

GEOLOGICAL AND NATURAL HISTORY SURVEY OF CANADA.
ALFRED R. C. SELWYN, C.M.G., LL.D., F.R.S., DIRECTOR.

REPORT
ON THE GEOLOGY OF THE
MINING DISTRICT OF CARIBOO,
BRITISH COLUMBIA,

BY

AMOS BOWMAN, M.E.



PUBLISHED BY AUTHORITY OF PARLIAMENT.

MONTREAL:
DAWSON BROTHERS.
1888.

This document was produced
by scanning the original publication.

Ce document est le produit d'une
numérisation par balayage
de la publication originale.

TO ALFRED R. C. SELWYN, ESQ., C.M.G., F.R.S., LL.D.,
Director Geological and Natural History Survey of Canada.

SIR,—The first part of my report on the mining district of Cariboo, British Columbia, is herewith respectfully submitted. The second portion will include details and detailed plans of mining developments.

I have the honor to be, Sir,

Your obedient servant,

AMOS BOWMAN.

NOTE.—The bearings throughout this report are given with reference to the true meridian, unless otherwise specially noted.

REPORT
ON THE GEOLOGY OF THE
MINING DISTRICT OF CARIBOO,
BRITISH COLUMBIA.

By AMOS BOWMAN, M.E.

PART I.

The work in the Cariboo District of British Columbia, here reported upon, was carried out during the seasons of 1885 and 1886, under the control of the Director of the Geological Survey, but with the assistance of a money grant from the Government of British Columbia, and on a plan agreed upon beforehand. The enlightened policy of the Government of British Columbia has thus rendered possible the completion of the map work in a comparatively short space of time, the demands upon the funds of the Geological Survey being such as to make it impossible to devote more than a certain sum annually to work in each province or district. The call for special assistance in the Cariboo district arose principally from the absence of any trustworthy map, and the necessity of undertaking a geographical as well as a geological survey, while the decline in product of the placer mines, and the efforts being made toward the development of "quartz mining" appeared to deserve such immediate assistance and guidance as might be afforded by a systematic study of the district and a reasonably accurate delineation of its features.

Cariboo has not only been the mainstay of gold mining in British Columbia for many years, but has proved, for its area, one of the richest placer mining camps in the world; and it would therefore appear reasonable to assume the existence in it of rich quartz lodes, from which, by natural processes of waste, the alluvial deposits have been supplied. The importance of the Cariboo district will be understood when it is stated that probably half the gold product of British Columbia since 1860, or not less than \$15,000,000, was derived from it, and chiefly from a few miles in length of auriferous drift in several valleys, of which those of Williams, Lightning and Antler creeks have been the most productive, and have made Cariboo famous.

Joint,
Provincial and
Dominion
surveys.

Importance of
Cariboo gold
field.

LIMITS OF FIELD.

On plateau
region of the
Upper Fraser.

Politically, Cariboo district embraces a complete section across the northern interior plateau, from the coast mountains to the Rocky Mountain region, north of the Canadian Pacific Railway, and within the drainage basin of the Fraser. This is bisected in a north and south line by Fraser River. Popularly, "Cariboo" includes only the eastern half, or the gold country north of Lake La Hache. To the principal mining developments of this area our investigations were accordingly confined, and the map herewith presented does not include all the outlying portions even of the area thus limited.

The south-eastern limits of the Cariboo mining district include the valley of the Horsefly, and country extending eastward of it to the water-shed of the Clearwater and North Thompson rivers.

The most northerly mines of importance within this area are those of Hixon Creek, a tributary of Cañon Creek, between Quesnel and Fort George; and the newly-discovered mines of Goat River, a tributary of the Upper Fraser (probably identical with "Shuswap River" on Trutch's map), on the eastern slope of the Cariboo Range.

The lower half of it has been explored by prospectors, and has become tolerably well known by report, to many of the residents of the district beyond present mining localities.

The eastern Alpine region, and the low-lying northern parts, where Bear and Willow rivers join the Fraser, are little known even to the residents of Cariboo, and may be set down as scarcely explored, economically or otherwise. Geographical explorations in these little-known regions have been confined to the lines of survey on the Upper Fraser and Clearwater rivers, by the Government railway parties in 1872-76.

Between the Upper Fraser (Tête Jaune Cache) and the well-known Cariboo mining country of Harvey and Cunningham creeks, the distance is but 50 miles; yet very few prospectors or explorers besides Mahood, of the railway exploration party in 1872, and Isaacs' prospecting party in 1886, have been through it.*

* The best map in existence, which included Cariboo, was that known as Trutch's Map, drawn by J. B. Launders in the Lands and Works Department of British Columbia, under the direction of the Hon. J. W. Trutch, scale 25 miles to the inch; a creditable and well-executed compilation of the surveys of the Admiralty, and surveys and explorations of the Royal Engineer corps under Col. Moody, and above all of the geographical information collected by the Hudson Bay Company's officials from Indians, including the reports of intelligent prospectors and miners, a few of whom had been surveyors. A later map on the same scale was that compiled by E. Mohun, C.E., and published under the direction of the late Hon. W. Smythe, adding to Trutch's map such corrections as had been developed by the Dominion Railway surveyors and the explorations of the Geological Survey; none of them, however, in the mining region of Cariboo. The scale however was much too small for our purpose, and the information was mostly sketched.

Work in 1885.

The work of this season was necessarily for the most part of a geo-
graphical and topographical character, the geological and mining
problems being assigned a secondary place till the main outlines of
the map had been laid. My assistants during the year were Messrs.
James McEvoy, B. Ap. Sc., S. P. Tuck, C.E., and L. R. Voligny, C.E.

Barkerville, in the centre of the Cariboo mining district, was, in the first place, connected by an odometer survey along the waggon road with Quesnel; and from Barkerville as a centre traverses were extended by measuring-wheels along the principal roads and trails of the district.

Work in 1886.

During this season I was assisted by Mr. McEvoy. We entered the southern edge of the Cariboo district map near Beaver Lake on the 6th of July, and work was actively prosecuted in the district till the 30th September. The whole time spent in the field this season was four months and a half, but this included time spent in going to and returning from the district, as well as that consumed in making various necessary arrangements. Pack animals were employed in moving from place to place, wherever possible, but some parts of the district could only be reached on foot; and for the purpose of making a micrometer survey of Quesnel Lake and examining its shores, boats were utilized. Some topographical work was included in the operations of this season, but much of my time was devoted to the detailed examination of mines and auriferous creeks.

The results of field work in 1885 and 1886 included eighty-one plotted sheets, forty panoramic topographical sketches, and ninety-seven smaller sketches of the same kind, chiefly intended to show the topography, and relief of the country.

The mountainous, and often almost inaccessible character of portions of the district included in the maps, presented us with many difficult problems in transportation, and in the execution of the work. These were successfully overcome by the ready and efficient co-operation of my assistants and men.

Dr. Hugh Watt, of Barkerville, obligingly undertook the reading of the mercurial station barometer on which the reduction of our observed altitudes depended. To Messrs. John Bowron and W. Stephenson, Provincial Government Agents at Barkerville and Quesnel Forks respectively, we are indebted for innumerable favors; and, in fact, all the residents of the district, including even the Chinese, seemed to take an interest in our work, and to assist us whenever possible.

COUNTRY SURVEYED.

The profitable
gold fields.

Evidently this vast region could not have been adequately explored in one or two seasons, nor during the progress of systematic surveys in the old placer mining region. Directing our attention, therefore, to a narrower area, as distinguished by profitable mining operations,—included within the limits of the Cariboo District map,—the country topographically surveyed lies within the parallels of 52 deg. 45 min., and 53 deg. 45 min., and the meridians of 120 deg. 45 min., and 122 deg., comprising, thus limited, an area of 3,137 square miles. This block extends into the alpine region mentioned, while it covers the whole of the placer mining country which has been found specially noteworthy on account of its yield of gold.

The first step in our work was to enter the larger field first referred to, and to make the necessary reconnaissance surveys, in order to discover the extent of the gold-bearing country, and its relations to the surrounding country, with a view to narrowing the field. The second was to make a systematic geographical and geological survey of the smaller area.

SURVEY OPERATIONS.

Outside work.

While our survey operations were chiefly confined to the smaller area, the road traverse measured from Lake La Hache to Lightning Creek Meadows, at Beaver Pass, belongs to the wider field. A great deal of both geological and general survey work had to be done outside of the limited area, in order to arrive at necessary results in the mining region itself. It includes reconnaissance surveys of all approaches to the mines, by horse trail and by projected railway; of Quesnel River, including its mines, situated between the forks and the mouth; of the Cottonwood River mines (between Cottonwood Bridge and the Hixon Creek trail-crossing); the trail from Quesnel Mouth to Hixon Creek, about forty miles; and a small area of country at the junction of Hixon and Government creeks, the site of important mining operations.

Bases
measured.

The geographical work included the measuring with the steel tape of two independent base lines fifty miles apart, situated respectively on Snowshoe Plateau and at Quesnel Mouth.

Areas mapped
in detail.

Detailed maps of all the important mining localities were also completed. The geographical foundation (embracing from one to three miles on the paying creeks,) having been procured during the first season of field work, the details and geological features remained to be obtained during the second.

Accuracy.

The accuracy of the creek maps must not be understood to be equal

to that of a transit survey carried out into all these details; nor is that of the Cariboo district map to be understood as including transit intersections to the minor points, many of which were not in sight from the transit stations. The detail maps were based on compass surveys, and, generally, wheel measurements; but parts of them were filled in by track or reconnaissance surveys, where such information could not be procured in any better shape.

The topographical details of the District map were plotted from the sketches described. Where immediate intersections could not be had, the objects were located relatively to fixed points, in such detail as the sketches permitted. Topography.

I deemed it necessary to occupy a number of transit stations outside of the smaller area, for the purpose of connecting our triangulation system in the mining region with a point on Fraser River at Quesnel Mouth. This served as a check of the waggon road survey. Its principal object, however, was to ensure the accuracy of the triangulation system, by the measurement of a second, or check base, in the neighborhood of Quesnel Mouth. Check work.

POSITIONS.

Taking our departure in 1886 from Ashcroft, 8.4 miles south south-east from Cache Creek, the position of that place was fixed by Ogilvie's railway traverse, and Klotz's telegraphic and astronomical observations, under the direction of Captain Deville, the same season, as follows:—

Ashcroft siding, latitude $50^{\circ} 52' 50''$.
 “ “ longitude $121^{\circ} 16' 36''$.

From Cache Creek to a point marked by a stake on the north shore of Lake La Hache, near the 125 mile-post, the Lands and Works Department measured a line following the waggon-road nearly, placing the latter point north of Cache Creek $78\frac{1}{4}$ miles, and west of it $16\frac{3}{8}$ miles. The accuracy of this survey, however, Mr. Gore, the Surveyor-General of British Columbia, considers cannot be guaranteed to be closer than 1-10th of a mile in a measured mile, it having been run by compass, and chained by Indians. Assuming it to be in the main correct,—the point so fixed being the nearest fixed point of the Provincial Land Surveys,—we have for its position:— Longitude by traverse.

Stake on Lake La Hache, lat. $52^{\circ} 00' 53''$.
 “ “ “ long. $121^{\circ} 16' 35''$.

Thence to Barkerville by our own Survey, with prismatic compass and wheel measurement—courses calculated by latitudes and departures—the position of Barkerville was obtained independently of our own and Lieut. Palmer's astronomical observations. The minus or east departures were found to be in excess of the plus or west departures by just six miles, giving us as the longitude of Barkerville $121^{\circ} 33' 24''$.

Longitude.

Latitude.

Its latitude by a series of sextant observations taken by myself and Mr. McEvoy in 1885 as $53^{\circ} 4'$.

Independent observations.

This position agrees very closely both in latitude and longitude with Lieut. H. S. Palmer's determinations from independent observations, so that the position of the central point of the mining region may be considered as satisfactorily established within the limits of accuracy required.

Skeleton map.

Triangulation.—The diagram on the opposite page shows the triangulation framework of the Cariboo District Map, with primary and calculated triangles.

By the old steamer and waggon road route, followed by us into the country in the working season of 1885, Barkerville, the trading centre of the mining region, was reckoned to be distant from Victoria 550 miles.

COMMUNICATIONS.

The following table of distances by steamer and waggon road route is compiled from Williams Directory of British Columbia, 1885, p. 243 :

FROM VICTORIA TO

	Westminster.	Sumass.	Hope.	Yale.	Lytton.	Spences Bridge.	Cache Creek.	Clinton.	Soda Creek.	Quesnel.	Stanley.	Barkerville.
	Miles.	Mil's.	Mil's.	Mil's.	Mil's.	Miles.	Miles.	Mil's.	Miles.	Mil's.	Mil's.	Miles.
Total ...	75	40	41	19	57	21	30	26	132	60	35	12
	75	115	156	175	232	255	285	311	443	503	538	550

By the old Douglas route, used before completion of the waggon road:—

FROM LILLOOET TO {	Clinton. Miles. 47	Soda Creek. Miles. 179	Quesnel. Miles. 239	Stanley. Miles. 274	Barkerville. Miles. 286
--------------------	--------------------------	------------------------------	---------------------------	---------------------------	-------------------------------

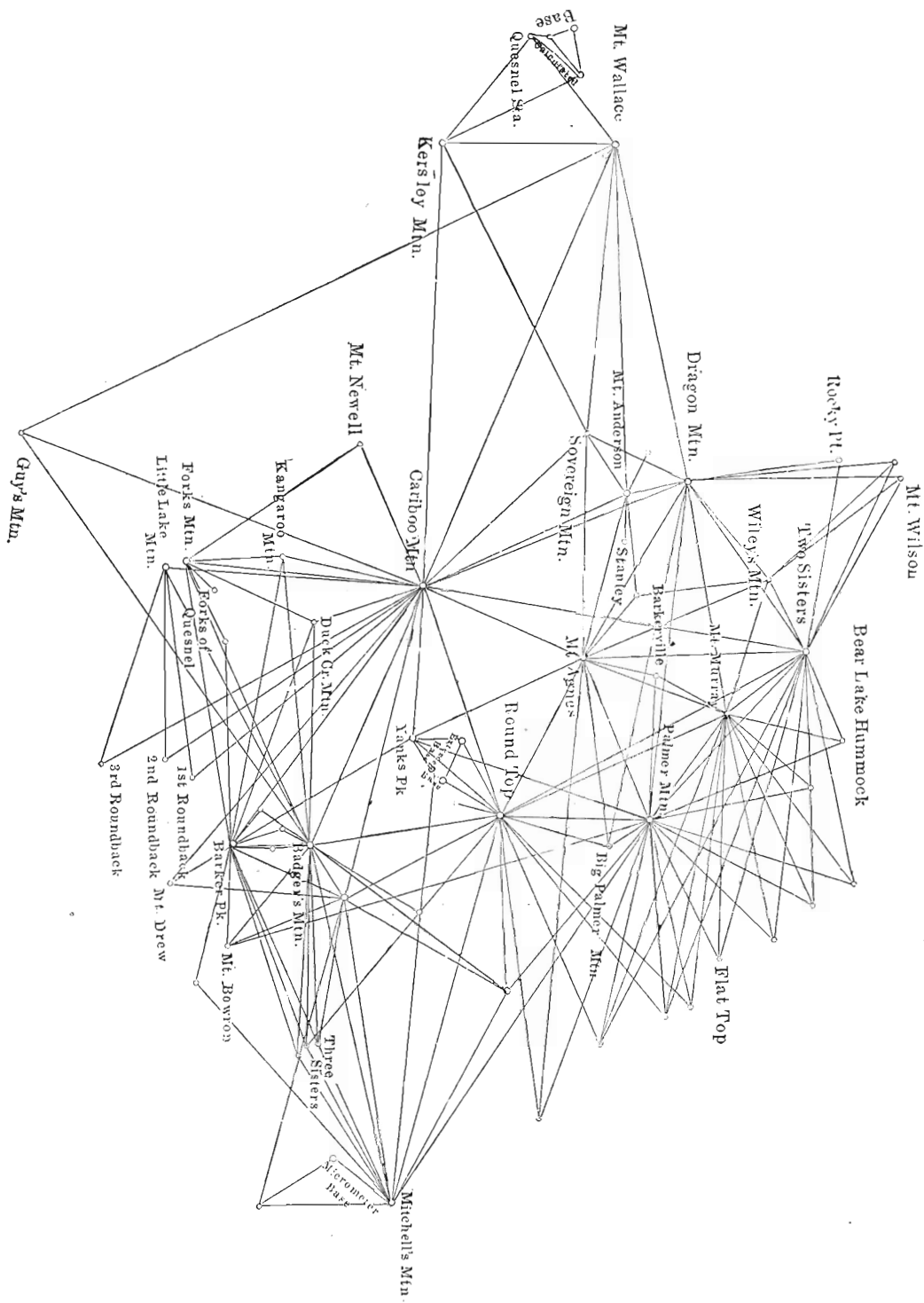


DIAGRAM OF TRIANGULATION POINTS IN CARIBOO DISTRICT.

Road and Trail Distances.

The following is a table of distances obtained with the wheel:—

GOING EASTWARD FROM QUESNEL (H. B. CO'S CORNER) TO—	
	Miles.
Four-mile Creek.....	3.8
Wallace's Rancho.....	13.3
Bohannon's, Cottonwood.....	20.0
Cottonwood Rancho.....	21.5
Boyd's "Cold Spring House".....	25.2
Beaver Pass House.....	38.3
Stanley Post Office.....	44.8
Eagle Creek Bridge.....	47.5
Barkerville.....	56.5

GOING SOUTH-EAST FROM BARKERVILLE, VIA SAW-MILL FLAT, TO—	
	Miles.
Grouse Creek.....	4.0
Antler Creek Bridge.....	8.0
Porter's (old Antler Town).....	10.5
Little's cabin, Saw-mill Flat.....	13.0
Veith's store, Little Snow-shoe.....	24.4
Junction Little Snow-shoe and Keithley.....	27.0
Veith & Borland's, mouth of Keithley.....	32.1
Quesnel Forks.....	49.0

GOING SOUTH-EAST FROM BARKERVILLE, VIA CUNNINGHAM CREEK, OVER SNOW-SHOE PLATEAU, TO—	
	Miles.
Sharp's cabin, Cunningham Creek.....	16.9
Harvey's Creek Forks.....	25.3
Veith & Borland's, mouth of Keithley.....	35.4

GOING NORTH FROM BARKERVILLE TO—	
	Miles.
Mosquito Creek.....	6.2
Cornish Creek.....	8.4
Hardscrabble Creek.....	10.5
Walker's mine Sugar Creek.....	1.5

GEOLOGICAL FIELD WORK.

Method.

During the first season, the method pursued in regard to geological work was simply that of reconnaissance, with a view to observing the accessible features of the district. In places not likely to be revisited, all the necessary geological observations were completed. During the second season, the distribution of the rocks, and the mining features of the country governed, not only my own movements, but largely the movements also of the geographical party, whose work was narrowing towards completion. A section was made from the limestone rocks of

Beaver Lake, through the gold bearing series, to the water-shed of the Cariboo Range between Mitchell's Lake and Canoe River, ending opposite to, and not far distant from Tête Jaune Cache. Subsequently, the chert rocks of Bear River, which occupy a prominent position in Cariboo, were intersected at various points, and in different directions.

Quartz ledges, especially those adjacent to the placer mines, were everywhere noted, and in many instances carefully examined, and sampled for assay.

The most important areas in connection with mining operations within the district, which have been examined in greater detail, are indicated by rectangular blocks, outlined upon the accompanying map. Of these special maps have been drawn, and lithographed on scales, to accompany the descriptive details forming Part II of the present report.

PHYSICAL FEATURES.

Mountains and Valleys.—The relief of the district surveyed is shewn upon the accompanying map by means of contour lines, having a vertical interval of 250 ft.; every fourth one, accordingly, representing 1,000 ft. A heavy contour carried throughout the region represents a datum-plane on a level with the mouth of Williams Creek, near Jack of Clubs Lake, 4,000 ft. above the sea. Each 1,000 ft. contour, is marked by pairs of dots, for easy reference to the datum plane. Details connected with mining.

A closer examination of the features of the region under consideration, establishes the fact that the north-westerly trends so remarkable for continuity and regularity in the region of the upper Columbia, are here carried out in all the geological and physical details. The Cariboo Range, forming the north-eastern limit of the Cariboo country, is the north-westerly continuation of the Selkirk Range. The crystalline schist or "gold belt," seen on Quesnel Lake, is represented by similar rocks on Shushwap Lake and in Eagle Pass. Relief.

The region of Mount Agnes and Snowshoe Plateau is an expanse of smooth and rounded flat-topped schistose hills, having the same uniform north-westerly trend, and rising in Cariboo District to an altitude of a little over 6,000 feet. To the right and left of it, following the same trend, are low-lying valleys forming the present drainage channels of the country. These are occupied by recent deposits. Lying along side of them are ranges of hills occasionally rising into mountains, which represent valleys of an older date, *i. e.* synclinals, or troughs occupied by rocks newer than the gold-bearing series. The valley of Quesnel River on the left or south-west side, is 4,000 feet lower of Mountain axes.

The gold range. than Snowshoe Plateau; while the valley of Bear River and Bear Lake on the right or north-east side is 3,000 ft. lower than the gold range.

Transverse breaks.

Two remarkable breaks cross the schist or gold belt, connecting the two valleys described. These valleys are occupied by streams characteristic of the present drainage system, and by lakes. Cariboo Lake, and Quesnel Lake, extend, or formerly extended, entirely through and across the axis of the gold belt. These lakes, and the low-lying valleys connecting them, are accompanied by narrow belts of level land, much of it in the form of terraces or benches. At the lower levels of the country, generally, terraces are frequent. The smooth rounded character of the mountains of the schist belt is, however, itself, due to the presence of these terraces at higher altitudes, and their continuations over the mountain flats and summits, forming plateaus of which Snowshoe Plateau and Bald Mountain Plateau are examples.

Terraces.

On the west, Quesnel River valley becomes a part of the plain. Going eastward, and beyond the axis of the Bear Lake valley; the aspect suddenly becomes alpine.

The reader imagining himself located upon the summit of Mt. Agnes on the map, sees, in the accompanying panoramic sketch looking south-west, that half of the horizon embracing the rolling plains of the interior. Turning around and looking north-west, he sees the gold region at his feet; the alpine region, and other features herein described, beyond. By noting the horizontal and vertical angles written along the margins of these sketches, he will be able to identify each point upon the map, or in the country itself.

Panoramic views.

From Mt. Barker (six miles east of Cariboo Lake) looking west, he can see the half horizon of another sketch, made to exhibit the character of Snowshoe Plateau, and the cross cutting valley of Cariboo Lake.

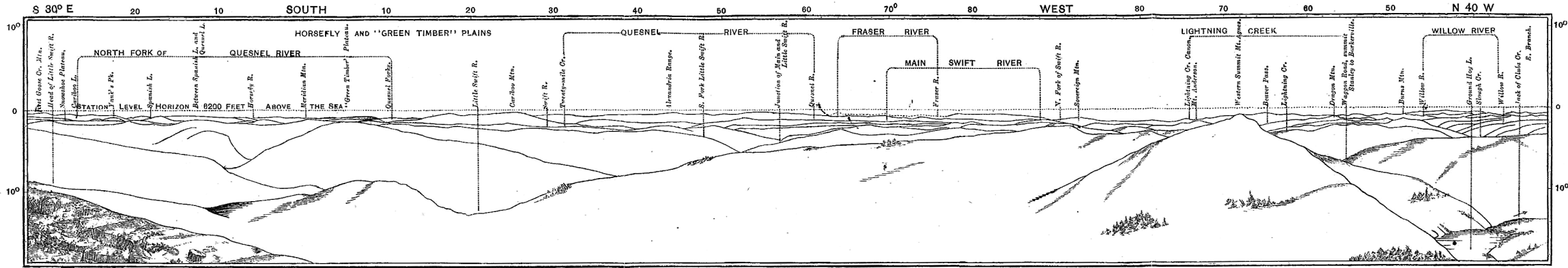
Forest.

The forest covered portion of the country ceases, going eastward, with the boundary line between the Mesozoic rocks and the gold bearing schists—approximately along a line drawn from the middle of Quesnel Lake to the head of Swift River—and further east generally at altitudes above 3,000 feet.

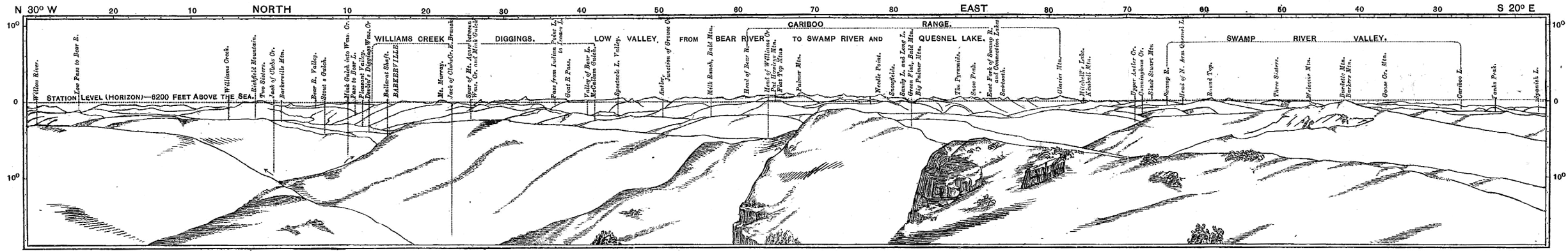
Thrifty forests exist above that level only in clumps, on sheltered uplands, or on slopes where both soil and shelter are favourable. Such forests and clumps of trees as exist on the higher mountains are often very attractive to the eye, especially on the plateaus of the gold-bearing belt. On the southern slope of Mount Mitchell, in the Cariboo Range, a handsome forest of cedars and firs having an undergrowth of Devil's club, rises to a level of 4,000 feet above the sea.

Snow.

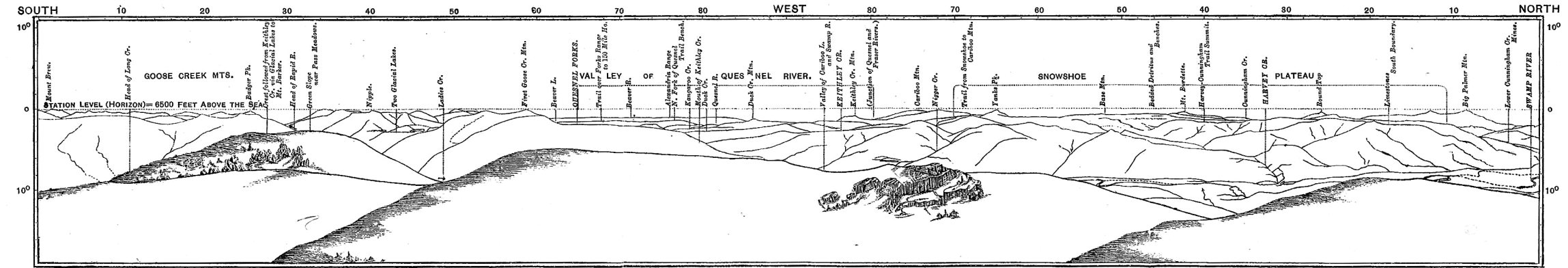
Perennial snow lies on the summits of the eastern or Cariboo range, eastward of Bear Lake valley, only between 7,000 and 8,000 feet



PANORAMIC SKETCH FROM MOUNT AGNES, (4½ MILES S.S.W. FROM BARKERVILLE.)
LOOKING SOUTH-WEST TOWARD THE PLAINS.



PANORAMIC SKETCH FROM MOUNT AGNES, (4½ MILES S.S.W. FROM BARKERVILLE.)
LOOKING NORTH-EAST TOWARD THE ROCKY MOUNTAINS.



PANORAMIC SKETCH FROM MOUNT BARKER, (6 MILES EAST OF CARIBOO LAKE.)
EMBRACING THE WESTERN HORIZON, AND SHOWING THE CHARACTER OF SNOWSHOE PLATEAU AND THE CROSS-CUTTING VALLEY OF SWAMP RIVER.

above the sea. While westward, the surface contour of the country is smooth and pleasing. East of Bear Lake valley all the mountain tops appear rugged, and snow-fields are common and extensive, frequently terminating in glaciers, which descend to a level of 5,000 feet above the sea.

Three-fourths of the territory of the Cariboo map lies above the 3,000 feet contour. Snow lies on the ground above that altitude for four months in the year. Quesnel Lake is closed by ice from November to March.

GEOLOGY OF CARIBOO DISTRICT.

Approaching the Cariboo country from Ashcroft on the Canadian Pacific Railway, the traveller passes over a region, extending from C che Creek to Clinton, of chert rocks and limestones, which have yielded fossils of Carboniferous age,* and which occupy the plateau in parallel undulations between the Rocky Mountains and the Coast Ranges. Passing over the plateau of the "Green Timber," these undulations are seen to have been completely buried in places by a series of Tertiary clays, sands, and gravels, capped by volcanic matter, and covered by drift of glacial origin and date. Underneath the Tertiary, represented by the gravels and volcanic matter of the Green Timber, are clays and lignites. These have usually been found to be restricted to narrow basins scattered over the plateau of the Cordillera, and have yielded fossils of Miocene age.†

Leaving the waggon-road at the 150-mile house, we reach the southwest corner of the Cariboo Map on Guy's mountain, at 2,500 feet above the sea, being one of the undulations mentioned. It is composed, like many of the Clinton and Hat Creek mountains, of limestone.

Descending from Guy's Mountain into the valley of Beaver Lake, at the low level of 2,200 feet above the sea, we see benches skirting the hill-sides, and beneath the gravels seen in these benches, throughout the region of Cariboo, are found at the lowest levels, occasional crop-pings of the lignites of the middle Tertiary.‡

Having thus entered our field of survey at its nearest point to the Canadian Pacific Railway, and Cariboo waggon-road, we are prepared for the transition from the formations heretofore examined, to those now to be described.

Formations
observed.

*Reports of Dr. Selwyn and James Richardson, 1871-72, pages 56-62; and of Dr. G. M. Dawson, 1875-1876-77.

† Reports of Dr. G. M. Dawson for 1875, 1876, and 1877.

‡ The fossils obtained nearest to this locality are from Quensel Mouth, described in Dr. Dawson's Report for 1875-76. The nearest lignite is at Boyd's Cold Spring house, on Lightning Creek, a little above its junction with Swift River, mentioned in the Report of 1876.

Exclusive of the superficial deposits, the rocks met with in the Cariboo district may, according to our present knowledge of them, be classed as follows in descending order :—

Pre-glacial gavels, Pliocene ?.....	} Cainozoic.
Basalts.....	
Clay-shales, etc., with lignite, Miocene.....	
<i>Quesnel River Beds</i> , argillites, agglomerates, etc. }	} Mesozoic.
In part at least Lower Cretaceous.....	
<i>Bear River Beds</i> , Limestones, cherty quartzites and beds of volcanic materials, probably in part }	} Palæozoic (Upper.)
Carboniferous	
<i>Cariboo Schists</i> , rocks more or less completely crystalline, of very varied character.....	} Palæozoic (Lower.)
<i>Quesnel Lake Crystalline Series</i>	} Archæan.
Granites and granitoid rocks.	

RECENT.

Valley and
surface
deposits.

The low-lying valleys of Beaver River, Quesnel River, and Bear River, and the higher valley of Willow River, are observed to have flats, which are frequently a mile, to two miles, in width. Still higher lying meadows than those of Willow River, are found in places on nearly all the tributary branches, at various altitudes. Usually these occur where the configuration of the country has led to the formation of basins in the interrupted descent of the streams. The recent deposits of these valleys are indicated by a yellow coloring on the map.

The material of the recent deposits consists of the ordinary thin stratum of humus, or loam, overlying very extensive bodies of sand, and gravel. The latter were washed down from higher deposits of gravel and sediments of an older date, and were bedded in the flats by the present streams.

Soil.

A soil that would be classed as good agricultural land, extends over the low or level portions of the hills and plateaus, yielding excellent crops of grass. Indeed no better grazing country can be found than the mountain meadows of Snowshoe and Bald Mountain plateaus in July, August, and September. These meadows situated at altitudes from 3,000 to 6,000 feet, afford opportunities for summer grazing in connection with a varied agriculture, and the wintering of cattle at lower levels.

POST TERTIARY AND TERTIARY.

The formations of the Post Tertiary and Tertiary, are unimportant as to area covered, since such areas are usually otherwise colored to represent the underlying rocks. These formations are superficial in character. Where rendered important by their product of gold, and occurring in the form of narrow belts of gravels accompanying the valleys of streams, they are indicated by hachures in red on the map.

But in point of fact the entire surface of the country is covered by Post Tertiary detritus, blending into still older gravels partly Tertiary, of as great or greater economical importance. All these gravels will be appropriately considered and delineated in connection with the details of mining as shown upon the mining maps.

The volcanic rocks of Tertiary age, which are so widely distributed elsewhere over the plateau of British Columbia, were noted only at two points within the area of the Cariboo map, viz.: on the north arm of Quesnel Lake, (in association with Tertiary gravels), and at Guy's Mountain. In both cases they cover limited areas. The lignite clays, although present, can be seen only in localities situated near the bottom of the lowest valleys, and are usually covered or hidden by the Tertiary and post Tertiary gravels. They represent a notable feature in the drainage of the country related to middle Tertiary history, and will be further referred to in that connection.

MESOZOIC.

Quesnel River Beds.

A large area which can be definitely referred to the lower Cretaceous, accompanied by an older series of rocks, (which may be Jurassic,) is delineated by a green coloring, occupying the trough of Quesnel River valley. They cover the entire lower and left hand margin of the Cariboo District map.

This belt is crossed in travelling from Beaver Lake to Quesnel Forks, and thence to Kangaroo Creek—along the usual travelled trail from the 150-mile house to the mines. It has an average width of sixteen miles, within the area of the map. All along Quesnel River and at Cedar Creek on lower Quesnel Lake, this formation has yielded auriferous gravels. These were the first "pay gravels" discovered; and the first to be profitably mined in the Cariboo country.

The prevailing habitus of the series is that of mixed volcanic and sedimentary rocks. Massive beds succeed each other with great regularity. The dip is flattish rather than steep, but frequently at a greater angle than 45 degrees. Their strike corresponds with the general

trend of the formation, which is that of the troughs and ridges generally.

Boundaries.

The limits of the formation are: along Beaver River valley, on their south-west side; and along a line from Upper Swift River to Spanish Lake valley on the north-east side. The latter boundary extends in a north-westerly direction to Lightning Creek, below the Bonanza mine, where it forms Red Cañon of Lightning Creek between the Bonanza and Boyd's Cold Spring house. In the opposite or south-easterly direction, it continues to Quesnel Lake, striking the Lake a few miles above Lynx Peninsula. Thence eastward it forms the south shore of Quesnel Lake.

Aspect.

The hills composed of these rocks are much lower than those of the underlying gold bearing schists, on the north-east. Their surface is rough and craggy. Trees appear to have a precarious footing. In a large area on the south-side of Quesnel River the winds and fires together have prostrated most of them before attaining any considerable size. In the valley of Hazeltine Creek, however, the soil derived from this formation is deeper, and the forest is luxuriant. The hills in general have a characteristic even, flattish surface contour. They can be recognized from a distance as belonging to the formation of the trough of Quesnel River valley. Generally they are from two to three thousand feet lower than those of the gold schists.

Localities examined.

They were examined at several places on Cottonwood Cañon; between the Cottonwood Ranch and Hixon Creek trail-crossing; at the Donaldson Bridge in the Cañon of the Quesnel ten miles above Quesnel mouth; at Wallace's Mountain, and on the dividing ridge between Quesnel and Cottonwood Rivers; at Morehead Creek; and at several places along the south fork of Quesnel, as well as on the north, and on the shore of Quesnel Lake. Mr. McEvoy noted them along his track-survey from Quesnel Forks to Quesnel Mouth.

Lithological features.

There is a lithological resemblance throughout of the rocks of the above named localities, as shown by the specimens collected, which testifies to a history distinct from anything elsewhere observed in the district.

Among them were found the characteristic conglomerates of the "Shasta Group." The cementing material is often a brownish, or greenish mass. From conglomerate to breccia, with the same cementing material, they pass into a compact rock, consisting of the cementing material alone. Sometimes this is crystalline, and in massive beds, less frequently thinly bedded. Of the mineral ingredients aside from hornblende and felspar, the crystalline varieties are frequently fine in grain, and not readily determined without the microscope.

Metamorphism

These rocks have been subjected to considerable metamorphism. In small outcrops it is often difficult to recognise any definite strike or

dip, jointage and cleavage planes being more prominent than those of bedding. In the larger exposures the latter can, however, generally be detected.

The bulk of the strata constituting the group are clearly the result of sedimentary deposition, while others are as clearly of contemporaneous volcanic origin, both molten and fragmental.

Fossils were collected on the south shore of Quesnel Lake, near Cretaceous. Hazeltine Creek; and at Big Wheel Flat, two miles below the outlet of Quesnel Lake. Of three species collected, two appear to be undescribed. The third is the well-known *Aucella Piochii*, of Gabb, indicating the horizon as probably equivalent to the upper part of the Shasta group of California.

By reference to the accompanying section, it will be seen that there is a great thickness of these strata overlying some that are auriferous, southward of Quesnel River; and that these latter come to the surface mostly along that stream, and northward of it. Thickness.

Reasons for supposing that Jurassic rocks may be represented in the district, exist in the occurrence of slaty and certain other beds observed immediately below these holding fossils, on the south shore of Quesnel Lake; and in similar slaty beds observed a little above the Falls of the South Fork of Quesnel River, near Quesnel Forks. The latter consist of soft and perfectly black carbonaceous slates of a character also observed in some of the beds in the Cañon of Lightning Creek. These slates differ from those of the older gold schists in possessing no perceptible crystalline ingredients. Jurassic?

The placer mining carried on between the outlet of Quesnel Lake and the town of Quesnel Forks, owes its wealth of gold to the rocks described. If any rocks of Jurassic age occur here they may be supposed to come to the surface unconformably with the Cretaceous. Recent published evidence indicates that the rocks holding *Aucella Piochii*, which have been referred to the Neocomien, may be as new as the Dakota group. Placer mining.

We have here a repetition of gold-bearing rocks exhibiting in several particulars conditions peculiar to the foot-hills of the Sierra Nevada, in California, viz: the occurrence of the Shasta group of Shasta county, with an *Aucella* allied to that characteristic of the gold-bearing shales in Mariposa county, on which the geological position of the California gold-bearing shales has been based; the association with Carboniferous limestones, in Shasta and Sierra counties, and again, the formation in which these fossils occur flanking a higher range of crystalline schists, containing no fossils, but intimately associated with adjacent older crystalline and granitic rocks, in Cariboo District, as in the Sierra Nevada. Californian resemblances.

UPPER PALÆOZOIC.

Bear River Limestone and Cherty Series.

Carboniferous. Allusion has been made to the geological position of the small patch of limestone and associated rocks seen at Guy's Mountain, in the south-west corner of the Cariboo map. This is supposed to be identical with the Carboniferous limestone of Cache Creek and other localities.

Leaving the limestones of Guy's Mountain and the Quesnel River rocks just described, and continuing our route in a north-easterly direction along the line of section marked upon the map—which cuts across these different formations nearly at right angles—we ascend to the plateau of the gold bearing schists, commonly known as the "Slate Belt," near its north-eastern boundary on Round Top Mountain. The usual route of travel is a little to the right of our imaginary line, following the western shore of Cariboo Lake and the valley of Swamp River as far as Harvey Creek, where it ascends Snowshoe Plateau, to our line of section.

Limestones. Standing on Round Top, and facing north-east, we look across the second geological valley or trough, described as an existing valley, viz., that of Bear Lake, and Upper Swamp River. On Swamp River again, there is an immense white cliff of limestone, in a mountain rising opposite Harvey Creek, a thousand feet above the valley. Similar white cliffs of limestone are seen to the eastward and northward, within a radius of 160 degrees, as far as the eye can reach, for fifty miles, on both sides of the Bear River valley, embracing generally the formation coloured grey upon the map.

Cherts and
volcanic rock
metamorphism

This formation is remarkable not only for its limestones, but for its cherty rocks, and differs in these respects from any other in the district. Among the chert rocks are occasional beds of volcanic origin, and limestones do not always accompany the cherts. The formation was intersected at many different points, and traversed in many different directions, before its identity and continuity could be ascertained. In contrast with the crystalline schists of the gold belt, none of the characteristic crystalline rocks are to be found init. To this, some of the limestones are an exception. The rocks in general are more compacted and more altered than those of the Mesozoic area of Quesnel River. It forms part of several distinct ranges of mountains; amongst which the Two Sisters (6,800 feet above the sea) are the highest in the vicinity of the gold region, being exceeded in height only by the alpine peaks of the Cariboo Range; the culminating points within the area of this formation averaging about the same height as those of Snowshoe and Bald Mountain plateaus, in the auriferous belt.

On the north-east side, the boundary of the formation is near the western foot of the Cariboo Range, at the lowest levels of the Bear River basin. The south-western boundary is not so distinctly marked by physical features. It rises to the same heights, and in many places coalesces with the gold-bearing schists, on the flanks of prominent mountains of its own, or of schist formation.

From Swamp River, at a point a few miles above the junction of ^{Boundaries.} Harvey Creek, the line between it and the gold schists crosses over the northern slope of Round Top, and continues thence westward to the Great Bend of Cunningham Creek without having given rise to any decided bounding valleys of erosion. From the last mentioned point continuing westward, it keeps close to, without precisely following, another north-westerly trending chain of valleys, represented by the Cunningham-Antler Pass Creek, a tributary of Cunningham Creek, and by a portion of Antler Creek, Pleasant Valley Creek, Sugar Creek, Valley Creek and Willow River.

It is thirteen miles in width opposite Barkerville and above Bear ^{Width.} Lake. It widens towards the north-west, and narrows in the opposite direction to five miles and a half at the head of the North Arm of Quesnel Lake.

In appearance the mountains of this formation are generally smooth. ^{Aspect.} On the summits and higher slopes they are bald and grass covered. They show a brown colouring of soil, visible from a distance of many miles. Their outlines show an intimation of rocky ribs, more apparent than in the mountains of the gold bearing schists. At the same time their regularity sets off, and in rounded and graceful curves contrasts with the rugged peaks of the Cariboo range beyond. Their lower slopes and foot-hills are covered, in all favorable places, by dense and luxuriant forest.

The rocks of this formation were examined at Wiley's Mountain, at the head of Sugar Creek, at the Two Sisters Mountains, at points along the trail from Barkerville to Bear Lake, at Mount Murray, along lower Antler Creek, on the Palmer Mountains at Antler-Cunningham Pass, and at the head of the North Arm of Quesnel Lake.

The most striking peculiarity of these beds is the prevalence of green- ^{Green cherts and jasper.} ish cherts, and of jaspery silicious rocks. Older volcanic sediments occur in all gradations of fragmentation, from breccia to sandstone and from sandstone to shale. The cementing material is usually of a greenish cast, as are the rocks themselves, when compact.

The degree of metamorphism has been plainly much greater than in the Mesozoic area, and distinctly less than in the area of the gold schists. The limestones, for example, are only occasionally and locally altered to a perfectly crystalline condition. Pressure has produced

in some instances, that faint appearance of schistosity which is peculiar to the schists. It has nowhere produced the perfectly crystalline characters universal in the schist belt proper.

At Eight-mile Creek Cañon, on the trail from Barkerville to Bear Lake, along with other characteristic rocks of the series, there are grey schists and sandstones more altered than elsewhere seen within the limits of this formation. It was first thought that these were older than the typical cherts of the Bear River series. A tendency towards a crystalline slaty character is apparent in the mineral ingredients, which, nevertheless, show distinctly on their weathered surfaces, their original fragmental character.

The position of these altered rocks is probably low in the series. They may represent transition beds, rather than the underlying gold schists, from which they differ in uniting distinctly fragmental, with some of the characters of the crystalline rocks. Situated in the axis of the Sisters range, the lower strata of which they represent, a local metamorphism under greater pressure, may sufficiently account for their aspect as described. A tendency to silky foliation in the softer shales is a further characteristic.

Regular
bedding.

Another feature notable in the rocks of this formation is their regularity of bedding. The rocks are often seen in massive beds, only moderately inclined.

Fossils.

A series of fossils was collected near one of the mining camps on lower Antler Creek, situated about three miles below the junction of Pleasant Valley and Antler creeks. Crinoids are preserved in the limestone, but unfortunately too imperfectly for determination. Their rounded forms afford only presumptive testimony,—along with the stratigraphic and lithologic evidence—of an age not newer than Upper Palæozoic.

Gold.

The placer mines of Lower Antler Creek have derived their gold from rocks of this formation. The yield has been sufficiently good to indicate the presence of the precious metals in their accompanying veins, in quantities that render them worthy of the attention of the prospector.

LOWER PALÆOZOIC.

Schists of the Cariboo Gold Belt.

Axial range.

We come next in descending order to the gold schists; a series of crystalline rocks, which are low down in the geological scale.

The gold range of Cariboo, lying between the two troughs described, has an average width of twenty miles, from Swift River on the west,

to the two Valley Creeks on the east;—or from Spanish Lake, nearer the eastern border of the map, to the head of the North Arm of Quesnel Lake.

Its boundaries are: on the south-west side, the north-eastern ^{Boundaries.} boundary of the Mesozoic rocks of the Quesnel River series, already described in detail; on the North-eastern side, that of the Palæozoic rocks last considered, along with which they form the mountain system of the gold region, or the gold range of Cariboo.

This implies a geological relationship. These gold schists are, as ^{Apparent conformability} already stated, much more highly altered than any of the rocks in the Bear River series. Their junction, as observed on Antler Creek below Pleasant Valley Creek, exhibits, however, a similarity of strike and dip suggestive of conformability. But the greater degree of metamorphism is apparent at a glance and is alone good evidence of ^{Relative ages.} their greater age. Their inferior contact with gneissic and granite rocks points to the same conclusion, and the presumption is that they constitute some part of the lower Palæozoic—perhaps even pre-Palæozoic—system.

There is a certain individuality in the appearance of the gold belt superficially. The soft and friable schists readily decompose under atmospheric influences, and there is consequently a disposition to rounded forms in the outlines of the hills. Round Top Mountain, ^{Aspect.} dominating Snowshoe Plateau by some hundreds of feet, contains quartzite beds, which have resisted weathering. Mount Agnes, Richfield Mountain, Yank's Peak, and Cariboo Mountain, are prominences due to the ability of the rocks there coming to the surface, to resist weathering.

The northern slopes of these mountains are frequently steeper than ^{Escarpments.} the southern. The fact is usually attributable in Cariboo district, as it is elsewhere, to the inclination of the beds, in connection with the eroding operations of adjacent streams, facilitated and sometimes directed by the jointage of the rock. More rarely cliffs may have been determined by lines of fracture and displacement.

The strike of the rocks, as in the formations heretofore described, is ^{Strike.} usually in the direction of the mountain ranges. The entire schist or "slate belt" is furthermore characterized by an abundance of quartz-veins; and on the higher mountains these rise above the surface, and generally follow in direction the strike of the slates.

In the folding to which the schists have been subjected—by a ^{Abundance of quartz veins.} pressure exerted at right angles to the trend of the ranges—there appears to have been a tendency to fractures in a north-westerly and south-easterly direction.

The fissures resulting have afforded facilities for the percolation of

alkaline and silicious waters, the presence and prolonged action of which forming quartz, served as nature's healing agency of the fractures. Large veins are more frequent, and more remarkable on the mountain tops—Richfield Mountain, Mount Agnes, Mount Burdell, etc.—than in the valleys.

Lithological.

Lithologically the Cariboo schists are altered sediments—clays and sandstones, with occasional small bands of limestone and calcareous shales, comprising popularly the characteristic “slate rock,” where gold is looked for, in veins, and placers, by the experienced miner.

The “slate” varies from a black or bluish shale, cleaving, commonly, in the direction of the bedding, to a more or less foliated grey or green chloritic, or talcose schist; the varieties ending with typical mica-schist. The latter is the most characteristic and most widely distributed of the varieties of the Cariboo “slate.”

Bands of silicious and calcareous ingredients can be traced. Also bands of more or less decidedly marked mica schist, containing several varieties of mica.

In the gold region, eruptive rocks occasionally occur in the form of dykes. A dyke on the eastern slope of the Round Top summit is of hornblende rock. Dykes of “porphyry” are not uncommon.

Thickness.

As it would be unsafe, where the rocks are so frequently on edge, to draw conclusions regarding their thickness from any general section, however accurate, attention may be directed to the following distances on the Cariboo Map, where a constant dip in the same direction was observed. On Williams Creek such uniformity occurs for five miles; on Antler Creek, it occurs for four miles and a half; and along the crest of the Goose Creek Mountains, from Goose Creek to Barker's Mountain, six miles.

In Devlin's Diggings at the foot of the Williams Creek section, and again at Mink Gulch above Richfield, the attitude is vertical. Above these points are seen the usual gentler northerly dips. There is probably a repetition of beds on Williams Creek, such as is indicated on that part of the general section corresponding to it.

In that part of the section corresponding to the crest of the Goose Creek Mountains, it will be better in accordance with the facts to conclude that some beds have been inverted, than it would be to assume a thickness of 30,000 feet. The total thickness of the schists is probably as has been indicated on the section, from five thousand to eight thousand feet.

Schist belt and more crystalline, older rocks.

In delineating the schist belt, two shades of coloring are used: that of the main body (Payne's Grey) representing the gold schists on the north and west; and that of the more highly crystalline area to the south-east, exhibited on the North Fork of Quesnel River, and again

along the shores of the North Arm of Quesnel Lake, which is represented by a lighter shade of the same color.

These two areas possess certain rocks and other characteristics in common. Others are peculiar to each. The more crystalline of the schists characteristic of the gold region occur also in the eastern area, in association with coarser crystalline felspathic and quartzose ingredients. In the western area no granitic or gneissic rocks are anywhere found in place. In the eastern area, on the other hand, the Mount Stevenson group of mountains is a granitic core of the highly crystalline series.

The characteristic rocks of the western and eastern areas respectively, are seen in close proximity at Shoal Bay, a little westward of the junction of the two Arms of Quesnel Lake. They are in association with each other at several places between that and the head of the North Arm. They appear to be related, and separable only by regarding the more crystalline as an older and underlying member, re-appearing in folds in the gold region.

A belt of the eastern and older rocks was recognized on the North Fork of Quesnel River. Similar coarse crystalline rocks were observed at Cariboo Mountain; and near the wing-dam on the waggon road between Boyd's and Beaver Pass. They occur at other places in the schist belt, where their presence might be accounted for by folds of the older series accompanying the schists, although it is impossible at present to trace such connection throughout the district.

Among the rocks of this eastern area are granites, gneisses, quartzites, and other of the characteristic Archæan rocks. The surface features of the country, although rounded, are rougher and more craggy than those of the gold region.

Rocks of the Alpine Region of Cariboo.

Belonging to the Cariboo Range, east of the Bear Lake trough, the rocks of Mount Mitchell were examined, and were found to be the same as the gold schists of the western area above described. Limestones occur in large masses near by, overlying the schists unconformably and with their accompanying rocks forming the crests of the range.

The latter exhibit a contrast to the schists, in their more rugged and alpine character, as well as in their greater regularity and the moderate inclination of their bedding.

Neither in the Cariboo Range, nor in the crystalline region of which Mount Stevenson is the representative, has gold been found in quantity corresponding with that of the area described as the gold region.

proper. And though gold has been found in all the creeks, and has been more or less mined on the easily accessible ones, the fact remains that it has not been found in profitable quantities in any other part of the country under consideration, nor elsewhere than in the area of the folded schists.

Lithological
resemblances.

The entire crystalline series of the gold region of Cariboo is lithologically identical, as near as can be described in general terms, with the rocks of the Pre-Cambrian and Cambrian gold regions of eastern Canada. The gneissic and schistose type of rocks of the Mount Stevenson group especially (supposed to represent the lowest horizon, on account of their association with granite in a central and massive mountain group) finds lithological representatives in the Pre-Cambrian rocks of the eastern provinces of the Dominion, and in the Appalachian axis.

Section from Guy's Mountain to the Cariboo Range.

Succession of
formations.

The line of section drawn from Guy's Mountain across the schist belt of the Snowshoe Plateau, to the summit of the Cariboo Range, a distance of sixty miles, is constructed on a scale, horizontal and vertical, of two miles to the inch; the base being sea level. On it is shown the succession of the formations represented in the district; their attitude as seen at different points, in travelling across them, and their thickness, as deduced from the dips and distances along the line of section. Its course is north 40° east, therefore not exactly at right angles to the average strikes, and the mountain trends of the district.

MINING GEOLOGY.

Dip and Strike of the Country-rock.

In practical importance not second to distribution, are the dips and strikes of the several rock-formations, which have been summarized in the accompanying section. In order that the data from which the section was drawn may be further available to the miner interested in tracing quartz veins, a large number of strikes in each of the formations are shown upon the district map. All the bearings are from the astronomical meridian, the magnetic meridian being N. $26\frac{1}{2}^{\circ}$ E.

Significance of
dips and
strikes.

The general agreement of the strikes with the trend of the hills and streams, in a south-easterly and north-westerly direction, has already been mentioned. It is not difficult to obtain from the attitudes of

G. CACHE CREEK ROCKS.

UPPER PALÆOZOIC.

K. QUESNEL RIVER ROCKS.

bedded volcanic agglomerates, argillites etc. Lower Cretaceous in part
MESOZOIC.

B. CRYSTALLINE ROCKS OF NORTH FORK OF QUESNEL RIVER & LAKE.

Gneisses mica schists, granular and silicious
micaceous schists of Duck Creek.
Round Top etc, probably ARCHÆAN.

B TO C. CARIBOO SCHISTS.

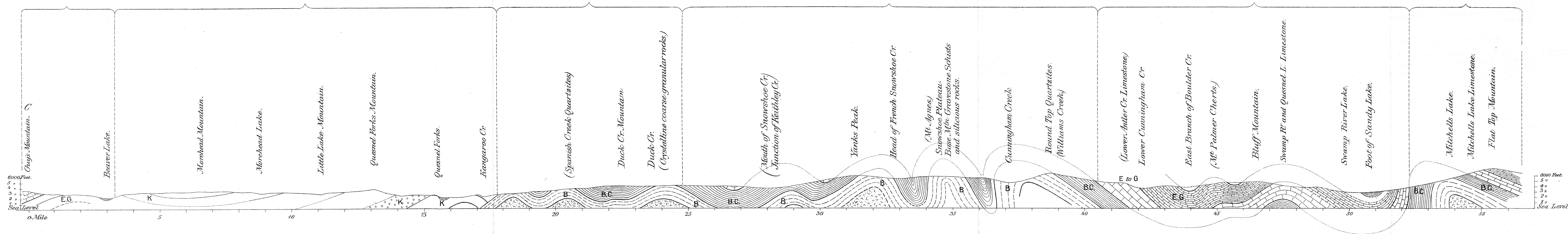
("gold bearing" slates) black, grey and greenish metamorphic schists—
silken, talcose, and micaceous. LOWER PALÆOZOIC.

E to G. BEAR LAKE ROCKS.

limestone cherts and quartzites
probably UPPER PALÆOZOIC.

B to C. CARIBOO SCHISTS.

overlain by massive limestones.



SKETCH SECTION FROM GUYS MOUNTAIN TO THE CARIBOO RANGE, VIA SNOWSHOE PLATEAU.

Vertical and Horizontal Scale 2 miles to 1 inch.

the rocks exhibited in the section, an intelligible idea of their history as off-shore sediments of an ancient Archaean ridge, or archipelago of the Cordilleran region. Facts of importance to the quartz miner are developed by a comparison of the dips and strikes of the rocks on the several profitable placer-mining creeks. They will be more precisely shown on the creek maps, which are on larger scales. The positions and areas of the several creek maps are outlined on the general district map, along with other details which cannot be shewn upon the scale of the district map.

The dips and strikes plotted on the district map suffice to show the existence of an axial line C D which marks the position of a saddle, or anticlinal in the gold slates and schists. It lies close to some of the prominent mountains of the region, but seldom strikes through their highest points. The dips on either side of it are usually nearly vertical, though occasionally they are nearly horizontal, as if occupying the unbroken summit of an arch. The line is nearly parallel to the general strike of the schists, and equidistant from the massive limestones of the Bear Lake series, on the north-east. Anticlinal axis.

In tracing a line of this description through a country where there is a succession of wavy folds, it is not easy to distinguish the continuation of the axis of one fold from that of the next one in the series, on account of their frequent interruption by cross fractures, and by valley erosions. One such cross fracture is indicated by the dips of Beaver Pass and Ruchon Creek. It runs in a north-north-easterly direction, and corresponds with the course of one of the vein systems of Burns and Island Mountains. Another is seen in the transverse-cutting valley of Swamp River, Cariboo Lake, and of the north fork of Quesnel River, which has deflected all the strikes adjacent to that valley from their normal direction. A similar disturbance of the Mesozoic rocks occurred, judging from the plotted dips and strikes, on Quesnel Lake between its outlet and the narrows. Folds.
Transverse
breaks.

A clue to the identity of beds, and accompanying veins on Williams and adjacent creeks, is afforded by the limestone bands. They occur to a limited extent in the gold schist series. In the folds of the rocks exhibited upon the general section of the country in a broader manner, the limestones are seen repeating themselves in widely different attitudes. The limestones of Jack of Clubs Creek on the northern slope of Mount Agnes, those of Black Jack Cañon, and of the lower part of Barkerville on Williams Creek, as well as those of Antler Creek, and Cunningham Creek, similarly repeating themselves, will be found susceptible of identification, and correlation by means of their dips and strikes. Identity on
different
creeks.

Dip and Strike of Veins.

Quartz veins are represented on the Cariboo map by a heavy red line, drawn in the direction of their strike; the dip being indicated in the same manner as that of the country-rock.

Related to
placers. Their general correspondence in strike with that of the country-rock has been alluded to. A glance at those parts of the district map which are covered by the outlines of the creek maps will show the geological features bearing on their continuations through intervening ridges and approximately their identity on the different creeks. Such identity may often be of little consequence at the distances in question, but it is noteworthy wherever traceable, especially as it is found to have a certain relation to the quantity of gold in the placer diggings of the vicinity.

Openings on
ledges.

Early in the history of these mines, attention was directed to the croppings of ledges noticed between Lowhee Creek, Proserpine Mountain, and the head of Grouse Creek. Openings were made on the Enterprise ledge on Lowhee Creek; on the Bonanza, Black Jack, and Steadman ledges on Williams Creek; on the Wilkinson ledge, on Proserpine Mountain; and on the Dufferin and Fountain-head ledges on Grouse Creek; all approximately in the same line of strike.

Relationship of
veins to
placers.

The dotted line E F is drawn along the upper edge of the richer placer diggings, from Red Gulch via Mosquito Creek, Lowhee Creek, Stouts Gulch, Williams Creek, Grouse Creek and Antler Creek to Cunningham Creek, showing a close enough relation to the series of veins which are plotted, near the same line of strike, to render additional details regarding them of interest. The depth of the superficial soil and gravel has prevented their connection being actually traced on the surface, between these different creeks. The testimony of accompanying rocks, their relative position geographically, their geological position between the top and bottom of the series to the north of the axial line of Mount Agnes, and the dip of the ledges themselves are the factors throwing light upon the question of their relations on the different creeks. Finally the contents of the ledges as given, may be investigated.

Differing dips.

A comparison of the dips and strikes of the ledges with those of the country-rock, reveals the fact that while they agree remarkably in strike, they do not agree in dip. This fact holds good in some of the principal ledges throughout the mining region. The identity of strike, and not of dip, is readily explained by the supposition that the quartz veins filled fissures which were influenced in direction by that of the bedding and the lines of disturbance during uplift. They happen to be parallel to the strike, though they are often independent of the

Vein fissures.

bedding. Veins of this description do not necessarily continue downward within the bedding to any depth; though a coincidence of the plane of bedding with the direction of the fissure or vein, doubtless frequently produced conditions favourable thereto.

Among the series of veins enumerated, the Island Mountain ledges ^{Island Mountain ledges.} show a southerly dip, of from 66° to 80° . The Enterprise, Steadman, and Proserpine ledges are vertical. The Bonanza, Dufferin, Fountain-head, and Nugget Gulch, and Antler Creek ledges have a northerly dip, of from 50° to 80° . All of them are in a country rock which has a prevailing northerly dip. If they belong to one system, a remarkable twist would have to be accounted for. Elsewhere at Island Mountain the northerly dips may very probably occur also.

The persistency of the strike of the principal ledges of Cariboo in ^{Causes.} the direction of the trend of the mountain system, co-incident with that of the schists, must be ascribed to a common original cause, that of the uplift and folding, therefore it is only incidentally related to the bedding of the schists.

Other peculiarities of these veins, including the character of their ^{Vein contents.} contents, are referred to below, and will be considered hereafter in giving further details of the creeks.

The cross-vein system of Burns Mountain is different from that last ^{Transverse system.} described in general direction, being north-north-easterly and nearly vertical. The adjacent country rocks dip to the south-eastward 30° , finding a parallel to their strike in the rocks of Beaver Pass and Ruchon Creek, which dip to the westward at a similar angle.

On Snowshoe Plateau the ledges show an agreement in strike with that of the country-rock, yet with notable variations in dip. The ledges of Duck Creek, the North Fork of Quesnel, and of Spanish Creek vary from the country rock both in strike and dip.

Distribution of the Placers.

It is found that those parts of the Cariboo country which have a ^{Grouping of placers according to erosion.} record in placer mining, can be included within the red lines G. G. and H. H., forming a circuit with a diameter of forty miles, of which Cariboo Mountain is the centre. The periphery is represented by a circular belt of about ten miles in width. It includes the diggings,—beginning at the north-west, and following the hands of a clock,—on Lightning Creek, Ruchon Creek, Willow River, Sugar Creek, Hardscrabble, Slough Creek, Red Gulch, Mosquito Creek, Lowhee Creek, Williams Creek, Grouse Creek, Cunningham Creek, Harvey Creek, Snowshoe and Keithley Creeks, Goose Creek, Duck Creek, Spanish Creek, the north Fork of Quesnel, Kangaroo Creek, Cedar Creek, the south

Fork of Quesnel, Morehead Creek, and the main Quesnel River; and covers all of the formations described in the district; that of the gold schists being the only one remarkable for the wealth and permanence of its diggings.

A feature attending the entire list of creeks, embracing the placer mining country generally, is the width and depth of the erosions peculiar to the placer area.

Accumulated wealth in the form of placers, is simply representative of a great thickness of the country-rock, including quartz-veins, disintegrated and removed. Its metal has been concentrated, and retained, along with the heavier rocks and the harder gravels which resisted disintegration.

Nature's
assays.

Higher portions of the creeks, reaching up into the mountains or into the plateaus in their vicinity, within the placer belt, it is frequently observed, have not proved correspondingly rich. This fact should not be placed in evidence against the wealth of ledges not adjacent to the richer placers, or outside of the limits of the principal placer belt. These ledges simply happen to be visible where erosion has not had the opportunity to do its work. Had the streams done an equal amount of cutting away and concentration upon them, there might have been placers in their vicinity, perhaps equally rich. Concentration by denudation being thus duly allowed for, the placer deposits will generally prove to be the most reliable indication of the wealth of the adjacent ledges.

Indications

It is well understood that angular boulders and coarse gold cannot have suffered such attrition and hammering as are incident to much travelling in the course of a stream bed. Thus the placer mines indicate first, the belts of auriferous country-rock, the streams will indicate the direction, and the transported matter itself shows the distance we have to go to the ledges, whether large or small, from which the placer gold was derived. They may justify mechanical exploitation or not, according to circumstances peculiar to the district, such as transportation, etc., quite apart from their character.

The lines of strike, accompanied by the axial line C.D., and the area of deep erosions included between the lines G.G. and H.H., furnishing respectively, the elements of identity of the rock, and of the value to be attached thereto from the testing of it by erosion, will be found to contribute materially towards confirming a judgment from nature's own hand, of the promise of the ledges on the different creeks.

Quartz Ledges Examined.

Williams Creek.—Among the ledges which have attracted the attention of the placer miners, and later of quartz prospectors, in a few instances succeeded by systematic underground mining,—are the following, with their principal features, and assay values, as found:—

Proserpine Ledge.—At Wilkinson shaft house. Strike and dip, etc., not visible on account of the filling up of the shaft; supposed to be in line with Mason Avenue, which runs N. 47° W.; bearing to Bonanza ledge N. 43° W. The strike of the soft black slates, taken 200 feet west of the Wilkinson shaft, was found to be N. 43° W.; dip about vertical. Hence the ledge here may be considered as between beds. Body not visible. *Contents*, quartz, pyrites, ferric-hydrate, carbonaceous matter, and a little siderite. The shaft is 50 feet deep; it was sunk in 1864-66, by Wilkinson. Quartz.
Vein between
beds.

At the Proserpine shaft house, 700 feet east from last, the attitude is about the same, the vein dipping S. $< 75^{\circ}$; body, 10 feet. *Contents*: galena, iron pyrites, quartz, chlorite, brown oxides, and a bluish felspar. An assay by Mr. Hoffmann, of specimen containing iron pyrites and galena, in a gangue of quartz and chlorite, gave gold, 0.787; silver, 20.738 ounces to the ton. Another (No. 54) yielded only a trace of gold, and no silver. Pyrites in "slate" is said to have assayed very high. The shaft is 97 feet deep. (Filled with water.) a Galena.

At a distance of 630 feet W.S.W. from the Wilkinson shaft house is the "supposed Steadman Ledge," a body of quartz striking east and west, with a southerly dip of 75° . It is in slates striking N. 33° W., and dipping north-eastward $< 65^{\circ}$; showing local irregularity in the attitude of the country rock, and an intersecting vein system. Vein across
beds.

Steadman Ledge, Richfield. A body of about four feet in width can be seen near the bed of the creek, where it has been exposed by an open cut. Strike, N. 48° W., standing about vertical. Fifty feet from it the slate rock strikes S. 35° E. and dips north-easterly $< 70^{\circ}$; apparently in broken ground, as a hundred yards above it, and about the same distance below it on Williams Creek, the slate rocks strikes S. 65° E. and dips northward from 70° to vertical. *Contents*: A specimen sent to me by James Reid in December, 1886, obtained from a depth of 30 feet, assayed by Mr. Hoffmann, contained gold, a distinct trace; silver, none.

Hines Ledge, above Richfield. Quartz with pyrites and mineral resembling limonite. A body of quartz several feet or more in width was sunk upon by the occupant of the adjacent cabin. Depth of shaft, six feet; body of ore, four feet; direction of strike and continuity unknown. It is at the head of the profitable placer mining on Williams Creek. Contained little or nothing.

Stout's Gulch Ledge, Hydraulic Diggings, near Barkerville. An assay, by Dr. Harrington in 1876-77, of a specimen collected by Dr. Dawson, from a five-foot cross vein, containing white quartz with iron pyrites, gave gold, .335 oz.; silver, .131 oz. to the ton.

Vein between
beds.

Bonanza Ledge, situated near the divide between Stout's Gulch and Lowhee Creek, near Barkerville. Strike of ledge N. 48° to 63° W.; dip northward < 45° to 60°; strike of slates in tunnel, N. 65° to 80° W.; dip northward < 45° to 60°. The above are repeated trials at different places. Taking an average, that of the ledge would be N. 55½° W., and of the rock N. 72½° W. The strike of a large body of quartz on the surface several hundred yards east of the tunnel known as the "Big Blowout," agrees in the main with that of the ledge in the tunnel. It is plotted on my track survey as W. N. W.; but Mr. Craib, who observed instrumentally at my request, reports its strike, N. 49° W. On the whole, I am inclined to think the Bonanza ledge runs in the bedding of the rock. Country rock, slate; showing evidences in places of fragmental origin. *Contents*: Quartz, with polished "slickenside" wall, iron pyrites, graphite, etc.

Country-rock
and contents of
ledges.

An assay of south casing of Bonanza ledge by Dr. Harrington (Report of 1876-77, p. 477), gave gold, .064 ounces; silver, .023 ounces to the ton; of north casing, only traces of gold; and of blue quartz containing slaty matter, only traces of gold.

Specimens received at the Survey Office in 1878, containing white quartz, pyrites, and some carbonaceous matter, gave gold, .554 ounces (\$11.45); silver, .335 ounces to the ton. It had been reported as containing \$90 (Rep. 1876-77, p. 478).

Erroneous
assays.

Mr. Forrest states that this rock was assayed in 1878, and was reported to contain \$90 a ton, but that subsequently the assays were reported erroneous. Mr. Harper, who worked some tons at Nason's Mill, claimed that it paid \$3 to \$4 a ton, but did not get gold enough to make a bar. No rock from the Bonanza was crushed in Riotte's time, beyond test samples.

Development
work.

A tunnel several hundred feet in length strikes the ledge 55 feet below the surface, and a shaft from its inner end 50 feet deep, shows the ledge to a depth of 105 feet below the surface. Counting in the side stringers it is estimated to be 22 feet in width. Some galena is found in the hanging wall; in the foot wall the ore is all pyrites.

Uncertain
strike.

Home Rule Ledge, Barkerville Mountain, half-a-mile west of lower end of Barkerville. The opening on this ledge is a hole less than ten feet wide and deep, leaving the strike and dip uncertain. Mr. Dooley, the first locator, considered it as running east and west. Mr. O'Neil, subsequently owner, considered it as running north and south, basing his conclusions on appearances in the opening. These would indicate

a ledge of about five feet in width, dipping east $< 80^\circ$, having porphyry in the foot and hanging walls. There is, however, a stringer of quartz extending through this porphyry in an easterly and westerly direction, dipping S. 75° , which may represent the Dooley ledge. At a distance of 250 feet south of Mr. O'Neil's opening there is a body of mineralized quartz from five to six feet in width, striking N. 41° E., and dipping north-westerly $< 80^\circ$. Twenty feet to the east of that there is a confused body of quartz separated from it by porphyry. In a southerly direction from the Home Rule opening, Mr. O'Neill found other similar croppings between these and the mouth of Stout's Gulch. *Contents*: Iron pyrites, limonite, and galena; yellow earthy oxides, ferric hydrate, accompanying pitchy looking limonite. In places along with galena, also a reddish brown, a yellow, and a white oxide. The principal characteristics of the Home Rule is its abundance of mineral in the shape of galena, limonite, pyrites, and their oxides; in which respect it is not excelled by any ledge seen by me in the district. An assay by Hoffmann of a specimen containing an association of galena, iron pyrites and limonite, gave gold, .020 ounces; silver, 6.562 ounces to the ton.

Lead sulphide
and oxide.

Dooley Ledge, an easterly extension of the last. Mr. Dooley's principal opening is about 500 feet east of the Home Rule opening, and the body of quartz disclosed strikes N. 75° W., dip S. $< 70^\circ$; width, three feet. It does not show as much mineral. What there is resembles that of the Home Rule opening, except in lesser degree of decomposition. The country rock in the vicinity, a spotted slate, strikes N. 80° W., and stands vertical. Probably, on further development, the ledge will be found to run with the slate. On the brow of the hill, back of Sincox's dwelling, the latter strikes N. 75° W., and dips N. $< 75^\circ$.

Probably
between beds.

Sergeant Lindsay Ledge, Richfield Mountain. Strike of main ledge, N. 69° to 76° W.; side ledge, N. 81° W. Width of main ledge, $4\frac{1}{2}$ feet; side ledge, $2\frac{1}{2}$ to $5\frac{1}{2}$ feet. The main ledge dips S. $< 50^\circ$, and the side ledge is vertical. These two bodies form a single ledge at the foot of the hill, (where the ledge has been opened), and diverge at a small angle to the westward. Country rock, grey slate, with an apparently flattish dip. It has a cleavage striking S.S.E., dip easterly $< 60^\circ$. Great bodies of similar quartz crop on all sides near this ledge, and show a continuance in many different directions by smaller croppings. *Contents*: quartz with ferric hydrate and a little pyrites. A uniformly whitish barren-looking quartz, occasionally fragmental, and showing brown iron oxides in bands. Assay by Hoffmann yielded gold a trace; silver, 1.808 ounces per ton.

Veins across
beds; pyrites.

Lowhee Creek.

Veins between
beds; free gold.

Enterprise Ledge, $1\frac{1}{2}$ mile west of the Bonanza watershed. Close to it on the west, and parallel to it in course, is Jack Pinkerton's ledge so similar in attitude, body and other characteristics that it might be described as a repetition of the Enterprise. Strike of Pinkerton ledge, N. 59° W.; dip northerly $< 85^{\circ}$; width, nine feet. The ledge is about 200 feet from the Enterprise; both striking with the slate, which dips however, S. 70° . They cross Lowhee Creek about 2,000 feet below the Victoria upper shaft house, which would strike near the position of the Ralph ledge, on Barkerville Mountain. The country rock is finely laminated chloritic slate.

Not same as
Bonanza.

Strike of Enterprise ledge, N. 62° W. vertical; body eight to ten feet. These ledges, accordingly, do not appear to lie in the extension of the Cariboo or Bonanza ledge. On Lowhee Gulch, where the Enterprise and Pinkerton ledges cross it, the slates hold the same strike, S. 60° E.; showing an unbroken country between; but the dip is less, being only about $< 40^{\circ}$, while the colour of the rock is more greyish. George Byrnes & Co., in 1878, drifted in quite a distance on a ledge at or near this crossing. *Contents*: Quartz not containing any mineral visibly; remarkable for their perfectly polished slickensides. An assay of a specimen of "Enterprise ore," sent by W. Pollard to the Survey office in 1878, contained white quartz, pyrites, iron oxide, and slaty matter, and yielded gold, 20.096 ounces; silver 4.929 ounces to the ton. Opened by a tunnel about 350 feet long.

Intersecting
galena.

Victoria Shaft Ledge.—Peculiar quartz crystals, encased in galena. Supposed by Mr. Forrest to be the western extension of the Bonanza. The Victoria was tapped 100 feet west of the shaft-house, by a tunnel running magnetic north, which cut a body of sulphurets two feet in width, but broke off abruptly to east-ward, in the direction of the Bonanza.

Sam Crane's Old Store.—Stringers yielding \$20 a ton.

Island Mountain.

"*Lady of the Lake*" Ledge, on west shore of Jack of Club's Lake. Pyrites, and quartz, with carbonaceous matter. Assay—gold, a trace; silver, none. A tunnel was run in by Forest Dunlevy & Co., some years ago; course, W. to N.W.; continuity undetermined; body in places, eight feet. Vein lost.

Following the strike of the John's ledge from the John's tunnel eastward about 1200 feet, in sight of Jack of Club's Lake, and 300 feet back from it, bodies of quartz have been found having a similar strike, but no continuity in developments so far made. This supposed

extension of the Island Mountain or Walker Ledge, is claimed by Robert J. Walker. The rock near the lake strikes S. 65° W., dipping northward < 45°; accordingly agreeing with that of the John's tunnel.

The John's or Island Mountain Ledge, one-third to one half mile west of Jack of Club's Lake. Strike, as observed in tunnel, N. 83° W.; dip, southward < 60° to 75°. Mr. Walker gives the strike as S. 50° W. magnetic, S. 75° W. true, or 22° more to the south than I found it in the John's tunnel. The rock strikes W.S.W. to S.W.; dip to northward, < 25 or 30 degrees. A well defined pyrites ledge of 41 to 51 inches has been followed in about 50 feet. *Contents*: Iron pyrites, and quartz. A working test of a sample lot from the John's tunnel, I am informed, yielded Mr. Craib in 1887 \$30 to the ton. This ledge has been supposed to be identical with the Walker ledge. It is 830 feet east of the Walker opening, and within 1500 feet of Jack of Club's Lake. The John's tunnel or Island Mountain ledge however, varies in strike from that in the neighbourhood of the Walker ore-house to the extent of 20°. Strike with rock, dip contrary.

The Island Mountain Company's operations during 1886-87 included the purchase of the Lane and Kurtz Mill, and the grading of a mill site on Jack of Club's Lake, at a point where the course of the western portion of the ledge would strike the Lake. From the John's tunnel it was proposed to deliver, during the winter of 1886-7, 1000 tons of quartz; and to add to the mill, concentrators, and roasting and leaching appliances for its treatment. Development.

For several thousand feet the quartz here opened to sight, it will be observed, while not departing widely in strike from that of the slates, distinctly does not follow their bedding. The ledge shows every appearance of regularity and continuity. Contrary dips.

Walker Ledge, 830 feet west of last. The ledge strikes S. 75° W., and dips to southward < 60°. Strike of rock in cut near ledge, S. 60° to 65° E.; dip N. < 45°. A heavy body of quartz is in sight, varying in thickness from three to six feet. The cut into the Walker ledge runs S. 50 feet, striking the ledge nearly at right angles. *Contents*: Honey-combed quartz, and brown iron oxide from decomposition, with glistening white talcose mineral resembling mica. From same locality, quartz, iron pyrites, and greenish tale. A quantity of rock milled by Riotte in 1887 (imperfectly roasted) yielded \$19.03 to the ton. The bulk of the rock worked by Mr. Riotte was hauled to the Lane and Kurtz Mill, and not roasted at all. Being mostly iron pyrites, with very little or no free gold, it yielded only a few dollars to the ton. During the winter of 1885-6 Mr. Nason worked 3000 lbs. of ore from this ledge taken from the dump at the Tests.

ore-house, and obtained \$19.70. Mr. Walker reports a sample of the tailings sent to Pittsburgh for assay which yielded \$61 to the ton.

Contrary dips. West of the Sadou ledge crossing, another cut ending in a short tunnel, has been run into the Walker ledge. It is 420 feet westward from the ore-house. The slate rock strikes N. 75° W., and dips northward < 45°; perhaps is a little disturbed. A bearing taken along its strike, as indicated by Mr. Walker from his developments here and elsewhere, was S. 79° W. About 500 feet further west in this direction, the ledge is again opened by a cut which discloses a body three feet and a half in width, nearly vertical, or dipping slightly to the south. Mr. Dunlevy owns an extension here of 1500 feet. The ledge is traced another 1500 feet west, where it is known as "Joe Mason's extension." About a mile beyond that, to the westward, are the ledges elsewhere noted having a similar strike, at the head of Mosquito Creek.

Veins across beds: pyrites *Sadou Ledge*, near last; strike, S. 30° to 45° W.; attitude, nearly vertical. Mr. Walker observed it as S. 14° W., magnetic, which agrees approximately. Strike of country rock, S. 55° W.; dip, northward < 45°. The Sadou ledge is opened by a short tunnel, several hundred feet to the westward from Walker's opening. It is a ledge crossing the above named; body, 2 to 4 feet. *Contents*: A milk-white quartz coated with hydrated peroxide, having pyritous cavities gave, gold, .658 ounces; silver, .233 ounces to the ton. Assay by Harrington, in 1876-7, of rusty quartz, with mica slate, from the Sadou ledge gave gold, .175 ounces; silver, .802 ounces to the ton.

Fault. The Sadou claim runs 600 feet in the general direction of the ledge up into the mountain, taking in a width of 100 feet. It is owned in Paris. At the bottom of the cut there is evidence of a fault, in quartz lying near to, if not belonging to the ledge.

Veins across beds. *Fox Ledge*.—Near last; strike, W.S.W., dip, southward < 85°. Country rock, slate; strike, S.W., dip, N.E., < 40°. An irregular broken ore body of considerable extent. *Contents*: An abundance of iron pyrites, and iron oxides containing free gold. Yielded colors of gold after roasting. An assay of selected ore is said to have yielded \$60.00 and \$70.00 to the ton.

Veins across breakage. *Wright Ledge*.—Near last; strike, south-westerly, nearly vertical. Strike of country rock, S.W., dip, N.W. < 30°. Body, 2½ feet, and less. *Contents*: Pyrites &c. Assays are said to have yielded \$50.00 to the ton. The ledge lies along the tunnel, which is in the strike of the rock, for the first twenty feet; then diverges it on the right hand of the tunnel. The tunnel runs S.W. 150 feet; then S.S.W. 170 feet; total, 320 feet.

Galena. *Atcheson Ledge*.—A small ledge between the Fox and Wright. *Contents*: galena, with other ore.

The Fox, Atcheson and Wright ledges have some appearance of breakage, which may also affect the Sadou and Walker ledges.

About 200 feet eastward from the mouth of the Wright and Atcheson openings, Mr. Walker, in 1869, ran a tunnel south, 124 feet in length, nearly at right angles to these ledges, without striking them; showing that they pass more to the north; and further proving, that the Walker ledge does not, as it should not, pass in that vicinity.

Soda Co.—Mr. Walker informed me that about 2,000 feet west of the Dunlevy cut above mentioned, Flynn & Co. under the name of the Soda Co., have located a ledge which crosses the Walker, striking N.W. magnetic, (W.N.W. true), is four feet wide, and yields an assay of \$38.00 to the ton. Vein across beds.

The Sadou ledge, and some bodies of quartz showing on the mountain near the "Lady of the Lake" facing Jack of Club's Lake, correspond in course and attitude with some of the ledges of Burns' Mountain, four miles further south.

Mosquito Creek.

Ledge in Saunders placer diggings.—Strike, N. 62° E., dip, north-westerly, very steep. Strike of country rock, S. 75° W., dip northward < 80°. Body, one foot to two feet and over. *Contents:* Quartz, and felspar, with ferric hydrate, and a little iron pyrites. Chlorite and white mica with nests of pitchy iron oxides are also characteristic. An assay by Hoffmann yielded a trace of gold; no silver. Vein between beds. Altered strike.

Ledge near Flynn's lower diggings, where float galena in large masses, from adjacent ledges not identified, gets into the sluices. Assay by Hoffmann yielded, gold, 0.182 ounces; silver, 36.458 ounces per ton. Galena.

Ledge in Flynn's upper diggings, 500 feet above last, large irregular bodies of quartz are seen in place. *Contents:* a little pyrites, and a white talcose mineral. An assay by Hoffmann yielded a trace of gold; no silver. These are the uppermost placer diggings on Mosquito Creek.

Six hundred feet further up Mosquito Creek forks; in the forks a tunnel has been run into the hill 500 feet, intersecting two or three quartz ledges of moderate size. Their course is easterly and westerly. One contains a great deal of galena, and is probably the source of the numerous specimens of that mineral found in Flynn's placer mine. Normal strike. The other contains sulphuret of iron.

Ledges at the head of Musquito Creek.—One mile from Flynn's cabin. Dip contrary. Supposed Island Mountain or Walker Ledge. Course, E. and W. magnetic=N. 64° W., dip S. Body about five feet. *Contents:* Galena, with white and yellow oxides.

*Lightning Creek.*Veins across
beds.

Beede or Perkins' Ledge, on Burn's Mountain, one mile and a quarter north of Lightning Creek. Strike, N. N-E., vertical; differing from that of the slate. The country rock graduates from slate to shale; in some places it is plainly unaltered from sandstone. It is a soft chloritic rock, in places; silicified, in others, and in the Burns' Mountain Company's tunnel it is hard to drill. Strike, N. N. W.; dip, eastward $< 30^\circ$. Body from six to eighteen inches, sometimes widening to three feet or more. There are several ledges of this sort near each other.

Contents: Quartz, with galena, ferric hydrate and iron pyrites. The quartz is usually honeycombed from decomposition of the pyrites, resulting in dark brown, bluish and blackish oxides. Accompanying the galena there are white and dirty yellow oxides. An assay by Mr. Hoffmann of quartz carrying a little galena, gave gold, 2.625 ounces; silver, 3.033 ounces to the ton. Another, holding more galena, yielded gold, 0.365 ounces; silver, 29.896 ounces per ton. Free gold shows in fine particles after roasting and washing. Development work consists of a tunnel (the Reid) about three hundred feet long, and several shafts, fifty to seventy feet deep, with connecting drifts and stopes. Several hundred yards north of the Perkins shaft is *the Laura Ground*, on one of the Beede series of ledges which has been extensively opened by the Cohen incline, etc.

Development.

Striking with
rock, dip
contrary.

Burns' Mountain Company's Ledge, on Burns' Mountain, two miles north of Lightning Creek. Strike of ledge, N. 36° E. (as traced on the surface by Mr. Jacques), attitude, vertical. Strike of country rock, N. 35° E., dip, south-easterly $< 30^\circ$. Body in main shaft, two feet and a half to five feet. *Contents*: Iron pyrites and galena, with yellow oxides. Assays various, including some visible free gold.

Breakage.

At their principal shaft the Burns's Mountain Company has sunk on a ledge five feet wide at the surface, to a depth of about fifty feet. In the last half of that distance the ledge suffered a break; the quartz diminished to two feet and a half; pinched out, came in again in considerable force, but its further continuity has not been determined. Selvedge lines and gangue, with broken rock, filled the place of the vein where broken.

Development.

From a point on the northern slope of the mountain, one hundred and seventy-four feet lower than the shaft house, a tunnel has been brought in, over eight hundred feet in length, to a point vertically under the shaft. Two series of veins were intersected, running N.E. and N. 30° to 36° E. respectively. During the season of 1886 they were drifted on, and prospected under the superintendence of Mr. Jacques.

Silver Ledge, Burns' Mountain Company. Galena and pyrites.

Strike, N. 30° E.; body two feet; in tunnel, very small. Assay by Hoffmann gave gold a distinct trace; silver, 3.442 ounces per ton.

Ledges near junction of Van Winkle and Lightning Creeks.—On the north side of Lightning Creek, opposite the old Van Winkle Company's headquarters, there is a small ledge which strikes N.W.; dip, N.E. < 55°; thickness, two feet, with parallel seams of smaller size. This is on an island of bed rock, between the Point claim and the present Van Winkle Creek. In the rich Placer ground of the Point claim, in 1875, four men, working in two shifts, took out five hundred ounces of gold a week. *Contents:* Quartz with chlorite and a little ferric hydrate. An assay by Hoffmann gave a trace of gold; silver, none.

On the south side of Lightning Creek, nearly opposite to the last, a little lower, and directly opposite to the Van Winkle dump, is a small ledge or stringer which strikes S. 72° W., and dips southerly < 40°, following the strike and bedding of the country rock. Body, six inches. *Contents,* quartz with chlorite and ferric hydrate. An assay by Hoffmann gave a trace of gold; silver, none.

From this point for three hundred feet down Lightning Creek, was the richest placer ground on the creek. David Edwards, who cleaned the bed rock in drifting, states that quartz was visible in considerable quantities under-ground. A large mass of it was found on a bench on the north side, about two hundred feet below first mentioned. No ledge was visible under the creek, so far as he knows.

Above the junction of Van Winkle Creek, three or four small ledges cross Lightning Creek, between Van Winkle and Eagle creeks.

Sam. Montgomery's Ledge, quarter of a mile above Stanley. Strike (from information), about S. 30° E. Body, two to four feet. *Contents:* Quartz with a little chlorite and limestone. Barren-looking. Assay by Hoffmann gave a trace of gold; silver, none.

Mr. Montgomery reports a ledge uncovered in the diggings at this place about 1876, which had a strike of S. 30° E., as nearly as he can recall it, and a width of four feet. It is probably identical with the ledge from which my specimens were obtained,—cropping under the bluff on the south side of the Creek, a little above Montgomery's cabin.

At the timber shaft, about 100 feet farther up, a "rotten ledge" was uncovered, from four to six inches in width, which crossed the creek in the same direction. The diggers sunk into the rotten ledge four feet, all along its course, and washed the loose stuff, which yielded the best prospects in the claim. Montgomery got coarse gold out of it, \$4.00, \$6.00, and an ounce (\$18.00) in weight. About six hundred ounces of the coarsest gold in the claim was taken out of this rotten ledge.

Veins between
beds; pyrites.

Striking with
rocks, dips
contrary.

Vein across
Lightning
Creek.

Rotten ledge.

Stringers.

Chisholm Creek.—One mile and a third north of Stanley. Lowest ledges or stringers found near rich placer ground just above Sam Montgomery's old placer diggings. Small veins of barren-looking quartz. Strike E.S.E., dip northerly < 50 degrees; body ten to twenty inches. *Contents*: Quartz with a small quantity of chlorite and ferric hydrate. Assayed by Hoffmann, gave a distinct trace of gold; silver, none.

Vein across
beds.

The diggings were worked in 1863-4, and paid \$50.00 a day to the hand—the richest on the Creek. While these ledges may have contributed to the results in part, the probability is that most of the gold was from ledges further up.

Two or three series of ledges with a similar strike are found between this locality and the junction of Oregon gulch. Here a narrow vertical ledge crosses the gulch at its outlet, in a northerly and southerly direction, showing excellent ore.

"*The Foster Ledge*" is in this vicinity. It is tapped by a tunnel running W. to S.W., a hundred feet above the junction of Oregon gulch, not now accessible. It was at one time the subject of much attention, founded on finds in the placers of its vicinity. Its strike is said to be south-westerly.

Sugar Creek.

Cooper's Gulch.—A little over half a mile above its mouth. A two feet and a half vein containing plenty of mineral, pyrites and galena, with ferric hydrate, chlorite, felspar and quartz. An assay by Hoffmann gave a trace of gold.

Galena Ledge.—Two thousand five hundred feet up Cooper's gulch. This may be identical with the Galena ledge crossing Sugar Creek a mile above Cooper's Creek; striking in that direction. Body two feet and a half, weathering into a hollow in the hill side. *Contents*: Quartz with a little galena, (often coated white) and iron pyrites. Assay by Hoffmann yielded distinct trace of gold; silver, 0.525 ounces per ton.

Forks of Cooper's Gulch.—Near last. Barren-looking quartz with white talc. Strike, S. 80° E., dip, N., nearly vertical.

Up the S.S.E. branch one quarter mile, another ledge crosses, striking S. 50° E., and dipping southward $< 70^{\circ}$ in which there is nothing visible at the point of crossing. Mr. Wiley thinks it is the same ledge which shows on the point of the mountain about half a mile to W.N.W. in good body, containing at that place an abundance of iron sulphurets.

Vein across
beds.

Ledge in Wiley's Old Diggings, at mouth of Cooper's Gulch on Sugar

Creek, (containing conglomerate cement boulders). Strike S.W. A ledge of good body, two or three feet, and fine looking ore, but undetermined continuity. *Contents*: Quartz, pyrites, and brown oxide. Assay by Hoffmann gave a distinct trace of gold; silver, none. The placer ground was rich in its vicinity. Mr. Wiley attributes it to the ledge.

Upper Ledge in Cañon above Wiley's house; strike of ledge N. 80° E., dip northward $< 75^{\circ}$. On the north-side of Sugar Creek a body of quartz six to eight feet in thickness stands above the surrounding surface. *Contents*: Quartz with iron pyrites and a little copper pyrites. Assay by Hoffmann gave a distinct trace of gold; silver, none. Vein across beds.

Fifty feet above the creek on the north side there is a bench which was worked by Mr. Wiley ten years ago. It yielded \$4.00 a day near this ledge, and \$2.00 away from it.

Lower Ledge in Cañon, 150 feet below last. This strikes N.W. and S.E., and dips to southward $< 70^{\circ}$; accordingly crossing the last mentioned on the bench. At the edge of the creek on the E. side there is a body three feet in width, which appears to be a bunch—continuity doubtful. Country-rock, slate, strikes N.W., dip northward $< 70^{\circ}$. *Contents*: Quartz with reddish weathering siderite, and ferric hydrate. Assayed by Hoffmann yielded distinct trace of gold; silver, none. Another specimen showing, along with quartz, siderite, and ferric hydrate, also chlorite, and a small quantity of blende, yielding on assay, a distinct trace of gold; silver, none. Veins across beds.
Carbonates.

This ledge crossing the last mentioned on the bench described, at or near the crossing contains copper pyrites, malachite, and a pitchy ore probably a copper sulphuret. Copper.

Ledge at Ditch waterfall, near Wiley's cabin. Strike with slates S. 55° E.; but not following their bedding. It dips southerly $< 60^{\circ}$, while the slates dip northerly about the same amount. Body, two feet. *Contents*: Brown iron oxide in moderate quantity. It yielded gold appreciably, in the sluices of the adjacent placer mines, although not containing much mineral visible to the eye. Strike with rock: dip contrary.

Ledge at Wiley's cabin, (passing under woodshed). About 200 feet below last, striking with the slates. Body, 2 to $2\frac{1}{2}$ feet. Continues through the diggings; east of the creek enters hydraulic diggings near the Walker tunnel. *Contents*: Quartz with iron pyrites coated black, ankerite, ferric hydrate, chlorite, and a small quantity of blende. Specimen assayed by Hoffmann yielded gold, a trace; silver, none.

Dirt from its vicinity thrown into Wiley's sluices, yielded a different gold from that of the placers overlying it. Gold is invisible to the eye in specimens.

Lower Diggings Ledge.—Still another ledge crosses the creek about the middle of the lowest placer bench worked to bed-rock, a quarter of a mile below Wiley's house. Strike, N. W. & S. E., vertical; body, $2\frac{1}{2}$ to 4 feet. It contains an abundance of sulphuret.

On Mustang Creek, which enters Sugar Creek half-a-mile below Wiley's, there are several quartz ledges seen crossing Isaac's placer diggings diagonally. These diggings are two miles above the mouth. Wiley supposes these ledges to be the continuations of those of upper Cooper's Creek.

Grouse Creek.

Vein between
beds; iron
sulphide.

The Clear Grit Ledge, situated on Canadian Creek, two miles east of Barkerville, strikes apparently with the slate country rock, N. W., and is, like it, vertical in attitude. Body, five feet. *Contents*: Iron pyrites with the usual accompaniments, in abundance.

The Fountain Head Ledge, on Grouse Creek, is situated at the head of the placer diggings above Cañon Ravine, and strikes N. 52° W. dip northward $< 65^{\circ}$; having nearly, if not precisely, the same attitude as the country rock. Body, ten feet, running in parallel stringers, which are separated by selvages. The vein does not show on the East side, but ought to go through the Ottawa Company's placer claim. *Contents*: Quartz with a little chlorite and ferric hydrate; iron pyrites weathered out of a honey-combed quartz. An assay by Hoffmann gave a distinct trace of gold; silver, none.

It has been little more than touched; while its position and appearance would seem to warrant prospecting it. Notable on account of parallelism of quartz deposits.

The Lady Dufferin Ledge at the head of the creek, strikes S. 65° E.; dip northward $< 70^{\circ}$, with the country rock. Width, five feet nine inches. *Contents*: Iron pyrites with oxides, quartz, and carbonaceous matter. It contains rather a barren-looking quartz. Iron sulphurets in stringers are seen running into the slate hanging wall. Assay by Hoffmann yielded gold, 2.042 ounces; silver, 0.292 ounces per ton.

Twist and
breakage.

Porphyry.

The ledge has been exposed by a tunnel sixty-five feet long, running S. 75° W. The ledge is named the Lord Dufferin on the east side of the creek. Here its strike, as seen at the surface, appears to be S. 25° E., dip northward $< 60^{\circ}$; but on entering the tunnel it is S. 80 to 85° E., dipping from nearly vertical to $< 50^{\circ}$ northward—showing a displacement by a twisting movement. A porphyry streak of six inches divides the ledge. From stray pieces it is supposed that additional porphyry dykes exist which had, probably, a good deal to do with these disturbances. The country rock is a spotted bluish slate, which falls down in large angular blocks, often knotty in appearance. It has been exposed by a tunnel run S. 25° E. to a depth of 175 feet.

Antler Creek.

Porter's Ledge on middle Antler Creek is a little below the old town of Antler, on the west side. Two ledges here show, within 50 feet of each other. The upper one is best seen above the trail and several hundred feet back. Strike E. S. E., dip to southward $< 80^\circ$. These ledges show also in the creek, and beyond it, several hundred yards E. S. E. Body, unknown. *Contents*: Quartz and a little chlorite, with ferric hydrate, running from brown to blackish in parts; weathered specimens showing also yellow and white oxides. An assay by Hoffmann showed a trace of gold; silver, none. Southerly dip;
iron and lead
sulphides.

The lower ledge shows a large body of ferruginous matter, with some fine-looking quartz. Body and character cannot be determined without digging.

Pebbles of ironstone are found in the sluices of the Yellow Lion Co. at McBean's Flat. Where these pebbles are found on Antler Creek, it is said there is gold found with them. They are jaspery in appearance, approaching hematite in the quantity of iron they contain; and were probably derived from a ledge, which in depth becomes pyritous. Pebbles,
ironstone.

The Limestone Ledge of Nugget Gulch, half a mile above Porter's house, strikes and dips with the country rock, and has a body of several feet in thickness, blending into limestone. *Contents*: Ankerite and ferric hydrate. An assay by Hoffmann showed that it contained neither gold nor silver. Nugget Gulch in the vicinity has been mined for 1,000 feet up from its junction with Antler Creek, and the source of nuggets had been attributed to the limestone ledge. Further up, Nugget Gulch has not been prospected to bed-rock. Vein between
beds; iron
carbonate.

Round-Top Mountain and Cunningham Creek.

On Round Top Mountain there is a comb of quartz or quartzite which is evidently too massive to be anything else than barren. The summit itself is mostly quartz, or quartzite, which strikes with the rest of the country rock; strike N. 80° W., dip northward $< 40^\circ$. Vein between
beds; iron
oxides.

The "Big Ledge," or comb of quartzite on the eastern member of Round Top Mountain, one mile S.E. of last, contains oxides of iron in small quantity, with very little pyrites. Strike more to the S.E. than on the main summit; dip, also northerly, but steeper. Country rock, slate. This comb runs from one-quarter to three-quarters of a mile E.S.E. from our Round Top camp, striking over the summit of the eastern mountain. Slides from it, on the N. side, show oxides of iron in sufficient quantity to colour the side hill of the northern escarpment red, visible at a mile distant.

Between beds ;
sulphide. *Ledge on Cunningham Creek*, near the head of Sharp's Ditch, two miles west of Round Top, and 100 feet above the ditch. Course, N.W. and S.E., with the rock; dip northerly less than $< 48^\circ$. Quantity of ore considerable, but the continuity has not been proved. *Contents*: Iron pyrites, nearly pure; also decomposed products, with quartz. An assay by Hoffmann showed a very distinct trace of gold; silver, none.

Between beds ;
carbonate. *Ledge in Sharp's Diggings*, Cunningham Creek. This is called the "Big Iron" Ledge, and is an iron stained ledge or dyke, containing pyrites. Its attitude is that of the country rock, which is slate and limestone. *Contents*: Ankerite, with a little quartz, chlorite, and some ferric hydrate. The assay by Hoffmann showed a trace of gold; silver, none.

Unknown
ledges. *At the Chinamen's Diggings*, on the western hill-side, half a mile below Sharp's, great numbers of quartz boulders are found scattered, indicating proximity to a ledge of good character, not yet discovered. The digging in 1886 yielded well. It is a side-gravel deposit of local origin.

Snowshoe Plateau and Snowshoe Creek.

Vein across
beds; lead, iron
and zinc
sulphides. *The Holmes Ledge*, Breakneck Ridge, head of Six-mile Creek, on the Antler trail, strikes east and west; attitude, nearly vertical. It is in a comb of slate extending down from the Mountain, the country rock striking N.W., dip N.E. $< 70^\circ$. Cleavage lines of large masses appear to correspond with the strike of the rock. Body of ore very considerable, in the shape of nests from three to six feet in width, the continuity of which has not been determined by openings. *Contents*: Galena, and iron pyrites, with zinc blende, accompanied by white oxides; galena in considerable abundance. A sack of the ore was sent to San Francisco for a working test, which resulted very favorably, having yielded, it is said, a profit to the owner, above cost of test.

Veins between
beds; free gold. *Haywood's Arastra Ledge*, one-quarter mile north from upper Little Snowshoe Creek, strikes S.S.E., and dips eastward $< 45^\circ$, like the country rock, a grey slate. Body, six to eight feet, as seen in a shallow prospect hole of the same dimensions; not further determined by exploration. *Contents*: Pyrites in quartz, with ferric hydrate, chlorite, and (reported occasionally) free gold. The quartz is a good deal honey-combed, from decomposition. A specimen assayed by Hoffmann yielded gold, 0.408 ounces; silver, 0.058 ounces to the ton. Another showed a distinct trace of gold; silver, none.

A tunnel was run in by Mr. Haywood many years ago to tap the ledge. Its direction was N. 6 E., and length, 90 feet. It did not follow the ledge; and very little can be seen from the developments, of

the character of the ledge. Prospect ditches, and openings made by Haywood proved, however, an abundance of quartz.

An arastra located on the ground was unprofitably worked by Mr. Arastra. Luce. Its name was originally the Douglas ledge. Mr. Haywood reports that he found visible gold all the way down, from the day he commenced prospect work, to the bottom of his hole, which was located on the richest place at the surface.

His tunnel was on one side of the ledge, crossed it diagonally, and then kept alongside. About 40 feet in, was obtained the mineral now seen on two dumps. Various stringers three or four inches in thickness were crossed, besides the main ledge.

A ledge on the top of the hill, 1,400 feet N.N.W from the Arastra ledge, also follows the strike of the rock. There is quartz scattered all over the top of the hill.

The Snowshoe Creek Rich Boulder Ledge, never identified, was the ledge sought in the Arastra location. The only other ledge ever found on Little Snowshoe, besides the Arastra, in proximity to the placers, is on the point 200 yards below Smith and Anderson's hydraulic diggings. In 1874, Mr. Haywood ran a tunnel to find a high rock-bed bench of the channel, and found this ledge. It contained a good deal of galena. What struck him was, that it appeared to be the same kind of rock as the rich quartz boulders for which the Little Snowshoe Creek placer diggings have been noted, containing galena and free gold.

Boulder ;
specimens,
galena, and free
gold.

The Arastra ledge did not contain exactly the same kind of quartz as these boulders ; galena was lacking. Other ledges and stringers near it, however, above and below the Arastra, contained galena. About 200 yards west of the Arastra, still another ledge was found, running S.W., which contained galena.

On Horseshoe Gulch, forming the extreme north-easterly source of Little Snowshoe Creek, several ledges and stringers are seen crossing the gulch diagonally, in the strike of the slates ; course, N. 30° W. Contents, of ledge noticed, quartz and galena.

Vein between
beds ; galena.

The Steele Ledge is on the dividing ridge between little Snowshoe and French Snowshoe creeks ; containing honey-combed quartz and brown iron oxide, with blackish parts. Several bodies of quartz a few feet wide show on the surface, without much appearance of continuity ; nor containing much visible mineral. Developments, about 18 inches sunk on ledge.

The *Galena Ledge*, near by is supposed by Haywood, to be in line with the Arastra Ledge ; being S. 21° E. from Arastra Ledge three quarters of a mile ; on spur forming the north-west side of Yank's Peak, one fourth of a mile from summit. It is in line with the tunnel ledge on French

Vein between
beds ; galena.

Snowshoe, which figured during the quartz excitement of 1878. Chunks of galena are found on the surface immediately below this ledge. Mr. Haywood supposes the galena in the Little Snowshoe placer mines to have been derived from it.

The "*Big Ledge*," on the S.W. side of Yank's Peak, claimed by Haywood and Rawley, strikes north and south, and according to Haywood, standing vertical, shows only scattered croppings to speak for itself.

Vein between
beds: galena.

Galena Seams and Veinlets.—A mile below the Arastra, and about 100 yards below Haywood's present house, Haywood, in 1876, found a seam of galena an inch thick, on the east side of Little Snowshoe Creek, in plumbaginous black slate, along with a scraggy, sparry quartz. It was in the strike of the rock, running from S. E. to N. W. Near the same locality on Little Snowshoe Creek, pyrites occur in association with a felspar weathering red, in the rocks cut through by the creek.

On Harvey Creek.

Veins between
beds: iron
sulphide and
carbonate.

The *Ironstone Ledge*, one-quarter mile below falls of Harvey Creek. Olive and bluish felspar with iron pyrites. Over three feet in width. Strike east and west; dip, N. $< 60^\circ$; with the slates apparently. It is from three to eight feet wide, and is repeated in another locality near it. *Contents*: Siderite, with magnetic pyrites and a little iron pyrites; a great body of metal, being nearly solid ore. Assay by Hoffmann showed a distinct trace of gold; silver, none.

The ledge weathers red on the surface. Projecting into the creek, boulders from it strew the placer mines below.

Duck Creek.

Veins across
beds: lead, iron
and zinc
sulphides.

Ledge 300 feet above the Forks Trail crossing. Strike of ledge S.W.; attitude, vertical. Strike of country rock in the vicinity E. and W., dip, north. Body two to four feet. *Contents*: Galena with white and yellow oxides, a small quantity of iron pyrites, zinc blende, reddish oxides, and opaline hornstone. Assay by Hoffmann showed a trace of gold; silver, 3.850 ounces to the ton.

A surface cut was made in 1878 on the north side of the creek, disclosing considerable quantities of galena. On an adjacent discoloured bluff of country rock, an excitement was raised 25 years ago, owing to placer finds supposed to have been traced to this vicinity.

Borland Ledge, two miles above trail crossing; strike, S.W.; attitude, vertical. Strike of slates in the vicinity, S.E.; dip, southerly $< 25^\circ$. A body of four to five feet in width crops out on the N. side of the creek, into which a shallow cut has been made. *Contents*: Quartz

with iron pyrites and chlorite. Assay by Hoffmann showed a trace of gold; silver, none.

In the winter of 1878, the Chinese, supported by the merchant Ching at Quesnel Forks, took great interest in this ledge, and worked at and around it the greater part of the winter, without accomplishing much. It was believed to be rich.

North Fork of Quesnel River.

Moore's Ledge.—A ledge is reported by Mr. James Moore cropping at low water on the left bank of the North Fork 100 yards above the mouth of Spanish Creek. It crosses the river at right angles. Body, three feet.

Below Spanish Creek the bed of the North Fork was found rich; Placer gold. above it, poor in gold.

Ne Tye Ledge.—A mile below mouth of Spanish Creek Chinese hydraulic diggers near old Diller tunnel, exposed ledge in washing. ^{Vein across beds; iron sulphide.} Strike, N.W., dip, N.E. $< 60^\circ$. Slates strike east and west, dip, north eight degrees. Body, one to four feet; irregular in continuation. Contents: Quartz with ferric hydrate, from decomposed pyrites. Assay by Hoffmann showed a trace of gold; silver, none.

The Diller tunnel was run into a point on the right bank, intersecting a ledge in this vicinity.

The Stephenson Ledge also on the right bank, one mile and three-quarters below the mouth of Spanish Creek, was opened by shaft and tunnel in 1878. Body and contents, unknown.

Spanish Creek.

On Spanish Creek there are seven or eight known ledges, reported by Mr. Moore. ^{Numerous ledges.} A mile above its mouth there is a ledge two feet wide, not containing any sulphurets. There is a ledge from five to seven feet in width at the meadows, near the outlet of Black Bear Creek. It contains galena in streaks about an inch wide, and strikes N.N.E. Another, a mile up Black Bear Creek, is six inches wide, and consists of decomposed quartz. Above that, one mile and a half is a ledge four feet wide containing iron pyrites. These ledges run in the same general direction.

While working placers on Black Bear Creek, Mr. Moore frequently found pieces of pure galena weighing from one ounce to ten pounds, and many quartz boulders containing galena.

*South Fork of Quesnel River.*Gold in
conglomerates.

Between Quesnel-Forks town, and Quesnel Lake, a nine-mile stretch of Quesnel River has been designated as the South Fork. In the placers accompanying the river here on high shelves of bed-rock, quartz boulders occur along with iron pyrites, and their rusty decomposition products, derived from the newer mesozoic rocks of that region. A soft conglomerate is picked by the miners, in order to wash it; and its metallic contents are seen to have led them occasionally far up on the hill sides, above the bed of the old river channel. Much of the gold on this stream, accordingly appears to be a secondary deposit. Veins in this area are certainly less numerous, and have attracted little attention in connection with the placer deposits.

*Between the Main Quesnel and Swift Rivers.*Vein across
beds, free gold.

The Dominion Ledge on western end of Cariboo Mountain; strike N. 85° E.; dip, southward, < 80°. Body, eight to ten feet. It plunges down, and follows midway the steep northern escarpment of Cariboo Mountain. It is conspicuous above the surface, from six to twelve feet in width, for one third of a mile. Beyond that to westward and eastward, its identity becomes less certain, mingling with neighbouring croppings. Although broken fragments are found to the westward in the line of strike, the appearance is that of a diminution in strength in that direction. Cross stringers occur plentifully. Country rock, grey slate. Three quarters of a mile to the westward, black slate succeeds the grey. Strike of country rock, N. 40° W., dip, S.W. < 50°. *Contents:* A barren-looking white quartz, in some places stained light yellow. Specks of free gold are visible occasionally.

Development.

Development work has amounted only to the removal of about 100 cubic feet of rock from the surface of the ledge. Several miles to the westward, on or near the strike of the vein, Mr. Porter panned gold out of the surface dirt, at a point where the mountain slopes down into the valley of Swift River.

*Hixon Creek.*Veins between
and across beds.

Quesnel Company's location on Washburne Ledge. Strike N. 46° W., dip N.E. < 70°, with the slate country rock. Body from 6 feet to a few inches. Cross-veins of less body, striking N.E. and standing vertical, contain richer ores. *Contents:* Iron pyrites, grey copper, and their decomposition products, with free gold. Assays by various parties, from \$28.00 to \$274.00, averaging over \$70.00 per ton, in gold and silver.

The main shaft is 200 feet deep. The Mason shaft, several hundred feet north of it at the base of the hill, is 40 feet deep; and the Koch shaft is 70 feet deep. Development.

Three more or less crooked prospecting drifts have been run northward into the hill, searching for a continuous ore body. Following bodies of quartz, in several instances the general course was with slates, as given above. The oldest of these was run by Buckley and Washburne, the next by G. B. Wright and Coleman, and the last by the present company, under the superintendence of Mr. George Koch. The last mentioned was the only one in 1886 open to inspection. It starts from the bottom of the Koch shaft, and is 174 feet long. The others start in at the surface level, and are about two-thirds that distance in length.

From the main shaft, drifts have been run along the strike in opposite directions, and also along the cross-veins, in opposite directions; and in other directions, at different depths, and in different places, amounting to a large aggregate of exploratory work. The lack of continuity in the ore bodies found near the surface, and the smallness of the rich cross-stringers, has been baffling. The main shaft having been deepened in 1887, a short drift to the north-east disclosed a large and promising ore body. Ore bodies.