

OPEN FILE 203

BUREAU OF MINES
Office of Prov. Mineralogist

Rec'd. OCT 24 1924

Ans'd. _____

EQ- QUATSINO 1872 (1) A
(copy 1)

R E P O R T

UPON THE COAL-FIELDS, TINDER-LANDS, COPPER-VEINS, ETC.

BELONGING TO THOMAS. W. LOCKWOOD MCKEAN ESQ.

NOW THE PROPERTY OF THE WEST VANCOUVER COMMERCIAL
COMPANY, SITUATED UPON THE SOUNDS (OR BAY) OF QUATSINO,
VANCOUVER ISLAND,

By JOHN J. LANDALE, C.E. & M.E.

1872.

The Sounds of Quatsino are situated on the north-west side of Vancouver Island, about 240 miles seaward from Victoria. The entrance is from the Pacific Ocean into and through the main Sound, which has a southeast arm, an east arm and a west arm. The coal fields are situated upon the northern side of the west arm, and northwestern side of the east arm, and constitute the 5000 acre tract. The principal copper veins found upon the 2,000-acre lot, situated upon the southerly side of the east arm.

There is abundant timber on the 5,000-acre tract and adjoining lands. Vessels of 2,000 tons burden could readily be employed, entering the west arm, taking in cargo along-side the coal-field, etc., and departing.

The depth of water in the sounds is great, and the navigation short and easy.

GENERAL GEOLOGICAL FEATURES

The coal strata lie on a bed of calciferous sandstone, many hundred feet in thickness, the latter deposit being, I apprehend, equivalent to the carboniferous or mountain line stone of older series. Among other special characteristics in the stratigraphy of the fields is the following, viz:

While there are several beds of conglomerate through it, still two of them require particular attention, and form distinctive features in the basin, the one of an aggregate thickness of 70 feet overlying and in contact with the calciferous sandstone, and the other entirely above the coal; the former containing finer stones and pebbles, and having a dull reddish color, owing to the presence of peroxide of iron, while the latter is coarse in its material, and not so finely cohesive, and is at least one hundred feet in thickness.

I have classed these two last mentioned deposits as the lower conglomerate and upper conglomerate.

Through the whole formation, consisting of coarse and fine conglomerates, sandstones, shales, fire-clays and coal, are found fossiliferous beds, an examination of which determines the age of these strata, which may be referred to the cretaceous period.

Dicotyledinous plants form the principal vegetable impressions; stems like calamites are common, and belemnites are met with, and among animal remains we have the following shells: Ammonites, plagiostoma, inoneranu, hippurites, various chana-like shells, trigonal alaeferinus, and some still more recent types, as pectunculus, (subsevis) astarte, natica and pludina, (several varieties), all these over-lying the coal-beds.

Most of the shales are more or less bituminous, and the different seams of coal are characteriaed by a shining cubical fracture, by a regular lamination, and an almost complete exemption from sulphurs in the cutters or vertical divisions.

These three facts, viz: the carbonaceous character of the shales, the regular lamination of the coals, and, above all, the small amount of sulphur present, constitute important points of excellence over and and all coal fields yet discovered on this coast.

A large penine fault, just below the line of section "A.B. cuts off the whole basin by throwing it down to southward, on which side of it are to be seen, at the surface, the calcareous sandstone whereon the basin lies, and also the underlying metamorphic rocks. The latter are principally altered clay slates, broken up, twisted and turned by masses of crystalline feldspathic trap, in which are found concretionary masses of lime stone. The trap does not cross the great fault.

COAL SEAMS

The seams of this basin are five in number and have been found in out-croppings on various parts of the field, and in sundry small shafts sunk by myself. The dip is southward, with an average inclination of 1 inch in $3\frac{1}{2}$ or 4 inches.

The first seam of the general section is "G", and is found cropping out about two miles up the stream, by the Indians, Natsenuchtum.

It varies in thickness from 2 ft. 8 in. to 2 ft. 11 in., and consists of different varieties of coal.

This is the best household coal I have seen on these coasts. It is almost pure carbon, burns clearly, evolving a strong, continuous heat, and leaving a small bulk of pure white ash (vide Analysis No. 1). The working of this seam would be 3 feet, 8 inches in height, as the fire-clay below the sandstone would have to come down. But the mining would be easy, as the "holding" would be in fire-clay. It will work best in the direction of the inclination, with long, narrow pillars, 28 feet by 8 feet, the short end being with the strike-narrow rooms.

The basin will contain about four thousand acres of this coal, and is computed to yield about 2100 tons per acre.

On the next seam "H", a shaft was sunk at the point marked X on the map, and a section laid open, as at detailed section "H".

There lies immediately above this seam a fine building stone, more particularly hereinafter referred to. The thickness of this seam is from 1-foot 10 inches to 2 feet thick. The coal is a denser quality than the former, is well fitted for coke-making, swells considerably while burning in an open fire, and leaves a good deal of cinder. It is well adapted, I apprehend, for smelting and smith's purposes.

There are about 3,500 acres of this coal, computed to yield about 2,500 tons to the acre.

From the nature of the strata above this seam, long wall working would be the most advantageous.

Of the next seam, "I", it would be impossible to speak, as it is only seen (quite vitrified) at one point, lying close on the fault, west of Adamson's hut. It appears to be hard coal, and in its natural state would probably be a hard coal of the cannel kind. I have made no calculations in regard to it, or seam "J".

The next seam "K", was found in a shaft sunk for the purpose of striking another coal that appeared on the fault at Adamson's hut on the east side thereof. In the general section it appears as the upper side of two seams "K", and is more particularly shown in the detailed section "K" on map 2.

It is 2 feet, 6 inches in thickness, of a bituminous shale highly impregnated with gas, and closely resembling, in many particulars the world-renowned Torbanehill or Bogwood Gas Coal. It would, I apprehend, yield paraffine by distillation.

The bowl of a common tobacco pipe filled with this shale powdered, gave a jet of gas for two minutes and a half, and that with very imperfect luting around the bowl.

This seam resembles the Torbanehill in another particular, viz: in burning it loses its weight immensely, and but little in bulk. There are at least 4,000 acres of this coal, computed to yield about 2,250 tons per acre. This seam approaches sometimes very near to the under and main seam "K", and can easily be worked.

The next or main seam "K", was found in a shaft, close to Adamson's hut, in the West Arm. It is 4 feet, 6 inches in thickness. There is some resemblance between this coal and seam in No. 3 at Manaimo, with this important

difference, however, the Nanaimo coal has its laminae and cleavage joints filled with a crust of earthy matter consisting of the carbonates of lime and iron, and often iron pyrites, to an extent that frequently renders the coal useless, while the only impurities to the seam "K" are little laminae of shale of a dark color, which burns nearly as well as the coal itself, the cleavage joints showing scarcely any sulphur, being very thin and containing only a little lime.

The Quatsino Coal is thus seen to be greatly superior to the Nanaimo. For steaming the coal of this seam "K" surpasses any yet discovered on the Pacific Coast.

It will be found throughout the whole area of 5,000 acres, and may be computed to yield about 3,000 tons to the acre.

QUALITY OF COAL

The basin is broken up by four faults into three great divisions. These are shown on the plan of the basin on Map No. 2, and are marked respectively, "Fault down to east", "Fault down to east", and "Great fault throwing down to west."

The effects these faults have on the beds is shown by a section along the average line of strike from "A" to "B", marked "Section along line A.B. (Average Strike)." Two cross sections along lines running with the inclination are given, also, viz: "Section on line E.F." on east side of basin, and "Section on the line C.D." in the middle of same.

The whole area of the coal claim is 5,000 acres, or nearly 8 square miles.

The quantity of coal contained therein, according to foregoing calculations, would be about 41,350,000 Tons, deducting, however, one-fifth for the action of the faults,-

a large estimate, and there still remains the enormous quantity of 33,080,000 tons, or 600,000 per annum, for a period of 55 years.

But this calculation does not embrace all. The depth of the shaft at Adamson's hut is 30 feet, and discloses the two seams "K", viz: the bituminous or "quasi" cannel, or gas coal, and the heavy deposit of steam coal below.

In those parts of the field on the rise from the shore, the depths of this bottom seam "K" will be greater, varying from the first found depth to probably about 120 feet. There is also occasional denudation of the upper seams.

In the course of my observations on Vancouver Island, I have never found the lower conglomerate nearer than 220 feet to the top of the series, and it is generally much further off, so that in going down beyond 120 feet, other seams of coal may be discovered of great extent and excellence.

QUALITY

The coals of Quatsino differ, as we have seen, in character, and are thus, it may be remarked, variously adapted to the different uses, commercially and otherwise, for which coal is so necessarily and extensively employed.

The coal seam "P" is the best household coal yet seen on these coasts. It is almost pure carbon, burns clearly, evolving a strong, continuous heat and leaving a small bulk of white ash. It is a singularly clean coal, causing little or no dirt or unpleasant odors, and would take the market in any part of the world. (see Analysis No. 1).

The coal seam "H" is well-fitted for coke-making, for smelting purposes it is the best I have seen here, and this for the prime reason that there is so little of sulphur or other impurities in the coal. In fact, for smelting I regard this coal as invaluable on this Coast:

Besides the presence of several copper lodes on the

very lands under consideration, and in other parts of the sounds of Quatsino, the facilities for erecting these smelting works, etc., give an importance to these coal fields difficult to be over-estimated.

A "New Swansea" might be easily established upon the west arm of Quatsino Sound (vide Analysis No. 2).

The upper seam of "K" closely resembles in many particulars the world-renowned Torbanehill or Boghead Cannel Coal.

It is very highly impregnated with gas, and for this purpose it would command ready sale at San Francisco and other cities where gas is consumed. The use of this would effect so large a saving in purifying, machinery and even retorting, that a prompt and appreciative market could always be had. This coal has only a trace of sulphur (vide Analysis No. 3).

The under main seam, "K", is unusually well-adapted for steam purposes. It makes less klinker than any now in use on this coast, it is, above all, well nigh free from sulphur or other impurities. In a word, for steam purposes, this coal surpasses any yet discovered on the Pacific Coast (see analysis No. 4)

SUPERIOR ACCESSIBILITY OF THE QUATSINO MINES.

The situation of these coal mines is not only the best on Vancouver Island, but better than any north of Cape Flattery.

First, as to easy access, and second, as to excellence and security of harbor.

The tedious and intricate navigation of the Straits of Yuca, Gulf of Georgia, and Johnson's Straits is avoided.

There is simply the unobstructed navigation of the Pacific, The Sounds of Quatsino being on the ocean side of the Island. Vessels can make a clean run up to the entrance of

the main Sound. No difficulties are presented to the mariner in making the position in all weathers. The entrance made, vessels of the largest draught can sail with ease and safety up the main sound into any one of the arms or sounds that may be desired; and it is to be particularly noted that the passage from the entrance to the main sound to the anchorage opposite the coal-fields, in the western arm, would take only some two or three hours, while the passage of vessels going to Nanaimo and the Pacific Coal Company's mines consumes, the former about three days, and the latter about six days, under the most favorable circumstances, in from the open sea, and sometimes even one, two or three weeks are taken in making the last-named passages.

THE COST OF OPENING UP.

The cost of opening up the coal fields of Quatsino would be less than that of any other of which I have knowledge on this Coast.

My observations extend to Nanaimo, Bellingham Bay, Harewood, the Pacific Coal Company's works and the Puca Straits Mine, with all of which, except Bellingham Bay, I have been professionally connected.

To place workmen, provisions, engines, saw-mills, etc., to cut down get out, saw and prepare lumber, to erect large wharf and buildings; to set up engines etc.; to open up mines so as to get out daily, sell and deliver, on board of vessels at wharf, at least 200 tons of coal, day after day, continuously, the cost would be about \$50,000.

My estimate does not reach that, but I put it down for safety in not making an under-estimate.

TIMBER.

The shores of the Sounds of Quatsino about with timber of the following kinds, viz: spruce, pine, yellow and

white pine, hemlock, cedar, crab and alder.

Pine suitable for spars is found everywhere, sometimes of an enormous size. The timber spoken of is well-known to be of a superior quality. The demand for spars, timber and lumber generally, is already large, and is increasing, in fact, faster than the present means of supply.

SLATE & BUILDING STONE.

About half-a-mile from the head of the west arm there is a mile of slate-section, consisting of several varieties, blue, violet and black, of good quality and well-suited for roofing, billiard tables, etc. One of the laminae would make excellent set stones. Some of the slates contain ammonites, but most of them are free from shells.

Some two feet above the seam coal "H" is found a deposit of very fine free-stone, about 4 feet in thickness, well suited for grind-stones and building purposes. It would dress well with the chisel, is not liable to crack or flake off, and lies in bands with regular vertical cleavages.

COPPER.

The best defined copper-lode, or vein, is that at Aklar, on the South side of East Arm, upon the 2,000 acre tract. The vein stone appears about 3 feet wide in the out-crop, and contains black oxide of copper and gray copper ore. There is also a well-defined vein of copper and iron pyrites at Ipaincoits, about three feet wide.

There are numerous indications of copper, as well as of other minerals, but I have no means of exploring or testing these mineral deposits.

That there are valuable copper and other mineral lodes upon the Sounds I have no doubt.

Many extensive and valuable copper mines have been discovered on Vancouver Island, and on Queen Charlotte's Island. Several of these mines are now actively developed, and would afford constant employment to large smelting works.

ANALYSIS NO. 1. L Seam 1st. "G" of detailed sections.

Fracture cubic, horizontal, laminae and vertical, cleavage plains, thin films, carbonate of lime.

	Specific Gravity	1.360	1.320
In 100 parts,			
	Moisture,	2.70	2.28
	Coke -----	60.00	57.70
	Ash left on burning, -----	11.09	11.00
In 100 parts, not dried:			
	Carbon, - - - - -	70.00	71.00
	Hydrogen, - - - - -	5.30	5.35
	Nitrogen, - - - - -	1.28	1.10
	Oxygen, - - - - -	10.01	11.55
	Sulphur, - - - - -	0.41	0.60
	Ash, - - - - -	13.00	10.40

Coke from this does not swell much. The ash left from burning is gray and easily fusible.

ANALYSIS NO. 2. Second seam, section "H".

Cubic Fracture, laminae filled with lignitic matter.

Lustre small.

In 100 parts:

	Moisture - - - - -	2.50	2.58
	Coke - - - - -	64.20	61.18
	Ash - - - - -	14.00	14.28
In 100 parts, not dried:			
	Carbon - - - - -	67.50	67.00
	Hydrogen - - - - -	5.15	5.10

Nitrogen,	1.75	1.50
Oxygen,	12.00	13.17
Sulphur,	0.90	0.84
Ash,	12.70	12.39

This coal would be well suited for smelting purposes.

Analysis No. 3. Upper part of "K" detailed section
 "K" burns clearly, parts with gas freely, dullist black, with
 very little lustre.

Carbon	60.436
Hydrogen	8.320
Nitrogen	1.235
Sulphur	0.300
Oxygen	4.551
Ash,	25.168
	<u>100.000</u>

ANALYSIS NO. 4 Lower seam "K" detailed section "K".

Specific Gravity,	1.320	
Carbon	66.15	66.15
Hydrogen	4.70	4.50
Nitrogen	1.25	1.10
Sulphur,	0.80	0.70
Oxygen,	13.50	11.50
Ash,	13.60	14.05
	<u>100.00</u>	<u>100.00</u>

This will make a good steam coal and gives a great heat.

RESUME.

The coal-fields of Quatsino are extensive, covering
 an area of five thousand (5,000) acres.

The total yield of coal is calculated to be at least
 thirty-three millions (33,000,000) of tons, or six hundred
 thousand tons per annum for fifty-five years.

There are also upon the property immense deposits of slate and freestone of superior quality, and well-suited for building and other purposes.

The main copper lode on vein is found upon the 2,000-acre claim. There are other numerous indications of copper, and other minerals, in the immediate vicinity of the Sounds.

In other parts of Vancouver Islands, and in Queen Charlotte Island, valuable copper veins have been discovered, and are being actively worked.

Smelting works might be most conveniently and cheaply erected upon the borders of the coal fields themselves, all the raw materials for making and carrying on such an establishment exist thereupon the spot.

A "New Swansea", rivalling Swansea itself, and surpassing all others on these coasts, might be created with ease, and made to yield large and permanent profits.

In point of accessibility, the Sounds of Quatsino are quite easy, and in some respects easier than the Bay of San Francisco.

The Governor of Vancouver has given assurance that he will establish a port of entree at Quatsino, as soon as the business requirements will justify it.

John J. Landale,

Civil and Mining Engineer.