

Extract covering California coal mines and resources from:
Report of J. Ross Browne on the mineral resources of the states and territories west of the
Rocky Mountains (1868)

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REPORTS
ON THE
MINERAL RESOURCES
OF THE
UNITED STATES.



U. S. Treasury Dept.
REPORT

OF

J. ROSS BROWNE

ON THE

MINERAL RESOURCES

OF THE

STATES AND TERRITORIES WEST OF THE ROCKY MOUNTAINS.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
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LETTER

FROM

THE SECRETARY OF THE TREASURY,

TRANSMITTING

The report of J. Ross Browne on the mineral resources of the States and Territories west of the Rocky mountains.

MARCH 5, 1868.—Referred to the Committee on Mines and Mining and ordered to be printed.

TREASURY DEPARTMENT, *March 5, 1868.*

SIR: I have the honor to transmit to the House of Representatives the report of J. Ross Browne on the mineral resources of the States and Territories west of the Rocky mountains.

Very respectfully, your obedient servant,

H. McCULLOCH,
Secretary of the Treasury.

Hon. SCHUYLER COLFAX,
Speaker of the House of Representatives.

The Coos Bay, Oregon, is a fair coal for many purposes. When first taken from the mine it appears as compact and solid as "cannel," but as it contains a large per centum of moisture it soon loses this appearance, and crumbles when exposed to the air. It leaves but little ashes,

The Fuca Straits, Washington Territory, coal is moderately well adapted to steam or manufacturing purposes, burning with a bright, clear flame and but little smoke, leaving but a small quantity of dark sandy ashes. This coal "cakes" a good deal, which is its chief defect.

The coal found farther north not being much used in California, its traits are not well understood.

It is found by experience that the coal of this coast is less destructive to boilers and grates than the anthracite imported from Pennsylvania or the bituminous coals of Australia.

The article on the geology of the coal formations of the Pacific coast, furnished by Mr. W. M. Gabb, of the California State Geological Survey, and published in the previous report, gives much general information on this branch of the subject, and may be referred to for geological details respecting the formations in which coal is found on the Pacific coast.

NEW DISCOVERIES IN CALIFORNIA.—A company has been organized within the past few months for the purpose of working a seam of coal recently discovered near the mouth of Bear creek, a tributary of the San Lorenzo, a few miles above Santa Cruz. The seam is stated to be nearly five feet thick, and the quality good for surface coal.

It may be well here to state that coal is much influenced by the atmosphere. Experiments made by the Peninsular and Oriental Steamship Company of England, prove that coal obtained from the best mines in that country loses 20 per cent. of its heating power when exposed to the atmosphere for a few months in hot climates. The steamers belonging to this company, when in the tropics, consume one-fourth more fuel than when in the temperate climate of Europe. As the temperature of the atmosphere on this coast ranges as high on land during the summer months as in the tropics, it would be unreasonable to expect the coal found near the surface to be as good as it will be at a depth out of reach of atmospheric influences.

A seam of coal is being worked on the south fork of Clear creek, Shasta county, a few miles west of Piety Hill, and about 30 miles from the silver mines. It was discovered in 1863, but was not worked till the discovery of the mines in 1865 afforded a market for the coal, which is used to generate steam for the engines since erected. A shaft has been sunk on this seam about 60 feet deep, at the bottom of which the coal is found, about four feet thick, and of fair quality.

In this part of Shasta county there exists a belt of shales nearly a mile wide, tilted to an angle of about 25 degrees, which contains thin seams of coal. These might be made to yield a supply of fuel for local use.

Mr. John S. Royal, in January, 1867, discovered an outcrop of coal in Corral Hollow, San Joaquin county, about 30 miles south of Mount Diablo, in a ravine from which the previous rains had washed the soil to the depth of 25 feet. The seam, where exposed, is about eight feet thick. It is generally believed that the beds of coal worked at Mount Diablo pass through this locality. The cost of transportation and labor has heretofore prevented the working of coal with profit in this vicinity. The projected railroad from San José to Stockton passing within four miles, and the San Joaquin river being accessible by a wagon road, it is probable the new discovery may at some future time prove valuable.

Nearly 1,000 tons of coal were taken from mines in this vicinity in 1863—200 tons of which came from the Commercial, and 800 tons from the O'Brien. The quality was good and well adapted for generating gas.

In 1866 a company was organized for the purpose of distilling oil from this coal, of which it is said to contain 65 gallons to the ton. The quantity of water

that entered the shaft, and the want of proper pumping machinery, caused a suspension of operations. It is possible that with proper machinery the coal deposits of Corral Hollow might be profitably worked.

Clark, Bruce & Company have recently discovered three seams of coal on the west side of Butte mountains, on the Colusa road. The position and other conditions lead to the supposition that these seams may be continuations of those worked at Mount Diablo. Samples of the coal tested at Marysville gave satisfactory results. The work of prospecting is being carried on.

Deposits of coal have been discovered in San Luis Obispo county, in the Salinas valley, about 70 miles from Monterey. The coal crops out in a small oval valley about a mile in length, at the head of the Salinas. There are six or seven distinct seams in this outcrop within the distance of 300 feet. The formation has been considerably dislocated and the strata tilted up, but the outcrop may be traced for 20 miles. The third seam from the top is nearly seven feet thick, and has been examined to some extent. The coal is a lignite. The lowest seam in the series is about five feet thick and has also been examined by means of a short tunnel. The other seams vary from 10 inches to four feet in thickness.

THE MOUNT DIABLO COAL MINES are located on both sides of a high ridge which projects from the north side of Mount Diablo. They are favorably situated for access to navigable water, being in Contra Costa county, about five miles south from the San Joaquin river, at a point where it is deep enough for vessels of 1,000 tons to approach the bank.

The first mine in the district—the Teutonia—was located in 1858. Though coal was discovered there in 1852, none of the valuable mines were located till 1859. Several of the most productive have been located since 1860. It will be perceived by these dates that California coal mining is still in its infancy.

The majority of the locations have been made on the outcrop of coal, which is traceable for several miles, trending easterly and westerly. The Peacock mine is on the western edge; the Pacheco and San Francisco are west of the Peacock but not on the outcrop. The disturbed condition of the seams has caused the abandonment of these three western mines. The Cumberland, or Black Diamond, one of the most valuable mines in the district, is located about three-quarters of a mile to the north of the Peacock. Somersville, a small town created by the working of the mines, is situated about a mile to the east of the Black Diamond, from which it is separated by a high ridge, and is the centre of operations at present. This place contains about 200 buildings, including hotels, stores, a temperance hall, and a school-house, and has about 800 inhabitants. Within half a mile of it are the mouths of five different mines, from which coal is, or has been, extracted. On the northwest is the Union, a short distance from which is the Manhattan; a few hundred yards further east, and somewhat lower down the side of the ridge, is the Eureka; southeast of this, in a ravine at the base of the western side of the ridge, is the Pittsburg; about 1,000 yards to the north of this, and still lower down in the ravine, is the Independent. All these mines thus clustered together about the sides of a steep, rugged mountain present a singular appearance. The lofty chimneys of the steam engines belching forth columns of dense black smoke; the dark, dingy dwellings of the miners and those who minister to their wants; the tall trellis-like viaducts across the ravines, over which the locomotives are constantly passing between the mines and the wharves; the clanking of machinery, and busy hum of workmen and teamsters; the great piles of black waste at the mouth of each mine, all tend to give a peculiar interest, if they do not impart much beauty, to the scene. The distant view of the surrounding country, as seen from the ridge, embraces stretches of grassy meadows teeming with cattle and sheep; purple hills breaking in rugged outline against the sky, and glimpses of the San Joaquin meandering through its tule banks, dotted with the white sails of sloops and schooners, while here and there

a neat cottage embosomed in orchards and surrounded by yellow grain fields, presents a scene of quiet beauty, suggestive of the progress of civilization.

The Central mine, one of the first worked, but at present idle, is located near the base of the hill, three-quarters of a mile to the east from Somersville, from which place it is separated by the hill. The Pacific, the most recently opened in the district, is located near Marsh's creek, seven miles east of Somersville.

The above are all the mines at present in a state of development. The Mount Hope is on the Black Diamond Company's ground, of which that company resumed possession in August last, and is not described as a separate mine.

The mines now producing coal are the Black Diamond, Union, Pittsburg, Independent and Eureka. The workings in these mines are extensive, some of the levels in one connecting with those in another, so that a person may travel a mile on the line of the seam.

It is estimated that during the six years ending July, 1867, 500,000 tons of coal have been taken from these mines. The quantity received at San Francisco, as shown by the following table, amounted to 302,554 tons, while the consumption on the ground, the waste in handling, &c., and the quantity sent to the interior by water and teams, will make up the difference:

Annual receipts of Mount Diablo coal at San Francisco.

	Tons.
1861.....	6, 620
1862.....	23, 400
1863.....	43, 200
1864.....	37, 450
1865.....	59, 559
1866.....	79, 110
First six months 1867.....	53, 215
Total.....	302, 554

The discovery of this coal has caused a reduction in the price of the imported article. In 1857 the average price of imported coal was \$35 per ton. In 1867 the average price is about \$15 per ton. A reduction of \$20 per ton.

The Mount Diablo coal is used almost exclusively by the river, ferry, and coasting steamers, and by most of the stationary engines at San Francisco, and at places convenient to the rivers. The flour mills at Napa, Suisun, and other places, use it, and considerable quantities are consumed at Sacramento and Stockton. Shipments are occasionally made to the Sandwich Islands, where it is used for running the engines on the sugar plantations. During the first six months of 1867, 1,300 tons were shipped to Honolulu.

The working of the mines has created several prosperous villages in their vicinity, among which may be named Somersville, Clayton, Nortonville or Carbondale, and Pittsburg Landing, the terminus of the Black Diamond railroad, about two miles from Antioch and four miles from New York.

From the known dimensions of this coal field it is calculated to contain about 12,000,000 tons. It is probable its extent will be traced beyond the present recognized limits.

THE BLACK DIAMOND.—The company owning this mine was incorporated in 1861, and have worked their property continuously since. In August, 1867, the mine produced about 4,000 tons, which was its average monthly product for some time previously. It employs about 150 men. The coal is extracted through two levels, but there is another in progress which, when completed, will strike the vein about 800 feet below both the present adits.

The upper level is run on what is known as the Black Diamond seam, and is reached by a tunnel 430 feet in length, cut through the sandstone which encloses the coal. The workings on this level extend three-quarters of a mile on both sides of the tunnel. This coal seam is four feet four inches thick.

The second level is about 550 feet below the above, passes through the Clark seam, which is three feet six inches thick, and extends 300 feet beyond to the Black Diamond seam. The working on the Clark seam extends about half a mile on both sides of the tunnel and several hundred feet on the Black Diamond.

The third opening is being made by an incline, which will strike the coal about five hundred feet below both the other levels. It will cut the Clark and the Black Diamond seams. When this incline shall be completed this company will have a sheet of coal to work about 2,000 feet deep, running the length of their claim, nearly a mile. They also own the Manhattan, which they expect to work through the above levels by means of a drift now being cut.

In working the Black Diamond the miners pass through several bodies of coal of fair quality, but too small to work with profit, ranging from 12 inches to 18 inches in thickness, each being separated by a stratum of hard black slate. Two miles south of the tunnels on this mine the Black Diamond seam is found to be divided by two lenticular beds of tough clay, each from 10 to 12 feet thick, divided by a body of hard clay slate. This clay furnishes materials for the pottery at Antioch, and makes good fire brick.

The mine is worked by stoping and drifting, the men laboring by contract. Every facility is afforded by the company to take the coal out in as compact a form as possible. The arrangements for conveying it from the pit to the vessels on the river afford an illustration of California engineering skill. The mouth of the main adit is situated nearly midway up the side of a steep mountain, several hundred feet above the level of the plain. To overcome this obstacle, a massive incline has been constructed of framed timbers 900 feet in length, the angle of which is 15 degrees. A double car track is laid on the incline. By means of a stout wire rope passing over a drum, nine feet in diameter, the loaded car is made to haul up the empty one. A car carrying 20 tons of coal descending pulls up 10 tons of timbers and other materials used in the mine. The foot of the incline connects with a railroad over which the cars are hauled by a locomotive to New York, on the San Joaquin river, where the arrangements are completed for loading the fleet of vessels engaged in carrying coal to San Francisco and other places, without any further handling.

The railroad used by this company has no connection with the Pittsburg road, to be described hereafter; this latter is the property of another corporation. Its terminus on the river is four miles distant from New York.

THE PITTSBURG is worked by a slope cut at an angle of 30 degrees, by which the coal is reached at a distance of 350 feet. The monthly product is from 1,500 to 1,800 tons. The coal is hoisted by a horizontal winding engine of sufficient power to raise 200 tons per day.

THE PITTSBURG COAL RAILROAD.—In 1862 a charter was granted to a company by the State legislature to construct a railroad from the mines to the river. But little was done towards its construction till the summer of 1865. It was not completed and furnished with rolling stock till February, 1866. The road, a remarkable specimen of engineering skill, is only five and a half miles in length. From the mines to the plain, a distance of a mile and a half, the grade of the track is 274.56 feet to the mile. The four miles from the river to the base of the mountain is constructed on a gradient of 40 to 160 feet to the mile. To overcome the inequalities of the surface of the country eight trestle bridges had to be constructed, the most extensive of which is 340 feet in length; a tunnel 300 feet long had to be cut, and a number of heavy banks and culverts built. All the timber used in making the bridges is selected Oregon pine and California redwood. The rails, of English iron, are laid on square redwood ties. The gauge of the road is four feet eight and one-half inches. To overcome the friction of such a steep grade, two locomotives of a peculiar construction have been made at San Francisco. They have powerful engines and three pairs of 36-inch driving-wheels each, with cylinders 14 by 18 inches. Each weighs

about 17 tons when loaded with fuel and water, which they carry themselves, having no tenders.

The total cost of the road is about \$145,000.

All the mines in a position to do so have constructed side branches to connect with this road. It is estimated that it can deliver 3,000 tons of coal daily on board the vessels at the wharf. The coal is shipped from the cars to the vessels by shutes.

The friction on the brakes when the locomotives are coming down the incline is tremendous, but thus far no serious accidents have happened.

The coal from the Union, Pittsburg, Independent, and Eureka mines is carried by this road.

THE TEUTONIA, the pioneer of the district, has been explored to a depth of 500 feet by means of an incline cut at an angle of 30 degrees. At this depth the upper seam of coal, two feet thick, was reached. A horizontal drift from the bottom of this incline strikes the Clark seam where it is 3 feet 10 inches thick. Another drift, run in an opposite direction, strikes the lower or Black Diamond seam. It is known that there are two other seams of coal in this mine, the lowest of which is about five feet thick. The want of cheap facilities for conveying the coal to market prevents the owners from working it to advantage. The company owns 640 acres of coal land; have good engines, pumps, and hoisting gear. The mine faces the property of the Pacific Company; the ground nearly four miles between the two mines is almost a level plain. The land belonging to the Pacific Company extends to the hills bounding the Teutonia Company's ground.

THE UNION.—Operations on this mine were commenced in 1861. The coal is reached by a stope, which, in July, 1867, was 500 feet in length, having a vertical depth of 230 feet. The seam averages three feet six inches in thickness, and is on the Clark, or upper seam. The monthly product ranges from 1,800 to 2,000 tons. The hoisting is done by a horizontal driving engine.

THE INDEPENDENT.—Work on this mine was commenced in 1861, though the coal was not reached till 1866, owing to the quantity of water that entered the shaft, the mine being the lowest in the district, and worked by a perpendicular shaft 700 feet deep. Upwards of \$180,000 was expended for machinery, pumps, labor, &c., before the coal was reached. The pump in use at present, and which is barely sufficient to keep the mine dry, is driven by a 75-horse power horizontal engine, and lifts 130,000 gallons per hour. So great is the influx of water that a stoppage of the pumps for 24 hours would require 20 days' pumping to clear it. The hoisting and other machinery is powerful. The cages, or hoisting cars, each holding nearly a ton, are lifted by a rope four inches in circumference. About 200 car-loads are hoisted daily. The product of the mine averages about 1,500 tons monthly.

THE EUREKA is owned and worked by the Independent Company. About 160 men are employed in both mines. This produces about 1,500 tons per month, but could produce more. The company, in March, 1867, increased their capital from \$500,000 to \$3,000,000, in order to conduct operations on a larger scale, and have since made improvements.

The coal is obtained by an incline 600 feet in length, at an angle of 45°. It is taken from three seams. The upper, or Clark seam, is three feet eight inches thick; the middle, two feet six inches; and the lower, or Black Diamond, four feet. The two upper seams are passed through in reaching the lower one. The distance between the upper and lower varies from 225 to 350 feet. The Eureka uses a horizontal winding engine for hoisting.

THE CENTRAL, which, prior to the construction of railroads by the Pittsburg and Black Diamond Companies, furnished a large portion of the coal sent to market, is at present idle. The slow and expensive transportation by teams places it out of the field in competition with mines having the advantage of rail-

roads. It is in contemplation to construct a railroad to connect it and the Teutonia with the river. Both these mines are located on the same side of the mountain, and suffer alike from want of cheap transportation; both contain unbroken seams of coal; have been well opened, and have powerful machinery for working purposes.

THE PACIFIC, the property of a wealthy corporation of New York capitalists, is located about six miles east of Somersville, on the Rancho de los Meganos, or Marsh's ranch, as it is now called. The ranch covers three square leagues of land, embracing a portion of the foot-hills at the base of Mount Diablo, and extending to the San Joaquin river. Borings and other explorations have satisfied the engineers and agents of the company that the seams of coal worked in Mount Diablo pass in a nearly horizontal position under this ranch, covering a space of six miles square. A shaft is now in progress at a point near the western extremity of the ranch, several miles west of the disturbed formation in the Peacock, Pacheco, and San Francisco Companies' ground. It is calculated that this shaft will strike the Black Diamond seam at a depth of 400 feet. The calculation is based on the dip of the seam, which was reached by an incline sunk about 1,200 feet, from which the seam was prospected 200 feet laterally and found to average four feet four inches in thickness. The Clark and middle seams were reached in July last, dipping at an angle of 30°, leaving little room to doubt that the more important seam will be reached at a sufficient depth. The coal taken from the mine at present is used in running the machinery. The shaft in progress is intended to serve as the general outlet of the mine. Its dimensions are 16 feet by 8 inside the timbers. It is timbered all through and divided into three compartments, two of which are fitted for hoisting purposes. The centre serves as the pump shaft. It is estimated that when the mine is fairly opened and the machinery in operation, 20 tons of coal can be raised per hour. In July last, the shaft had reached 150 feet in depth.

The machinery was made at the Union Iron Works, at San Francisco. The pumping engine weighs 20 tons and is of 175-horse power, with three boilers, each 35 feet long and 42 inches in diameter. The pump is what is known as a Cornish "lift," having a six-foot stroke and 12½-inch bore. It is estimated to be capable of raising a body of water the size of the bore 1,000 feet.

The company have a lease of 13,316 acres of coal land. A railroad from the mine to the river is projected.

LABOR, WAGES, &c.—It is estimated that 1,000 men are employed in and about the mines at Mount Diablo. The miners work chiefly by contract. The general price for breaking out the coal is \$1 per square yard. The men who perform this labor make from \$4 to \$6 per day. The unskilled laborers are paid from \$40 to \$65 per month, in gold. Board and lodging costs from \$6 to \$8 per week. No Chinese are employed.

The monthly wages paid by the several mines in this district aggregates about \$50,000 or \$600,000 per annum. The average cost to the companies for extracting and delivering the coal is \$6 per ton, divided as follows: Miners' wages, hoisting, wear and tear, and interest on capital, or total cost of coal in the bunkers at mouth of mine, \$3 50 per ton; freight by railroad to Pittsburg, \$1 per ton; shipping from thence to San Francisco, \$1 per ton; commissions and general management, 50 cents per ton.

The present market value of Mount Diablo coal suitable for domestic purposes is from \$8 to \$9 per ton. As only 80 per cent. of that placed in the bunkers is marketable, 20 per cent. being screenings, which are sold at \$5 per ton, the margin of profit, after all expenses are paid, is very limited.

The above shows as nearly as can be ascertained the present condition and future prospects of the coal mines in California. It has not been a remunerative business to the capitalists who have engaged in it, owing to inexperience in the working of the mines, injudicious management, the high cost of roads to

navigable waters, and the difficulties to be overcome in creating a market where the best imported coals had been so long in use. All these obstacles to success are gradually disappearing, and it is believed the coal interest in California will, in time, pay a fair percentage upon the capital invested in it. Incidentally it has been of advantage to the country, having furnished employment to a considerable number of laborers, created a demand for machinery, and supplied cheap fuel for domestic use and for purposes of manufacture and navigation.

THE COAL MINES OF OREGON.—A seam of coal was discovered in May, 1867, on the land belonging to Mr. Frank Cooper, in Marion county, about 30 miles from Salem. Considerable quantities of the coal have been sent to that city, where it sells readily. A wagon road is being constructed thence to the mine, in order to supply the demand. At the depth of 65 feet the seam is about five feet thick, and the quality of the coal better than at the surface. Good coal has been found near the Premier mills, on Bear creek, a tributary of the Yaquina river, in Benton county, about 30 miles west from Corvallis. Five separate seams of coal have been found in this locality, varying from six inches to four feet in thickness. The most valuable seam is within five miles of Yaquina bay. This is about four feet thick, and nearly horizontal in position. It has been prospected over a considerable extent of the adjoining country. It is estimated that coal in this vicinity can be delivered at \$3 50 per ton, owing to natural facilities for working and transportation. Most of the mines are not more than five miles from navigable waters, and that distance over an almost level plain. A railroad could be cheaply constructed to the place of debarkation.

Towards the close of 1866 a seam of coal was discovered on the bank of Tillamook bay, 50 miles south of Astoria and 60 miles northwest from Salem.

There is another coal seam of a similar character on the shore of Nehalem, about 25 miles further up the river.

Extensive beds of coal are in progress of exploration about three miles from Farwell bend, on the Snake river. A tunnel has been run on a vertical seam about 300 feet, where a number of smaller seams connect and form a body of coal about 10 feet thick. The mouth of the tunnel is close to the bank of the river. Another seam of coal discovered, 200 feet above the original discovery, is said to contain good coal, and to be five feet thick.

Coal has been found in the Calapooya mountains, within a few miles of Barry's survey for a railroad from the Columbia river to California. This discovery is considered of importance in that part of Oregon.

There is a coal field on both sides of the Coquille river, in Coos county. The Coos Bay mines are in the northern edge of this field, which extends into Curry county. The seams, of which there are three, are thicker and the coal of a better quality on the Coquille river than at Coos bay. The two larger seams unite on the river and form a body of coal nearly 13 feet thick. There is another field between the south and middle forks of the Coquille, which is 1,600 feet higher in the mountains than the last mentioned. It has been traced for 22 miles in length by eight miles in width. One seam is 10 feet thick. The Coos Bay deposit extends about 25 miles north and south, and 20 miles east and west. It is most valuable on the south, but is only worked on the north.

COOS BAY COAL.—What is known as Coos Bay coal bears a good reputation in California. It is found in a number of seams which crop out on the surface of the ridge that divides Coos bay on the south from the Coquille river.

The locality of the best mine will be understood from a brief description of the bay. Coos bay is about 14 miles in length, varying from one and a half to two and a half miles wide. The main part of it has a direction northeast by southwest. At the upper end there is a sharp bend to the north. The Coos river rises some 30 miles inland and enters the upper end of the bend. Four miles from the mouth, in a densely timbered and hilly country, is Marshfield, the centre of the coal mining. The facilities for working the mines are crude. If