardly at all transparent. As the lake is left and the river ascended the banks become higher and higher, rising with a steep slope from the water level to 50 feet, and are composed of a siliceous clay that, where exposed through the burning of the protecting forest cover, becomes rapidly water soaked and unstable, giving way every here and there, and sliding into the river bed. Eight miles from the mouth of the Odei river a smooth flowing stream of considerable size, comes in from the west on the left bank, occupying a well marked valley with clay covered hills rising to heights of 150 feet on both sides. A few miles further up the river, above a series of short rapids, the immediate banks are low, rising by a gradual slope six to 20 feet above water level, and then extending back with a moderate slope for from two to three miles, where a height of about 100 feet is reached. Much of this land is, apparently, well adapted for cultivation; the clay is entirely free from boulders and mixed near the surface with enough vegetable humus to produce a friable and seemingly productive soil. The gentle slopes give good natural drainage, and the open character of the forest makes it a country easily cleared. But little timber is left of a size larger than eight inches in diameter three feet from the ground; all the dryer parts, denuded of old forest by the repeated fires that have swept over the region, being covered by forests of only 10 years' growth or younger.

"For the next 19 miles the river valley and neighboring country present the same general aspect. Here the valleys of the main river and the Odei approach one another separated only by a dividing ridge a little over a mile across and 150 feet high. The ridge is clay covered to the flat summit where knolls of . . . gneiss project. . . . Beyond the valley of the Odei, to the north, is a rolling, forested country, the hills, clay covered to the tops, rising by gradual slopes to about 100 feet above the intervening valleys that are themselves 20 to 50 feet above the river level. The forest is mainly spruce and tamarac of about 60 years' growth, the larger trunks reaching diameters of from eight to 10 inches, but the general average not more than six inches. In the valley, occasional white spruce and tamaracs attain diameters as great as 18 inches. These are trees that have escaped when the surrounding forest was burned, and are sufficient evidence that, but for the repeated fires, there would be large areas covered with good timber.

"For the next 28 miles the river, flowing in a rock bound basin, has the character of a long, narrow lake from half a mile to over a mile in width. Covering the well rounded ledges of gneiss that form the immediate shores, is the same thick mantle of clay, forming a country of very attractive appearance. Rising gradually from the river level to heights of from 20 to 50 feet, a flat or gentle sloping plateau extends back from two to three miles to another rise, where the general level is increased to about 100 feet. Recurring forest fires have not only denuded this section of its trees, but even the stumps have for the most part burned away, so that it is now covered only by an open growth of small white birch, poplar, willow and Banksian pine, with an undergrowth of vetched grasses and small shrubs. Just above is the Manago fall, where the river pitches over a ledge of gneiss with a vertical descent of 30 feet.

"The probable course of a railway through this country would cross the river at one of the rapids below Manago fall, where ledges projecting from either shore give good foundations for piers, and follow the north side of the river valley along the plateau land, described above, to the valley of the Odei, which would be crossed near where the two rivers approach one another. This would afford fairly deep water connection with Split lake and the Nelson river, and their sturgeon fisheries, by way of the deep and smooth flowing Odei and Burntwood rivers.

"Above Manago fall the river expands again to form a long, narrow lake for the next 10 miles of its upward course. The same rolling clay plateau extends back from both shores of the lake, rising gradually to an undulating, higher tract perhaps 100 feet above the lake level. The forest growth is still very open, allowing a good surface carpet of grasses, vetches and other vegetation. Diversified here and there by small open tracts, where the grass covered surface is free from trees, this country often presents quite a park like aspect. Throughout all the clay covered region the absence of erratics is striking; for miles no perched boulders nor transported materials of any kind, other than the lacrustine sediments, are seen, and even the country rock is deeply hidden under the heavy clay deposits that seem to be very homogeneous throughout, not laid down in thin layers as in the case of many clays of apparently similar origin in eastern Canada, but, if stratified at all, only in very heavy beds that seldom show their bedding planes.

"For the next fifteen miles to Waskwatin lake the river has a quicker descent and its course is broken by several small rapids. The surroundings country is slightly higher, rising in places about two hundred feet above the river and more steeply from its shores. From the south shore a clay covered bench, a quarter of a mile wide, rises to a comparatively steep slope to a height of a hundred and thirty feet, and extends back for miles, at about that level, with a gently undulating surface, free from boulders or rock, excepting very rare exposures. As a matter of fact, but one small knoll of the underlying rock was seen rising through the exposures. As rising through the clay at a point about two miles back from the river. The low flat along the river is covered by a sixty years' timber growth, mainly of Banksian pine and spruce. The higher plateau is wooded principally with spruce from six to eight inches in diameter, with scattered Banksian pines, poplars and white birches succeeding an earlier burned forest that was even younger when destroyed, and this following a still earlier that, by the stumps, is shown to have been somewhat larger. Evidently this country has been subjected to repeated burnings that have followed one another, often at intervals of comparatively few years. The areas of muskeg on the upland do not seem to be extensive, and no gravel beds nor boulder ridges were seen. The Indians report that this plateau-like country extends right across to the valley of Grassy river, with only gently swelling ridges and no high hills."

Pretty Sheet

Waskwatin lake has been described by Mr. J. B. Tyrell as "a very pretty sheet of slightly murky water, six or seven miles long and three miles wide, surrounded by sloping clay-covered hills wooded with white spruce and poplar, its surface varied by a few islands composed of clay overlying a floor of gneiss."

Two falls near its outlet would, in Mr. Tyrell's opinion, "furnish a large amount of power for driving mills or machinery of any kind." A supply of timber for building and fuel could be obtained from the surrounding country, "and the soil," he assures us, "would grow any of the ordinary roots or more hardy cereals." He concluded that it was "not improbable that before long, when this fertile country is made accessible by the advent of a railroad from the south, one of the most prosperous towns in the district may grow up on the shore of this now secluded lake."

Mr. McInnis thought the lake somewhat larger—eight miles by four—with a long bay extending to the west from its southern end. He thus describes it: "The waters are slightly turbid from suspended sediment and abound in whitefish (of good quality) and small sturgeon. On all sides of the lake are large tracts of nearly level clay land extending back for several miles and heights of from fifteen to fifty feet above water level, and beyond that continuing at a rise of little over a hundred feet. A mixed second growth forest, mainly aspen poplars, covers all the uplands, while on the islands and on low flats bordering bays of the lake are found white spruces and poplars of diameters up to one foot. The grass covered slopes, that rise with very gentle gradients from the shores of the lake, make this a country of most attractive appearance and one that apparently would be well suited for cultivation. The Indian inhabitants of this section cultivate with success small patches of potatoes. Bordering many bays of the lake are sand beaches . . . . made up principally of garnets and other haean detritus, but containing also limestone pebbles derived from the Hudson Bay basin."

Continuing along the river, Mr. McInnes describes the country as being of "the same general character" for thirty miles, "covered for the part with a mixed second growth from ten to thirty years old, but with here and there clumps of white spruce, with tall and straight trunks, a foot or more in diameter. On the shores of Footprint lake, in latitude 55 deg. 45 min. small fields of potatoes planted by Indians were looking remarkably well, the vines being about eleven inches in height and about ready to blossom when this locality was visited on July 10th. Above the broad flats extend back from the river on both sides, rising from a half a mile to a mile back to fifty feet above the river. The greater part of the flats and practically all the highland have been burned over within twenty years, and are clothed now with an open growth of small mixed timber; the land is free from boulders and gravel and has a good carpet of native grasses, including such good meadow forms as the blue-join and the wild rye. The open character of the forest permits a somewhat luxuriant growth of these grasses mixed with vetches, strawberry vines, etc., and with currant, gooseberry and other small shrubs and bushes.

To the southward of the most southerly bend of the river he found the land rising with a comparatively steep slope to a height of sixty feet above the river, and extending back "as a level clay-covered plain with about five inches of clay-loam soil, well mixed with vegetable matter, gradually merging downwards into pure clay. This "plateau has a gentle rolling service, the bottoms of the hollows, where small areas of muskeg often occur," being "forty feet lower than the slopes of the ridges," the "highest land reaching not more than a hundred feet above the river." For six miles back there prevails "higher land, wooded with Banksian pine, poplar and spruce and diversified by many open grassy glades." The areas of what is called muskeg here are "rather grasses marshes" than peat bogs, and are "comparatively insignificant in extent." But beyond this tract "broad belts of wet, grassy marsh land extend southwesterly into Grassy river below Wekusko lake and form practically the western limit of the clay-covered uplands, though in the river valleys and along the flanks of their bordering hills the clay land extends much further west."

10,000 Square Miles of Cultivable Land

In summing up his impressions of what he designates the "gently rolling clay covered country," Mr. McInnes writes: "Of the whole of this extensive plateau land, extending from the valley of the Nelson river westward to near Burntwood and Wekusko lakes (West Long. 99 degrees, 45'), northerly at least to beyond latitude 56 degrees, and southerly to the limestone escarpment, an area of about 10,000 square miles, it may be said it is characterized by a heavy clay soil entirely free from boulders. Lacustrine clays, composed of the rock flour once held in suspension by glacial streams and deposited by them as they reached the quiet waters of a great lake, are essentially the soils of this region; there is no distinct surface soil clearly separable from the clay subsoil, the one merges gradually into the other, the clayey character of the soil being very strongly apparent at the very surface where merely the shallow cover of decaying leaves and other vegetation is scraped away. Generally for from five inches to over a foot down the clay is deep brown in color from the admixture of vegetable matter and quite friable, and the rootlets of even the smaller surface vegetation reach down far below this level, though on the tops of many of the ridges the light buff-colored clay, without any appreciable coloration from vegetable matter, comes to the surface. The rolling character of the plateau generally provides fair drainage, but over considerable areas in its central portion, far from the valleys of the larger streams, there are large tracts that have not sufficient gradients for the proper flow of the surface water but could be made available for agricultural uses by being artificially drained."

The Country Onward to the Saskatchewan.

The western limit of "the good country" is in about longitude 99 degrees, 45 minutes, and then comes what Mr. McInnes describes as "a typical Archaean surface, consisting of high gneiss hills, bare and rugged, with intervening deep and sharp valleys generally occupied by muskegs. On the steep flanks of some of the slopes Banksian pine and spruce grow to a fair size, but owing to the thinness or entire absence of soil cover, the bare gneiss hills, devoid even of moss, are covered only by a scattered growth of small trees. Little flats along the river valleys are covered by clay forty feet or less. The clay deposits often become quite gravelly or give place to sand, showing probably an approach to the old shore lines of the lake, in the deeper parts of which the heavy deposits of clay were laid down. On these tracts white spruces grow in diameters of from a foot to two feet, but the areas are very limited in size. This section of country . . . embraces all the land extending from the escarpment . . . of the limestones which follows a nearly east and west line touching the southern ends of Reed and Wekusko lakes indefinitely to the northwest; it has, generally, the same rugged character with but very limited areas that are fit for cultivation, and must be considered as valuable mainly in the possibilities offered by the Keewatin belts, that here and there traverse it, for the occurrences of valuable minerals. No mineral deposits of value were noted though traces of copper were observed in the vicinity of File lake."

The country stretching from the south of this area to the Saskatchewan valley "contains," according to Mr. McInnes, "very few tracts of land suitable for settlement." He continues: "Practically only the river valleys, a few tracts adjoining some of the lakes, and parts of some of the slopes flanking the limestone ridges, can be considered as affording land suitable for cultivation. The upland is generally almost bare of soil, flat-lying limestones forming its actual surfaces, and the slopes, though covered to a good depth by clay, are for the most part too bouldery for tillage. Limited tracts here and there occur suitable for individual holdings, notably near some of the principal lakes. "The larger of these, Atikameg, (locally known as Clearwater), Cormorant and Reed lakes, are very beautiful sheets of clear water, well stocked with fish, including lake trout and whitefish. All are skirted by the located portion of the line of the propsed Hudson Bay railway, and may be expected with its advent to become favorite summer resorts for the people of the growing western cities.

"Atikameg, the most southerly, nearest to the Saskatchewan, is a very beautiful sheet of quite colorless, pellucid water about eight miles by eight, its expanse unbroken by island and attaining in its central parts depths of upwards of a hundred and fifty feet. It is apparently fed, principally, by seepage through the gravels and by springs, following the bedding planes of the limestones, from the Saskatchewan watershed, as no brook, worthy of the name, flows into it, though the overflowing stream is of good size even at lowest water.

"Cormorant lake, into which the last named flows by a short stream with a fall of twelve feet, is about half as large again as it. It's water, though not quite colorless, is clear and free from sediment, and its surface is diversified by many islands, some of large size. The islands are flat topped limestone ledges, generally showing low cliff faces rising from deep water, but varied by occasional sandy and bouldery beaches; they are well wooded and would furnish, many of them, ideal spots for summer residences.

"Reed lake, the most northerly, lies just without the limestones that terminate in a low escarpment fronting its southern shore. It has about the same area as Atikameg, but of a much less regular outline, and the shores are fringed by more than a hundred small islands.

"The hardy magnesian limestones or dolomites about these lakes would furnish good building stones, the natural bedding of the rocks causing them to break out readily into blocks from a foot to five feet in thickness and of almost any required size."

The valley of the Sasktchewan is here so low that it is annually inundated, except where infrequent ridges occur. The highest water is usually in July, when the river rises some eighteen feet above its low water line. Mr. McInnes writes: "On the north side of the river at the Pass, beyond a low flat, a kame-like ridge, with a gravelly surface and clay and boulder cone, rising from seventy to ninety feet above the river, follows the course of the stream for upwards of five miles to the Big Eddy, where it swings northerly and continues for another eight miles or almost to Atikameg lake. This ridge forms a sort of natural highway, along which the Indians have a road to their autumn fishing grounds in the lakes, and which has been utilized by the engineers for the location of the railway line. Along the wider parts of the ridge and on the flat at its base are situated Indian and half-breed settlements, where the natives are generally living comfortably in good houses, many of them raising horses and a few cattle, but few paying much attention to the cultivation of the soil, contenting themselves with small fields or garden plots of potatoes and the commoner vegetables."

Timber

As to timber Mr. McInnes reports: "Over the whole region the areas of forest, where the trunks are large enough to be of commercial value, are limited, though, but for recurring fires in the past, there would be a magnificent forest cover over the whole area, stunted only on the muskegs and on the Archaean and limestone areas and on the hill tops, where the soil is wanting or too thin to support a good growth. The principal tracts of large standing timber are situated to the north of Moose Lake, to the west of Atikameg, in the lower Grassy River Valley, and on the ridge separating Cormorant and Yawningstone lakes. The last named tract contains white spruce of exceptionally large size with tall clear trunks. Smaller areas are found on islands and points in the various lakes, along the upper valley of the Cowan River, and in clumps along the stream valleys in the district. Smaller timber, mainly black spruce

(Continued on Page Thirteen.)