

R E P O R T
OF THE
INSPECTOR OF MINES
IDAHO, 1899

Jerome J. Day

REPORT OF THE INSPECTOR OF MINES
FOR THE STATE OF IDAHO.

BOISE, IDAHO.

JAY A. CZIZEK * * * Inspector of Mines.

IDAHO

FOR THE YEAR 1899.

1900

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Letter of Transmissal.

OFFICE OF THE INSPECTOR OF MINES,
STATE OF IDAHO.

*To His Excellency, Frank Steunenberg,
Governor of Idaho.*

SIR:—

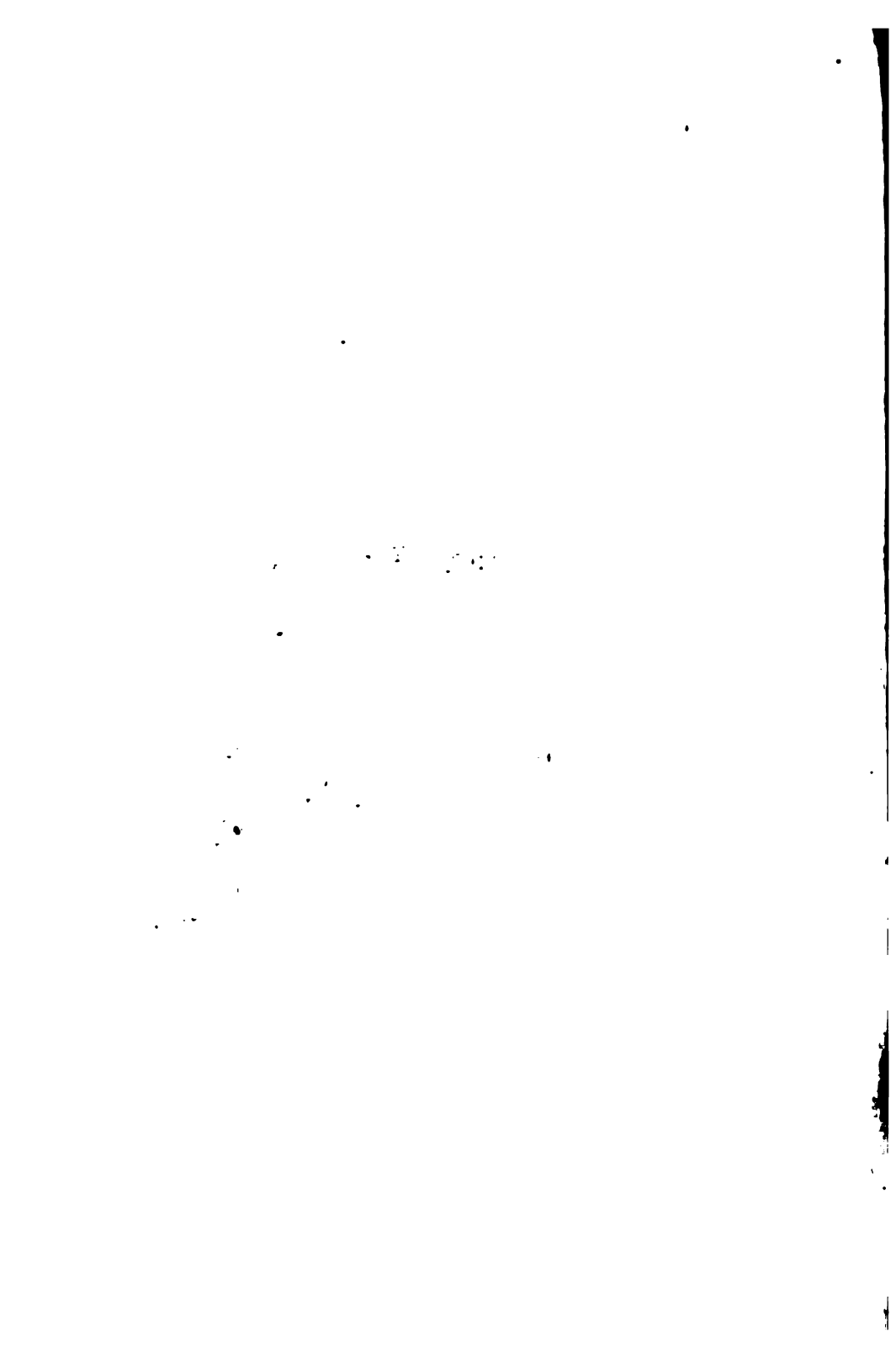
I have the honor to transmit herewith the first report of the office of Inspector of Mines for the State of Idaho, together with a brief general review of mining matters in this State. Owing to the difficulty of securing statistics and the proper reports and the slowness with which they come into this office, this report is not as complete and satisfactory as I could wish. It will, however, form the basis for a more extended report in the future.

Very respectfully,

JAY A. CZIZEK,

Inspector of Mines

BOISE, IDAHO, Dec. 31, 1899.



IDAHO comprises the territory lying between British Columbia on the north, the States of Utah and Nevada on the south, Oregon and Washington on the west and Montana and Wyoming on the east. It is nearly 410 miles long from north to south, and varies in width from 45 miles to 300, having an area of over 80,000 square miles. Idaho is nearly equal in size to New York and Pennsylvania combined. Its acreage is something over 55,000,000, and the present population of the State is 225,000. The coming census will show a great increase in population since Idaho was admitted to statehood in 1890. The elevation varies from 700 feet above the sea level in the extreme west to 10,000 in the extreme east. So varied is its surface that all kinds of climate are to be found and very near each other. There are no extremes of heat or cold in many parts of the State, and taken all in all it may with truth be said that Idaho is one of the healthiest states in the United States. While Idaho excels in agriculture, fruit culture, and stock raising, its chief industry is mining, and it is to this feature of the industry of the State that I call special attention at this time.

While the mining industry of the State is old, the office to which I have the honor of having been elected is comparatively new, and this is the first report of the mineral resources of the State that has ever been issued by my office. Like all first efforts it is in the nature of the case imperfect, and comparatively brief, but it will serve as a basis for future and more elaborate reports.

Idaho

A Glance Backwards.

FROM the date of the first discovery of the precious metals in Idaho in the early sixties to the present this State has taken and holds an enviable position among the mining States of the west. True, Colorado and Montana seem to have forged ahead more rapidly owing to the fact that these States for some reason seem to command all the necessary capital to develop the rich mines there, while Idaho, though wonderfully rich in all kinds of natural resources, especially in gold, silver, copper, and lead, did not attract the attention of men of capital until a comparatively recent date, but now that her wonderful properties are becoming known in the centers of the world's commerce, Idaho is rapidly taking the lead.

It may be truly said without boasting and preserving conservative limits that Idaho has a greater wealth of mineral resources than either Colorado or Montana. Her placers have been the wonder of the nation, and are still pouring their millions into the lap of commerce. Her lead mines now produce nearly half of all the lead produced in the United States. Her gold quartz mines have been touched only in places and her mountains of silver, when justice has been done to the white metal and bi-metallism triumphs, will reveal a wealth as marvellous as that of the Indies.

A conservative estimate of the wealth of gold and silver added to the world from Idaho since the discovery of gold here is in excess of \$250,000,000. Over \$40,000,000 in gold and silver have been turned into the various assay offices of the United States since the organization of the Territory. Since Idaho became a State in 1890 she has produced in gold and silver, saying nothing about lead and copper, \$72,744,575. By years the output of gold and silver, as given in the

Statistical Abstract issued from the United States Treasury Department, is as follows: 1890, \$6,663,838; 1891, \$6,896,970; 1892, \$6,196,451; 1893, \$6,703,159; 1894, \$6,333,081; 1895, \$5,804,380; 1896, \$8,813,757; 1897, \$8,038,605; 1898, \$8,692,107; 1899 (estimated), \$8,603,028.

The estimate for the year 1899 of the product of gold, silver, lead and copper is as follows: Gold, \$2,500,000; silver, \$6,103,028; lead, \$4,960,410; copper, \$60,000, or a total of \$13,623,418.

Apart from her large mountains of mineral bearing quartz her placers are extensive and valuable. The Snake River bars are rich in flour gold, which modern methods of treatment are now rendering available, and soon this vast wealth of the yellow metal will be poured into the avenues of commerce. With increased transportation facilities and the improved methods of treating the baser ores the mineral wealth of Idaho will soon be doubled.

Idaho By Counties

IT has been deemed advisable to give in this report a brief review of the mining industry of the State by counties. To make this feature convenient for reference it will be done in alphabetical order. The Inspector of Mines regrets that the limited space at his disposal in this report makes it impossible to give other than a very brief statement of the resources of the various counties.

Ada County.

PRODUCTION IN 1898.

Gold, 670 ozs.....	\$13,850
Silver, 140 ozs.....	191
Total	\$14,041

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 455 ozs.....	\$ 9,404
Silver, 115 ozs.....	66
Total	\$ 9,470

Ada County is one of the most populous counties in the State. In this county is Boise, the county seat, the capital of the State, and the chief commercial city in Idaho. Ada County has an assessed valuation of over \$5,000,000. It is chiefly agricultural and but little attention has been paid to mining, though the placers on Snake River and Boise River have yielded a large sum. The Twin Springs Placer Company have expended a large sum of money in building a flume to get water 'on their placer ground. They own 4000 acres of ground, and have built a flume nine miles long at Twin Springs with a capacity of 10,000 miners' inches.

The Upper Boise Hydraulic Mining Company own 1300 acres of ground up the Boise River and have expended about \$70,000 preparing to do business.

The Black Hornet and several other quartz mines near Boise have produced some ore and are now working, but not on an extensive scale.

There are 25,000 acres of land under cultivation in Ada County, and 35,000 acres under canals not now cultivated but susceptible to cultivation.



Bannock County.

PRODUCTION IN 1898.

Gold, 514 ozs.....	\$10,625
Silver, 104 ozs.....	134
Total.....	\$10,759

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 70 ozs.....	\$ 1,446
Silver, 5 ozs.....	3
Total.....	\$ 1,449

This county is more of an agricultural and stock county than mining. Pocatello, a thriving railroad city on the Oregon Short Line, is the county seat. It is at a disadvantage on account of the fact that it is just on the edge of the Fort Hall Indian Reservation. When this reservation or that

portion of it near Pocatello is opened up for settlement it will result in great good to Bannock County that is a county of great natural advantages.

There are at present at least 200,000 acres of land that are susceptible to irrigation in this county.

Bingham County.

PRODUCTION IN 1898.

Gold, 711 ozs.....	\$14,696
Silver, 72 ozs.....	95
Total.....	\$14,791

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 410 ozs.....	\$ 8,074
Silver, 10 ozs.....	6
Total.....	\$ 8,080

Bingham County is not a mining county, but it ranks high as a stock raising and agricultural county. It has 40,000 acres of land in cultivation, and 100,000 acres additional that can be cultivated when water is brought on the land. Its chief cities are Blackfoot and Idaho Falls. The Idaho Asylum for the Insane is located at Blackfoot.

Blaine County.

PRODUCTION IN 1898.

Gold, 537 ozs.....	\$ 11,101
Silver, 248,354 ozs.....	321,104
Total.....	\$332,205

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 1597 ozs.....	\$ 33,019
Silver, 970,958 ozs.....	582,574
Total.....	\$615,593

Blaine County was originally a part of what is known as old Alturas County, one of the most prominent counties in the State. The Wood River mines are known throughout the world as large producers. The Minnie Moore, the Queen of the Hills, the Idahoan and the Muldoon, among the old

properties of that section, are well and favorably known to mining men everywhere, while such mines as the Croesus, Tip Top, Red Elephant, Hattie, Donovan, Camas No. 1 and Camas No. 2 of later development are also well known. The year 1899 witnessed a great advance in mining developments in this county. The ore shipments from Hailey and Ketchum for the year 1899, not counting what was shipped direct, nor the product of the cyanide plant operating at the Camas dump, was \$230,000. In this estimate is not included the bullion output from the Croesus and Tip Top mines in the gold belt. The Red Cloud group on Deer Creek shipped about \$40,000 worth of silver in 1899. The Croesus, which was purchased of Horace Lewis in 1898 by H. E. Rigg and associates of Spokane for \$85,000, is being vigorously worked. A force of 35 men are working constantly on this property. The ledge is tapped by a cross-cut 600 feet at a depth of 200 feet vertical from the surface; then a shaft is sunk 230 feet with sump. From the shaft three levels are run at 50, 150 and 230 feet. It is operating a ten-stamp mill. Over 50,000 tons of ore are exposed on this property. The Tip Top, Jayhawker, New Comet, Sunday, Tyrannis, Fair Play and Star are doing well. Other mines are the Lucky Boy, the Lone Star group and the Aetna group.

Wood River's record in the past has been phenomenal. From twenty-nine of the prominent silver mines on Wood River has been shipped, since the discovery of the mines there up to the 15th of last November, over \$14,000,000 worth of silver bullion.

In nearly all the mines of the Wood River country the cost of fuel, coal for the most part being used, is \$8.50 per ton; timber costs from 6 to 8 cents per running foot; cost of transporting product from Wood River points to Denver or Omaha is \$12.00 per ton; cost of treatment per ton, \$6.00 to \$12.00; miners receive from \$3.00 to \$4.00 per day; timbermen, \$3.50; tapmen and laborers, \$3.00, and engineers, \$3.50; the shifts are ten hours.

Blaine County is also a good lead producer. In 1898 this county produced 2,189,670 pounds, and this year (1899) the output was 1,634,328 pounds. In copper, \$10,000.



Boise County.

PRODUCTION IN 1898.

Gold, 1008 ozs.....	\$206,864
Silver, 2685 ozs.....	3,472
Total	<u>\$210,336</u>

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 19,337 ozs.....	\$399,005
Silver, 46,331 ozs.....	27,798
Total	<u>\$427,493</u>

Boise County is celebrated far and near as one rich in mineral resources. It is one of the original counties of the Territory. It has an area of 3300 square miles. The Boise Basin is about 30 miles long with an average width of 15 miles. Her placers yielded for many years over a million dollars per annum and quite a number are now worked with profit. In this county are found excellent quartz mines. The quartz belt extends for a distance of 40 miles or more commencing with the famous Gold Hill mine and extending through the county. The Quartzburg district north of Idaho City has been producing gold since 1867. The Elmira group near Banner, owned by New York parties, is generally known as a good property. In this group the pay chute is over 500 feet in length. There are two veins. The tunnel struck a vein over a foot wide at a distance of 871 feet and after being driven eight feet further it struck another vein which varies in width from six to fifteen inches. The ore is chloride, occasionally black sulphurets, antimonial ruby and native silver. One of the mines of this group, the Crown Point, is opened to a depth of over 400 feet.

There is a fine 20 stamp mill in connection with the works besides a roasting furnace and an assay office.

In the Quartzburg district the most noted mine is the Gold Hill. The vein carries two to three feet of easily worked de-

composed sulphureted quartz yielding from \$10 to \$100 per ton. Large runs have been made yielding from \$50 to \$100 to the ton. The main shaft is down over 500 feet. The various underground openings aggregate a length of over two miles. This mine has already produced nearly \$3,000,000.

The Gambrinus District is near Idaho City. There are many other fine properties in this county and some excellent placers that yield largely each year. This county is well timbered, and parts of it well adapted to agriculture. It has 25,000 acres of land in cultivation.

The cost of fuel varies in different districts in this county. At Pearl coal is used and costs \$12.00 per ton; in nearly every other part of Boise County wood is used that costs about \$3.50 per cord. The county is well timbered and wood is comparatively cheap. From Pearl the cost of transportation to market is \$9.50 per ton. In the Idaho Basin the ore is worked there. Miners receive from \$3.00 to \$3.50 per day; timbermen get \$3.50; trammers, \$2.50; laborers, \$2.50; engineers, \$3.00; pumpmen, \$3.00; foremen, \$4.00; blacksmiths, \$3.00.



The Idaho Basin.

This section includes the headwaters of More's Creek, a tributary of the Boise River, and the productive area is probably 150 square miles. The placer mines of the Idaho Basin were discovered in August, 1862, by a party of Walla Walla prospectors, who located first at Pioneerville. Shortly after this the gold gravels of Centreville were located, and in December of the same year the rich diggings of Idaho City and Granite Creek were found. It is conservatively estimated that the Basin, since gold was discovered there, has produced \$50,000,000 in gold.

The Basin is located in the middle of that great irregular mountain mass extending between the Salmon and the Snake Rivers, and occupies the headwaters of More's Creek, a tributary of the Boise. Ten miles from the point where it joins

the Boise River, More's Creek divides into two, the westerly branch being called Grimes' Creek. Five miles above this the narrow canyon in which More's Creek flows widens out to a broad valley. At Idaho City the creek branches again and both forks head in the high mountains near Wilson Peak and Elk Creek Mountain. Throughout the Basin the primary gold deposits present a certain similarity. They are all contained in granite rocks or associated dikes. They are all either fissure veins or impregnations connected with fissures. Nearly all of these fissures have a direction ranging east-west to northeast-southwest. The ores consist chiefly of auriferous pyrite, arsenopyrite, zincblend and galena in a gangue of quartz ore, more rarely, calcite. The fresh ores from deeper levels contain free gold in larger or smaller quantities. Not more than 60 per cent. is usually caught on the amalgamating plates. Gold predominates largely in the value of the ore. The alteration of the country rock in the vicinity of the veins is throughout of the same character.

A careful study of the occurrences of gold placers and gold quartz in the Idaho Basin will convince the student that the former depend upon the latter. There are two regions where quartz vein deposits are concentrated, the Gambrinus mining district on the ridge between Elk and More's Creek, and the gold belt extending from the Boise ridge near Quartzburg to Grimes' Pass. Every creek and ravine leading up to these deposits have been rich while the watercourses in other parts of the range are almost barren. In nearly every instance a rich ravine has led up to a quartz vein. Practically all of the placer gold in this district has been derived from the quartz veins in these two districts. In the immediate vicinity of Idaho City but few quartz veins occur. The Gambrinus mining district is located about six miles from Idaho City, between More's Creek and Elk Creek, and numbers some good mines, among which may be mentioned the Illinois, the Eureka, the Lucky Boy, the Populist, the Cleveland, Gambrinus, Boulder, Forest King and Washington. The Illinois

vein is typical of many veins in the Idaho Basin. Large masses of quartz are rarely seen. The vein consists of a wide belt of sheeted and broken granite with many small quartz seams between the joints of the sheets or running through them. These small quartz seams carry the gold, while the granite is worth nothing. The Elkorn District adjoins the Ganbrinus and is situated on upper Elk Creek, the chief claims being the Elkhorn and the Summit.

The gold belt of the Quartzburg-Grimes Pass District begins at the Ebenezer claim near Quartzburg. The Gold Hill, Pioneer, Iowa, Carroll, Kenebec, Black Bear, Mountain Queen and some others are the chief claims of this district. The Summit Flat district lies on the headwaters of Elk Creek, Clear Creek and More's Creek, and comprise the Barry, Peerless, King, Mammoth, and others. The Wilson group lies a little further north. Placer deposits occur at many points along Lost River and Bear River near Kempner. Twenty-two miles northeast of Idaho City are the silver mines of Banner, where the deposits are large, well defined quartz veins carrying rich silver sulphides.

The Neal mining district, while located in Elmore County, is nevertheless in the southwest corner of the Boise Basin quadrangle. It covers an area of nearly 10 square miles, the productive area being at the heads of Bender and Wood Creeks. The chief claims are the Hidden Treasure, the Homestake, the High Five, the Golden Star, and a few others. The veins here have the common trend northeast, dipping to the south, and as to form may be referred to three classes: Veins filling large fault fissures, where are to be found the principal claims; veins along the minor shearing planes of the granite, more or less irregular, but in general carrying high grade ore, and veins of a hard white quartz carrying no values.

The Black Hornet mining district may be mentioned in this connection. It is on the eastern side of the Boise ridge, eight miles southeast of Boise, situated at elevations from 4000 to 5000 feet. A number of quartz veins are found in

this district, chief among which are the Black Hornet, the Viola, Ophir, McIntyre, Gray Eagle, Golden Rule, Montana and some others.

The Boise mining district contains a number of prospects that have not as yet produced much. The Shaw mining district has attained some prominence, the Rising Sun vein being, perhaps, the most noted.

The Willow Creek district lies in Boise County about twenty miles from Boise, and near it is the Rock Creek district, the two extending in an east-northeast direction for eight miles. The productive mines of this district at present are on Willow Creek and comprise the De Levan, the Checkmate, the Friday, Leviathan, Birthday and Lincoln.

I take pleasure in stating that the substance of this article on the Idaho Basin was taken from that excellent and exhaustive government publication of the United States Geological Survey, Department of the Interior, entitled "Mining Districts of the Idaho Basin and the Boise Ridge, Idaho," by Waldemar Lingren.

Canyon County.

PRODUCTION IN 1898.

Gold, 413 ozs.....	88,537
Silver, 97 ozs.....	125
Total.....	88,662

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 100 ozs.....	82,067
Silver, 25 ozs.....	15
Total.....	82,082

Canyon County is a fine agricultural county. It was for many years a part of Ada County but was made a separate county by act of the Legislature in 1894. Its county seat is Caldwell, a thriving town on the Short Line. There is some placer mining on the bars of Snake and Boise Rivers in this county.

Cassia County.

PRODUCTION IN 1898.

Gold, 1031 ozs.....	\$21,213
Silver, 113 ozs.....	146
	\$21,459
Total.....	

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 75 ozs.....	\$ 1,551
Silver, 5 ozs.....	3
	\$ 1,554
Total.....	

Cassia County's mines are largely in an undeveloped condition. She has some good placers. As a stock and agricultural county she ranks high with the counties of the State. There are many large stock ranches in Cassia County and quite a large number of sheep, cattle and horses.

In addition to the precious metals, Cassia County contains minor metals and mineral substances of many kinds, including deposits of a good quality of mineral paint, large quarries of a very fair quality of marble, sandstone, granite, mica, and many indications of coal. The marble is found in large bodies in several localities and much of it cannot be excelled anywhere in the United States. When transportation facilities are better in this part of Idaho these vast marble quarries will be a source of great profit.



Custer County.

PRODUCTION IN 1898.

Gold, 2563 ozs.....	\$ 51,842
Silver, 156,068 ozs.....	202,949
	\$257,791
Total.....	

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 3411 ozs.....	\$ 70,505
Silver, 155,123 ozs.....	93,073
	\$163,578
Total.....	

Custer County is one of the oldest counties in the State, and is known far and near for the richness of its mines. Mining in this county dates from the discovery of gold there

in 1876. Since then its vast mineral resources have been pretty thoroughly explored. The county is well opened by good wagon roads, among which the State wagon road may be mentioned. The principal mining camps are Bayhorse, Clayton, Garden Creek, Squaw Creek, Slate Creek, Salmon River, Yankee Fork, Bonanza, Custer, Loon Creek, Stanley Basin, Seafoam, Sheep Mountain and the silver lead district of Houston or Big Lost River. Some 3000 mining claims are on record in the county. The yield of the precious metals in this county has been on an average \$1,500,000 a year since 1876, and for a few years while silver was a good price and the vast silver lead mines of the county were in active operation, \$2,000,000 per year. Much high grade ore is shipped by large freight teams to Omaha and other points during the summer season of each year. In the Bayhorse district the method of extracting the ores is by drifting and raise work, the ledges being flat. The cost of fuel in this district is \$4.00 per cord; cost per ton for transporting to market, \$6.00; the ore is treated by smelting; average cost of drifting per foot, \$4.00. The following wages are paid: miners, \$3.00; 10 hour shift; trammers, \$3.00. Character of country rock, slate; character of ore, chloride and gray copper.

In the White Knob mine, Lost River district, in Custer County, six miles from Houston, the course of the claim is north and south, strike of the vein the same, while the dip of the vein is not known. The altitude of the main workings is 8,500 feet, the character of the country rock is porphyry and lime, the character of the vein is contact, that of the walls or enclosing rocks, west, porphyry, east, lime. The ore occurrence is irregular, and the character of the ore is chalcopyrite, hornite, azurite and malachite. The tunnels and connecting shafts are deep, the shaft being 700 feet with drifts connected with ventilating shaft. The method of extraction is overhand stopes to chutes on tram line and open quarry work. Cost of fuel, \$4.00 per cord; cost of timber, \$15.00 per M.; cost of transporting supplies to the mine, 60 cents

per hundred weight; cost per ton for transporting to market, \$10.00 to the railroad; average cost treatment per ton, \$10.00; method of treatment, smelting; average cost of sinking, per foot, \$45; average cost of drifting, per foot, \$8.00. Miners receive from \$3.00 to \$3.50 per day, from 8 to 10 hour shifts; trammers receive \$3.00 per day; timbermen, \$3.50; topmen, \$3.00; laborers, \$3.00; engineers, \$4.00; pumpmen, \$3.50.

In 1898 Custer County produced 1,426,551 pounds of lead. This year the product was some less, but reached 1,315,178 pounds. In addition to this, Custer County produced \$8000 in copper this year.



Elmore County.

PRODUCTION IN 1898.

Gold, 2499 ozs.	\$51,659
Silver, 981 ozs.	1,268
Total	\$52,927

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 2398 ozs.	\$49,566
Silver, 850 ozs.	510
Total	\$50,076

Mines were discovered and worked in this county as early as 1863. The northern part of the county is quite mountainous. The mining camps of Rocky Bar and Atlanta are situated in this section of the county and are quite celebrated as producers of the precious metals. The area of the county is a little less than 6000 square miles, and taken as a whole is very rich in natural resources, especially in minerals. The fact that its rich mines are so far into the interior, there being as yet no railroads closer than Mountainhome, the county seat, has hindered the development of the county. The Neal mines are in this county. The Daisy mine in this district employs about twenty-five men and for the last year has been doing development work. The Homestake and the

Hidden Treasure are also important mines in this district. All these mines are fully equipped with first-class, up-to-date machinery. The Daisy is a patented mine containing twenty acres. The altitude of the main workings is 3800 feet; the vein is a true fissure vein, and the ore is oxides and sulphides. In this mine fuel costs from \$2.50 to \$4.00 per cord, while timber costs \$8.00, and lumber \$17.00 per M. Sinking costs on an average \$10.00 per foot, and drifting, \$3.00 per foot. Miners get \$3.00 per day, 10 hour shifts; trammers, \$2.50; timbermen, \$3.00; topmen, \$2.00; laborers, \$1.50; engineers, \$3.00 to \$4.00; firemen, \$3.00. It costs from 20 to 30 cents per hundred to get supplies into this mine



Idaho County.

PRODUCTION IN 1898.

Gold, 9845 ozs.	\$203,514
Silver, 2532 ozs.	3,274
Total.	\$206,788

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 5780 ozs.	\$119,472
Silver, 1500 ozs.	900
Total.	\$120,372

Idaho County is the largest county in the State, and one of the largest in the United States. The rich placer mines of Warrens and Florence, Oro Fino and Elk City in this county called the attention of the whole country to this portion of Idaho and caused a flood of gold seekers in the early sixties to wend their way thither. It has vast agricultural as well as mineral resources. The great Clearwater country has been called "the mother of gold," for it was the rich placers of this district that caused the gold excitement there in the early days. The quartz and placer district of Warrens is making good yields from year to year. The quartz camp of Warrens produces the richest gold quartz ever found in the State. The Elk City district in this county is quite important. As transportation facilities increase it will be among

the first in the State. The Buffalo Hump district has attracted no little attention and caused no small stir in the mining world. It has not been developed sufficiently yet to say with certainty whether the exceeding high expectations of those who discovered and promoted it will be fully realized. The formation in this district is granite, schist, syenite and porophyry, the principle ledges occurring at the contacts. The general character of the ore is an arsenical sulphide, carrying besides gold and silver a small percentage of lead and traces of copper. In places the ore is oxidized and pans some free gold, notably on the Cracker Jack, Santa Rosa, Elizabeth and Yankee Boy. Recent tests of the ore establish the fact that concentration is the proper method of its treatment here. The Big Buffalo ledge is from 30 to 36 feet wide and crops from 2 to 6 feet above the ground for a distance of 300 feet. The only development work so far done is on the Jumbo, about three miles southeast of the Big Buffalo. The Buffalo Hump country lies in the center of Idaho County. The Hump is 8700 feet high and is drained on the north by the south fork of the Clearwater and on the south by the Salmon River.

The following facts concerning the mines of the Hump are reliable:

From tests made of the original discovery Hump ore, three tons were milled by the Banner Company, of Florence, a Huntington mill and Wilfley tables, returning \$60.00 per ton on the plates and about 3 per cent of concentrates that assayed \$3000 per ton. Samples from the surface of the Big Buffalo ledge gave returns as follows: Average of 24 feet, \$34.81; average of 9 feet, \$458.17; average of 3 feet, \$712.17. In the Jumbo there has been a tunnel run on the lead 140 feet, gaining a vertical depth of about 100 feet and crosscut eight feet with no wall. The ore runs from \$12.00 to over \$700 to the ton, is free and could be saved to a high percentage with stamps and concentrating. It will require more development work in the Hump to determine the permanent value of the mines. The Hump district is reached

over the Northern Pacific by way of Lewiston and Camas Prairie, and from the south over the Oregon Short Line, P. & I. N. by way of Weiser, one of the finest agricultural countries in the west.

The Iola mine is located on Spring Creek, near Warrens.

The course of the vein in this district is east-west, and the strike of the vein is the same, dipping to the south between 20 and 25 degrees. The ore is found in chutes dipping to the east and in irregular bodies. The tunnels cut the vein at a depth of 250 feet. It is ventilated by four shafts. The mine is wet during the spring months, but dry and comfortable ten months during the year. Wood costs \$3.00 per cord; transporting supplies from Weiser, Idaho, 2 cents per pound; average assay of ore, \$10.00 per ton; average cost of treating the ore per ton, \$3.00. The ore is free-milling. The average cost of sinking, per foot, is \$7.00, and of drifting, \$6.00. The miners get \$3.50 per day; the trammers, \$3.00; 10 hour shifts. The superintendent gets \$4.00 per day and the assayer \$4.00; blacksmiths get \$3.50 per day.

The Little Giant is one of the most celebrated mines in Idaho. The altitude of its main workings is 6700 feet, and the character of the country rock is granite; of the vein, quartz; of the walls or enclosing rocks, mineralized granite; of the ore, gold and silver. The ore occurrence is in chutes. Development work engaged the attention of the owners of this mine during the last year. A shaft was sunk 100 feet below the tunnel level, and drifted west 100 feet, raised up to tunnel and stoped part of that block of ground. The ore is extracted by stoping and blasting. Wood for fuel costs \$3.00 per cord. The average cost of timber per month is about 2½ cents per running foot. It costs 2 cents per pound to transport supplies to the mine. It costs on an average \$3.00 per ton to treat the ore. The Little Giant employs 12 men, the miners receiving \$3.50 per day for a 10 hour shift.

Other important mines in this county are the Idaho Consolidated Gold Co. property, the Knott and the Keystone.

The Warrens placers are worked by dredges and the Bed Rock Flume Company is also operating near Warrens.



Lemhi County.

PRODUCTION IN 1898.

Gold, 12,569 ozs.....	\$259,524
Silver, 2056 ozs.....	2,697
Total.....	<u>\$262,521</u>

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 1056 ozs.....	\$ 21,827
Silver, 1275 ozs.....	765
Total.....	<u>\$ 22,592</u>

Mining in old Lemhi County dates from 1866, when a party of prospectors found their way into the mountain recesses and discovered rich placers, and at a place called Leesburg, seventeen miles west of Salmon City, the present county seat. Shortly after some fine quartz mines were found and from this time on Lemhi County rapidly advanced in importance as one of the leading mining counties in Idaho.

The A. D. & M. Co.'s mine at Gibbonsville employs 70 men. The course of both the claim and the vein is east and west. The character of the country rock is slate; of the walls or enclosing rocks, slate; of the ore, auriferous sulphides in quartz gangue. Four principal tunnels and subsidiary tunnels have been run in this mine, all the main tunnels connected by raises and winzes affording perfect ventilation with two main exits at extreme ends of workings of surface. Fuel costs \$2.75 per cord. The average assay value of ore per ton is \$15.00; the average cost of treatment per ton is \$3.50, the ore being treated by stamps and cyanide; average cost of sinking, per foot, \$8.00; of drifting, \$5.00. Miners get \$3.00 per day of 10 hour shift; trammers, \$3.00; timbermen, \$3.50; topmen, \$2.50; laborers, \$2.50; engineers, \$3.50; pumpmen, \$3.50; firemen, \$3.50; ore sorters, \$3.00; blacksmiths, \$4.00.

There are extensive placer mines along the Salmon River in Lemhi County, the area of good placer ground there being

quite large. The large number of mining districts in Lemhi County renders a special mention of each one in the present report out of the question, but the fact that capital is seeking investment there and mining interest is keeping up well, indicates the importance of the industry in that county.



Lincoln County.

PRODUCTION IN 1898.

Gold, 1629 ozs.	\$33,400
Silver, 202 ozs.	261
Total	\$33,729

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 1850 ozs.	\$38,239
Silver, 75 ozs.	45
Total	\$38,284

Lincoln County is more of a stock and agricultural county than mining. Its mines are for the most part undeveloped. Some placer mining is done along the rivers.



Oneida County.

PRODUCTION IN 1898.

Gold, 909 ozs.	\$18,791
Silver, 84 ozs.	109
Total	\$18,900

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 175 ozs.	\$ 3,617
Silver, 15 ozs.	9
Total	\$ 3,626

Oneida is another of the counties of Idaho that have but very limited mining interests. It is an excellent stock and agricultural county, among the best in the State.

Owyhee County.

PRODUCTION IN 1898.

Gold, 54,275 ozs.....	\$ 700,527
Silver, 1,320,210 ozs.....	1,706,938
Total.....	\$2,407,465

PRODUCTION IN 1839 (APPROXIMATE).

Gold, 33,549 ozs.....	\$ 693,457
Silver, 975,332 ozs.....	585,230
Total.....	\$1,278,687

In 1863 gold seekers discovered placer gold on Jordan Creek, in what is now known as Owyhee County. Not satisfied with what they found there they pushed their way into the mountain fastnesses of this county until they uncovered some of the richest gold and silver mines on the continent. The area of the county is about 6500 square miles and mining is its chief industry. The mining district covers a large mountain area and the mines are very rich and good producers. Among the famous mines of the district are the Delamar, the Trade Dollar, the Cumberland group on the east side of War Eagle mountain, the mines of the Flint district, the Pauper, the Poorman and many others that might be mentioned. Recent developments show that the mines of Owyhee County in general have lost nothing of their original promise of productiveness. Silver City and Delamar and other towns in Owyhee County are reached by stage from Murphy, a point on the Boise, Nampa & Owyhee Railroad, which joins the Oregon Short Line at Nampa. In the Flint district the character of the ore is gray copper, ruby and silver, the character changing to sulphide and the per cent of gold increasing with depth. In this district wood costs \$6.00 per cord; timber from 10 to 15 cents per running foot. Supplies cost for transportation from the railroad 1 cent a pound, and the cost of transporting to market of the product of the mines is \$20.00. The average cost for treating the ore, per ton, is \$1.60.

In the Delamar mine the altitude of the main workings is 6500 feet. The character of the country rock is Rhyolitic

and porphyry; the veins are fissure veins and many branches, while the ore is decomposed quartz porphyry oxidized, no sulphurets. The ore runs one-third to one-tenth silver, two-thirds to nine-tenths gold, in value from \$10.00 to \$12.00 per ton. One-third of the ore value is free milling over cw. plates. The ore occurrence is in large ore chutes in a fissure vein and its approximately parallel branches. There are ten known veins or branches which have all been followed into two veins in depth or laterally. The total workings of, open, is probably about five miles. The total openings made, not counting stopes, is eight miles. One new tunnel now running, to be 3000 feet long, will cut 500 feet below the eighth level, 130 feet vertically below the lowest workings. Here fuel costs \$8.50 per cord; timber, 15 cents per running foot; supplies to mine from Chicago, 3½ cents per pound, from Boise, 1 cent per pound. If product is shipped it costs \$24.00 per ton to get it to market. The average cost of treatment per ton is \$14.00. Drifting costs on an average, per foot, \$4.00. In the matter of wages, miners get \$3.00 per day; trammers, \$3.00; nippers, \$3.00; timbermen, \$3.50; topmen, \$2.50; laborers, \$2.50; engineers, \$4.00; pumpmen, \$4.00; firemen, \$3.50; shift bosses, \$4.50; foremen, \$10.00; assayers, \$4.00; blacksmiths, \$4.00. All work 10 hour shifts except engineers, pumpmen, firemen, shift bosses, foremen and superintendents, who have 12 hour shifts.

The Trade Dollar Mine has six miles of tunnels and drifts. In this mine the wages are from three to four dollars per day.

It is difficult to overstate the importance of the mining industry of Owyhee County to the State. The mines are steady and heavy producers, the output each year being large. In 1899 the output of the Delamar mine was \$532,565, two-thirds of which was gold and the other third silver. The Trade Dollar mine produced about \$900,000, nearly in the same proportion as between the two precious metals. It is estimated that the other mines of Owyhee County produced

\$100,000, making the total output of the mines there quite a respectable sum.



Shoshone County.

PRODUCTION IN 1898.

Gold, 13,011 ozs.....	\$ 268,961
Silver, 3,521,932 ozs.....	4,553,674
Total.....	\$4,822,635

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 4581 ozs.....	\$ 94,689
Silver, 2,328,475 ozs.....	1,397,085
Total.....	\$1,491,774

Shoshone County is the largest and most important mining county in the State of Idaho. Owing to the difficulty among the miners in that county in 1899 the output of silver and lead in that county for that year falls considerably below what it was in 1898. Under the head of "The Coeur d'Alene Mining District, Shoshone County," the mines of the county receive due attention in this report. The following supplementary information will conclude what we have to say as to the mines of this county.

The Hunter mine, located at Mullen, is one of the important mines of this district. The dip of the vein is straight, while the altitude of the main workings is 4500 feet. The vein is a fissure vein. The character of the country rock is quartzite, of the walls the same, while the ore is galena. The cost of fuel is \$3.50 per cord; timber costs 7 cents per foot. The cost of transporting supplies into the mine is 25 cents per cwt. Average assay value of ore per ton, \$4.00; cost of transporting product to market, per ton, concentrates, \$19.00; average cost of treatment, per ton, 25 cents; gross tonnage per year, 216,000; average tonnage per month, ore, 18,000; average cost of drifting, per foot, \$20.00; average number of men employed, 300, with the following scale of wages for from 8 to 10 hour shifts: Miners, \$3.50 per day; trammers, \$3.50; nippers, \$3.50; timbermen, \$3.75 to \$4.00; laborers, \$3.00; engin-

eers, \$4.00; shift bosses, \$4.50; foremen, \$5.00; assayers, \$125.00 per month; blacksmiths, \$4.00 per day of 10 hours.

The Bunker Hill and Sullivan mine, near Wardner, Idaho, is another important mine of Shoshone County. The dip of the vein is 38 degrees from the horizon towards the southwest. The country rock is quartzite, the vein is a fault fissure, the walls quartzite, while the ore is argentiferous galena with gangue composed of quartzite, iron carbonate and pyrite. The altitude of the main workings is 3000 feet above the sea level. The ore occurs in irregular masses approximately parallel to the strike of the vein and having a dip of 38 to 40 degrees. Some of the ore bodies are of great width. Development is kept well ahead of current work, and owing to the numerous openings to the surface, ventilation by natural means is very effective; the air is good in all parts of the workings. There are eight or nine exits to the surface. The ore is extracted by machine and hand drilling, using giant powder for blasting. Ore is sorted in the stopes and the waste is used for filling. The mine is worked through tunnels. The cost of fuel is, wood, \$3.50 per cord; timber costs on an average 5 cents per foot; cost of transporting supplies to mine, \$2.00 per ton; lumber, \$2.50 per M. The ore averages 10 per cent lead, 5 ounces of silver. Cost of transporting to mill, 10 cents by tramway; it costs on average 25 cents per ton to treat the ore, which is done by concentration. The gross tonnage of this mine is 1,100,000, or about 16,000 tons per month. The gross investment is \$3,500,000. Drifting costs \$5.00 per foot. There are 480 men employed in this mine. The wages payed the men are as follows for 10 hour shift: Miners, \$3.50; trammers, \$3.00; cagers, \$2.50; nippers, \$3.00 to \$3.50; timbermen, \$4.00; topmen, \$3.00 to \$3.50; laborers, \$3.00 for 10 hours' work; engineers, \$3.50; firemen, \$3.50; shift bosses, \$5.00 for 10 hour shift; foreman, \$6.00; assayers, \$5.00; ore assayers, \$3.00; electricians, \$4.00; blacksmiths, \$4.00.

The concentrates produced are shipped to smelting works

for further treatment. The cost per ton for freight and treatment averages about \$18.00.

In 1898 the lead output of the mines of Shoshone County was 118,862,754 pounds. Owing to strike conditions in that county in 1899 the output was not so large, 83,500,000 pounds, valued at \$4.45 per hundred pounds. Making the lead output worth \$3,715,750.



Coeur d'Alene Mining District, Shoshone County.

This great mining district came into prominence as a gold placer camp in the summer of 1883, placer gold being discovered in that year on Pritchard Creek, near Eagle City. This city sprang up as by magic and in 1884 it was a town of 2000 people. Murray was then laid out and for some years after was the chief town of the Coeur d'Alenes. In September, 1884, John Carton and Almedos Seymore, while looking for placers on Canyon Creek, discovered some float which, following up, they discovered its source and located the Tiger quartz lode. The next day the Poorman quartz lode was discovered by Scott MacDonald. These two claims were the first quartz discoveries in the Coeur d'Alenes. Others followed in rapid succession. In the fall of 1885 the Bunker Hill and Sullivan was discovered at Wardner, the showing creating quite an excitement: In the same year the Hunter, Morning and Evening lodes were discovered at Mullan and from this on the country containing these wonderful mines was the cynosure of all eyes, and attracted the attention of leading mining men of all sections of the United States. The first concentrator of the district was built by A. M. Esler at the Bunker Hill and Sullivan and was of the capacity of 100 tons. The years have brought some changes but the property is now under the management of F. W. Bradley, whose office is in San Francisco, and F. Burbridge, resident manager at Wardner. It is probably the greatest lead property in the world, exceeding that of the Broken Hills mine, in Australia, which has hereto-

fore been considered the greatest lead producer. The company has gradually absorbed all the adjacent claims and now has control of forty or fifty locations adjoining and connecting, and with the exception of the Last Chance Mining Company's property they have about all the desirable property at Wardner. Notwithstanding the labor difficulties of the year 1899 the property is in a prosperous condition. A new mill has been built and the company is now operating a 700 ton concentrating plant, producing about 3000 tons of shipping ore per month. They employ about 400 men. A tunnel two miles in length is being run to connect their mill at Kellogg with the Wardner mine, which will cut their ledge at 750 feet vertical depth below their lowest workings and with the incline of the ledge will give them about 1500 feet of stoping ground. When completed it will give them a large amount of ore which can be taken out without pumping.

THE LAST CHANCE.

This company has several valuable claims at Wardner. They are operating a 150 ton concentrator and producing from 750 to 900 tons of concentrates per month. There are other valuable properties near Wardner but are not being worked at present to any extent. Between Wallace and Wardner are some good mines that bear well in silver and as the price of silver advances these will prove quite valuable.

WALLACE.

From this point, which is now the main town of the Coeur d'Alene district, diverges Placer Creek, Nine Mile Creek, Canyon Creek and the continuation of the South Fork above Mullan. There are quite a number of properties on Placer Creek but no extensive development work has been done. The Custer and Granite mines are located on Nine Mile Creek and both these properties have been heavy producers but are not being operated at present. De-

velopment work, however, is being done on both these properties with good showings and fair prospects of resuming milling operations.

MULLAN.

Seven miles up the South Fork from Wallace, at Mullan, are the Hunter, Morning, Evening, You Like and many other good properties. The Hunter had the misfortune to lose its mill by fire this summer, but it will be rebuilt and plans are devised to secure a new concentrating plant. The mine is valuable and produces high grade ore. The Morning, Evening and You Like mines are being operated by Larson & Greenough, who have a 600 ton concentrating plant in operation and are producing 250,000 tons of concentrates per month, employing 250 men.

CANYON CREEK.

The Canyon Creek mines have been and are still the heaviest producers in the Coeur d'Alenes. The Standard produces 2200 tons of concentrates per month, which are the highest in value in the entire camp. As a dividend payer the Standard is among the best in the district. On the Formose property the company has erected a 75 ton mill, but they have not as yet taken out much ore. The Granite mill is idle at present. The Gem mill is owned by the Milwaukee Mining Company, is being run on ore from the Mammouth mine, which produces high grade concentrates. The Gem mine has been a good producer but is at present being worked by leasers who are handling only the upper workings, the low levels being allowed to fill with water during the low prices prevailing for lead and silver the last year. The Frisco mine and mill are being worked quite extensively. They are shipping from 1800 to 2000 tons of concentrates per month and furnish employment to 200 men. The product of this property runs high in silver. The Black Bear is now idle. The Standard employs about 200 men. The Tiger and Poorman, at

Burke, have been steady producers since 1887. A fire that broke out in 1896 destroyed the mills of both the Tiger and Poorman properties, but the work of rebuilding was commenced immediately after the fire and now a 500 ton concentrator with the latest improved machinery and appliances for the economical handling of ore is in operation. The mines that were allowed to fill with water were pumped out and the properties now produce from 1800 to 2000 tons of concentrates per month and give employment to 160 men. The machinery is of the best and can be operated either with steam or water power. The company are also operating an electric light plant of 175 horse power. The depth of the Tiger and Poorman augurs well for the Coeur d'Alenes as it insures a long life for the camps. With all the noise made about the Rossland, Cripple Creek, Creede and other camps, none of them can rival the Coeur d'Alenes as steady and profitable producers. They have gone on steadily working these mines for the past nine years except for brief periods now and then and the shipments now are about 13,000 tons per month.

The production is distributed as follows: Bunker Hill and Sullivan, 3000 tons per month; Morning, 2500; Standard, 2200; Tiger and Poorman, 1800; Helena and Frisco, 1800; Last Chance, 750; Mammoth, 600; other properties, including prospects, 350, making a total of 13,000 tons per month, averaging 55 per cent lead and 30 ounces of silver, which at present prices show a valuation of over \$750,000 a month or \$1,000,000 a year. The Coeur d'Alenes furnish employment for over 2000 men the year round, and from \$1,000,000 to \$12,000,000 yearly to the world's wealth. This district now supplies nearly one-half of the total amount of lead produced in the United States.

As to the general formation and features of this important district it may be well to add a few items for the information of the people at large.

The veins of the Canyon Creek district are true fissure veins and as such are likely to go to great depth, some of

them having already gone to a depth of 1200 feet with no signs of decrease in the quantity or quality of the ore. The ore chutes in all the Canyon Creek mines are well defined, regular in width and length and lying between two walls that require but little prospecting outside the walls of ore bearing bodies. The chutes are much longer than usually found in other camps with like quality of ore. The pay streaks vary from 2 to 30 feet in width and the ore is clean, with no sortage or waste. In the Wardner district the veins are not so well defined and regular. The ore bodies lie between the two walls, which are from 200 to 300 feet apart, and between these walls the vein is filled with ledge matter, the ore bodies being buncy in character and somewhat irregular as to position, requiring a large amount of prospecting work and no little sorting of the waste from the ore when found. It would be called more of a mineral zone than a fissure vein. The ore bodies are large and from 2 to 100 feet in width, but the chutes are short as a general thing.

Speaking in a general way as to the formation of the camp, the country rock is slate with more or less quartzite and is said to resemble closely the formation of the Hartz mountains in Germany, in which district the lead mines have been worked for the last century to a depth of over 3000 feet. The general character of the ore is an argentiferous galena and carries on an average about one-half an ounce of silver to one per cent of lead.



Washington County.

PRODUCTION IN 1898.

Gold, 434 ozs.....	\$8,972
Silver, 82 ozs.....	106
Total	\$9,076

PRODUCTION IN 1899 (APPROXIMATE).

Gold, 210 ozs.....	\$4,340
Silver, 95 ozs.....	57
Total.....	\$4,397

As yet the mining resources of Washington County have not been developed. With the building of the P. & I. N. Railroad into the Seven Devils district, which enterprise has been already pushed as far as Cambridge, and will extend if the plans of the company are carried out even beyond the district mentioned, thus furnishing transportation for the vast copper resources of the Seven Devils, Washington County will take a high position in mining among the other mining counties of Idaho. The Seven Devils district undoubtedly has some of the best copper properties in the United States, if not in the world. It is destined at no distant day to rival Butte, Montana, in the wealth and productiveness of its copper mines. The altitude of the main workings of this mine is about 7000 feet. The character of the country rock is granite and lime; of the vein, quartz; of the ore, bornite and malachite. Fuel costs \$3.50 per cord; timber, \$16.00 per thousand; supplies transportation, 2 cents in winter, and less in summer. Sinking costs on an average \$12.00 per foot and drifting \$3.00. Wages are from \$3.00 to \$4.00 per day, 8 to 10 hour shifts.

In the past year the copper district of the Seven Devils has attracted much attention. For the first time in the history of the Seven Devils a systematic and thorough effort under good management was made to show the vast wealth in copper in this district.

The Peacock, Copper Key and Wedge, White Monument, Decorah, and Arkinsaw claims have recently been secured and are now under the control and management of the Boston and Seven Devils Copper Company who are actively developing these properties on a systematic and substantial basis, which will, within the next year demonstrate the merits of the district. For the most part the mines are being put in shape for future work, but the Blue Jacket has been shipping ore by wagon for sixty miles and thence by rail to New York. Thirty-five car loads of ore were shipped to New York from this mine during 1899 that went 40 per cent copper, some gold and

some silver. This is only one property, but others in this district show up well, and the future looks bright for Washington County in the matter of its copper product. When the wonderfully rich copper properties in the Seven Devils district are developed and working it will rival Butte or any other district in the United States.

The country rock of this district is generally granite, sections of which are overlaid by diorite occasional lime dikes cutting through it east and west.



==== Other Mineral Resources of Idaho ====

GOLD, silver, lead and copper are not the only mineral resources of Idaho. These attract the greatest attention and at present are more prominent than any of the others, but the State has large resources of other minerals that deserve more than a passing mention.

Owyhee County has some of the best opal fields in the United States. Of late these fields have attracted the attention of capitalists and they will from this time on be thoroughly developed. An eastern syndicate composed largely of Boston capitalists have secured some of the best of these properties and are expending money in the development of the opal mines. Experts pronounce the Idaho opal as being of great power and brilliancy. Some of the stones taken from the opal mines of this State are on exhibition in Boston, where they attract the attention of connoisseurs, and favorable mention of them are made in many of the leading papers of the country. The Idaho marble is also attracting no little attention. In some counties, notably Bear Lake and Cassia, some of the valuable deposits have been uncovered and show up well. The marble in Cassia County is found in large bodies in several localities, and much of it is of excellent quality.

Indications of large deposits of a good quality of coal are not wanting in many of the counties of Idaho, especially in

the southeast. I may be permitted to express it as my conviction that the coal beds of the southeastern counties of Idaho are a continuation of those of Wyoming, and of the same quality of coal, and extend for hundreds of miles into the State. Plans are now maturing to uncover these beds in some of the counties and develop them.

Latah County has some ruby prospects that show well. The stones are of fine quality.

The native rock of Idaho is excellent for building purposes. In Boise, the capital of the State, some of the finest buildings in the city are built from the stone quarried near the city. Many of the buildings composing the Idaho State Penitentiary are built from the stone quarried from the grounds owned by the State near the site of the prison, and the buildings present quite a handsome as well as substantial appearance.

Cyanide and Chlorination in Idaho

WHILE Colorado was the first State in the union to use the cyanide process it was in quite an early day introduced in Idaho, and is now successfully used in nearly every part of the State. An account in outline of this process may be of interest.

The ore after being properly crushed, and roasted if necessary, is placed in the leaching tanks and a weak cyanide solution is added, which is allowed to saturate the pulp and rise above the top about one inch. After remaining there for some time the solution is drawn away, and it becomes necessary to wash the pulp, which generally consists of about three washes. The quantity of water required should be sufficient to displace as much of the remaining gold solution as possible, and in some cases a vacuum is used to dry the pulp to about 15 per cent moisture. After the ore has been heated and thoroughly washed, it is sluiced out of the leaching tanks over either Wilfley tables or riffles and blankets. The idea

of concentration is to recover the coarse gold which has not had time to be affected by the cyanide and also any sulphides carrying values. The solutions containing the gold are then allowed to pass through zinc shavings, the gold and silver being precipitated by the zinc. The clean-up of the zinc boxes is very simple, and the zinc slimes that contain the gold and silver are treated at the mill as a general thing and the bullion shipped direct to the mint. The cost of treating ore by this process per ton in a 50 stamp mill for each twenty-four hours is approximately \$3.90. The cost will vary with the amount of wages paid, but this estimate is made on the basis of \$3.00 a day for labor and \$5.00 a day for coal. The cyanide process has been very successful in different camps in Idaho in the treatment of old tailing dumps. The method of treatment is the same as treating crude ore but as a general thing some neutralizing agent must be used. It is used in various ways and in connection with other methods of treatment. So far the treatment of slimes or very slimy ore in large quantities by the present mechanical arrangements in use has not been commercially profitable.



=====**Chlorination**=====

CHLORINATION requires about the same kind of crushing machinery as in the treatment of ores by the cyanide process, but instead of crushing as fine twelve to twenty mesh is all that is required, and by keeping the crushing coarse the washing of the pulp in the chlorination barrel is more perfect. Every chlorination plant must roast the ore before treatment, the same roasters being used as are employed in cyanide mills with the same methods of cooling the ore before going to the hoppers over the chlorination barrels. The barrels in use vary in size from the five-ton barrel, weighing complete about ten tons, to the ten-ton barrel, weighing about eighteen tons. The shell of the barrel is made from heavy steel plate with cast iron heads,

well bolted, all lined with heavy chemical sheet lead. In the barrel is a filter, which consists of a sheet of perforated lead, wooden segments and asbestos cloth all put in to please by the man in charge. The roasted ore is charged into a barrel with water to make it of the proper consistency and the required amount of chloride of lime and sulphuric acid added. After the barrel is charged it is closed and revolved slowly from three to eight hours when the solution containing the gold is drawn off through the filter into lead lined settling tanks. The filtering and watering is assisted by air or water pressure.

Sulphur dioxide and hydrogen sulphide gas are used by some of the mills to precipitate the gold from the solution and the liquor is passed through a filter press where the gold slimes are collected, dried, roasted and finally reduced into almost pure gold by melting with proper fluxes. The other method to precipitate gold from the solution is to pass the liquor through pulverized charcoal which is finally taken from the precipitating boxes and spread on large roasting pans made of cast iron and the charcoal burnt off, leaving a gold residue which is mixed with fluxes, melted and run into bars. The chlorination mills use the same methods of concentrating tailings as the cyanide mills. The percentage of saving by the cyanide process compares very favorably with that of the chlorination process which is 85 to 95 per cent. of the assay value. The former is better in silver bearing ores as it will recover 70 to 80 per cent of the values in silver while the other process will not save silver to any appreciable extent.



Concentration

CONCENTRATION of ores is one of the most important of all processes applying to low grade ores. Each year is prolific of new inventions to carry on this process to the best advantage. However, nearly all the new methods are in

line with the original plans of this process differing only or mainly in the manner of applying the principles involved.

The theory of concentration is based upon the variable specific gravity of the different minerals. The point in the process is to separate the various metals, collect those that have value and reject the remainder.

The necessary limits of this report are too small to allow a detailed account of this interesting process, but it is familiar to every one tolerably well acquainted with mining in the different states.

The increased use of canvas tables is noticeable, while another late departure is the separation of the zinc from lead and iron sulphides and making a marketable zinc product as well as lead iron.

With more improved methods of concentration that are certain to come at no distant day, large bodies of ore in many of the mining camps of this state that cannot now be worked with profit owing to the low grade quality of the ore can be handled successfully, and this will add largely to the mineral output of Idaho.



Smelting

THIS process of treating ores is in use in many parts of Idaho. It is in fact fire concentrating. The ores are fused in a furnace, the product, a copper-iron matte, containing the concentrated values, from which the silica is separated in a molten state. This process saves from 90 to 96 per cent. of the values. Large bodies of ore otherwise of no value can be handled profitably by this process, as while it would not pay to ship the ore it does pay to ship the concentrates.

Product of Gold and Silver in Idaho

By Counties, Calendar Year 1898.

COUNTIES	GOLD		SILVER		TOTAL VALUE
	Fine Ozs.	Value	Fine Ozs.	Value	
Ada.....	670	\$ 13 850	148	\$ 191	\$ 14 041
Bannock.....	514	10 625	104	134	10 759
Bingham.....	711	14 698	72	93	14 791
Blaine.....	537	11 101	248 354	321 104	332 205
Boise.....	10 008	206 884	2 685	3 472	210 356
Canyon.....	413	8 537	97	125	8 662
Cassia.....	1 031	21 313	113	146	21 459
Custer.....	2 653	54 842	156 968	202 949	257 791
Elmore.....	2 499	51 659	981	1 268	52 927
Idaho.....	9 845	203 514	2 532	3 271	206 788
Lemhi.....	12 569	259 824	2 066	2 097	202 521
Lincoln.....	1 619	33 488	202	261	33 729
Oneida.....	909	18 791	84	109	18 900
Owyhee.....	34 275	708 527	1 320 210	1 706 938	2 415 465
Shoshone.....	13 011	268 901	3 521 982	4 553 674	4 822 635
Washington.....	434	8 972	82	106	9 078
Total.....	91 698	\$1,895,566	5 256 700	\$6,796,541	\$8,692,107

Total Product of Idaho

During Calendar Year 1898.

METALS	Quantity	Value
Gold, fine ounces.....	91 698	\$ 1 895 566
Silver, fine ounces.....	5 256 700	6 796 541
Lead, pounds.....	122 479 275	4 899 171
		\$ 13 591 278

The output of lead and silver in Shoshone County is only about 60 per cent of the capacity of the mines, owing to labor difficulties.

Product of Gold and Silver in Idaho

By Counties, for the Year 1899.

COUNTIES	GOLD		SILVER		TOTAL VALUE
	Fine Ozs.	Value	Fine Ozs.	Value	
Ada.....	455	\$ 9 401	110	\$ 66	9 470
Bannock.....	70	1 446	5	3	1 449
Bingham.....	410	8 074	10	6	8 080
Blaine.....	1 597	33 019	970 958	582 574	615 593
Boise.....	19 337	399 685	46 331	27 798	427 483
Canyon.....	100	2 067	25	15	2 082
Cassia.....	75	1 551	5	3	1 554
Custer.....	3 411	70 505	155 123	93 073	163 578
Elmore.....	2 398	49 566	850	510	50 076
Idaho.....	5 780	119 472	1 500	900	120 372
Lincoln.....	1 850	38 239	75	45	38 284
Lemhi.....	1 056	21 827	1 275	765	22 592
Oneida.....	175	3 617	15	9	3 626
Owyhee.....	33 549	693 457	975 322	585 193	1 278 650
Shoshone.....	4 581	94 689	2 328 475	1 397 085	1 491 774
Washington.....	210	4 340	95	57	4 397
Total	75 054	\$1,550,958	4 480 174	\$2,688,102	\$4,239,060

Total Product of Idaho in 1899.

METALS	Quantity	Commercial Value	Coinage Value
Gold, fine ounces.....	75 054	\$ 1 550 958	\$ 1 550 958
Silver, fine ounces.....	4 480 174	2 688 102	5 792 417
Lead, pounds.....	86 449 506	3 760 553	3 760 553
Copper.....			60 000
Total value			\$ 11 163 928

N. B.—In computing the value of the lead output of the State it was figured at \$4.35 per C.

In Conclusion

IN concluding, this report may point out that the exhibit herein made does not do justice to Idaho as a mineral producing State. The State has been only partially prospected. No State in the Union has more extensive and valuable mineral resources than Idaho. In lead her mines are the greatest in the United States, and when the vast copper properties of the Seven Devils district are developed as they bid fair to be in the near future, the copper output of Idaho will astonish the world. With the triumph of bi-metallism will come wonderful activity in the rich silver mines of the State; and with even the larger use of silver, the silver output of the State will be astonishingly large. Her gold placers yield large, and her vast gold quartz mines, with modern facilities for working and better transportation facilities, which are sure to come, will double and quadruple the gold product of the State. When the problem of saving the fine flour gold of the Snake River bars has been solved, and these bars are worked, it is impossible to tell how large the gold output of the State will be. The fact is that the output of the precious metals in Idaho is much larger than that given in this report. The report is based on the amount of gold and silver actually accounted for by the United States assay office in Boise, but large quantities of the precious metals are mined here and taken out of the State that are not reported to the assay office at all. There are few smelters in Idaho, and no inconsiderable quantities of gold and silver taken from ores shipped out of the State for smelting are credited to those states where the ore is smelted and Idaho does not get the credit for them. This State, it seems to me, from a careful examination of the conditions here, is a good point for the establishing of smelters, at least in certain localities. The attention of mining people is respectfully called to this subject.

