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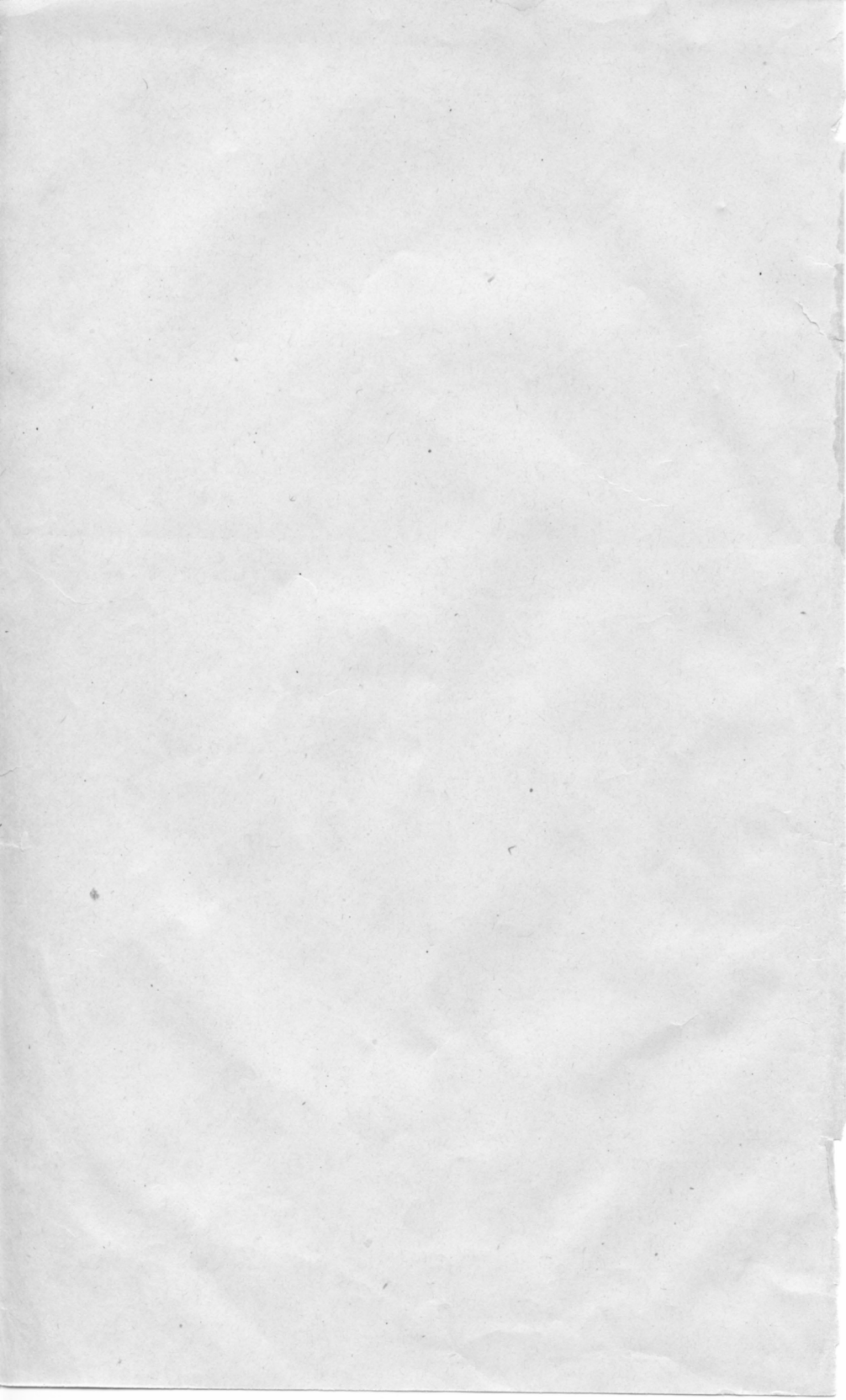
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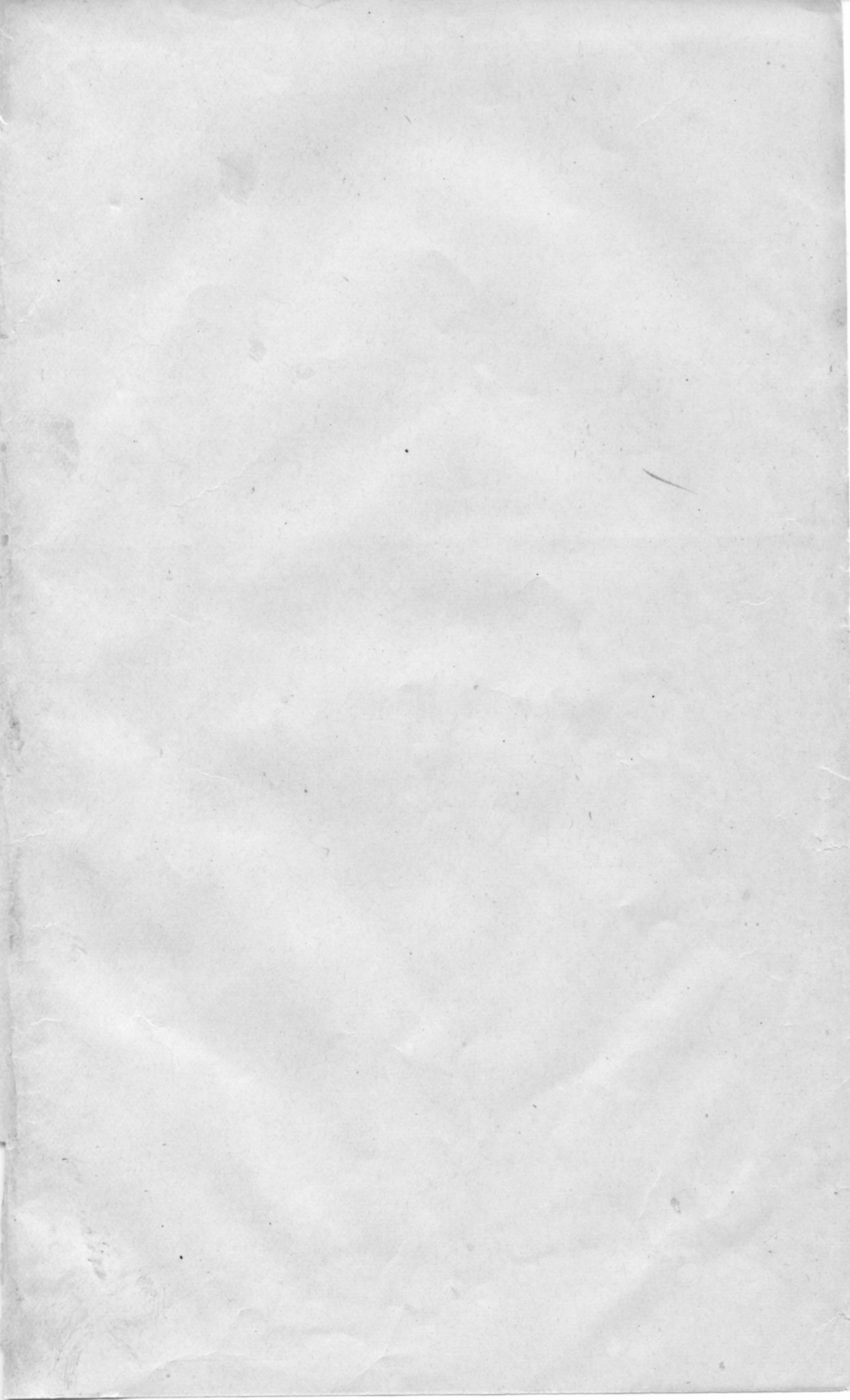
Idaho Geological Survey's annual reports from the Idaho State Mine Inspector to the governor for years 1903-1908, originally in a single bound volume, are divided by year. A digital facsimile of the volume may be re-created by removing this page and combining PDF files for years 1903-1908.



Idaho Bureau of Mines and Geology
MOSCOW, IDAHO







ERRATA.

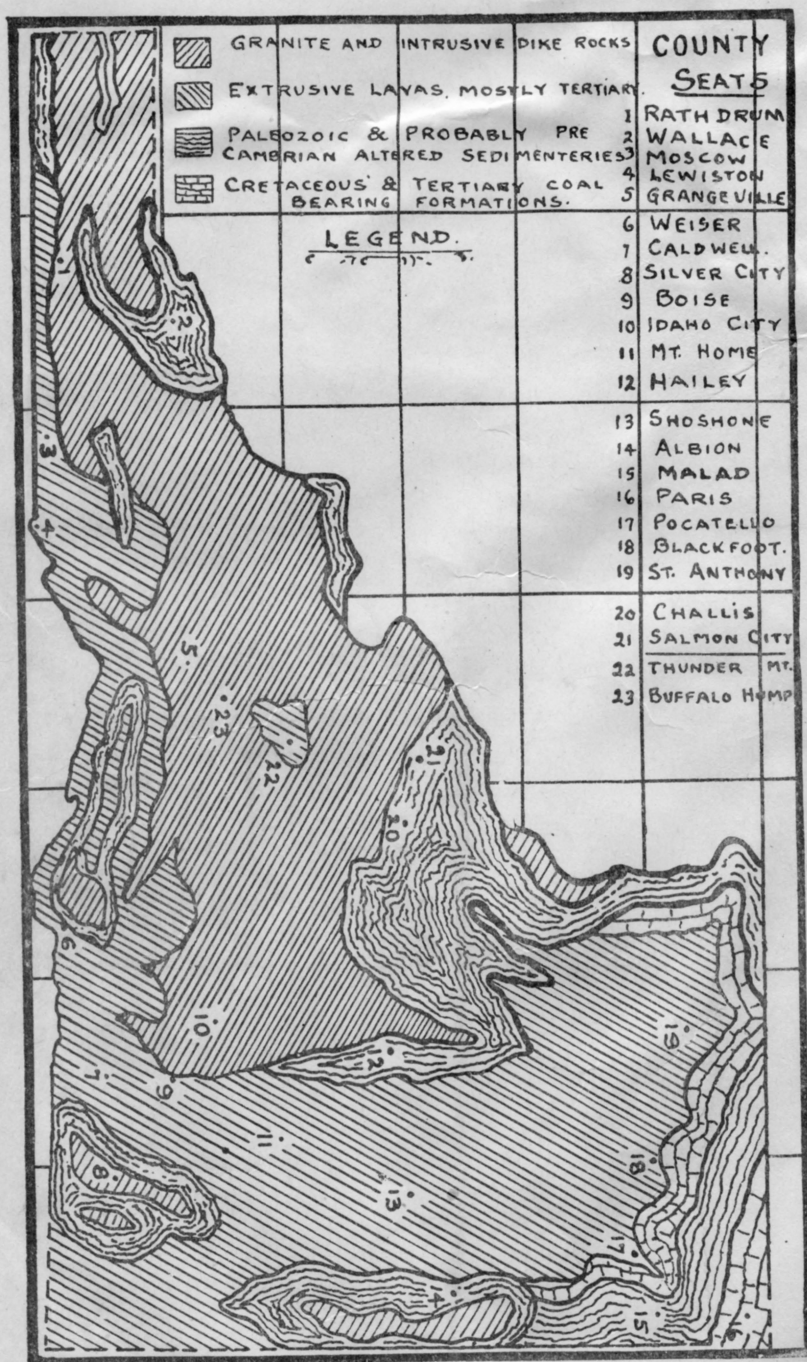
- ✓ Page 15, line 3, should read "Silicate of Alumina."
- ✓ Page 21, paragraph 4, should read "Alturas Mining Co."
- ✓ Page 54, strike of White Knob vein, should read east of north and dip south of east.

Page 100, paragraph 2, last line, should read "light values in lead."

- ✓ Page 110, paragraph 4, last line, should read "thirty-five miles."
- ✓ Page, 128, seventh line, should read "66.57 per cent lead."
- ✓ Page 140, paragraph 4, should read "Mr. Harry A. Lee, Commissioner of Mines of Colo., and Mr. John Byrne of Mont.

Page 40 and 41, "Nevada" should read, "Utah."

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GEOLOGICAL DIAGRAM ILLUSTRATING THE PROPORTION AND DISTRIBUTION OF THE PRINCIPAL IDAHO FORMATIONS.

Idaho Bureau of Mines and Geology
MOSCOW. IDAHO

7452

REPORT
OF THE
MINING ❁ DISTRICTS
OF IDAHO
FOR THE YEAR 1903.



—BY—
ROBERT BELL
Inspector of Mines.

BOISE, IDAHO.
STATESMAN PRINTING CO.
1904.

LETTER OF TRANSMITTAL.

Boise, Idaho, January 1, 1904.

To His Excellency, John T. Morrison, Governor of Idaho :

Dear Sir—I have the honor to transmit herewith my official report as State Inspector of Mines for the year ending December 31st, 1903.

Very respectfully,

ROBERT N. BELL,

State Inspector of Mines.

REPORT
OF THE
STATE MINE INSPECTOR
OF THE
STATE OF IDAHO.

INTRODUCTORY.

The State of Idaho is situated entirely on the Pacific slope of the continent and with the exception of one of the smallest counties in the southeast, "Bear Lake," is drained entirely through the Columbia River. It is roughly triangular in shape and contains a total area of eighty-four thousand eight hundred square miles. Its extreme width from east to west is four hundred and twenty-nine miles and its greatest length from north to south five hundred and four miles. It is bounded on the north by British Columbia, on the east by Montana and Wyoming, on the south by Utah and Nevada and on the west by Oregon and Washington.

The national census of 1900 gave Idaho a population of one hundred and sixty-one thousand seven hundred and seventy-two. There has been a rapid increase in population since that date, however, and the magnitude of the various irrigation, mining and industrial enterprises now on foot, and in several instances well under way, together with the remarkable advantages the State possesses in the way of undeveloped natural resources, are such as to warrant the prediction that the population of 1900 will be more than doubled before the close of the present decade.

Idaho first came into prominence in a mining way by the discovery of placer gold at Pierce City in 1860; from there the pioneer miners extended their search through the rugged intermountain sections of the State, resulting in the discovery of a dozen other famous camps and the total production of placer gold to date is conservatively estimated at \$250,000,000 in value.

In going over the remoter sections of the State today,

now well connected with wagon roads and good trails, one can not help but marvel at the obstacles that had to be overcome in such a trackless wilderness of mountains, canyons and streams. So far removed from a base of supplies one can not help but revere the memory of the early pioneers who blazed these trails, and the iron nerve they must have displayed in doing it.

The rich and easily accessible placer values of the State are pretty well exhausted. The placer mining business is now practically simmered down to large operations of hydraulicing and dredging, which involves the use of modern machinery. The placer gold production is still quite important, however, and formed fully 45 per cent of the total gold output of the State for 1903, and that it was not still larger was due to a short water season.

The source of the rich placer values of all the Idaho camps has almost invariably been traced to the erosion of gold bearing fissure veins in the near vicinity of the placers, and the discovery and development of the ore-bearing fissures in various parts of the State, together with others that have suffered less erosion, affords a fertile field for the profitable investment of capital and a promise of future importance in the matter of gold production that will compare favorably with any State in the Union.

The metal resources of Idaho are varied, embracing besides gold and silver, numerous rich and extensive lead and copper-bearing districts, whose ores invariably carry an important amount of precious values that can be recovered as a by-product at slight expense, which forms an attractive advantage to investors and will have an important bearing on the advancement of our mining industry.

In the ratio of the different metals produced in Idaho during 1903, lead outranks all the others combined and gives the State the distinction of being the leading lead producing State in the Union, and judging from the nature of our ore deposits and their recent development, we are warranted in anticipating that Idaho will retain this position indefinitely.

"Almost every mining district in the State enjoyed a renewed and vigorous impetus to aggressive mining enterprise during the past year, which resulted in a marked increase in metal production over 1902. (This was par-

ticularly noticeable in the Coeur d'Alenes.) The underlying causes responsible for this improved condition are, first, the continued great industrial prosperity of the country; second, confidence, as proven by example, that our State contains large and permanent deposits of the precious and useful metals and a growing belief that mining is a profitable industry when accorded the same care and business method granted other industrial pursuits.

"Conducted on an intelligent business basis and experienced management, mining is demonstrated to be one of the most profitable enterprises in which money can be invested. As a general rule the time and capital required to put a mine on a paying basis, after it is discovered, is comparable to like equations in the erection and equipment of a manufacturing establishment expected to yield large returns upon investment."

Numerically the failures far exceed the successes in mining, but the mercantile reports show that nine-tenths of all men who engage in business pursuits sooner or later make failures, and it is generally through a lack of investigation and misconception of the magnitude of the enterprise that lead to failures in mining.

As a result of the Thunder Mountain boom of 1901-2, Idaho has been made the base of some of the rankest mining stock promotions that ever a mining country was afflicted with. The East has been flooded with cheap shares and the trashiest kind of prospectus literature which fools no one but the small investors whose cupidity gets the better of their judgment, but it does bring ridicule and odium on the industry of the State in general and hurts legitimate mining and ought to be condemned.

Idaho contains many meritorious new mining enterprises and not a few of them are in the Thunder Mountain country and are being intelligently developed on legitimate lines with a bright prospect of success and are worthy of all encouragement. But many of the ludicrous exaggerations and misstatements that have been fathered on this much advertised district are unwarranted.

To answer such criticisms as this department is subject to, I have to suggest that constituents consider the size of the field and the limited fund available for traveling expenses; the time consumed in visiting remote districts, in some cases involving long horse-back trips. There is

enough office work connected with the handling of this department to occupy a man's time for fully six months of the year, a good deal of which is of such a nature as to involve the personal attention of the Inspector.

I traveled 15,000 miles in the State during the field season of 1903 on official business and only reached a dozen of the principal mining counties, while without exception every county in Idaho contains mining operations and resources that require the service of this office.

It has been my experience so far that the smaller operations require this service fully as much as the larger mines, and frequently more, as they are often undertaken by men of limited experience, and several serious and fatal accidents have occurred during the year among this class of operators that a warning suggestion might have prevented.

For one man to properly cover a field of such enormous extent is like trying to police a city the size of Salt Lake with one patrolman, and the office will need a regular deputy at no distant date.

The primary object of this office is to protect mining employes against dangerous conditions, to collect statistics, and in general to advertise and promote the development of the mining resources of the State; and, given adequate funds, the office can serve a very useful purpose in this respect and if its duties are conscientiously administered it will prove no sinecure, for the industry is expanding by leaps and bounds.

There are very few laws on our statute books designed to safeguard the lives of men in mines and I shall recommend some measures to that end to the next session of the Legislature.

These new measures need serious study and consideration and are not to be lightly passed upon as the industry is in a stage of development where it needs encouraging and not hampering, but that such laws are needed will be apparent from the following summary of the causes of the fatal accidents reported during the year, 1903:

Explosions of blasting compounds	7
Fall of rock	4
Falling down shafts and chutes	3
Falling from crosshead and bucket	1
Riding on skips against orders	2

Suffocation	1
Tapping old works containing water	1
Caving ground, "placer mine"	1
Total	20

There were engaged in active mining work throughout the State during the year, as near as can be ascertained, about seven thousand men. Of this number three thousand are credited to Shoshone County alone, whose monster ore bodies, worked as they were to their capacity during 1903, as might be expected, claimed the largest number of victims.

As there has been no record kept of mining fatalities in this State by my predecessors I have nothing with which to compare. From the above it will be seen, however, that the number of fatalities for the whole State was about 2.85 per 1,000 employed, which compares favorably with our neighboring mining States.

The non-fatal accident list is very incomplete and unsatisfactory, but the number will exceed the fatal accidents three or four to one, with the same causes predominating as in the fatal list—"explosion of blasting compounds and fall of rock."

The awful loss of life due to the premature explosion of nitro-glycerine compounds used in blasting, while often due to the carelessness or willful recklessness of the victim, can doubtless be materially reduced and a law governing the manner of storing, thawing and handling the same, should be passed.

Burning powder made from nitro-glycerine compounds produces a colorless gas that will brighten the flame of a candle and is at the same time deadly poison to human life, and the storage of a large quantity of this explosive underground in an air course in which men are working is an unwarranted risk.

The only reasonably safe way to thaw powder is by steam heat properly arranged, or by placing it in a receptacle surrounded by hot water. There are several cheap and simple devices on the market designed for using hot water that can be recommended. Powder should be thawed slowly and never by dry heat if avoidable. The common practice at many small mines of thawing powder in a building like a blacksmith's shop or timber shed, by any

kind of device, is especially condemned, and the keeping of caps and making primers in a place where powder is kept is criminal carelessness. These two dangerous elements should be kept at a safe distance apart until the last move towards loading. Stringent rules should be enforced involving the careful examination by the miners themselves of working faces for unexploded portions of old charges before drilling is recommenced.

The falling of rock is the next most prolific source of serious and fatal accidents, especially in the Coeur d'Alenes. The mines in this district are situated in one of the finest timber belts in the West and timber is most lavishly used, and as a matter of fact is kept up as close as practicable to the working faces at all the big mines. A great deal depends on the miner in this respect. He should exercise the first law of nature and protect himself by trimming down all the loose and shattered rock, and if necessary put in temporary or permanent timbers before risking his head under an unsafe place. This, however, is one of the dangerous features incident to mining large bodies of ore, which from the nature of the business is difficult to overcome.

Most of the large companies of the Coeur d'Alene district have admirable sets of rules formulated for the protection of their employees, which, if diligently studied and followed, would materially reduce the list of accidents.

The practice of riding on skips intended for hoisting timber and ore, to avoid the exertion of climbing ladders, should be either allowed, and definite local rules provided governing it, or strictly prohibited.

All shafts, winzes, chutes and fill holes should be covered or protected with guard rails when not in use.

As soon as practicable, all mines should have double or triple exits and connections between levels.

Visiting Mines.—The desire of persons to go underground, especially in shaft mines, who are unaccustomed to mines and mine ways, should be condemned. It is a novelty, an experience to relate to friends, but an experience in which the dangers are little appreciated, and can afford nothing but the gratification of a morbid curiosity. One fatality occurred in the State this year from this cause where the better judgment of the superintendent of a small mine was overcome by his desire to please.

So far as the authority of this department extends, operators are authorized to restrict the practice to interested people and such as have definite business underground.

A law should be passed covering this point, and I have no doubt it would meet the hearty approval of all large mine operators who appreciate the danger, trouble and expense to the company to be courteous.

The foolhardy practice of tapping old works filled with water without an accurate survey cost one life during the year. It should be condemned and prohibited by law and a law governing the depth at which mines may be worked with a bucket is also needed.

Fire Protection.—This is a subject which requires serious consideration in this State, where so many mines are worked by tunnels and where the practice is so common of piling a lot of inflammable material in the way of buildings that frequently include a power house, blacksmith's shop and timber shed at the mouth of a main entry to a mine, often without any fire protection at all. Such an opening, especially a tunnel, connected to the surface at a higher point, will generally be an intake for air in the winter time, and should a plant catch fire, the tunnel would be apt to act as a flue to draw in the smoke and smother every man in its track. Such a calamity cost the lives of eight men at the Kersage mine, in Montana, last fall, and affords an awful example of this danger.

All main tunnel entrances covered with buildings should be provided with a tight fitting emergency door at a point not less than fifty feet in from the portal, to stand open, if necessary, until needed, and so adjusted that it could be closed, in case of fire, by a pull wire from the outside.

"Such plants as use steam should have a hose and hose connection to the feed pump, where nothing better is available, and keep the same ready for instant use. As a rule the water supply in small plants is limited, and safety is largely dependent on quick action. A good supply of hand grenades hung about the building in convenient places are quite a safeguard and should be indulged in."

On the lines above suggested, this department hopes to be of some service to the mine owners and working miners of the State. Operators receiving a copy of this report are requested to consider such points as are applicable to their respective properties.

The statistical feature of the report is not as complete as could be desired and can doubtless be very much improved upon. Every mining operation has an individuality of its own that needs to be studied. Operators are frequently reticent about giving information, and scattered as they are over such an enormous territory, frequently in very remote sections of the State, it is simply out of the question for one man to become acquainted with the actual conditions in the various mining districts in one year, and the co-operation of operators particularly in reporting accidents and answering other mail inquiries of a statistical nature is urgently requested. Several important districts that could not be reached in 1903 will be given the preference in 1904.

Ventilation in Idaho mines is usually good and from an economic standpoint alone mines should be kept as free as possible from vitiating gases. An average miner engaged in hard work requires twenty cubic feet of free air per minute, and the quantity of labor he will perform is likely to deprecate with the quantity of free air supplied below that standard.

Electricity.—This subtle force is commencing to serve a very important purpose in the economic operation of Idaho mines and is already very extensively used for power purposes in the Counties of Owyhee and Shoshone. The handling of electric currents of high voltage forms a new element of danger that should be left entirely to electrical specialists, for electricity plays some peculiar pranks, and the average miner usually knows as much about volts, ohms and ampers of electricity as he does about Greek. A fatal accident on the Pocatello power line at Blackfoot, by which a young man was electrocuted was reported last fall. This was caused by handling a metal transformer that had been disconnected from the current for over twelve hours. That such an instrument could “store” enough electricity to kill a man after it had been disconnected from the feed wire for twelve hours seems hard to be appreciated by one outside of the profession, and if true, affords an example of the dangers connected with the handling of such concentrated force.

Idaho's Geology and Mining Resources, by Counties.

The geology of Idaho compares more closely with that of Colorado than any other mining State in the proportion and distribution of its rock formations and contains all the series of rich metal values and other mineral products that have been so productive in Colorado.

The writer has for years looked upon Colorado as the precious metal mining school of the world. I have been gratified in traveling over Idaho to find that many of our most successful mines are being handled by Colorado men, who brought a ripe experience from the Centennial State, and that the enormous undeveloped mining resources of Idaho may soon equal the present magnificent yield of Colorado in the value of the products of its mineral fields, is not altogether a dream, as shown by the rapid increase of our past year's output.

There has been a good many inquiries made to this department during the year for a geological map of the State, and it was my intention to prepare something giving the general outlines and proportions of the different formations, but that feature had to be deferred for the present owing to the stress of other office work.

The following chapters are intended to supply a ready reference that will give a brief general idea of the geology, vein formation and ore deposition of the various counties and their probable future importance as shown by development. A number of the various counties in the granite belt being comparable in many ways, repetition is unavoidable. It is not necessary, however, to wade through the whole work when desiring information on any special section, as the counties are arranged in alphabetical order and can be readily turned to.

It is hardly to be expected that a subject involving such a lot of tedious and laborious personal investigation as this does can be made very definite in one short season's work and the description will doubtless be inadequate for some counties. The information given about any mining

enterprise or district is derived either from a personal investigation or the most conservative available authority.

Idaho is one of the best watered and best timbered States in the Union. This statement can not be appreciated by travelers on either of the main divisions of the Oregon Short Line which traverse some of the large desert areas of the Snake River Valley.

From the northern rim of this great valley, however, to the extreme northern limit of the State, the country is practically covered with a continuous forest growth, and embraces some of the finest lumbering sections in the world.

The State is drained principally by three great river systems that ramify through its remotest corners and combined form a stream navigable for big freight steamboats below where the waters leave the State at Lewiston to form one of the main branches of the Columbia.

Topographically, the whole State, with the exception of the broad valley of the Snake River and some intermountain basins of comparatively small extent, is a rough aggregation of mountain and canyon—a deeply eroded broad plateau, remnant evidences of which still remain along the western borders of the State and form rich agricultural districts. There are no very definite range system except the main Rocky Mountain-Bitter Root divide that forms the border line between Montana and Idaho.

The extreme elevations range from eleven hundred feet to thirteen thousand feet above the sea level. The numerous large streams and their tributaries run on steep grades and the available water power is practically unlimited.

There are three broad geological features. The whole central northern part of the State, with some very limited boundaries and island-like inclusions of crystalline sedimentary and igneous rocks, is occupied by granite formations that range from Archaean to early Tertiary in age. This is probably the largest connected area of granite in the United States. The only other similar areas that at all compare with it, are those of Colorado and the Sierra Nevada range in California.

Next in areal extent to the granite are the igneous extrusive lavas that cover the whole Snake River valley with basalt and rhyolites, the rhyolites predominating east of the center of the State and the basalt west, and include

a fringe along the western edge of the entire western tier of counties.

Almost all the famous placer camps of the State are confined to the granite areas, including that of Silver City in the granite uplift of the Owyhee range, and the vein source of all the placer gold from this enormous field is richly manifest and largely virgin, containing exceptional promise of future possibilities and greatness in the matter of gold production.

The smallest but the most important division of the geology of Idaho in the value of the present metal production of the State is the Palaeozoic series of schists, slates, quartzites and limestones that flank the western slope of the Bitter Root range in Shoshone and Kootenai Counties and wind around the southeastern end of the great central granite mass in a comparatively narrow belt between the granite and the lava plains of the Snake River, and also show a strong development along the southern border of the State.

To this latter series are confined the lead, silver and copper deposits of Kootenai, Shoshone, Lemhi, Custer, Blaine and Owyhee Counties, whose magnitude and capability for production the mining world as yet hardly appreciates.

In addition to the above, recent development has shown a very important area of cretaceous formation in Fremont and Bingham Counties that contains a series of coal veins, one of which is ten feet thick of clean, high class bituminous coal.

A shallow horizon of tertiary sediments containing lignite coal and antedating the Columbia lava flow can be found in limited exposures in fully two-thirds of the counties of the State.

ADA COUNTY. ✓

Ada County, while one of the smallest counties, is laid out for eight-tenths of its area over rich agricultural valley land and the adjacent aluvial covered plateau of the Snake River plains, but also contains a narrow belt of country along its northern border that covers a portion of the granite slopes of the Boise ridge, and is rich in mineral resources.

Boise City is the seat of government of the county, as it

is of the State. It is beautifully situated just below the mouth of the canyon where the Boise River emerges from the mountains, and in one of the most fertile agricultural and horticultural valleys in the world. It has the largest population and is the political and commercial center of the State. It has a rapidly growing importance and tributary resource of business possibilities that are just commencing to be appreciated.

The valley portion of this county is entirely underlaid by basalt and lake-bed sediments. The granite slopes to the north contain immense dikes of gold-bearing rhyolite. The Black Hornet and Curlew Creek districts have large fissure and contact veins of quartz carrying fine values in gold and silver. The Black Hornet mine at Black Hornet district, ten miles east of the city, has been developed to the extent of over one thousand feet of tunnels and shafts on a ten-foot vein of quartz containing iron pyrites and an occasional sprinkling of lead and carries an average value of \$8.00 per ton. This mine has a shipping record of seventy-five carloads of sorted ore and concentrates that average better than \$50 a ton in gold.

The Viola, an adjoining mine, has one thousand feet of development and a similar fine showing of mineral. Both of these properties, together with quite a number of others in this district, have been idle during the past year, except for the necessary assessment work. The district possesses some very interesting features and advantages for deep tunnel work, which if conducted on conservative practical lines, such a venture promises profitable results.

By far the most important mineral product of Ada County for the past year was the output of building stone, building, paving and fire brick, the value of which is conservatively estimated at \$50,000 or over.

The building stone is derived from the extensive beds of Payette sandstone that represents an old tertiary shore line deposit around the base of the granite hills in the suburbs of the city, and a quarry of beautiful blue granite is situated a few miles up the Idaho City road.

The great deposits of fire clay owned by the Idaho Vitri-fied Brick and Pipe Company of Boise are of enormous extent and of exceptional quality. These deposits are located partially within the city limits and form the basis of an industry hardly appreciated even by the owners themselves.

The products of fire clay, so-called, are very largely composed of silica "quartz," which is one of the most infusible of substances in nature, with just enough clay (~~oxide~~ *Silicate* of alumina) to hold it together.

The quality of fire brick and other similar products that will stand the intense heat that furnace linings and crucibles are subject to and retain its shape is very scarce and in enormous demand. The following report of a test of the Boise product in this line is worthy of note.

This test was made at the Pocatello shops by the engineering department of the O. S. L. Railway Company.

The report states:

"The fire test on this brick was excellent. We put it in the flue welders furnace in the boiler shops, and subjected it to a white heat for twenty minutes. At the end of that time it showed no perceptible fusing but developed several perceptible cracks.

"The sample of Denver brick and that of Mohawk, a brand of Jersey City brick, were put in the furnace at the same time. The Denver brick was the first to give way, fusing and finally melting so that it ran into a shapeless mass. The Mohawk brick acted in the same way but stood up longer than the Denver brick. The Boise brick has given the best test of any fire brick which we have subjected to such intense heat."

The above is a handsome indorsement of this important Boise product under a severe comparative test with the product of two of the most noted sources of such material in the United States.

The rapid burning out of furnace linings, etc., is an expensive annoyance to the smelting industry, and if the Boise company has a product that is only a small degree superior to other sources of supply in resisting the destructive effects of high temperatures, the world is its market, and it should study its advantages most carefully in detail, for it means an industry for its stockholders and for Boise which undoubtedly will develop to enormous proportions. In addition to fire brick, this company also manufactures the finest grade of finishing brick and a vitrified paving brick that is equal to artificial stone. Their output during 1903 was three million brick which brought an average price of about \$8.00 per thousand.

While Ada County's contribution to the gold yield of the State during 1903 was among the smallest amounts of

any county reporting gold, this county has a possible resource of precious bullion that may outclass every other section in the State.

At Deer Creek, fifteen miles east of the city, a series of great dikes cutting the regional granite have been located within the past year, which are said to carry paying values in gold all through their width.

These dikes are supposed to be rhyolite or quartz porphyry; they apparently stand on end and vary from one hundred and fifty to six hundred feet in width. The most prominent property of this new district is known as the "Big Ledge" and is being worked under bond by Hon. J. H. Richards. This dike is six hundred feet wide, and its development consists of five short prospect tunnels, one of which is two hundred feet in length, and driven as a cross-cut at right angles to the strike of the dike.

This property has been subjected to dozens of assays with quite conflicting results, both favorable and unfavorable, which is not an uncommon thing in assaying gold ore, as reference to the not very remote mining histories of Cripple Creek, Colo., and Mercur, Utah, will recall.

It appears that the gold in this ore is in an easily volatile form, and assayed in the usual manner gives very unsatisfactory results, but by adding an excess of litharge to the assay charge, a fairly constant result is obtained which indicates an average value of \$3.50 per ton, and is said to show an extraction of over ninety per cent by cyanide test in the laboratory.

This material is a rather fine grained granular rock containing very finely disseminated specks of mineral that resemble iron oxides under the glass and occasionally a small crystal of live iron pyrite. It all looks alike, crushes readily, and percolates perfectly with a low consumption of cyanide as far as the experiments have gone, and promises to yield a handsome result to this method of treatment.

Judge Richards is having a working cyanide test made at the present time of a three-ton sample at the laboratory of Mr. F. A. Greer in Boise. This sample represents an average of the full length of the two hundred feet cross-cut tunnel. The fire tests already run on it show that it contains an average value of \$3.60 per ton in gold, and should a successful extraction of the values be made by this working test, it may mean a city of fifty thousand peo-

ple for the Ada County metropolis within the next five years, and the establishment of a gold-producing district in its suburbs that will rank at the head of the list.

BLAINE COUNTY. ✓

Blaine County is one of the south central counties of the State, Hailey is the county seat and is approached by the Wood River branch of the Oregon Short Line railway, which leaves the main line at Shoshone and extends to Ketchum, twelve miles north of Hailey.

Hailey is prettily situated in the beautiful valley of Wood River, whose rich green fields and smooth verdure covered slopes, form a charming contrast in the summer season to the long strength of desert, sage-brush and lava plains over which it is approached.

Hailey, besides being the county seat, is the center of an extensive range and stock raising industry; is also the center of one of the richest mining districts in the State, which is just awakening from a lethargic condition of inactivity, and the Wood River mines are again commencing to cut quite a figure in the mining history of Idaho.

The revival of interest in the silver-lead mining districts of Blaine County during the past year has resulted, according to the careful estimate of the Watt Banking Company, in the production of 6,157,956 pounds of lead, and 385,193 ounces of silver, which are gratifying items to record, and commence to savor of the early days when the Wood River mines around Hailey were enjoying the same position of prominence in the annals of Idaho silver-lead camps that the Coeur d'Alene mines around Wallace do today.

The lead ores of Wood River are almost invariably high grade in silver, ranging from 1 to 3 ounces silver for each unit of lead and at several properties carrying important values in gold.

The Wood River mines have produced silver-lead bullion to date, conservatively estimated, at from seventeen to twenty million dollars in value.

There was over two dozen producing mines in the district in 1889; their ores were derived from fissure veins in a district whose geology was little understood, mines that experience has taught need constant and systematic development ahead of ore extraction, which under the old method of operation they not only did not get, but in most

instances were robbed and gouged of their ore bodies as fast as they appeared, with the result that when the panic in silver prices came, in the early nineties, and knocked off half the value of their principal product, it found most of the companies with empty treasuries and gutted mines, after which many of the principal producers lost heart and suspended operations.

The Wood River region has enjoyed the advantage of several visits from prominent Government geologists and a most interesting report of a reconnaissance covering this field, written by Mr. Waldmar Lindgren, can be found in the Twentieth Annual Report of the Geological Survey and should be carefully studied by interested parties, for while it maintains the characteristic conservatism of the survey about particular properties it will prove a valuable aid in understanding the structural features of the formations in which the bonanza ore bodies have occurred.

The Wood River formations consist of closely folded strata of quartzite, limestone, slate and shale of the carboniferous age, together with numerous dikes and great area of eruption granite, and quartz diorite of more recent date, that have been extruded and overflowed, or faulted over the sedimentaries. Most of the lead-silver mines are confined to the altered sedimentary rocks, but the Idaho Democrat has produced a large amount of high grade silver-lead ore from a fissure in the granitic formation.

In common with every important lead-silver district in the world, the veins and formations of the Wood River district have been subject to faulting movements that have produced confusing conditions, and most of them must be deciphered underground, as surface exposures of the formation are not common, being generally weathered smooth and obliterated with soil and vegetation.

The largest and most valuable ore bodies of the district so far developed have been confined to the altered sedimentary formations, and generally occur in profound fissure veins, or fractured zones of movement. They appear to be subsequent to, and mostly independent of, the extensive bodies of igneous rock that accompanies the sedimentary formations, but from the fibrous and banded appearance so common to the ores of this district they were unquestionably derived from the precipitation of ascending hot mineral solutions through pre-existing fissures and permeable space, and may be expected to go deep.

The revival of interest in the silver-lead mines of this district is largely due to the bonanza ore disclosures made within the past year in the deep levels of the Minnie Moore mine at Bellevue, six miles below Hailey. This famous old producer, with a bullion record of seven millions of dollars, was abandoned by its English owners as an exhausted dug-out proposition in 1889. It was purchased at a very modest figure by Mr. Irvine E. Rockwell and associates at Chicago, after lying idle for twelve years, with nothing to recommend it but a record and a thousand-foot shaft full of water, together with the fact that the mine had been opened on a profound fissure vein, whose almost continuous out-crop can be followed across the mountains for a distance of three miles.

After taking the water out of the mine a little intelligent cross-cutting at the 900-foot level proved that through the blundering management or want of conception of the rudiments of geological knowledge, the old company had left an ore reserve containing a gross value of approximately two million dollars above the bottom level of the mine, and about seventy feet to the south where it had been thrown by an incipient fold. The accompanying diagram will illustrate the nature of this disturbance. All the work to the right of the line A. B. was done by the old company and included hundreds of feet of drifting in the limestone beds at the ninth and tenth level. The work to the left of the line, after finding the vein going down again on its normal dip, has been done by the present management, and disclosed a normal repetition of the famous bonanza ore bodies that produced so richly for the old company above the ninth level.

The main ore body opened by the present company has been completely blocked out above the 1,000-foot level, and followed by a winze to a considerable depth below. During the progress of this work the mine has produced about half a million dollars worth of ore, and is said to have reserves still in sight valued at a million and a half.

The main ore shoot now exposed is 350 feet long, of first and second class ore; the first class ore at the 1,000-foot level is clean steel galena from a foot to nine feet wide,

The mine is shipping thirty cars a month at the present time, about half of which is mined from the first class streak, and samples 70 per cent lead and 110 ounces silver per ton.

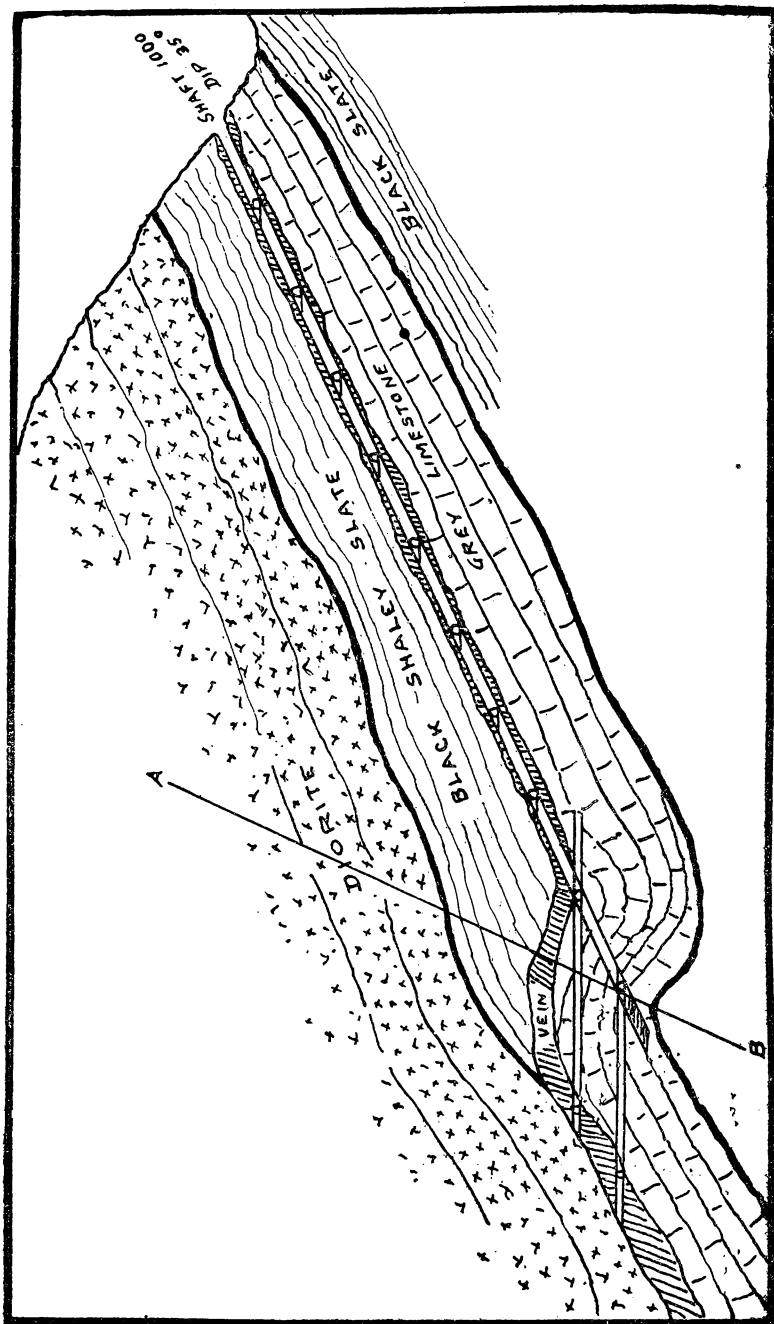


DIAGRAM CROSS-SECTION OF MINNIE MOORE VEIN AND FORMATION.

The second class ore is concentrated four tons into one, and runs about 55 per cent lead and 60 to 70 ounces silver, and the general showing of the property at the present time strongly indicates that it may repeat, and probably discount, its former record of production, for the fissure is just as clean cut at the lowest point now exposed, and the ore just as clean and high grade in both silver and lead, as it was in the upper levels.

All the ore thus far produced by the Minnie Moore mine has come from one short claim, less than 1,400 feet in length, and it seems unreasonable to suppose that such a limited segment of such a fissure should contain its only profitable ore bodies.

A stretch of territory covering this great vein for two miles has been secured by the Idaho Consolidated Mining Company, who are actively developing the property at the present time, with surface manifestations of mineral in the way of great shoots of gossen iron ore, sprinkled with lead minerals, and copper carbonate that are far superior to the surface evidences of ore at the Minnie Moore, and it will not be surprising to hear of them discovering a match for the old bonanza in the near future.

The ~~Consolidated Virginia Mining Company~~ ^{Idaho Mining Co.}, who also own a choice property on the great fissure close up to the Minnie Moore, are doing some intelligent development work and also have a very bright prospect of success.

There are several instances among the silver-lead producers tributary to Hailey that have experienced disturbances similar to that of the Minnie Moore, doubtless in some instances much more profound, but most of them are so situated that they can be much more economically investigated by tunnelling from the surface.

According to local authority, several of the old properties were opened on minor fissures, while larger and more pronounced veins were neglected for the reason that they carried less evidence of pay at the surface.

In the light of recent silver-lead mining experience, especially in Utah, these big veins, associated with other rich ore deposits, are worthy of serious consideration, for in that State it has been proven in several instances that rich and extensive ore bodies show their highest crest of pay mineral at a depth of 500 to 1,000 feet or more below the apex of fissures filled with barren gangue.

There are five hundred men employed in development

work in the Wood River country at the present time, and it is reasonable to anticipate that some important strikes will be recorded during the year.

Among the most actively operated properties are the Minnie Moore, Idaho Consolidated, Consolidated Virginia, Star, Creosus, Idaho Democrat, War-Dance, Tip-Top, Elkhorn, Boyle Mountain Mining and Tunnel Company, Lipman Tunnel Company, Five Points and Rosetta mines. There are also a number of men working on leases, and the prospect for a largely increased yield of bulion during 1904 is very bright.

The Blaine County mines show some sharp contrasts. The Creosus mine, situated in the great area of quartz-diorite, four miles west of Hailey and surrounded by rich silver-lead mines, produces high values in gold, associated with iron and copper sulphides, but no lead. This mine has a strong steep pitching fissure accompanying a fine-grained intrusive dike; it has a large amount of ore in sight and is being systematically developed. A fine three compartment shaft is being sunk on the vein, which will be carried one thousand feet deep, and is now rapidly approaching half that depth.

The War Dance mine, one of the high ore crests in the district, reverses the theory that zinc in a lead district is an indication of weakness, for the War Dance has an immense showing of high grade zinc-lead ore associated with rich silver values, while the Minnie Moore, the deepest developed ore body in the district, is practically free from zinc. Similar occurrences to the above are reported in the Couer d'Alenes.

The Blaine County gold belt proper commences twelve miles west of Hailey, from where the granite formation with igneous intrusions and lava outbursts, extend over the northwest corner of the county and connect with the main central granite mass of the State.

The Tip Top mine, situated about a mile east of Doniphan, is one of the best equipped, best developed and deepest gold mines in the State. It is opened on large quartz filled fissures in granite that is accompanied with a small intrusive dike and a zone of shattered granite gangue fifty feet wide. This mine is developed with a steep incline shaft nine hundred feet deep, and a winze on the vein two hundred feet still deeper, giving a total depth of one thousand one hundred feet. This property developed its highest

grade and richest ore body at the nine hundred-foot level, from where it is said the values, amounting to nearly an ounce of gold per ton, have been followed down to the bottom of the winze, which affords an interesting instance of increase of value at considerable depth, that should have a favorable bearing on similarly situated deposits, and there are lots of them in the State.

Near the Tip Top are situated the Big Camas, Camas No. 2, Gold Star, Cinder, Hero and Lena mines, all great surface showings of gold-bearing quartz in granite walls that appear to warrant deep development.

In the Little Smokey District, near the west border of the county, there are some other gold properties of exceptional promise, also some important placer deposits and a belt of country noted for rich gold float ore that affords a very inviting field for some diligent prospecting work.

In this district is situated the Liberal mine, whose development shows several contact bodies of gold-bearing sulphide ore of good value between walls of granite and porphyry, that are of immense size. This property is of such proportions as to warrant further extensive and systematic development to put it in shape for the economical extraction of its great ore bodies, which give evidence of a source of supply for a large milling plant and warrant the anticipation of a profitable career in the production of precious bullion.

Not far from the Liberal, the Five Points mine is working a force of men on one of the strongest fissure veins in the district, containing high average values in gold, and already has some important reserves of ore undercut, while the Rosetta Mining Company, in the same section, is actively developing a fine system of large fissure veins that are reported to be showing up some very satisfactory values.

The south half of Blaine County overlaps the lava plains of the Snake River valley, and along the north side of the river carries some bars quite rich in the characteristic scale gold, for which Snake River is noted, that annually produce quite an item of bullion from small placer operations.

The northern border of this county is marked by the Sawtooth range of mountains, which, extending east as the Big Lost River range, contains some majestic mountain scenery, and lofty peaks that play tag with the stars, at

elevations ranging from 11,000 to 13,000 feet above sea level.

The south flank of this range and its eastern terminal stretches are made up of the Wood River series of metamorphic rocks, with an underlying core of granite, and contains some very important prospects, mine and mining districts, of silver, lead, gold and copper-bearing ores, that occur at short intervals as far north as Kaufman, one hundred miles northeast of Hailey, where an important shipment of rich copper ore was sent out during the year from the Valley View mine, situated on the line between Blaine and Fremont Counties.

BOISE COUNTY. ✓

Boise County occupies a western central position in the State and covers the extensive drainage of the Payette River and some of the important tributaries of the Boise River. Idaho City is the county seat.

This county contains the largest number of individual gold producers and continues, as it has in the past, to be one of the largest producers of the precious metal. Its famous Boise Basin, with a placer record of \$100,000,000 to its credit, continues to yield important amounts of placer gold, while the numerous promising gold ore deposits of this county are rapidly being developed to a stage of profitable production and cut quite an important figure in the total gold output of 1903, with the prospect that their yield will equal and probably far exceed that of the placer mines during 1904.

Much the largest part of the area of this county extends over the great granite mass of central Idaho. There are some local areas of unaltered sedimentary rocks—Payette sandstone and shale—also some quite extensive exposures of basalt along the western border and some limited areas of altered crystalline sediments in the high mountains towards the eastern border of the county.

The granite formations are quite extensively cut by dike rocks, including porphyry, diorite and diabase basalt and rhyolite, and the ore-bearing fissures are almost invariably associated in some way with these igneous intrusions.

The topography of this county while containing no very high elevations is rough and mountainous, with numerous deep cut canyons and rapid streams. It is especially adapted for mining and contains many natural advantages

in the way of tunnel site advantages, water power, timber, etc.

The mountain ridges are often rounded and show the effect of erosive forces. They are usually well timbered and the county embraces some valuable and extensive areas of magnificent yellow pine suitable for lumber.

The Boise Basin section, situated at the head of Moore's Creek, has received marked attention from investors during the past year; still, some very flattering opportunities remain.

The enormous output of placer gold from this Basin was mostly derived from an area of about fifteen miles from north to south by a maximum width of thirteen miles from east to west, which, in comparison to its size, probably equals the output of any placer field in the world.

The area above described embraces not only Idaho City but also the towns of Centerville, Placerville, Quartzburg and Pioneerville, all of which have been rebuilt in recent years and present a neat and thriving appearance. A drive through this famous mountain Basin in the summer time, with its good roads, long avenues of stately pines and firs, its soft rounded landscape and deep cut canyon approaches, going in by Moore's Creek, and returning by Paris Canyon, or vice versa, is a charming experience and a drive hard to excel for scenic effect and historical association in the State.

The present placer output of Boise Basin is largely derived from big hydraulic works near Idaho City, together with a dredging plant at the same place, two more at Centerville and a steam shovel at Granite Creek.

Quartz mining in this Basin is still in its infancy, and yet the Basin has a quartz mining history which is unique, and holds out most encouraging indications of future success.

It is a notable fact that all the richest placer gulches of the Basin have led up to rich gold-bearing quartz veins, and there can be no question but that the erosion of these veins was the source of the placer gold, and as the outcrop of the numerous rich ore-bearing fissures show a vertical range of fully two thousand feet at the present day, it is conclusive that the chief sources of the placer gold was not exhausted by erosion.

The most notable quartz property of the famous Basin is that of the "Gold Hill Gold and Silver Mining Com-

pany" at Quartzburg. This property has but few equals in the history of straight gold quartz mines in the whole mining world.

Until 1903 it was the deepest mine in the Basin and is still a mere prospect in depth. It has two veins and an extreme vertical development depth of four hundred feet. One of these veins is a small quartz-bearing fissure that varies from one inch to five feet wide. It was drifted on for thirty-two hundred feet at the third level and yielded continuous pay ore all the way worth ten to thirty dollars per ton, together with quite a percentage of high grade concentrates.

The big vein was an altered quartz-porphry-granite contact impregnated with iron pyrites and was worked in shoots seventy-five to one hundred feet long, and as much as fifty feet wide in places, yielding from six to ten dollars per ton in free gold. The property was worked in an old-fashioned twenty-five stamp mill. It has a bullion record of three million dollars. There never was an assay outfit on the ground during the whole twenty odd years of constant operation. The only instrument relied upon for keeping track of the values was the placer gold pan, and the tailings were ruthlessly allowed to run to waste with their values in unsaved gold, which are said to have represented nearly half the value of the original ore.

This property was owned by a company of placer miners who believed in dividing up their profits at the end of each month, with no thought of a sinking fund for essential dead work. When the upper levels were exhausted and it became necessary to handle water and equip the mine with decent machinery it was shut down and finally passed into other hands.

This is an example of the half-hearted way in which many Idaho gold veins had been treated, especially in the Boise Basin district. The former manager of this property, who worked the bottom level of this big vein, is authority for the statement that the values were just as good in the bottom as they were in the higher levels.

It is reported by excellent authority that the present owner of the property, Mr. Robert Grayson, will equip it with a modern plant of machinery the coming season and start an extensive campaign of development, and from the nature of the deposit, occurring as it does at a true igneous contact in granite, together with its remarkable history of

production, there is good reason to believe that when developed and handled under modern mining methods it may again become one of the noted producers of the State.

There are dozens of handsome lode mines among the old placer beds of the Basin now awaiting the advent of capital that afford encouraging evidence of opening out into good mines at depth if systematically and intelligently developed.

Among the most actively operated properties at the present time may be mentioned the Mineral Hill mine, recently purchased by a Chicago company. This property carries a vein of large size and continuity along its strike. It occurs in a contact of porphyry and eruptive granite. The ore is similar to that of the Pioneer and is said to carry about the same kind of average values. This vein traverses the head of Ophir Gulch and was doubtless the principal source of the very large yield of placer gold that this tributary is credited with.

The Mary Jane Mining Company is working a choice tract of territory comprising ten claims. This property is developing some big ore reserves. It is equipped with a saw mill and hoisting plant, and a quartz mill of three twelve hundred fifty-pound stamps with quadruple discharge mortars, and has a capacity of twenty tons a day. A two compartment shaft is being sunk at this mine, which was down one hundred sixty-five feet on December 21st and it is expected that the vein will be cut at one hundred seventy-five feet. This vein has been opened by several other shallow shafts and about five hundred feet of tunneling. It is five to fifteen feet wide between walls, and by milling tests of considerable quantities the ore is shown to contain an average gold value of ten dollars per ton.

The Washington mine, six miles above Idaho City, has been milling ore quite continuously through the year with good results and the company is now sinking a winze from the four hundred to the five hundred-foot level, which makes the Washington the deepest mine in the Basin and it is showing very good ore at that depth.

The Daily group, purchased during the year by Mr. Vivian Thorn for English investors, is being equipped with a large hoist with which he proposes to sink a vertical shaft six hundred feet deep and thoroughly explore the ground and block out ore reserves sufficient to last for two or three years before erecting a mill. This is a wise policy

as it is impossible for a mill to be intelligently designed until the true live character of the ore is reached at and below water level.

The Daily group contains a series of ore shoots that carry high average values in free gold near the surface. The altered and mineralized granite in which the ore occurs also carries values that it is thought will pay to work for a considerable width, and the property promises to develop a mine of considerable capacity.

The Lucky Boy property, adjoining the Daily group, is equipped with a ten-stamp mill and a steam hoist good for one thousand feet. This property has been idle for two years. The Lucky Boy carries a big vein of quartz and altered granite carrying good pay values. Its failure is said to have been due to mismanagement. That the property has merit, is testified by the fact that definite arrangements are being made at the present time to purchase and work the property by local miners and business men of the Basin.

The Gold Coin mine, near the Washington, has developed some very profitable ore during the year. This company lately installed a saw mill on their property and are cutting lumber for the construction of an electric plant for power purposes.

There are several other ore-bearing fissures in the Basin of exceptional promise, and Boise County has a number of promising districts, but space only permits a brief mention of the principal features.

PEARL DISTRICT.

The Pearl district is situated twenty miles west of Idaho City near the Canyon County line and about the same distance north from the State capital. This is at present the most productive quartz camp in Boise County.

The Pearl district is in sharp contrast with the Basin. The same weathered and eroded hills are here, but they are smooth and grassy and devoid of timber.

This district shows a remarkable succession of well defined fissure veins in metamorphic granite. These veins are in close association, but not generally in contact, with a system of parallel dikes of diorite and porphyry. The mineralized belt of this important district extends from a mile west of Pearl to the Kentuck and Osborne mines, five miles further northeast, where it crosses the Payette

River. It is six miles long by two miles wide and is continued in several good ore exposures beyond the river.

The veins of this district strike from due east and west to northeast and southwest. They are fissures of the true fissure type. They are later than the diorite and porphyry dike and are often split up in passing through them. There is another set of dikes and necks of rhyolite and basalt of recent tertiary date in the vicinity of the mines, as well as some limited areas of lake bed sediments, Payette sandstones and shales.

The best developed mines in the district are the Checkmate, the Lincoln and the Kentuck, all three of which are equipped with small mills. The Kentuck plant was only gotten into commission in December, 1903, and did not cut much figure in the year's output. The Checkmate mill of ten stamps ran only four and one-half months, when the property changed hands and has since been undergoing extensive development. The Lincoln mill is a Chilean mill of one hundred fifty tons capacity and was only run on day shift, making an average daily run of about eight hours during seven months of the year, its operations being bullion, and since the electric power has been introduced the total production of these two plants, run irregularly as they were, amounted to nearly \$90,000 dollars in gold bullion, and since the electric power has been introduced from the big Payette River Power Company's plant near by, they are unlikely to be hampered from lack of power in the future, and their present extensive ore reserves warrant the anticipation that the combined output of the district for 1904 will be as near \$300,000 as it was \$100,000 in 1903.

The ores of this district resemble those of Gilpin County, Colorado, very much. They consist of oxidized quartz and granitic gangue near the surface, which changes at a comparatively shallow depth to a mixture of iron pyrite, arsenical pyrites together with zinc blend and a small percentage of galena and copper sulphides. The increase in the galena in these ores is a sure indication of increase of gold value and is eagerly anticipated by the miners.

The proportion of values are about ninety-five per cent gold and five per cent silver on the average, and they range from eight dollars to twelve dollars per ton for mill dirt, and forty dollars to one hundred fifty dollars for smelting ore. About twenty-five per cent of the value is saved

as free gold on copper plates, and of the balance ninety per cent is saved by concentration on Wilfley tables. The concentrates run about the same as the smelting ore, and are shipped to the smelters at Salt Lake for treatment, except the new plant at the Kentuck group, near the river, the product of which is shipped to the White Knob Copper Company's smelter at Mackay.

The Checkmate mine is developed to a depth of five hundred feet on the dip of the vein and has made a total output of over \$500,000. This mine was purchased in August by the Gold Dollar Mining & Smelting Company, who also own the Dewey or Levan group adjoining it at the north, which gives the company a very extensive tract of territory right in the heart of the camp that is traversed by half a dozen well known fissures.

During the year the four hundred-foot vertical shaft on the old Checkmate vein was sunk one hundred feet deeper and a cross-cut started north and south from the fifth level. The cross-cut to the south struck the Bayhorse vein at a point six hundred feet deep below its apex on the dip, and one hundred fifty feet out from the shaft, and just about where it was anticipated from the dip shown in the shallow cuts at the surface. This vein was found to be four feet wide with values ranging from five dollars to twenty dollars per ton.

The old Checkmate vein strikes east and west and dips north at an angle of fifty degrees. Its walls are smooth and well defined, excepting local patches where the vein is interrupted with a small diabase dike having nearly the same strike and dip.

The ore in this vein expanded from a shoot sixty feet long at the first level to a succession of shoots that aggregate five hundred feet along at the fifth level and an average width of about five feet and contain average gold values of eight dollars to twelve dollars per ton.

The ore in these shoots in some places reaches twelve feet between walls. It is largely an altered granite gangue threaded with banded lines of metallic sulphides with almost invariably a pay streak of the clean high grade smelting ore, a few inches to a foot or more thick, on one or the other wall.

These ore shoots are easily mined. Holes can often be drilled with a coal auger. The material crushes readily and makes a granular free running pulp which concen-

trates to excellent advantage. The ten stamp mill on the property crushes forty tons a day and yields a very clean product of concentrates.

With its four main fissures opened from the cross-cut at the fifth level of the Checkmate shaft, and proving a resource of ore in each one of them of equal volume with that of the Checkmate vein above the fifth level, this property is likely to warrant a milling plant of three or four times its present capacity. It is evident that the ore on the surface of these parallel veins are equal in size and in some openings far superior to what the Checkmate was at the surface. There is some strong evidence at hand that they will carry the same value and strength under ground in proportion as the Checkmate has.

The Lincoln mine, a mile west of the Checkmate, has responded in a very gratifying manner to the development work which has been carried on during the past year.

This mine is opened with an incline shaft three hundred thirty feet deep. At two hundred thirty feet deep a drift has been run out east and west ten hundred twenty-five feet, in continuous pay ore all the way. This remarkably continuous ore shoot varies from a foot to fifteen feet wide, while the extent of the shoot to the east has not yet been reached, but still shows a handsome breast of mineral five feet wide containing an average assay value of fourteen dollars per ton.

The average width of the stopes in this mine are from five to six feet. They produce quite a lot of clean smelting ore worth from three to eight ounces gold, together with ten to fifteen ounces silver, per ton, while the average battery assay of the mill dirt sent up has been over nine dollars for the past month.

The Lincoln Company is making half a carload of high grade concentrates a day at present. A new level is being run out at three hundred thirty feet deep and a hoisting plant of larger capacity is on the way. With these improvements completed the property will be able to make a carload of concentrates a day in addition to the crude shipping ore encountered and promises to show a gross earning capacity of over \$20,000 a month in the near future.

The ore at the Lincoln is almost identical to that of the Checkmate; in fact, the same holds true of almost all the mines in the district, with probably a little higher silver results here and there.

There are about a dozen properties being actively operated at the present time in the Pearl district and giving employment to fully two hundred men. These mines are already developed in various stages, ranging from that of the Checkmate to a few hundred feet of shallow work. Several of them have shipping records from surface openings, and the description of their vein's ores and operations would be practically a repetition of the conditions described in the Lincoln and Checkmate, only in varying degrees.

The Pearl district gives remarkable evidence of strength and permanency to great depth and in nearly every property where intelligent development has been carried on the values have either increased or the pay ore bodies have expanded all out of proportion to the surface indication.

This extensively fissured zone has been cut by the canyon of the Payette River to a depth of two thousand feet since these fissures were formed and filled, which is not only an argument for permanency of values at depth in this district but is also likely to have an important bearing on the probable permanency at depth of the values in the Basin veins, which are apparently of the same age.

The ores at Pearl are undeniably base and afford an ideal field for the process man. If some cheap chemical method of getting the values can be devised so that the present shipping cost can be cut out the Pearl district would likely develop a resource of gold ore that would prove a worthy comparison in value and volume to the Little Kingdom of Gilpin County, Colorado, with which we have taken the liberty to compare it.

At the extreme southern end of Boise County, near the Neal Mining district, a very important enterprise was brought to successful completion during the past year, consisting of a large power plant put in by the Highland Valley Power Company and which includes a substantial dam across the Boise River equipped with heavy turbine wheels capable of developing two thousand horse power.

The primary object of this enterprise is to pump water for mining purposes on some rich gold bench diggings near by which promises to yield important revenues to the company. The dam is capable of developing a large surplus of power above the company's mining requirements which it is the intention to put on the market a little later.

A new milling plant is being put up at Miller Mountain, thirty miles north of Idaho City, by the Nampa Mining Company, who have opened up an extensive body of gold ore of good grade and have every promise of developing a successful and profitable milling enterprise during the coming season.

The old placer diggings of Boise Basin contain a mineral resource in the form of monazite, a heavy yellow sand which is locally called Bummer Hill sand, which may, in favorable localities, renew the life and value of these old diggings.

Monazite is the ore of thorium and other rare oxides and has lately come into large demand. Formally its chief use was for the manufacture of Welshbach mantles on account of its remarkable incandescent properties.

The recent advancements in scientific experiments have shown that thorium, next to uranium, has the highest radio-active properties of any element so far discovered, which adds an important prospective value to this mineral. The invention of a new incandescent electric lamp in Germany which uses a solid pencil burner instead of the usual film and is composed of the rare oxides contained in monazite has largely increased the demand for it, and, as the sources of it are very scarce, our Boise Basin deposits may be worthy of consideration in the near future. This same mineral also occurs quite plentifully in the old diggings at Warren, Idaho County. A recent quotation on clean monazite was one hundred fifty dollars per ton laid down in New York. This sand is as heavy as magnetite black sand and would be just as readily saved by undercurrents and burlap tables.

Boise County has some fine placer and quartz territories along the eastern tributaries of the North Fork of the Payette River, and a very extensive region along the middle tributaries of the river which offer a most inviting field for exploration. The outlook is very bright for the annual output of gold bullion from this county to increase rapidly.

BANNOCK COUNTY. ✓

Bannock County is one of the extreme southeastern counties of the State. It extends from the Snake River on

the west to the Wyoming line on the east, and has an extreme depth from north to south of fifty-four miles.

Pocatello, the county seat, and second largest city in the State, is situated on the Portneuf River at a point a few miles north of where the river leaves a narrow canyon and at the edge of the broad Snake River plains.

Pocatello is best known as a railway center, being the junction of the northern division of the Oregon Short Line Railway, with the main line and is the mechanical headquarters for the whole Short Line system, which maintains very extensive shops at this point for the manufacture and repair of locomotives and rolling stock, and gives constant employment to a small army of mechanics.

Besides its rapidly growing importance as a railroad center, the weathered mountain uplifts, which occupy the southeastern three-fourths of Bannock County, lie immediately adjacent to Pocatella. They contain quite a variety of valuable minerals, and since that part of the Fort Hall Indian Reservation, adjacent to the city was thrown open to settlement in 1901, this district has attracted a good deal of attention from prospectors.

The formation of this vicinity, as classified by the Hayden Survey, consist of steeply tilted carboniferous limestones, mica schist, white quartzite, quartz porphyry dikes, greenstone and chlorite schists, Jurassic limestone and conglomerate together with some tertiary sandstones and shales.

The formations above described are favorable for the development of valuable ore deposits and comprise some of the same series that have been noted as rich producers in other prominent mineral fields.

The principal ore so far developed is copper ore, occurring as lenses and compression veins in the greenstone schist and conglomerate, and galena lead ore in the limestone formation. Both the copper and lead ores carry important values in gold and silver, and in some big bodies of iron and manganese oxide ore, nickel has been detected, while some porphyry dikes sprinkled with altered iron pyrites are said to contain gold in paying quantities and some specimen values are reported.

The most important development in the Pocatello district so far is on the Fort Hall Mining Company's property, about six miles south of the city on the western side of the track. This company has a large group of claims

covering the strike of a big contact vein of quartz between walls of schist and conglomerate which contain some very fine ore at the surface consisting of copper carbonate and chalcopyrite.

This property is equipped with a power drill and is being developed by a long cross-cut tunnel which is expected to reach the vein at a point seventeen hundred feet in from the portal, and several hundred feet below the apex. This tunnel has attained a length of one thousand feet and has already passed through several fissures in the schist and conglomerate that contain bunches and streaks of copper-iron pyrites, carrying very good gold and silver values. This work is being rapidly pushed under the management of an experienced Utah mining man, and gives good promise of profitable results when the main contact vein is reached.

At the head of Rabbit Creek, about nine miles east of Pocatello, the Moonlight group of claims has been worked steadily during the year with a small force of men. This property carries a fissure in conglomerate with well defined slickensided walls about five feet apart. The course of this vein runs north and south and dips east at an angle of forty degrees and has about five hundred feet of development, part of which is an incline on the vein.

The ore contained in this vein is high grade bornite and copper glance associated with some carbonate near the surface. It occurs disseminated through the matrix of the conglomerate vein filling, and as large kidneys of clean mineral, which seems to show some relation to cross fracturing that penetrate the foot wall.

The dump at this mine contains two hundred tons of ore worth five per cent copper, also a twenty ton lot of as sorted ore which samples sixty-six per cent copper and ten dollars in gold and silver.

The Lost Horse mine on Pocatello Creek, three miles east of the city, was equipped during the year with a small steam hoisting plant and a shaft was sunk seventy feet on a large quartz vein in silicious schist which carries some very flattering values in copper and silver. Threads of mineral were found in the bottom of this shaft which are said to have yielded as much as twelve hundred ounces of silver per ton.

The Hovey group of claims, two miles southeast of Pocatello, carry considerable development in the shape of short

inclines and tunnels, which make some very good exposures of copper sulphide ore associated with white quartz and barita in a formation of greenstone schist.

There are several good tunnels further south and on the east side of the track. Probably a dozen properties within ten miles of Pocatello are being quite intelligently prospected and in several instances show considerable evidence of developing into successful mines.

Big bodies of iron gossan are reported from the different points in this district and are worthy of more attention from prospectors than they appear to be getting, for such deposits often lead to good big deposits of copper or lead in depth when associated with other forms of copper or lead manifestations. I sent a sample from one of these big iron croppings to the largest nickel firm in the United States, who gave a return on the ore of a trifle under one-half of one per cent copper and one-fourth of one per cent nickel per ton. This, of course, meant only a strong trace, and had no commercial value, but it demonstrates that nickel actually exists in this district, and while the sample tested only contained five pounds of nickel to a ton of ore, the cropping from which it came was completely oxidized and may possibly be underlaid with valuable copper-nickel sulphide ore at no great depth.

The prospects of this district are all conveniently located near the railway and the Salt Lake smelters, which is quite an advantage over more remote mineral fields, and its successful development will mean a great deal to the city of Pocatello and should be encouraged.

BINGHAM COUNTY.

This county lies north of Bannock; it is oblong in shape, being forty-two miles from north to south and one hundred thirty-five miles from east to west. Its eastern half overlaps the broad Snake River plains, and is entirely underlaid with basalt and rhyolite lava, and embraces a wide belt of rich, well cultivated agricultural land bordering the river on both sides.

It is traversed from south to north by the Montana division of the Oregon Short Line Railway. Blackfoot is the county seat and Idaho Falls its largest city.

There is quite an item of placer gold annually produced in this county from the fine gold bars and terraces along

both sides of the stream. Most of these operations have been confined to sluicing and catching the gold on burlap tables. Two large dredging machines were introduced during the year, and as there are extensive tracts of ground in this county very favorably situated for dredging operations, which contain average values of ten cents per cubic yard and over, and the successful operation of this class of machinery is likely to result in a considerable increase in the gold output.

The eastern half of Bingham County, extending through to the Wyoming line, contains a variety of valuable mineral resources. It is largely occupied by great folds and mountain uplifts that range in elevation to five thousand feet above the adjacent plain and consist of carboniferous limestones, Jurassic limestones and conglomerates and a very important horizon of coal and oil-bearing cretaceous sandstones and shales, the whole cut by extensive intrusions of igneous rocks.

Coal blossom has been found at a number of places over the whole northeast quarter of the county, which is also true of oil shale and oil signs of excellent promise. This important resource is worthy of extended investigation and study, for the discovery and successful development of mineral fuel would prove of vast importance to this thickly settled agricultural section, and to the State at large. There are most encouraging evidences that profitable coal deposits will be found.

The Brinson coal property, situated in the canyon of Willow Creek seventeen miles due east of Idaho Falls, contains a series of coal veins in a wide belt of soft gray sandstone that has been folded into almost vertical lines by lateral pressure; only one of these veins has been opened. The upturned edges of these sandstone beds have been overflowed by sheets of rhyolite and basalt, forming broad undulating terraces on either side of the canyon for several miles, but the sedimentary series crop up above the lava a short distance to the southeast and are said to show in extensive exposures and a gentler dip in that direction, and should afford a likelier field for investigation.

At the Brinson claim a shaft has been sunk one hundred feet on a vertical vein of coal three feet wide. The walls of this seam are formed by a narrow bed of blue shale full of shell fossils and palm leaf impressions resembling cretaceous forms.

The structure of the coal is full of lenzy slickensides slips and polished surfaces, due to intense pressure and movement which has evidently compressed the southwest wall rock into the vein as it is badly mixed with shale and dirt for half of its width. The other half next to the northeast wall and separated from it by a half inch seam of lime spar, gave the following analysis:

Fixed carbon -----	45.20 per cent.
Volatile carbon -----	32.10 per cent.
Moisture -----	1.40 per cent.
Ash -----	21.30 per cent.
Sulphur -----	Trace.

The coking quality of this sample was very favorably commented upon by the chemist, but, of course, the percentage of ash destroys its value for coking. The other features are the exceptionally low moisture and sulphur contents, which are worthy of note, and indicate a very superior fuel except for the ash, and the ash is most probably largely due to the local disturbance of the bed. If it can be traced through to a point where more favorable structural conditions exist a workable vein of very superior bituminous coal may be anticipated.

Northeast of the Snake River, near Irwin, a coal vein has been traced in continuous outcrop or blossom exposure for five miles between Rainey Creek and Palisade Creek, which is said to be ten feet wide. A sample of this blossom gave analysis almost identical to the Brinson sample. Several prospects are reported showing good-sized beds of clean coal from the upper Willow Creek country, while at a point near Victor, in the extreme northeast corner of the county, some exposures have been found that represent a gently dipping vein which probably belongs to the handsome deposits of clean bituminous coal recently opened a little further west in Fremont County.

Near the southeast corner of Bingham County, in the vicinity of John Grey's Lake, and especially on the northern slope of Cariboo Mountain, the deposits of gold and copper ore are very promising.

Rich placer beds producing coarse high grade gold were mined on McCoy Creek and its tributaries in early days. These streams head right up under the veins of the main Cariboo Mountain, which is a monoclinal uplift over nine thousand feet above the sea level at its summit.

The strata of this mountain are plainly exposed on its

northerly slope and consist of steep pitching beds of limestone and conglomerates together with conformable intrusive sheet of diorite or syenite, also dikes and contact fissure veins, which cut the bedded series and show prominent exposures on the slope towards Grey's Lake.

The eroded edges of the contact bedded deposits on the slope opposite the lake were unquestionably the source of the placers on McCoy Creek.

The veins in this district carry considerable development and one of them, the Robinson, was at one time equipped with a forty stamp mill which was unfortunately burned down. This mill is said to have saved an average of five dollars per ton in free gold from ore that was mined twenty feet wide.

The ore in the bedded contact veins is simply altered limestone impregnated with specular hematite and brown iron oxide. Pipes of soft iron ore occur in these bedded veins which pan very freely and carry high values. There are several properties in the vicinity of the Robinson which are well developed and show extensive bodies of pay ore, and their general structural features and values somewhat resemble the Mercur District in Utah. Several of the fissure veins show a strong mixture of copper minerals, one of these, the Holden group, which is being actively developed at the present time, carries high values in copper, ten to fifty per cent, in a vein of ore eight to nineteen feet wide, together with ten dollars to twenty dollars per ton in gold and silver. This district has a number of very promising properties which are well worth the attention of capitalists.

BEAR LAKE COUNTY.

Situated in the extreme southeastern corner, Bear Lake is the smallest in area of any county in the State. The beautiful broad and well settled valley of Bear River traverses the center of the county from south to north and discharged its waters into the Salt Lake basin. Paris is the county seat, and Montpelier the largest city.

Within a few miles of Montpelier a broad anticlinal fold, which rises to an elevation of fifteen hundred feet above the valley, bounds it on the east, and contains a number of mining properties which are locally well thought of.

Traversing the partly eroded axis of this fold which is

made up of fine grained sandstone or flagstone, limestone and lime shale, a continuous string of mining locations extend for fully six miles that include development varying from a ten-foot prospect hole, to a two hundred foot tunnel, and one vertical shaft two hundred feet deep.

The ores of this district carry copper, gold and silver, that seem to be a precipitation on an ancient shore line near the junction of the flagstone and the overlying limestone. The average ore is low grade, but select samples run as high as fifty per cent copper. The best ore seems to have replaced fossil impressions of twigs and carbonaceous matter. There are no dike rocks in the vicinity of these deposits, although the flagstone is locally misnamed "trap."

On the opposite side of the valley, along the eastern slope of the Bear River range, some large and remarkably rich boulders of copper ore were found in early days, and several profitable shipments of ore were made to Salt Lake. A great deal of development work has been done for the purpose of discovering the source of this ore, without very pronounced success so far.

Reddish tinted tertiary formations are well represented in this county as are also the Wyoming cretaceous series, with prospects of coal and oil; also jets of natural gas are reported near the southern border of the county. While to the north several valuable deposits of native sulphur occur in the vicinity of Soda Springs on both sides of the line between Bear Lake and Bannock Counties.

CASSIA COUNTY.

Cassia County, containing an area of over four thousand square miles, is one of the extreme south central counties of the state. It is bounded on the north by the Snake River, and on the south by Nevada. It has no railroad transportation at all, and Albion, the county seat, is approached by daily stages from Minidoka on the main division of the Oregon Short Line.

Cassia County, while at present one of the most sparsely settled counties in the State, is bound to jump to the very front rank in point of population within the next few years, as a result of the gigantic irrigation enterprise now well under way within its borders. This enterprise is said to be the third largest irrigation venture in the world and

will cover a connected stretch of the finest agricultural land that lies unreclaimed in the whole west, and is capable of supporting a population of thirty to forty thousand people.

The northern half of Cassia County, that portion which overlaps the Snake River valley, is underlaid with the usual basalt and rhyolite lava with intervening beds of silty sedimentary rock, remnant evidences of Lake Idaho, which at an early tertiary date filled the whole Snake River Valley to a depth of several thousand feet and extended across the full width of the State from the Wyoming to the Oregon line.

The southern half of Cassia County is occupied with irregular mountain groupings which consist of a granite or schist base, overlaid with an extensive development of quartzite, limestone and slate together with igneous intrusive rocks. In addition to the crystalline formations which contain some important metal mines, a narrow belt of unaltered sandstones and shales flank the lower slopes of the mountains, which are probably cretaceous, and contain some important coal deposits.

Several of these coal veins have been opened by short tunnels and inclines in the Goose Creek Mountains and it was the intention to investigate their merits during the year, but owing to the stress of other work the trip had to be deferred. These veins are said to be from four to eight feet wide and pretty clean coal. As to the quality, whether lignite or bituminous, I am unable to say, but from information which I have obtained they promised a source of domestic fuel which will prove of great local importance to the rapidly growing population of Cassia County.

The principal metallic mineral belt of Cassia County lies about twelve miles southwest of the county seat and forty miles from Minidoka on the Short Line Railway, while Kelton, a station on the Central Pacific Railway in Nevada, is situated a distance of fifty miles south.

The veins of this district are true fissures cutting a formation of mica schist. The Cumora vein traverses the southern slope of Conant Creek, with a course northeast and southwest and a steep dip. It is four feet wide with smooth, clean cut walls and can be readily traced along its strike through the Melcher and Giant claims over a distance of six thousand feet.

The Cumora is developed by a tunnel four hundred feet

in length, a winze forty feet deep and a raise to the surface one hundred feet, together with several shafts about one hundred feet deep. Almost all of the above work is done on the vein and exposes from three to five feet of ore which at a shallow depth below the surface is well sprinkled with sulphides of iron, copper and lead, carrying average values ranging from six dollars to thirty dollars in gold, and forming a very fine concentrating ore. The property is equipped with a five stamp mill and concentrating tables.

The Melcher mine, adjoining the Cumora to the northeast, has been quite a steady producer and shows much the same vein characterizes as the Cumora. The Melcher is owned by Salt Lake capitalists and is now being opened by a twenty-eight hundred foot tunnel which is expected to cut a vein at a depth of eleven hundred fifty feet. Over two thousand feet of this long tunnel has been completed.

The Giant mine is the southwestern extension of the Cumora vein and has a good strong showing of mineral that is also opened up to considerable extent by tunnels.

There are a number of other fine locations in this district in various stages of development, of which the Annie and Badgie have made shipments of ore which yielded good returns.

The veins of this district have occasionally produced specimen gold ore of remarkable richness and beauty. Sheelite, a valuable tungsten ore, is found in the lower hills, and some fine bodies of copper ore are also reported from several parts of the county, while the immense bed of beautiful marble contained in these hills is of very fine quality and promises to prove of very considerable economic importance as the State develops.

Placer mining is carried on quite extensively along the Snake River border of the county where ground has been work by dredging to the extent of five thousand cubic yards a day for five years during the open season, and results obtained have amounted to an average of about ten cents per cubic yard, at a total cost of five cents per cubic yard, making an average saving of ninety per cent of the gross contents of the gravel in spite of the proverbial fineness of the gold.

CUSTER COUNTY.

Custer County is situated well within the rugged central mountain mass of Idaho. It is tapped by the Salmon River branch of the Oregon Short Line Railway, extending from Blackfoot to Mackay, which, however, only reaches about twenty miles over the county line and falls seriously short of the useful purposes it could serve if extended to the Salmon River, for Custer County is one of the richest mineral fields in the State, with a record of production that amounts to something like \$30,000,000 in value.

Broadly speaking, the western half of Custer County is occupied with granite and great areas of igneous rocks of the acidic type which are richly gold-bearing and contains several important mining districts, while the eastern half of the county shows an exceptional development of the important series of altered sedimentary formations and contains some notable silver, lead and copper-producing districts whose enormous output to date is only an earnest of what they are capable of given the advantage of railway transportation.

YANKEE FORK DISTRICT.

In the matter of gold production the Custer Mountain mines at Custer City, in the Yankee Fork Mining District, rank first. At this place the Lucky Boy Mining Company is employing about seventy men and operating a twenty-five stamp mill. This company owns a large part of the famous group of parallel fissure veins which traverses the igneous mass of Custer Mountain from east to west and have already enriched the commerce of the world with precious bullion to the value of ten million dollars. The source of ore at present is from the Lucky Boy, one of the central fissures of the group, which is developed through a steep incline shaft sunk on the vein to a depth of nine hundred feet. The ore is a hard white quartz and bands of calcite. The values range from ten dollars to thirty dollars per ton, of which about sixty per cent is gold and the balance silver associated with a fine dissemination of silver and iron sulphurets and some manganese minerals.

The Lucky Boy vein has done a great service to Idaho mining interests during the past year by showing a very marked increase in values, especially gold, in passing down from the eighth to the ninth level, which practically

amounts to a remineralization of the fissure, and argues well for the future of this famous cluster of mineral channels at great depth, as it does for a number of other properties of this class in Custer, Elmore and Owyhee Counties.

The position of the deepest ore bodies on Custer Mountain are all fully a thousand feet above the drainage level of Yankee Fork which cuts across the strike of the zone and affords an opportunity for deep cross-cut tunnel work which is seldom equaled. Such a tunnel started from the back of the Lucky Boy mill would tap half a dozen pronounced fissure veins within six thousand feet of the portal at a maximum depth of nineteen hundred feet, and from present indications would be apt to reveal ore bodies carrying the same sensational values for which this system was famous during the eighties.

Among the other famous producers of this district, the Charles Dickens, owned by the same company as the Lucky Boy, has quite a remarkable history. It has yielded small shipments of sorted ore which carried gold and silver values ranging from two to ten thousand dollars a ton, with a total production of five hundred thousand dollars from a depth of about two hundred feet.

The McFadden mine at Estes Mountain is another producer and has a handsome contact fissure vein between a foot wall of greenstone and a hanging wall of rhyolite.

The Montana mine, on another splendid fissure in rhyolite and accompanied with a phonolite dike, has been opened through an incline shaft to a depth of five hundred feet. This considerable development was all done by a horse whim and produced ore to the value of \$350,000, every pound of which was shipped to market by pack train at great expense and still paid a margin of fully forty per cent profit.

The Montana still has a handsome shoot of oxidized ore near the bottom of the shaft. It is ninety feet long and three to eight feet wide, all of which contains good milling values. Spots of the Bonanza argentite ore that used to yield an average shipping value of from one to three thousand dollars per ton in gold and silver are also shown, and there is no reason to doubt that other bodies of this class of ore will be uncovered by the further exploration of this clean cut vein.

The Montana is still owned by the original locators who spent their profits with a lavish hand while they were com-

ing easy and were unable to properly equip the mine with the necessary machinery when it got too deep for hand work. This property is on the market at a reasonable figure and affords an opportunity for a mining investment that may develop into a bonanza if intelligently handled.

At a point about a mile east of the Montana mine, on the opposite side of Jordan Creek, the Golden Sunbeam Mining Company erected a milling plant of a daily capacity of thirty tons during the year and is working a zone or stockwerk of mineralized rhyolite overlying a quartzite formation, which is reported to be yielding satisfactory results. This deposit amounts to a whole mountain of ore carrying gold values all through with occasional stringers of high grade material. It would be an interesting test to follow one of the quartz bands in this body of altered igneous rock down into the underlying metamorphic formation, where a change of mineral and probably better values might be anticipated with the change of formation.

Twenty-five miles north of Custer the old placer district of Loon Creek, which has a bullion record of \$2,000,000 but whose rich gravel beds have long been exhausted, has recently come into prominence by the disclosures of high grade gold bearing ore in the Lost Packer mine, whose ore shipments already sent out have been such as to warrant quite a boom for this almost forgotten district, which is likely to become quite a hummer before the close of another season.

The present Loon Creek excitement dates back to the discovery of the Lost Packer mine by Mr. Clarence Eddy only eighteen months ago. Since then a dozen new stock companies have been launched which are based on Loon Creek properties, but so far the Lost Packer is the only one that has been developed to any extent or shipped any ore, but several of the other properties are being opened and are commencing to show flattering evidences of success.

The Loon Creek District is situated in a very rugged mountain section, yet it is very easily approached from Custer City up Jordan Creek, over a good wagon road to the foot of Estes Mountain Pass, then over a good trail that follows down another water course after crossing the summit. This trail can be transformed into a wagon road at a very reasonable cost and will likely be built during the year.

The formations of Loon Creek are principally granite, which vary from the gray fine grained variety so common to central Idaho to one containing the coarse pink tinted crystals of *orthoclase* feldspar which characterizes the granite of Pike's Peak back of Cripple Creek. The granite is cut by a great variety of dike rocks which vary from light colored rhyolite and quartz porphyry to heavy basic hornblend diorite. There are dozens of great quartz bearing fissure veins traversing the district, also numerous narrow belts of schist that may be due to shearing movements. A thin bedded series of slate quartzite and silicious limestone occur near the old placers that, while completely altered, look suspiciously like the Wood River series of carboniferous sedimentary formations.

The Lost Packer vein is a nearly vertical fissure that splits a prominent mountain spur from top to bottom, cutting down through a series of heavy terrace like sheets of light colored igneous rock that caps the mountain; it maintains the same strength and size down into the underlying granite. This great vein is over twenty feet wide in places and is being developed by three adit tunnels started and driven on the vein at elevations varying from one hundred to seven hundred fifty feet below the highest ore crest. The vein filling is quartz and schist gangue sprinkled with iron and copper pyrites and carrying a band of almost pure amorphous chalcopierite of a beautiful yellow color in pay streaks twenty to forty inches thick, following one or both walls. The richest ore carries besides the copper a sprinkling of silver white sulphide of bismuth.

The Lost Packer has shipped five full carloads of first class ore to the Salt Lake valley smelters during the past year which averaged very close to eight ounces of gold, fifteen ounces silver and ten per cent copper per ton. It is not so much the shipping ore but the remarkable value, considering the width of the milling ore now showing up in the No. 2 tunnel of this property which is giving it real bonanza proportions.

This tunnel for some time has been carrying a breast of fine concentrating ore thirteen to fifteen feet wide, in addition to the shipping streaks, that samples forty to fifty dollars per ton, its full width, in gold, silver and copper, which means a source of pay mineral above the lower tunnel level which will run up to fancy figures in the aggregate if the values are maintained to that depth. The evidence at hand not only indicates that they will, but holds out definite promise of an improvement at further depth.

Mr. Eddy, the original locator of the Lost Packer, and his associates, discovered another property during the past summer on East Mayfield Creek ten miles nearer Custer City than the Lost Packer. His new mine is considered by many to be the second best thing in Loon Creek, and forms the basis of a new company called the Lucky Star Mining Company. This property is being actively developed and is showing up some pay streaks of shipping ore in a wide vein of lower grade material.

In the parlance of the camp, Mr. Eddy is called a "Lucky Devil." I happen to know the gentleman and have seen him work. He is one of those prospectors who devoted very little time hunting game and fishing when in the hills, but travels with his face towards the ground all the time, and climbs a mountain side like a deer and his luck is due more to his well directed energy than to the devil.

STANLEY BASIN.

Stanley Basin, situated at the junction of Valley Creek and Salmon River, twenty miles southeast of Custer, is one of the historic placer camps of Idaho which has yielded a fair quota of precious bullion annually for nearly forty years. Its main streams were successfully worked during the past season by a large dredging plant and two small hydraulic companies, and produced some handsome bricks of bullion. This district is situated near the foot of the majestic Sawtooth Mountains with their broad, densely timbered moraines and beautiful glacial lakes. The topography of Stanley Basin is composed of low, rounded, grass covered granite hills flanked by the glacial valleys and backed to the north by the rugged volcanic peaks of Yankee Fork.

Great dikes of quartz-porphyry and syenite-porphyry traverse the main placer area of Stanley Basin north and south and are apparently off shoots from the great igneous

mountains massed to the north, and gold-bearing quartz veins also occur associated with thick bands of fluor spar and fluorite stain containing very fine gold, and suggest a probable tellurium combination.

At several points rich placer dirt has been mined right up to and into these big dikes of porphyry, and soft talcy screenings from big cuts and tunnels in the dikes have produced free gold at the rate of five ounces per ton. The quartz is often of a curly agate variety and suggests its origin from ascending hot solutions. Hot and warm mineral springs occur by the dozens throughout this district and at several points are found issuing directly from the walls of the gold-bearing dikes.

Several of these dikes have been developed to some extent and produce some very beautiful specimen gold ore in the form of coarse colors precipitated on brown cubes of altered iron pyrites with which the shrinkage-planes of the rock are sprinkled. At several points bright iron pyrites are found disseminated through the body of the porphyry that show no gold when panned raw, but when roasted yield a handsome string of colors. Most of the porphyry dike properties of this district are still held by the original locators and offer some fine chances for investment.

Six miles above the mouth of Stanley Creek there is being developed under the management of one of the most capable mining engineers in the country a gold vein that has just been brought to a producing stage, with a twenty stamp mill and cyanide plant, that will doubtless prove one of the biggest gold producers in the State.

This mine is known as the Valley Creek mine. It is opened on a monster fissure cutting the regional granite, accompanied and crossed diagonally with big dikes of porphyry. This fissure is from twenty to thirty feet wide, and, according to elaborate check sampling tests, carries an average value all through of ten dollars per ton, of which fifty per cent can be saved by simple plate amalgamation and a high per cent of the balance by cyaniding.

This new milling plant is to be started within a few days. The mine has three thousand feet of tunnel development and ore blocked out to supply a capacity of sixty tons a day for years. Its operation will add a very important amount to the rapidly increasing gold yield of Custer County.

Some very promising gold veins occur about twenty

miles southeast of Stanley Basin near the head of Warm Spring Creek, where, at the Fissure Borne mine, a ten stamp mill has been operated on a strong quartz fissure in granite which carries values ranging from five dollars to thirty dollars per ton. The mine still contains a good reserve of ore and a promise of opening up into a good paying property if handled intelligently. It is idle at the present time and its failure is said to be due to mismanagement.

A few miles still further to the southeast, in Washington Basin at the head of the East Fork of the Salmon River, some extensive development work has been done on the Blackman group, which discloses monster gold-bearing quartz fissures in eruptive granite, which are as much as seventy feet wide. These veins contain some very good ore, but on the average they are low grade. The ore is a shattered white quartz thickly sprinkled with iron sulphides and carries in addition to its gold values a small per cent of nickle.

LEAD-SILVER BELT.

Custer County's principal lead-silver belt extends along the main Salmon River from Slate Creek to Garden Creek, a distance of forty miles and following a general north and south direction.

The principal districts in the order of bullion produced are Bayhorse, Squaw Creek, Poverty Flat, Clayton and Slate Creeks. The total output of these camps approximated nearly \$15,000,000.

Since the fall of silver, the mining industry of this belt has fallen to a low ebb owing to its isolation. One small smelter at Clayton, with a capacity of fifty tons daily, however, has been run a few months each season during all the years of low silver prices, until the past year. It made handsome annual profits, amounting to nearly one hundred per cent on an invested capital of a quarter of a million dollars, but owing to a lack of available wet ore in this company's mines, the smelter was not run during 1903 and the output of this belt, amounting to four hundred eighty thousand pounds of lead and about thirty thousand ounces of silver, was largely derived from small leasing crews at Bayhorse.

A deal was on foot during the year to merge the principal mines into one company and there is a bright prospect that it will be consummated in the near future; such

a combination would afford a mixture of ores that would produce a desirable smelter charge and would bring the district out as a big producer again. As it is, the properties cannot be worked to an advantage separately. The list of mines which are intended to be put into this combination have ore reserves in sight estimated to contain 6,000,000 ounces of silver and half as many units of lead, together with very extensive reserves of virgin ground which promises to yield an enormous resource of ore for further development.

The mines of this belt are divided into two quite distinct classes. Their ores occur as irregular deposits of carbonate and galena lead-silver ore in limestone, and as pronounced fissure veins in slate carrying high grade silver ore. The lead ores carry proportionally high silver values, seldom running less than one ounce of silver to a unit of lead, and in some instances carry several dollars in gold to the ton of ore.

The silver ores are usually chlorides and rich silver-bearing gray copper ore in a gangue of massive siderite (carbonite of iron).

A section of the formations of this belt is exhibited to excellent advantage by the Bayhorse Creek Canyon which cuts it deeply at right angles to its strike.

The main divide at the head of the canyon shows a core of granite, which is overlaid with steeply inclined belts of quartzite, slate, blue and gray limestone, shale and tertiary lavas in the order named that dip to the east towards the Salmon River.

The canyon walls are very abrupt and the elevations rise to lofty mountain peaks ten thousand feet on either hand. The veins are generally parallel to the axis of the mountains and cross the canyon at a sharp angle, giving exceptional advantages for adit tunnel work.

The Ramshorn mine, in the slate belt, is one of the best developed mines in the State. It is opened on a true fissure vein which strikes due north and south, and dips west at an angle of fifty degrees. It has twelve adit tunnels started and driven in on the vein, and connected underground with raises. One of these tunnels is three thousand feet long and has gained a face depth on the vein of two thousand feet. This mine carries a total of ten miles of underground work and has produced \$3,000,000. It has ore reserves now blocked out estimated to contain a like amount.

The average ore of this mine runs about one hundred ounces silver and three per cent copper, and occurs in well defined shoots six inches to six feet wide and from fifty to three hundred feet long. The Skylark vein, running nearly parallel with the Ramshorn but having a flatter dip, is the same type of a mine with exactly the same class of ore and gangue and nearly as much development has produced over \$2,700,000. It is worked up closer than the Ramshorn.

Selected ore from these mines, which occurs in streaks of from a few inches to a foot or more thick, runs from five hundred to one thousand ounces silver and ten to twenty per cent copper per ton, and considerable quantities of this high grade material have been shipped from both of these mines.

The principal lead mines of this district occur in the limestone belt three miles below the silver veins above described. The most important deposit that has been worked, in point of production, is on the Beardsley Excelsior vein, a nearly vertical fault fissure cutting a heavy bedded series of gray, blue and black limestone. The ore occurred in great pipe-shaped shoots five to twenty feet wide and from forty to sixty feet long, filled with sand, carbonate of lead and nodules of galena.

These pipes were worked down from four hundred to five hundred feet and produced a 1,000,000 ounces of silver and about 750,000 units of lead. At the bottom they expanded into a mammoth body of concentrating mineral fifty feet wide and three hundred feet long. These mines are perfectly dry in the bottom and the ore still altered carbonate and oxides, and there is a strong probability that if this great body of mineral was followed down to water level it would be found reconcentrated in a sulphide form.

Another most entertaining feature of this limestone belt is the exhibition of two wide flat dikes or sheets of quartz porphyryite that can be seen issuing from the lower blue limestone horizon on the side of the canyon road a mile below Bayhorse town, which indicate a buried succession of alternating limestone and porphyry layers that may contain flat lake like bodies of lead ore similar to those at Leadville, Colorado, and the vertical pipes already mined may be simply vents to extensive flat bodies of mineral at greater depth.

There are a number of very handsome silver-lead prop-

erties in this district carrying ore varying from sand carbonate to block galena containing up to 70 per cent lead in carload shipments and almost invariably high silver values. The most important contributors to the past year's shipments were Cave, Pacific Turtle, Democrat, Silver Brick and Barton. All of these mines have produced a large amount of ore and are still mere prospects in depth. They are all so situated that they can be tapped by tunnels to great depth and promise extensive ore reserves when thoroughly exploited. The Turtle mine was purchased during the year by the Standard Metal Production Co. of Philadelphia, who are actively developing the property at the present time. They have opened up a very fine showing of ore and are planning to erect a mill on the property in the spring.

There are a number of fine lead-silver prospects and mines scattered along this belt for forty miles lying idle at the present time and should the deal for the big properties above referred to be consummated and a decent size smelter built, it would reap a rich tribute of custom ore from a dozen different districts, for Custer County's silver-lead resources are not confined to this main Salmon River belt alone, for rich deposits of this class of ore are being developed in the Seafoam, Grayhound Mountain, Sheep Mountain, East Fork and the Lost River ranges, all of which would come to active life and profitable production if afforded a decent local market.

THE COPPER BELT.

The Lost River Copper belt, of which Mackay and the White Knob Copper Company are the present active centers, is one of the most extensive in the west. It lies along the northeast slope of a bold range of mountains among whose lofty summits are White Knob Peak and Mount Hyndman, reaching eleven thousand and twelve thousand feet above sea level.

This is the divide that separates the drainage of Wood River and Lost River, an irregular continuation of the Sawtooth range, that terminates with low hogbacks in the edge of the Snake River desert thirty-five miles southeast of Mackay. The Wood River series of altered sedimentaries are well represented on this slope, also an additional extensive display of heavy bedded blue limestone and white dolomite together with extensive igneous intrusions.

The Copper Belt extends from Alder Creek to Copper Basin on the East Fork of Lost River, a distance of thirty miles. It carries more or less copper mineral all the way, with especially strong displays of ore at both ends and a most phenomenal showing at the property of the White Knob Copper Company's mine at Mackay.

The character of these deposits, their ores and enclosing formations, compare very closely with the Arizona copper deposits.

The White Knob mine is situated on a spur from White Knob peak at an elevation of eight thousand feet above sea level and two thousand feet above the valley of Lost River and the company's big smelter site. The surface manifestations of ore at this property amount to a mineral farm that cover the flat top of the ridge over an area of fully forty acres with low grade copper ore and copper stained formation in great patches and zones. Near a contact of a wide body of eruptive granite porphyry and overlying limestone beds, and including great masses of solid fifty to sixty per cent hematite and magnetite iron ore, which also carries important values in gold and silver.

The development consists of a vertical shaft seven hundred feet deep sunk from the croppings. This, however, is only used as an air shaft at present, for it has been supplanted with a cross-cut tunnel eleven hundred feet long that taps the ore on a level with the bottom of the shaft.

The ore bodies occur in the blue limestone, also in contact with a large dike of included coarsely crystalline feldspar porphyry. The ore seems to be a replacement of the lime and occurs in mammoth shoots thirty to fifty feet wide and seventy-five to one hundred feet long. The ground is dry and the ore still mostly altered reddish brown oxides and green carbonate of copper carrying from two to four per cent of the red metal together with about two dollars in gold and silver.

The main ore shoots have been persistently continuous from the surface down to the first big cross-cut called the Albert tunnel, with stations and drifts at convenient horizon. The work is very substantially timbered and equipped with adjustable chutes arranged for handling ore, iron or lime flux, all of which can be mined right on the ground. One of the largest ore bodies is showing sulphide mineral strong in stockwerk, threads, pebbles and masses of pure ore that varies from brassy chalcopyrite to spots of rich

soft blue black bornite ore. This sulphide is very desirable for matting and has been eagerly anticipated by the management. The strike of these great bodies is east ^{of north} and west with a steep dip to the ^{South} ~~North~~ and towards the valley. A second tunnel has been started down the mountain side which will tap the ore bodies nine hundred feet below the Albert tunnel and sixteen hundred feet from the surface.

This new tunnel is making rapid progress and should reach the big ore bodies in the early summer. It is started at the level of a deep gulch that furrows the mountain side where more water and much higher copper values may be safely expected when the ore bodies are reached.

The White Knob property is equipped with one of the finest smelting plants in the west. It has two large blast furnaces of three hundred fifty tons capacity each, with all the necessary attendant equipment, including an electric railway seven miles long connecting the smelter with the mine. The ore is smelted direct as it comes from the mine without preliminary milling. One of these furnaces was gotten into commission in October and with the slight delays incident to tightening the harness of a plant of this kind, has been in successful operation since, producing a high grade matt, which carries fifty-eight per cent copper and important values in gold and silver, with a slight loss of less than half of one per cent copper. As soon as the development of the mine is a little further along so that the necessary large daily tonnage can be handled economically the other furnace will be started and will give the plant its maximum daily capacity of seven hundred tons a day. The ore bodies already developed in the mine are said to contain a net value of something like \$2,000,000 over the cost of their extraction and reduction, and with the advantage of their precious values and the definite prospect of increased copper percentage at the new level now being opened the chances are that the White Knob will become one of the largest, most permanent and profitable producers of copper, gold and silver bullion in the west.

The new town of Mackay, three miles above the old town of Houston, at the present terminus of the Salmon River railway, is beautifully situated in the broad and fertile valley of Big Lost River, half a mile from the big smelter and three miles from the White Knob mine. It already has a population approximating one thousand people and a

tributary mineral field embracing the whole upper Lost River drainage that contains many fine prospects that are likely to give it a rapidly growing importance as a mining center.

Some very fine bodies of copper-iron ore have been opened up during the year on the McGinty group and other mines on Alder Creek southeast of the White Knob, while in the opposite direction directly adjoining the White Knob properties to the north, a new company has recently been launched to work an extensive tract of ground known as the McCallum group. This property follows the same contact as its big neighbor and has numerous fine surface showings of copper ore associated with the same granitic base rock and included porphyry dikes in blue lime; development work has already been started on this property and it has a bright prospect of success.

The Copper Basin mine, situated in Copper Basin, fifteen miles west of White Knob, has been developed to considerable extent and makes a similar monster mineral display at the surface, including huge gossens iron cropping containing fair values in copper, gold and silver, and is considered the second best copper property in the Lost River drainage. The belt is continued to the northwest for fifteen miles further and in the White Horse, Alta and International mines exhibits some very extensive deposits of smelting ores, all of which carry good precious values and promise important development.

ELMORE COUNTY.

Elmore County lies immediately east of Ada County and west of Blaine County, and comprises an area of something over two thousand five hundred square miles. Mountainhome, the county seat, is on the Oregon Short Line. The southwest half of the county overlaps the aluvial covered lava terraces of the Snake River valley and embraces some extensive stretches of rich soil that only lack the application of water to make this one of the most verdant sections of the State.

The first mountain uplifts north of the big valley are composed of pink rhyolite lava beds of enormous thickness and steeply tilted by faulting; these extend back to the north six to ten miles from the rim of the valley; then the central granite mass of the State is reached, which practic-

ally occupies the balance of the county's area to the north and is extensively ruptured with intrusive porphyries. This great granite field is watered by Boise River, splendidly timbered, and a rugged topography, of steep mountain ridges and deep canyons. It contains some notable mining properties around Atlanta and Rocky Bar districts, whose total precious bullion record exceeds \$30,000,000, and recent important discoveries indicate that this famous little section of the State's broad granite area will continue to be a very important source of gold for an indefinite period.

PINE GROVE DISTRICT.

The most noteworthy mining development of the past year in Elmore County has been the remarkable gold ore discoveries in the Franklin mine at Pine Grove, forty miles north of Mountainhome, whose success is due exclusively to the faith of local investors, of whom the present owner of the property, Mr. R. P. Chattin, the well known sheep man of Elmore County, has taken the longest risk and has been rewarded with a veritable bonanza. The Franklin mine was operated over ten years ago by one of those poorly managed companies who expected to gouge dividends out of the grass roots without first undercutting the ore in minable shape and whose venture resulted in inevitable failure. The mine lay idle for ten years and was held by desultory assessment work and by relocation.

It had been equipped with a ten stamp mill and had one short shoot of ore gouged out and caved over, and a record of rich float. When the present owner took hold a year and a half ago he ran a cross-cut tunnel into the side of the mountain under the point where the rich float had been found. This tunnel is run two hundred and seven feet long and tapped a perfect fissure vein at a depth of one hundred and seventy-five feet. The apex of this vein is not defined, owing to the deep covering of disintegrated granite sand. At the point where the vein was cut it proved to be a nearly vertical fissure accompanied with a small dike of greenstone; its ore body was from three to eight feet wide and maintained an average width of over four feet through a continuous shoot three hundred feet long, with smooth slickensided walls cutting a formation of coarse pegmatite granite.

The ore that was extracted in running through this



**DISCOVERY CROSSCUT TUNNEL ENTRANCE,
FRANKLIN BONANZA, PINE GROVE.**



handsome channel, and raising through it to the surface, was all rich brown honeycombed and iron stained quartz. Three thousand tons extracted during the year, largely from actual development work, was milled on the ground and yielded the remarkable average of twenty-five dollars per ton in free gold to simple plate amalgamation and a tailing average of six to eight dollars a ton.

A new cross-cut tunnel was started in August and has since tapped the vein at a point one hundred and forty-five feet deeper and found the ore to be twenty feet wide between the same perfect walls as above and carrying an average of nearly an ounce of gold across its whole width.

The drifts now being run out on the shoot at this horizon will undercut an ore reserve worth a gross value of over \$700,000, if the ore maintains its present value through half its present width and the same length along the strike as in the tunnel above, and there still remains another lift of two hundred feet between this second tunnel and the foot of the hill where another cross-cut tunnel about seven hundred feet long will tap the vein five hundred feet deep from the surface and will doubtless afford another extraordinary reserve of rich ore. It is gratifying to see such mining success as this come as a reward to local faith in our mineral resources. It is not the only instance either where the blundering mismanagement and half-hearted efforts to develop our mines by small companies has been discounted by local talent, and a few such examples as this will have a potent influence not only in upbuilding the mining industries of our State, but the profits of such successes usually stay in the State instead of being taken from it, and prove an important factor in the development of all of its resources.

Many of the finest palaces of Salt Lake City are occupied by miner millionaires who started their successful career with the pick and drill, and with little else but brain, brawn and undoubted faith in Utah's mines, mines that were practically abandoned as dug out by their foreign owners.

Idaho's old bonanza districts and virgin mineral fields offer many opportunities in this line that local investors will do well to keep an eye on.

Pine Grove is one of the prettiest sites for a mining camp imaginable. It is located on the banks of the South Boise River, on the Atlanta stage road, at an elevation of four thousand feet above the sea level; the mountain slopes

on either side of the river rise quite abruptly and offers excellent advantages for economical development by tunneling, with plenty of fine timber and water for power near at hand.

This district contains a number of handsome prospects whose outcrop are for the most part obliterated by the prevailing granite sand that covers the surface, but rich float ore has been traced to its parent vein at several points, and from the nature of the formation and the number of distinct and separate fissures it contains it is hardly probable that the Franklin bonanza is alone in this promising field.

ATLANTA.

This old district, twenty-five miles north of Pine Grove, was discovered in 1864 and was for several years worked very successfully as a placer camp. The great quartz veins that traversed the mountain sides soon attracted attention, for they showed large bodies of gold and silver ore right at the surface. These quartz veins occur in granite, and are accompanied with monster dikes of quartz porphyry and granite porphyry.

The main Atlanta lode is from fifty to a hundred feet or more in width, and with its numerous important spurs and lateral veins, ranging from two to fifteen feet wide, has produced millions of dollars worth of rich ore and still contains rich possibilities for production with the application of modern mining and milling practice.

The quartz mines of this district were mostly closed down by 1885, and from then until the year 1901 the main producers were allowed to remain idle.

In 1901 Mr. T. N. Barnsdale, the well known Pittsburg capitalist, took over the Last Chance, Monarch and Buffalo mines, and has since developed these properties to a very considerable extent, are still opening up large bodies of fine milling ore, and will probably at an early date instal machinery to treat the ore with.

This property is very substantially equipped and is being very ably and successfully handled by Mr. Daniel Kirby, formerly of Colorado.

The Pettit mine has been developed during the past year on quite an extensive scale and the work done increased the amount of ore in sight several times with marked increase in values. This property is now in the hands of the original owners, and a small force is now at work in the

mine blocking out ore preparatory to installing machinery in the spring for its reduction.

The East Atlanta and Old Chunk group of mines are also being developed by a New York company who have the property under bond and are meeting with good success.

The Nimrod group has passed into the hands of a Pittsburgh company, who have erected a mill and have a tramway on the ground to connect it with the mine, which will be put up in the spring. They have a large quantity of milling ore in sight of good grade.

Mr. R. G. Spaulding has taken a bond on the Jerico and West Atlanta mines and has let contracts to do considerable work during the winter. This work is being done to prove the extent of some large ore bodies that have been cut in this mine.

The Burton, a San Francisco corporation, has taken over the Jessie Burton and Moultrie mines and is working six men on them this winter.

Altogether there is quite a lot of development work in progress this winter at Atlanta, and some very important results may be anticipated by spring.

Among the other important claims of this district that are still idle are the Tahoma, Big Lode, Washington, Bay State, Dewey, Webfoot, Alaska and several others.

The Queens River group on Little Queens River, part of which are in the Atlanta or Middle Boise, and part in the new Black Warrior mining district, have lately passed into the hands of a large eastern company and will be energetically developed in the spring. Several of the claims of this property make a very handsome showing of ore and good reports may be expected from them when developed further.

The rich gold-bearing fissures that traverse the regional granite at Rocky Bar, which have also produced a very large amount of bullion since their early location in 1863, are again being actively developed after a long period of inactivity; among these old stars whose ore channels are again being investigated are the Ida Elmore, Confederate, Tip Top, Republic and Objection. Also the Flagstaff, Avalanche and seventy-six claims on another string.

SKELTON CREEK.

The Skelton Creek District, only a few miles from Rocky

Bar, has shown up some remarkable fine values during the past year from strong fissure veins in granite, associated with dike rocks. This is quite a new district, where some rich and profitable mines are likely to develop in the near future, that may produce bonanza shipping ore in which tellurium compounds may be anticipated, as specimens of that mineral are reported to have been found.

A definite evidence of the possibilities of this district were manifested by a trial run of paystreak ore from a ten-foot vein owned by Mr. R. P. Chatten of the Franklin Bonanza. This test of ten tons of ore was made in the Franklin mill at Pine Grove and gave a free milling result that averaged a little over one hundred dollars per ton in gold, and from the run a small lot of concentrates were saved that sampled at the rate of forty ounces of gold per ton.

BLACK WARRIOR DISTRICT.

This new promising district was only discovered the latter part of August, 1903, by Mr. Thomas Walter and Charles Birdwell. Interested with them in this property was Mr. Max Mayfield of Boise. Their first discovery was on the Black Warrior No. 1 claim, where they found ore assaying as high as three hundred dollars per ton in gold. They at once began looking around and found other claims and now have several groups, and, while only prospects, they have all the surface earmarks of making large producing mines.

These gentlemen are also the owners of the Black Warrior group Nos. 1, 2 and 3, the Mayfield Nos. 1, 2 and 3, the Bedford Nos. 1 and 2, the Tomahawk Nos. 1 and 2 and several other valuable locations. The second party went into this district early in September and found other fine surface ore croppings. Among the second party was C. M. Brown, an old-time Colorado miner, who located the Rico and Mammoth for himself and others, which have a most remarkable surface showing consisting of a lode two hundred feet wide that carries some values as shown by pan tests across its whole width.

Other parties came in later and located the Spokane, Geneva, Ohio and Old Soldier claims, that have shown up some fine panning from their location holes.

The White Ribbon and Dewey claims, owned by Charles Alexander, shows some wonderful rich rock and if it should prove to continue in depth it will become a big producer

of gold bullion, for the vein is large and the panning results in this instance are sensational. Messrs. Davis, Dowling, Wright and Richardson located the Fairview Nos. 1, 2 and 3, Cumberland, Black Warrior, Poet and several other locations. These claims carry big veins of ribbon quartz and the location work produced numerous specimens showing native gold.

Another fine group is called the Gold Bug and is owned by a company of that name who are driving a two hundred-foot cross-cut tunnel this winter. This property has a strong fissure carrying a thirty-inch pay streak that averages ten ounces in gold per ton and may become a shipper by early spring.

The veins of this district are all steep pitching contact fissures between granite and porphyry.

The lateness of the season and the early snow prevented anything much but location work being done last fall, but when spring arrives nearly all of those interested have signified their intentions of developing their claims to the extent of their means, and it will be well to watch the development of this district, for it is full of real boom possibilities.

NEAL DISTRICT.

This popular gold quartz district is situated within fifteen miles of Boise City, with which it is connected by an excellent wagon road. It is near the junction of Elmore, Boise and Ada Counties.

The prevailing formations is the gray granite common to the north end of Elmore County, at this district extensively sheeted and joined and cut by numerous intrusive igneous dikes and many strong fissure veins of quartz and mineralized country rock that carry fine pay values in well defined shoots in width varying from two to twenty feet; the prevailing strike is easterly and westerly and dips to the south. The ores of this district range in value from five dollars to twenty dollars per ton for milling ore, and fifty to two hundred dollars per ton for shipping ore, which can often be sorted out of clean streaks of massive iron sulphide.

The general conditions at Neal somewhat resemble those at the Pearl district, with the added advantage that the ores carry a much higher percentage of free gold. This district has several small mills and numerous ore showings

that warrant extensive development at depth, but none of the properties have been given a chance to show their merits in this respect but have been worked on the gouge principle. Yet there are evidences of permanency in both size and value at depth.

The principal properties under operation during the year were the Golden Eagle, the Hidden Treasure, Homestake and Ella Hill. The Golden Eagle and Homestake mills were operated for a few months. The Hidden Treasure is being developed by a force of men this winter under the managment of one of the best known mining engineers of Colorado and is locally considered as having a very promising future.

A small force is kept at work on the Daisy mine blocking out ore. This property was carefully and critically sampled during the year by a well known expert, who found fifteen thousand tons of measurable ore that carried an average value of sixteen dollars and twenty cents per ton, of which over seventy per cent could be saved as free gold and a very large proportion of the balance by cyaniding, with a clean cut contact vein showing every evidence of permanency at depth.

The Homestake is quite extensively developed and is being operated at the present time. It has a vertical shaft two hundred feet deep and several thousand feet of cross-cut tunnels and drifts and has been mined as much as sixteen feet wide. The ore usually occurs in shoots of from sixty to one hundred feet long by four to six feet wide and mills from sixteen to eighteen dollars per ton.

The Golden Eagle was operated for three months during the early part of the year. It has a three hundred foot shaft and three levels containing ore bodies that range all the way from three to thirty feet wide, with average values of from eight to twenty-five dollars per ton for mill dirt and from fifty to one hundred and fifty dollars per ton for shipping ore in the carload lots, a number of which have been sent out from this property to the Salt Lake valley smelters. The ore showing at the Golden Eagle is already of such volume as to warrant a large milling plant.

The Ella Hill mine is being developed by a long tunnel that is making good progress towards a coveted goal of rich ore bodies which it will tap at considerable depth. A fine body of ore was struck during the year in the No. 13 mine showing four feet of clean mill ore at the bottom of a fifty-

five foot shaft that contains an average milling value of ten dollars per ton. There are dozens of handsome prospects in Neal and vicinity. It is one of the most accessible gold camps in the State, surrounded by many natural advantages, and, with systematic development, at depth will doubtless become a large and permanent producer of gold.

LIME CREEK AND DIXIE.

These two promising districts, lying in the granite area just north of the rhyolite belt, have many promising properties.

At Dixie the Crown Point group carry several important parallel fissure veins, one of which has been developed by a shaft over three hundred feet deep and has produced a good deal of profitable milling ore and a number of carloads of high grade shipping ore from the bottom level. A long cross-cut tunnel is projected for this property to be started from the Boise River canyon that will develop the whole system at great depth and afford an economical avenue for the extraction of its ore.

This camp is very accessible; it is only twenty-five miles from Mountainhome and near the Atlanta and Rocky Bar stage road.

The Lime Creek district, a little farther along and to the east of the road, was the scene of considerable mining development during the year. At this district the Lime Creek Mining Company owns two fine properties known as the President and the Hawthorne groups.

There was a force of seven men employed on the President group all summer developing a big zone of mineralized granite containing well defined pay streaks of rich gold quartz two to six feet wide whose average gold values ranged from ten to one hundred dollars per ton.

The Hawthorne has two hundred feet of tunnel work and numerous prospect cuts exposing three different veins of low grade quartz five to ten feet wide. The owners of these properties are putting in a ten ton mill with foundations arranged for increasing its capacity to thirty tons a day.

The Jingo and Hornet mines, in the same district, were quite extensively operated during the year under bond by a Salt Lake company who worked a crew of ten men. This mine has six hundred feet of development on a large fissure vein carrying a pay streak one to six feet wide with average values of fifteen to twenty-five dollars per ton and oc-

casional bodies of shipping ore that runs to very high grades. Like almost all the other gold districts in Elmore County, Lime Creek enjoys fine natural advantages in the way of convenient timber and water for power. The mines of this county generally have enjoyed a more active season of development during 1903 than for several years, the fruits of which is likely to increase the total gold yield by fully one hundred per cent during 1904.

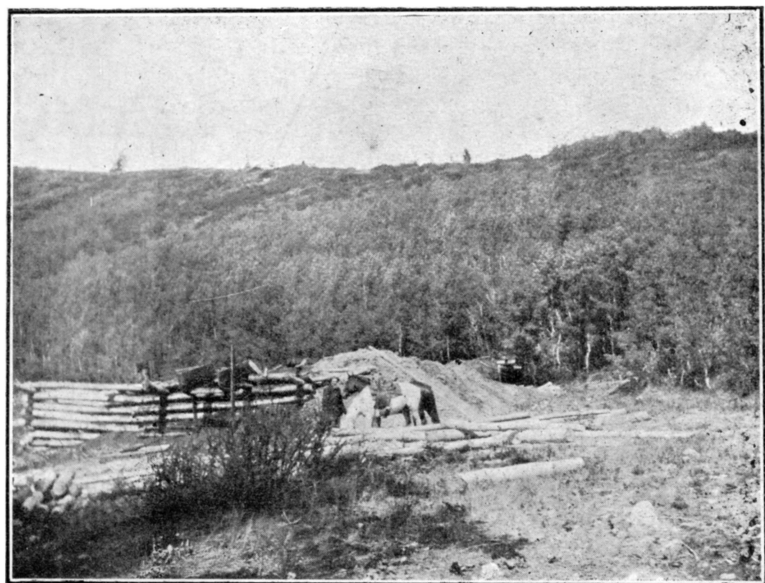
FREMONT COUNTY.

This county is situated in the eastern part of the State, and is bounded on the north by Montana and on the east by Wyoming. Its extreme width from east to west is one hundred and sixty miles and from the north to the south sixty-five miles. St. Anthony, at the present terminus of a branch of the Oregon Short Line extending northeast from Idaho Falls, is the county seat.

Fremont is at present one of the ultra-agricultural counties of the State, but the recent discovery of coal within its boundaries are such as to warrant the anticipation that at no distant date it may give employment to as many men under ground as some of the prominent mining counties do at present.

The central and largest part of Fremont County is laid out on the broad plains of the upper Snake River basin, with a fringe of rugged mountain slopes and plateaus around its eastern and northern borders. The predominating formations over its great valley area are basalt and rhyolite, the basalt appearing in the central plains as a shallow top dressing on a series of rhyolite beds, indicated by a fault at Heises' Hot Springs to be fully 1,000 feet deep. The rhyolite is underlaid by a coal-bearing cretaceous sandstone and shales, a fringing exposure of which can be followed along the south slopes of the Rockies extending for 40 miles along the north border of the county, resting on the steeply tilted metamorphic rocks of the main mountain uplift, from near Beaver Canyon to Rea Peak on the Shot Gun Creek, and probably continuing around the head of the basin past Henry's Lake. These formations are also well exposed encircling and probably underlying the whole of Teton Basin and on around the Big Hole Mountains extending into Bingham County.

The most important coal discoveries so far made are in



HORSESHOE COAL MINE. 500-FOOT TUNNEL DUMP.

a well, sunk for the purpose of developing oil on the Breckenridge ranch in the center of Teton valley near Hayden postoffice, and on Horse Shoe Creek at a point about four miles south of Oasis postoffice.

In the oil well that is being drilled by the Fremont County Oil, Gas and Coal Company, a vein of coal is reported to have been cut at a depth of 650 feet that was ten feet through, and a sample of these cuttings gave the following analysis:

Fixed carbon -----	48.70 per cent.
Volatile carbon -----	38.00 per cent.
Ash -----	11.20 per cent.
Moisture -----	2.10 per cent.
Sulphur -----	Trace.

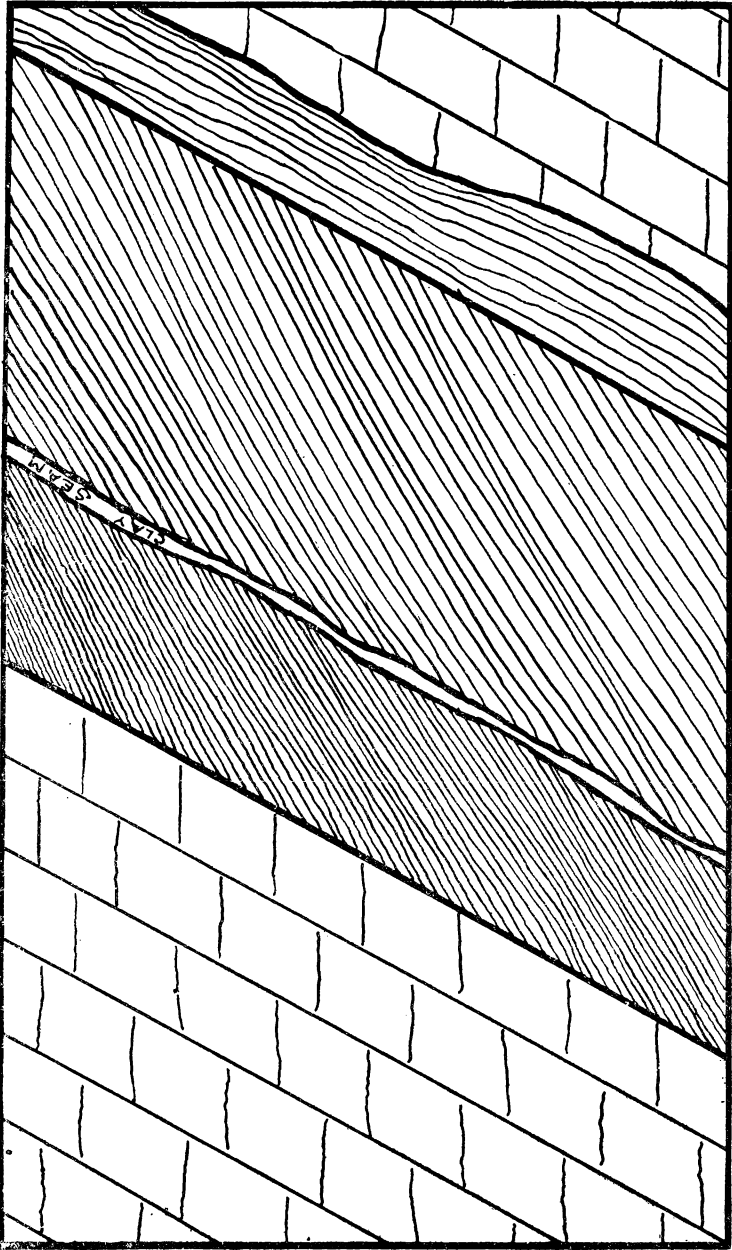
Total -----	100.00 per cent.
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At the Flamm mine, one mile above the Hegsted's ranch on the Horseshoe Creek, a vein of coal has been opened by two tunnels, one on each side of the creek, that are one hundred and one hundred and fifty feet long respectively, exposing a vein of clean coal from twenty inches to three feet wide that strikes north and south with a flat dip, about 10 degrees to the west. These tunnels, as far as they have extended, are under shallow bench ground that borders each side of the creek and the coal is still soft. The tunnel on the north side of the creek will, if continued, soon pass under a steep hill side, where added pressure is likely to produce hard merchantable coal. This vein is clean and has a smooth, stiff sandstone floor and roof, and may be one of a series of veins exposed further up the creek. No analysis was made at this point.

Above the Flamm claim about a mile, near the forks of Horseshoe Creek, a ten-foot prospect hole exposes a good coal blossom four feet wide that has the same strike and a steep dip. A mile above this claim, on the middle fork of Horseshoe Creek, the Horseshoe Coal Company have opened a vein that promises to prove of considerable commercial importance.

This vein strikes a little west of north and dips very steeply 62 degrees to the southwest toward the base of an abrupt bluff, the top of which forms the summit of the Big Hole Mountains, from where the country slopes off towards Rexburg and St. Anthony.

The accompanying cut, made from a photograph, shows



Sandstone Clean Coal 10 Feet wide Blue Shale Sandstone.

DIAGRAM CROSS-SECTION OF HORSESHOE COAL VEIN, TETON BASIN.

a small waste dump, at the mouth of the tunnel run in 500 feet on a ten-foot vein of coal. It represents all the waste taken out of the entire length of the tunnel, and most of it came from the first fifty feet in from the portal, the balance of the distance run on the vein was nearly all clean coal, amounting to 2,000 tons, that found a ready market on the dump, as it was mined at two dollars per ton.

The writer visited these works on March 17, 1903. The tunnel had been run in a farmer-like fashion, and did not have a decent stick of timber in it. A few sets of small quaking aspen poles near the mouth being the extent of the effort to secure the ground; the grade of the tunnel was the wrong way, about three degrees down hill, and the work generally in a dangerous condition, so much so, that the owners had become afraid of it and had quit work. The tunnel was still open and accessible, however, to a point four hundred feet from the portal, where a heavy fall of ground had occurred which prevented further access.

From a point fifty feet in from the mouth of this tunnel to the caved ground, four hundred feet in, the top of the tunnel exposed a continuous band of clean bituminous coal that averaged ten feet wide between walls and without a single break, and as straight as a board the entire distance. The tilted roof or hanging wall was a soft white sandstone, and the foot wall or floor, a compact blue shale.

The only apparent dirt in this handsome vein of coal was a band of white sandy clay about three feet from the roof that was from two to four inches wide; between this white band of clay and the roof the coal was hard, lustrous and brittle blasting coal; between the white band and the floor the coal was softer, full of smooth slips and straition marks, due to the pressure and movement, and showed a tendency to slack and break up more readily on mining. A sample was taken across the full width of this vein at several places that gave the following analysis:

Fixed carbon	55.57 per cent.
Volatile carbon	39.30 per cent.
Moisture	2.30 per cent.
Ash	2.33 per cent.
Sulphur	0.50 per cent.

Total100.00 per cent.

This demonstrates that the vein contains a fine grade of bituminous coal that is well adapted for steam or domestic

purposes. It burns with a free, long, oily flame, and the finest slack coal taken from this vein and sprinkled with water will burn up clean in a common wood stove.

A short distance above this big vein on the steep side hill, probably one hundred and fifty yards away, another vein three feet wide has been opened by an incline shaft ninety feet deep. It was half full of water, but on both sides of the shaft the vein was clearly defined dipping at an angle of forty-five degree and containing three feet of clean, bright, hard coal with a smooth, hard sandstone roof and a soft black shaley gouge under the coal about a foot thick, then a sandstone floor.

A sample across the vein thirty feet below the collar of the shaft, near the water; and thirty-two inches thick, gave the following analysis:

Fixed carbon -----	55.30 per cent.
Volatile carbon -----	38.20 per cent.
Moisture -----	4.30 per cent.
Ash -----	2.20 per cent.
Sulphur -----	Trace.

Total -----	100.00 per cent.
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The coal from this small vein is said to be fine black-smith coal by well known smiths who have used it.

The unconformable dip and strike of these two veins so closely associated is positive evidence of a local disturbance, as the steep pitch of both of them is of a deep disturbance.

A quarter of a mile further up the mountain, on the Griffith claim, a vein cropping has been exposed under the surface soil that shows 5 feet of clean black coal blossom, with a narrow band of white clay near the center of it, that lends the suspicion that it may be related to the big vein in the five hundred-foot tunnel. The Griffith vein is being developed at some depth by a cross-cut tunnel.

It is reported that there are two other beds of coal underlying and overlying the small vein from which the second analysis was given.

From the above it is apparent that this district contains a series of important coal veins carrying a very superior article of fuel well adapted for domestic use. That the series is badly disturbed locally by faulting is also evident, but whether these faulted segments will contain on a given section of land 5,000 tons or 5,000,000 tons of coal

is a question that only actual development can determine.

In passing up Horseshoe Creek from Hegsted's ranch to the summit of the Big Hole Mountain ridge, whose axis runs north and south, there is a raise of probably fifteen hundred feet and the three coal exposures with their sandstone enclosing formations all have the same general strike in a northerly direction and a westerly dip, which would indicate a series of steep faults and a monoclinial uplift. After passing over the summit the bedding of the formation continues to dip westerly towards Rexburg, where the coal beds may be found in the canyons that cut the western slope of the ridge and more conveniently situated in relation to the main valley settlements.

The writer made a special trip to study this feature in September but was unfortunate enough to strike a week of very severe weather in the mountains and had to abandon the attempt.

Reverting back to Horseshoe Creek, it will be noted that the main coal croppings are a mile apart, and if they represented the same horizon before the country was faulted, then the main fault segments must be a mile deep, and there is some reason to believe that this is the condition; and while the field may not be attractive to heavy capitalists or justify much equipment for some time, there is no question in my mind but that it contains a vast amount of fine fuel that will play a very important part in the future development of Fremont County and Idaho in general.

At a point two miles north of the Horseshoe Company's mine on the south branch of Packsaddle Creek a vein was discovered last fall by the Rammal Brothers that has since been opened by a sixty-foot tunnel. It has a similar strike and steep dip to the west as the others, and is three and a half feet wide of clean coal.

The coal in the face of the tunnel was hard and firm and came out in good big blocks, and although there was a local squeeze a short distance back from the face that pinched the vein off, it had recovered its size again. The hills in the vicinity of this mine are broken and benchy and would indicate considerable local disturbance.

The discovery in the oil well out in the main valley promises to be of the utmost importance and to indicate that the whole Teton Valley may be underlaid with coal. If the vein is there as described by the drillers, and it should

prove to belong to the same horizon as the Horseshoe series, other veins should be found closely underlying the first one, and by careful drilling some important information may be obtained that may justify expensive shaft development.

The excess of ash in the drill hole sample may not be a fair test of the vein as it is more than probable that some dirt would be ground in with the cuttings from the walls of the hole higher up.

The moisture result and volatile matter are very close to the other samples tested from the hill veins and both may belong to the same horizon.

Oil seeps are said to occur in swampy spots in several places along the Teton Valley, and oil half an inch deep in pools has been reported from a tributary of Shotgun Creek, near the north side of the county, but the writer has not personally seen any of these evidences.

A coal vein has been opened with some shallow work that shows twenty inches of clean coal at a point on the head of Camas Creek near the Montana line, and twenty-five miles northeast of Spencer, on the Butte branch of the Oregon Short Line railroad.

In a coal formation so closely associated with extensive rhyolite-lava flows it is not unlikely that under favorable conditions the rhyolite, which is evidently of later date than the coal-bearing sandstone, may have flowed sufficiently near some of the coal seams to change them into anthracite which, with such a low percentage of ash to start with, would be likely to produce an anthracite of very superior quality. This field is full of very fine prospects that warrant a systematic investigation and promise very important results in the fuel line, for which there is already an important local demand.

IDAHO COUNTY.

Idaho County is one of the northerly counties of the State that extends entirely across its width from the Montana to the Oregon line; it is of enormous extent and contains almost twice the area of any other county in the State.

Excepting for the broad basin-like plateau of Camas Prairie, where most productive crops of grain, vegetables and fruit are raised without irrigation, the bulk of this

great county is especially adapted for mining and contains a number of notable old placer camps, including Florence, Warren, Elk City, Newsome, Dixie and the Salmon River bars, whose combined output of gold exceed \$50,000,000 in value.

The general topography is one of abrupt canyons, including the main Salmon River and the main branches of the Clearwater with their numerous important tributary streams; between these streams are broad rounded mountain ridges, lending the evidence of a deeply eroded high plateau country now densely timbered with magnificent forests of pine, fir and tamarack.

There are no very high elevations, nothing exceeding ten thousand feet; the mountains to the south of the Salmon River are closely grouped in mass without any definite range system and form a very rugged region to travel in. The prevailing formations of Idaho County are granite with a basalt-covered belt bordering the western edge of the county and some crystalline metamorphic rocks in a narrow belt along the western slope of the Bitter Root range toward its eastern border, together with some extensive fields of acidic igneous rocks in the Thunder Mountain country to the south.

The most attractive and productive feature of Idaho County's numerous mining districts at the present time is the Buffalo Hump, or Robbing's mining district, situated fifty miles southeast of Grangeville, the county seat of Idaho County, from where it is approached by wagon road over an easy grade.

The discovery of the Buffalo Hump veins in 1898 was made the basis of one of those wild and woolly mining booms for which the western mining States are noted. This boom was short lived, however, for when the snow melted off the winter stories of great wealth, it was found that to win it would involve no small investment of money, muscle and time, but the snow did not melt the big ledges of gold-bearing quartz, which are still there, and just as big as ever, and their recent development is such as to warrant the anticipation that the glowing fairy tales told of their riches will be justified by the facts and actual bulion at no distant day.

The Buffalo Hump district probably holds the record for receiving the highest price for a ten-foot hole in the whole mining history of the State.

Mr. Charles Sweeny, who recently launched the big thirty million dollar mining merger in the Coeur d'Alenes, offered a quarter of a million dollars cash for the Big Buffalo vein, when its development did not exceed ten feet in depth, which figure was refused by the owners; he afterwards bought the property, when the excitement had died down a little, for about half that sum.

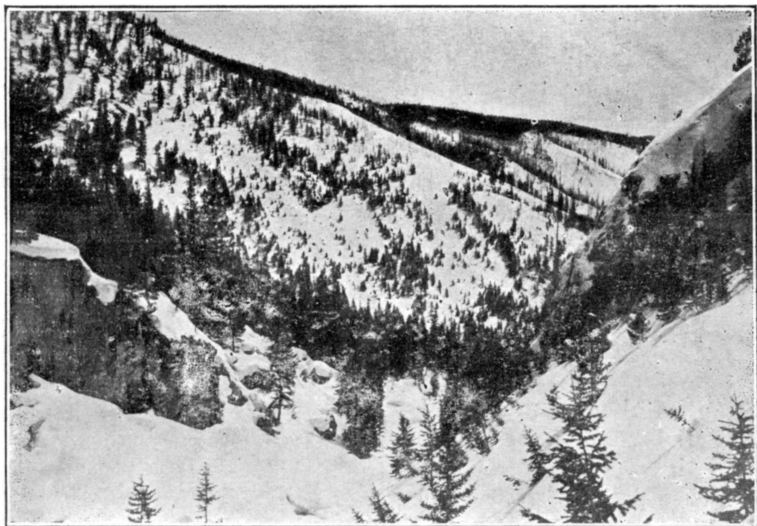
The Buffalo Hump summit is a sharp hog-back elevation of bare granite, which, viewed from some directions, roughly resembles the outline of a buffalo's back. The culminating point, or hump, has an elevation of eight thousand eight hundred feet above sea level; it is situated on the divide between the South Fork of the Clearwater River and the main Salmon River and is the highest elevation in a region of mountain country fifty miles square.

The country rock at the Hump district is practically straight eruptive gray granite of medium coarse grain. There are no dike rocks exposed over the present central area of the district, covering a belt of country six miles long by two wide, but this belt contains a parallel system of monster fissure veins of quartz that stand nearly vertical and strike almost due north and south.

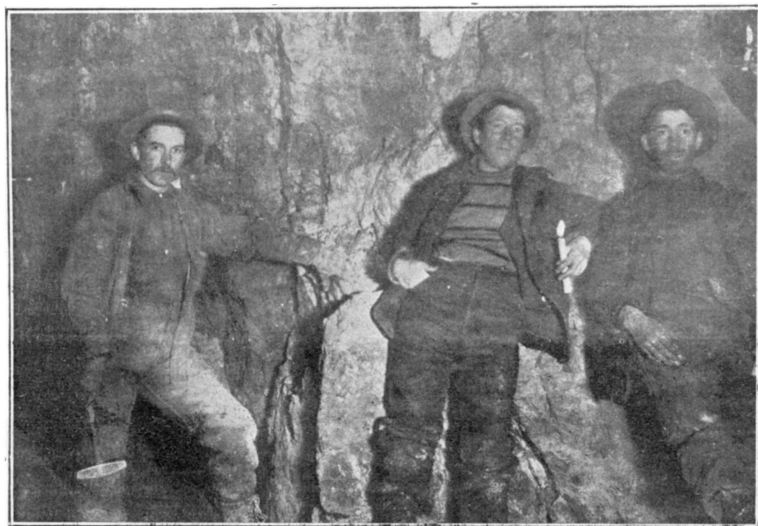
Well-posted local miners say that this belt contains a quartz vein from workable size up to 60 feet wide for every six hundred feet of its width, and after studying the surface of the belt for a while one will easily come to the conclusion that the statement is not an exaggeration.

The surface appearances of these great fissures are not attractive, owing to the excessive local ice action which has worn the veins down even with the enclosing granite walls, and at the present center of the district, including the Hump postoffice and the Concord postoffice settlements, some of the biggest ore bodies are situated in a broad flat glacial basin full of little benchy flats and swamps that form the head of Sheep Creek, in which situation the big veins are naturally eroded even with the inclosing formation and inconspicuous.

The Big Buffalo ledge, owned by the Buffalo Hump Mining Company, is located on the west side of this basin and forms the bed of one of the tributaries of Sheep Creek, which has cut a V-shaped trough along the soft wall of the vein for four thousand feet, exposing a succession of fine ore shoots for that distance; then the grade of the country drops off very rapidly, and at the first big drop



NO. 1—LAKE CREEK CANYON NEAR CRACKER JACK MINE.



NO. 4—CRACKER JACK VEIN, TWENTY FEET WIDE, BUFFALO HUMP.

an adit tunnel has been started on the vein which is already in several hundred feet. It is the intention to drive this tunnel back on the vein to the north which will develop the ore shoots as it goes along and undercut the discovery shoot at a vertical depth of nearly six hundred feet.

This property was opened by a shaft located at the discovery, on a little swampy bench near Hump town. This shaft is reported to be two hundred and fifty feet deep and in a cross-cut at the bottom level is said to show sixty feet of quartz between walls that carry over ten dollars in gold per ton on an average. This shaft produced some astonishing rich native gold specimen ore, pieces of which are still to be seen around the camp, that are nearly half gold.

A ten-stamp mill was put up on this property and run on a body of oxidized ore that was mined above a sixty-foot level in the shaft. This ore body was mined seven sets wide and seven sets high by about one hundred and sixty feet long and is locally reported to have produced gold bullion to the value of \$250,000. From a part of this operation, a tailings pile was saved said to contain 6,000 tons and average value of five dollars per ton in gold.

Owing to the enormous expense of pumping a shaft located in a swampy creek bottom, this operation was discontinued until the ground could be opened by the new drain tunnel now in progress.

This company's managers claim that the operation of the property did not pay, which is probably true under such adverse conditions, but the report that they have secured seventy claims in the district would indicate their faith in its future. After it is properly developed and equipped with the necessary milling capacity, run by water power, of which the company has plenty available and near at hand, all the gold won out of the ore of this great vein, over two dollars a ton should be net profit.

The veins of the Buffalo Hump are very clearly defined when opened under ground, and the ore shoots range from fifty to five hundred feet in length; the walls are usually smooth and hard, frequently polished, and the ore shoots are filled with a rather ribbony banded white quartz next to the walls that shades into a more massive variety towards the center with small vuggs lined with glassy crystals; they have evidently been formed by ascending mineral

solutions that filled pre-existing fissure spaces. This district is the highest in the region, has suffered less erosion than the adjacent country and the values are more likely, for this reason, to extend to great depth than in a placer district, the erosion of whose veins have produced millions of dollars worth of placer gold, like those of Elk City and Florence, near at hand.

The great quartz ore shoots of this district are usually quite thickly sprinkled at a short distance below the surface with banded lines and rich disseminations of iron pyrites, together with a varying mixture of copper, lead and zinc sulphides with free gold. The lead mineral here, as is usual in most Idaho Gold mines, indicates the richest gold values.

The free milling results obtained in this district vary from different veins, and in fact from different parts of the same vein. The deepest ore now being milled in the district is from the Jumbo vein. It is a straight hard white quartz from a depth of five hundred feet on the vein; it is richly sprinkled with iron sulphides, but shows occasional colors of native gold. The milling results save sixty per cent of the total value as free gold, fifteen per cent in the form of high-grade concentrates which net two hundred dollars per ton, and the balance going into a tailing pit for future treatment by cyaniding, to which method it is said to yield ninety per cent of the remaining values. Practically the same results as above were obtained on Cracker Jack ore, some of their higher grade material showing a little less free gold extraction, but just as good results on cyanide tests.

The country immediately adjacent to Sheep Creek Basin is very rugged and abrupt, a succession of deep cut canyons carrying large creeks and whose steep slopes are densely timbered. This topography will be appreciated by the statement that from the head of Sheep Creek at Hump Town to where the creek joins the Salmon River, the distance is only fourteen miles and the fall is fifty-seven hundred and fifty feet. These conditions mean a great deal for the economical development and operation of these veins. The accompanying picture, "No. 1," shows a view of Lake Creek canyon just below the Cracker Jack mine, which gives an idea of this topography.

The only properties producing in the Hump District during 1903 were the Jumbo and the Cracker Jack mines;

their combined milling capacity was equal to about one ten-stamp mill and their total bullion yield was one hundred and twenty-six thousand dollars. The accompanying cut, "No. 2," Buffalo Hump Bullion, represents the output of the month of July from four stamps on the Jumbo and five on the Cracker Jack. It weighed approximately nine thousand dollars, or about one thousand dollars a month a stamp. The five bars on the right are from the Cracker Jack mill and the three large ones from the Jumbo mill.

The five-stamp mill at the Cracker Jack was increased to ten in August and then shut down November first, pending the installation of electric power. The four-stamp mill at the Jumbo was increased to fourteen in October, and again to twenty-four on December 25th; the last ten are expected to be in commission by the 10th of January.

The new mill building at the Jumbo, built during the year, is of thirty stamps capacity, and the remaining six stamps will be put in during the winter to make it complete. This is one of the most substantially built and most conveniently arranged gold mills in the West, and contains, besides the stamp and vanner floors, a three-drill air compressor and electric light plant, the whole run by water power using two Pelton wheels fed by sixty inches of water under a head of six hundred and eighty feet. The cut, "No. 3," Jumbo, thirty-stamp mill, shows the outside of the building with the fire protection being tested from the power line which runs the machinery.

THE JUMBO MINE.

This property is situated in the canyon of Deer Creek four miles southeast of Hump postoffice and over a thousand feet lower. The vein strikes square into a bluffy granite mountain slope of nearly half pitch. The quartz exposures at the surface are nowhere over fifty feet long and about ten feet thick, rather hard and lean looking.

There are three adit tunnels driven on the vein which are one hundred and ninety, five hundred and fifty, and eight hundred and fifty feet in length respectively. The vein stands nearly straight on end and the face of the eight hundred and fifty-foot tunnel, known as No. 3, is five hundred and twenty feet vertically under the top of the first ore shoot in tunnel No. 1. All this work is connected underground and exposes two great shoots of definite clean gold ore. One of these shoots is two hundred and fifty

feet and the other three hundred feet in length by five feet to seventeen feet wide, which from constant mill tests made as the development has progressed has shown an average value for everything put through, which included the full width of the vein where it was seventeen feet between walls, of over ten dollars per ton in gold.

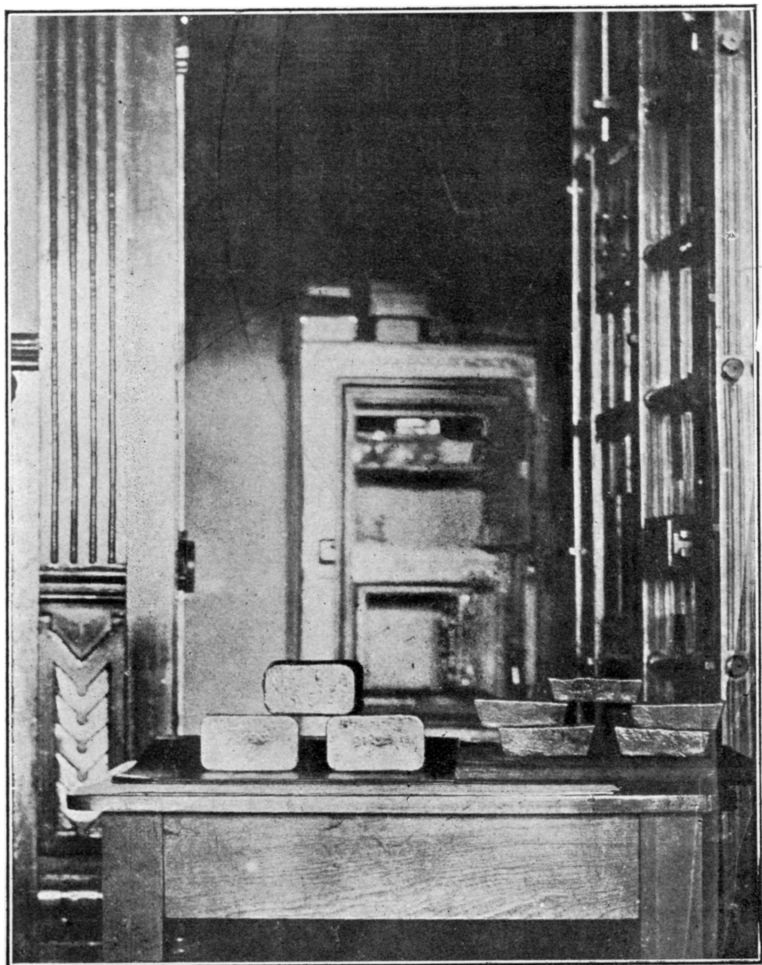
There is now blocked out in this mine measureable ore reserves amounting to fully one hundred and fifty thousand tons, and the new No. 4 tunnel now being pushed in from the level of the mill bin will, it seems reasonable to expect, more than double the present ore reserves, and lift the Jumbo away up in the list of gold quartz bonanzas.

The development of the Jumbo, its design and arrangement, including all the surface equipment, presents one of the finest examples of modern mining practice to be found anywhere in the West, and hewed as it was out of one of the most rugged phases of Idaho's rugged topography, stands a monument to the remarkable energy of its able manager, Mr. Frank Brown, a local mining man.

Mr. Brown dates his first mining experience from Gilpin County, Colorado. He was running a little store business at Florence when the Hump excitement broke out; he sold his business and bought a half interest in the Jumbo claim and started in with nothing but his bare hands. In 1898, with his associates, he bonded the property and had it turned down several times by expert talent. He finally induced some business men of Grangeville and Lewiston to put up enough money to build a two-stamp mill on the ground. The first month's run with this little plant produced a gold brick weighing two thousand dollars and demonstrated that the values in the big fissures of the Hump could be saved and made to yield a very handsome profit to simple mechanical separation.

After this substantial demonstration of his locally considered boom stories of the Hump, Mr. Brown received the enthusiastic support of local investors, with the result that he has developed them a gold mine that amounts to a bonanza and whose lasting qualities are among its most evident features.

The mining fields of Idaho could use an army of such boomers as Mr. Brown, men who are willing to back their judgment with their time and muscle, and there are several more such men in the Hump at the present time following in the footsteps of this successful pioneer, and



NO. 2.—BUFFALO HUMP BULLION.

the various mineral showings they are making are likely to afford some very entertaining mining literature in the near future.

Mr. Brown has recently been appointed general manager of the Cracker Jack mine, which will mean the same broad plan of development for this mine that has been accorded the Jumbo and the shortest advisable cuts to the dividend class.

The Cracker Jack mine, located two miles northeast of the Big Buffalo and Hump Town, and four miles north of the Jumbo, is looked upon as having even a bigger future as an ore resource of fully as good if not better range of value in gold as the Jumbo, and its location high up on the very steep slopes of Lake Creek canyon affords a remarkable advantage for deep tunnel work. This property carries a monster fissure of gold-bearing quartz that is even wider than the Jumbo, and has one ore shoot opened to a depth of one hundred and forty feet in an upper tunnel, where it has been drifted on three hundred feet, with a face of rich ore still going south that is ten feet wide.

The accompanying cut, "No. 4," "Cracker Jack Vein, Buffalo Hump," was taken where the vein is twenty feet wide and sampled twelve dollars per ton. The number of men in this picture spoil the effect and it does not show the full width of the vein, but will serve to give an idea of its size.

The ten-stamp mill at the Cracker Jack is situated right on the mine high up on the mountain side and was shut down on November 1st to save the excessive cost of hauling cordwood up hill and hauling the ore down from the upper tunnel to the mill, pending the completion of a new power plant, where power will be transmitted electrically from the company's valuable water privilege further down the canyon.

The machinery for this new electrical equipment, also for an air compressor for the mine was either on the way or on the ground by December 20th; it was thought it could be put in running order within sixty days, when the mill will probably be started again.

Pending the installation of this new machinery, development at the mine has been energetically pushed forth; a new cross-cut tunnel was started at the top of the mill which cut the big vein at a point over two hundred feet deeper than the upper tunnel and several hundred feet

further north. Late reports from the mine say that the main vein in the new tunnel is just as large and rich as it was above. It is now being developed with a drift heading under the upper work, which will add an enormous reserve of ore to the already large bodies exposed; two smaller veins of workable size were found in the cross-cut from which mill runs have been made that yielded eight to ten dollars per ton in free gold, and from present appearances the Cracker Jack will shortly justify its name.

There are quite a number of new properties being developed in the Hump this winter and a large force of men are employed.

Of these the Atlas, Ajax and the Lucky Lad mines are each equipped with steam hoisting machinery and are sinking in large ore bodies, while the Big Buffalo, Del Rio, Colonel, Mother Lode, Buffalo Chief, Wise Boy and half a dozen other properties are being opened by adit tunnels at considerable depth, and in several instances are already showing large reserves of fine pay ore.

The product of the Jumbo mine for November, with fourteen stamps dropping, was \$11,500 buillion, and in addition a big yield of rich concentrates. It seems very probable at this date that the Jumbo and Cracker Jack mills combined will operate forty stamps through full nine months of 1904, and if they do their production should exceed the total production of gold in the whole of Idaho County during 1903.

The Buffalo Hump district is ripe for another boom, a boom in which legitimate and conservative mining investors can anticipate rich rewards.

THE ELK CITY DISTRICT.

This district is one of the old historic placer districts of Idaho. Its total production of placer gold is estimated at \$10,000,000. It is situated among the low rounded ridges and flat tributary streams that empty into the upper South Fork of the Clearwater.

Elk City, a neat little mining town with a good hotel and several good business houses, is situated twenty-five miles north of Buffalo Hump. The formation here is a gneiss, of much older date than the eruptive granite of the Hump, a coarse granular rock, carrying an excess of bronze-colored mica arranged in wavy lines, and lenze shaped segregations of feldspar.

The low rounded ridges are covered with a deep mantle of sandy soil and densely timbered with black pine. Almost every little flat tributary gulch and draw over an area fully twenty miles square has been worked over for placer gold, and practically the only boulder residue left in these miles of old placer pits is gold-bearing quartz, of which there must be many thousands of tons ricked up, and while quartz vein croppings are scarce, investigation proves that the district is reticulated with steep pitching fissure veins that vary all the way from a foot to twenty feet wide.

This district is probably the most deeply eroded placer district in the State. The general elevation of the placer beds are about 3,500 feet above sea level, and the grass was just as green there on the 20th of October as it is in the upper Salmon River counties on the 1st of May, and the district should afford an ideal field for insistent and intelligent prospecting with the chance of striking big bodies of good pay ore, and possibly sensational shipping values, for it is evident that the source of the rich placers was not entirely exhausted in spite of the deep erosions of their parent veins, and it is not at all improbable that the district will become an important producer of quartz gold in the future.

The American Eagle mine, situated on one of the placer tributaries eight miles east of Elk City is opened on a vertical fissure of white quartz ten feet wide, accompanied with a narrow dike of fine grained igneous rock speckled with quartz crystals. The strike of this vein is northeast and southwest.

The development consists of two adit tunnels five hundred and one thousand feet long respectively, and connected with raises to the surface. The general massive white quartz filling of this vein runs about four dollars in gold. It makes several shoots of much richer ore; one of them is from two to ten feet wide and three hundred and fifty feet long in which the quartz is more shattered and richly impregnated with brown cube iron (oxidized pyrites) and carries an average milling value of twelve to fourteen dollars per ton.

The American Eagle mine was equipped with a ten-stamp mill with Wilfley tables in the fall of 1902. The mill was started January 1, 1903, and was run steadily during the year, producing \$75,000 worth of gold bullion or about one twenty-eighth of the total gold yield of the

State, a pretty good showing for a starter in the quartz gold history of this old placer district.

The lower tunnel on this vein was run at an elevation of not to exceed twenty feet above the level of the creek; it passed through a shoot of ore 75 feet long and four feet wide that contained average values of thirty-five dollars per ton. In driving through this ore shoot quite a sprinkling of live iron pyrites were encountered, rather coarsely crystalline and containing high values in gold up to twenty ounces, and in addition to this some bunches of tellurium ore of the variety petzite, a telluride of gold and silver.

Tellurium ore has frequently been reported from many points in Idaho, and there is good reason to believe that it is widely distributed over the mining districts of the State, but this is the first instance that I have personally met with it. I was presented with a handsome specimen of the mineral at this mine, and to make sure of its identity I sent a piece of it to Mr. Henry E. Wood, the well known assayer and chemist of Denver, who has probably handled as many telluride samples as any man on earth, and received the above classification from him. The specimen tested assayed at the rate of seventeen ounces gold and four hundred and eight ounces silver. This sample, of course, was mostly quartz and a specimen of the clean greasy black mineral would have run very high. I saw pieces of it in the company's office at Spokane which had been roasted and was literally matted over with beads of light-colored gold after the manner of a rich specimen of Cripple Creek ore.

What the discovery of this rich mineral will mean to the American Eagle company is hard to say. It may continue to be found in isolated kidneys, but occurring as it does just at the horizon of change from the completely oxidized condition of the vein, there is a strong probability that below the water level of the creek the quartz will be highly charged with pyrites and may probably carry enough of the petzite to sweeten it up to a sortable, high-grade shipping product.

It is gratifying to be sure of the occurrence of this rare gold-bearing mineral in Idaho, for its discovery and development has led to such sensational results in the Colorado camps in the past few years. Its discovery in our extensive areas of almost virgin mineral territory may hold similar agreeable surprises.



NO. 3—JUMBO 30-STAMP MILL. TESTING THE FIRE PROTECTION.

Among the other quartz properties of the Elk City District which have considerable development and good ore in sight, the Buster, Blue Ribbon and Cleveland mines rank high and all carry similar large quartz fissures to the American Eagle with fine pay shoots of rich ore. There are half a dozen other quartz properties being developed in this district and large shoots of good grade milling ore have been uncovered at several points and the outlook for this old district is very bright indeed.

From Elk City it is about fifty miles to the terminus of the Northern Pacific branch at Stites on the Clearwater River, and Newsome Creek is passed on the way out, where some important placer mines are successfully operated each season, as are also some gold quartz veins to a small extent.

Twenty miles west of Grangeville on the edge of Camas Prairie there is a promising little gold quartz district, part of which is embraced in the grain fields. This district has several fine prospects. One of them has been developed to considerable extent and has an ore shoot exposed that is three to four feet wide of red honey-combed quartz in granite walls, which averages ten dollars per ton in gold.

Two copper-bearing veins were worked with a small force of men on the west side of Salmon River a short distance below White Bird. There are some very promising gold-bearing copper veins along the narrow divide that separates the two great canyons of the Snake and Salmon Rivers.

At a point directly west from Lucile postoffice on the Snake River slope, the Blue Jacket, owned by Morton and Johnson, has been developed with a three hundred-foot shaft and three levels. This deposit acts like a great shear zone in the dark green igneous rock of the district and contains some good sized bodies of massive chalcopyrite ore that yields excellent results in gold and silver.

The Great Eastern and Great Western mines, lower down the mountain near the Snake River, have considerable ore stacked up on the tunnel dump of a good sized vein, which carries ninety dollars per ton in combined copper, gold and silver values.

Quite a lot of prospecting work was done in a promising gold district east of Lucile where gold-bearing intrusive dikes and quartz veins cut an extensive horizon of slates, schists and limestone beds which form the abrupt canyon

slopes. This district is noted for remarkably fine specimen ore where the gold seems to be precipitated on brown iron cubes. A rich strike was recently reported from the McKinley mine, where the vein was tapped at depth of nearly three hundred feet and disclosed an ore body fully twenty-five feet wide, said to contain values as high as two or three ounces in gold per ton.

A new placer enterprise was launched near Goff during the year in which several prominent Weiser people are interested. A large flume was constructed to convey the waters of Little Salmon River on to a high bar that borders the west side of the main river between Goff and Ruggles. The flume was well under way in October. This bar is known to carry high values in coarse gold. Several of the river bars in the vicinity of Lucile are reported to contain traces of native platinum, and the formation at the mouth of Little Salmon are favorable for a similar occurrence there, and it will be well to look out for it. At Grouse Creek, near Resort, the new hydraulic equipment on the Hathaway placers was successfully handled through the water season and produced a largely increased yield of gold.

There are several other placer properties in the vicinity of the Lake Creek Hot Springs, and in some of them the clean-up boxes produce a large quantity of rough sapphire crystals (corundum), some of them indicating gem qualities. Within eight miles of Resort, above the Bogan placers, some very large and extensive deposits of gold ore and gold-bearing zinc-lead ore occur which promise to form the basis of a good sized camp. The prevailing formation around Resort is gray granite.

It is only twelve miles north from Resort to the Marshall Lake-Bear Creek district. This district received considerable attention during the year and some important deals were set on foot.

The Marshall Lake district has the reputation of producing some of the finest native gold specimen ore of any camp in the State. The general formation is mica schist that is cut at right angles to its strike with well defined fissure veins. The veins are not large; they vary from one to three feet, however, and in places form into lense-shaped shoots ten to fifteen feet wide.

These veins are filled with oxidized brown quartz and white quartz that is in places well sprinkled with iron and

lead sulphides and coarse native gold. Occasional patches of soft amorphous lead gray mineral occurs in the ore which runs several thousand dollars in gold when assayed separately and may prove to be a combination of lead and tellurium.

The advantages for the rapid and economical development of the mines of this district are most exceptional. The fissure system is cut almost at right angles to its strike by the canyon to a depth of fifteen hundred or two thousand feet, developing the veins by a natural shaft, as it were, from which adit levels can be started and run in on the veins at convenient horizons on either side of the canyons, while the creek flows a large stream of water sufficient to afford fine water power, and the steep canyon slopes are well timbered, so that mining and milling can be very economically and profitably carried on, although the veins are not as large, for they carry high proportionate values, ranging from ten dollars to one hundred dollars per ton in average samples, and according to recent advice from the district several hundred pounds of ore have been extracted from the Kimberly vein which is all matted together with shreds of coarse native gold that is thought to contain values at the rate of several thousand dollars per ton in gold.

The Kimberly and Jewell group of ten claims, in which this rich discovery was made, is under bond to a responsible company of New York capitalists headed by Mr. James L. Hill, who are locally represented in Idaho by Doctor Law.

This company has already paid ten thousand dollars cash on the purchase price of the property and from present appearances the deal will be closed and a mill put up on the property in the early spring.

The veins of Marshall Lake in no small degree resemble the small specimen bearing schist fissures of Grass Valley, California. That their development may produce as many millions in precious bullion is a consummation devoutly to be wished. A great many very promising properties have been located in the district and present some good opportunities for investment. Marshall Lake district is most conveniently approached from Weiser over the Pacific and Idaho Northern to Council, then by wagon road via Salmon Meadows to Burgdorf's Hot Springs at Resort, where excellent hotel accommodations can always

be had. From Resort, it is about twelve miles over a good trail to the mines.

WARREN DISTRICT.

The old placer camp of Warren is situated eighteen miles east of Resort and is the last important settlement on the road extending from Council to the Thunder Mountain country.

The Warren district has a placer gold record of \$15,000,000 and there still remains some extensive stretches of flat meadow land which is especially adapted for dredging, and if intelligently handled by that method with the proper machinery should justify a big investment which would pay handsome profits.

The upper reaches to Warren Creek, especially in the vicinity of the town, are traversed by numerous steep pitching fissure veins of gold-bearing quartz in gray granite that range from one foot to five feet wide. The values in these veins run high in gold and carry some associated silver sulphide minerals which produce very rich concentrates, and causes some loss in milling.

Among the quartz mines of this district the Little Giant has been by far the largest producer and has turned out gold bullion estimated at upwards of \$300,000. and during its operation milling values of fifty dollars per ton were common. A long tunnel is being projected to develop this vein at considerable depth and reduce mining costs.

The Silver King mine, also close in to town, is equipped with a stamp mill and was operated during the year under the management of Mr. Ambrose Stuart for an eastern company, who own a very promising group of claims. In the same vicinity, the Gold Reef Mining Company is developing a promising fissure, and there are several other important quartz projects on foot in the vicinity that are likely to produce good results.

The veins at Warren are numerous and somewhat resemble those of Marshall Lake in size and values, only that the prevailing formation here is gray granite unpregnated with monazite. These veins make up in value what they lack in size and if systematically developed ought to yield large profits.

THE THUNDER MOUNTAIN COUNTRY.

The much advertised Thunder Mountain country covers the whole drainage of Big Creek and laps over the drainage of both the South and Upper Middle Forks of Salmon River in the extreme southeastern corner of Idaho County, a region of rugged mountains fifty miles square, consisting of volcanic formation of a prevailing acidic type of which greenish gray rhyolite, quartz, porphyry and trachytes are prominent members.

This field is bounded on every hand by the central granite mass of the State. The source of this great field of igneous rock is evidenced in a hundred prominent cone-shaped vents. There are few elevations over nine thousand feet, but the maze of deep cut V-shape canyons, abrupt, bluffy and talus covered slopes and sharp ridges form a tedious and difficult country to travel over.

The two most prominent centers of operation in this great field at the present time are around Roosevelt and along the upper tributaries of Big Creek, a large stream that enters the Middle Fork of Salmon River a short distance above its confluence with the main stream.

These two districts are about thirty miles apart and show a sharp contrast in their mineral occurrences.

In the Big Creek district the ore occurs as gold and silver-bearing massive quartz veins or altered and silicified dikes that range from ten feet to several hundred feet wide, and are often richly mineralized with massive iron pyrites, associated with sulphides of antimony, copper, lead and zinc, while in the Roosevelt district there are no true veins at all, and scarcely any free quartz, but the values have been found associated with a fine dissemination of iron pyrite permeating sheeted flows of rhyolite lava, particularly around the crater vents of the same, and concentrated on carbonaceous shale layers included in crater basin deposits of solidified volcanic mud, also on taley bed planes and joint lines.

ROOSEVELT DISTRICT.

The principal properties operated during the past year near Roosevelt were the Dewey, Sunnyside, Fairview, East Dewey and H. Y. group, whose crews varied from six to twenty-five men in October, together with a number of smaller ventures working less than six men. There are

about 400 men employed in the Thunder Mountain country this winter all told, including the Big Creek section and other outlying sections.

The property owned by the Thunder Mountain Gold and Silver Mining and Milling Company, locally known as the Dewey mine, is equipped with a ten-stamp mill which is the only quartz mill in the district at present. This mill was made in sections and packed in on mules, was placed on an unsecure foundation, which gives a great deal of trouble and causes a loss of time, but the mine was energetically worked and the mill kept in operation several months with a materially increased gold yield for the year over that of 1902.

At the Sunnyside mine a large amount of development work was accomplished during the year that has proven a bedded area of gold-bearing igneous rock two thousand two hundred feet in length by one thousand five hundred feet in width and shows at several points to be seventy-five feet thick. The lowest estimated average value of this great mass of material made by the company's manager, is six dollars to eight dollars per ton in gold.

The H. Y. group of claims, situated on the southeasterly rim of the Dewey Basin, were purchased last fall by an eastern company who are working a force of men this winter and are said to be finding some very good values in a great overflow bedded deposit similar to that of the Sunnyside.

The East Dewey was driving two tunnels in the fall which were reported to be in good milling ore.

The Fairview mine is being developed with a long cross-cut tunnel on which good progress was made during the year.

The Gold King and Toronto properties were working a crew of men and had accomplished fully 400 feet of work on the property in October.

THUNDER MOUNTAIN WAGON ROAD.

The development of this district has been seriously retarded by its remoteness and the excessive cost of transporting supplies. This feature should be materially improved upon by next fall by the completion of the Thunder Mountain wagon road, for the construction of which the State appropriated \$20,000 and the Dewey and Belle of Thunder Mountain Companies \$10,000 each.

The contract was let for this work to a responsible firm operating under the supervision of a superintendent appointed by the State. This new road leaves the Long Valley road in Boise County at Warner's ranch and goes in by way of Scott Valley over Trail Creek summit to the South Fork of Salmon River and up Cabin Creek over another summit and down Trout Creek; thence down Johnson Creek to Yellow Pine Basin; thence up East Fork Creek and over a summit to the head of a tributary of Monumental Creek and down that stream to Roosevelt.

Owing to the scarcity of labor the contractors were unable to secure the necessary help to complete the road during the past summer. It was built out from the west end about forty miles to a point on Johnson Creek near the mouth of Trappers Flat Creek, also some work at the Roosevelt end, amounting to about two-thirds of the total distance, with slightly less than half the appropriation used, and the contractors feel that they will be able to complete the work before the close of next season so that supplies can be gotten in on wagons or sleighs at less than half the cost involved last fall.

This road passes through a rich mineral country a good part of the way, including a new and important gold camp in the Warm Lake district where the character of the ore is similar to that of Buffalo Hump district—iron stained quartz sprinkled with pyrites and containing values ranging from ten dollars to thirty dollars per ton, in a similar gray granite formation, cut by numerous porphyry dikes.

The Sunbeam group in this new district carries a well defined fissure in a contact of granite and porphyry that is four to twelve feet wide and can be traced along its strike by prominent croppings and float ore for a distance of three thousand feet. The general average of all the ore exposed samples ten dollars per ton in gold and two dollars silver per ton.

This property was purchased from the original locators late in the year by the Fidelity Mining Company. It has a number of shallow openings indicating an extensive resource of pay mineral. A considerable force of men are at work on the mine this winter. The ground is easy to work and is surrounded by every natural facility for cheap development, in the way of a forest of magnificent yellow pine and tamarack, immense water power privileges and deep cross-cut tunnel advantages.

There are two other properties of similar character to the Sunbeam being developed in the Warm Lake district this winter and it promises to develop another new and profitable center of gold mining activity in the near future.

BIG CREEK DISTRICT.

This district contains some of the largest deposits of gold and silver-bearing ore in Idaho. It is reached from Council, the present terminus of the Pacific and Idaho Northern Railway, by wagon road via the towns of Salmon Meadows, Resort and Warren; thence by pack trail across the South Fork of Salmon River and over Elk summit. There is considerable intelligent development work in progress among its mines this winter.

The Werdenhof Mining and Milling Company's property, consisting of a group of twelve claims, is equipped with substantial cabins, warehouse, blacksmith shops, etc., and working a crew of twenty men. The country rock is altered granite and porphyry belts.

A great mineralized dike crosses this property in a north and south direction that varies from thirty to two hundred feet in width and contains large shoots of sulphide ore carrying average values of five dollars to eight dollars per ton, with occasional stringers of ore that run very much higher. The development this winter is being confined to a system of east and west fissures that cross the main dike.

One of these veins, known as the Octopus, is being opened by a deep tunnel for the permanent development of the whole group. This tunnel will be continued for a distance of one thousand six hundred feet and is now in three hundred feet. The Octopus vein has an outcrop fully sixty feet wide and carries values of about eight per cent lead and three dollars to twelve dollars in gold, with some silver.

About two hundred feet further north the Keystone vein carries very little of the base minerals, and is more of a free milling character, showing a pay streak three and one-half feet wide containing thirty-five dollars per ton in gold.

Still further north, less than two hundred feet, the Natulus vein whose outcrop varies from five to twenty feet in width samples eleven dollars per ton in gold, a large per cent of which is free milling. This company contemplates the erection of a mill and cyanide plant in the fall of 1904, and the tonnage of mineral that may be blocked out by that time will undoubtedly justify a large plant.

The Independence mine on the South Fork of Smith

Creek was purchased by J. B. Eldredge of Boise from Daniel C. McRea September 1, 1902. This property consists of twelve claims and fractions running forty-five hundred feet along the ledges. The country rock at this point is granite and porphyry with some belts of schist, altered lime and slate. This property carries three great quartz veins or zones one hundred to two hundred ten feet wide. The largest one has been cross-cut at two places about three thousand feet apart and shows a nearly solid body of blue quartz heavily charged with sulphides and said to average seven dollars to ten dollars per ton in gold across the entire width, together with some included pay streaks of important size containing purple fluorite quartz in which tellurium has been detected and which are said to average from one hundred dollars to two hundred dollars per ton in gold.

The two other ledges averaging from one hundred to one hundred fifty feet wide, are also heavily mineralized and some good assays have been obtained from them at the surface, but no work of importance has been done to show them up. Almost all the country rock between these great ledges is mineralized and carries light values in gold and silver.

The ores of this property have given some very satisfactory results to laboratory cyanide tests, and if they work out in practice the proposition should prove of enormous value as the ledges are so large the ore could be very cheaply mined by open quarry work for years.

The Blackfoot Gold Mining and Development Company's property, located on the head waters of Big Creek is finely situated for natural advantages tending toward the economy of operation, with plenty of timber and water privileges at hand to supply a hundred stamp mill.

There are three lodes crossing this property, one a contact sixty feet wide between granite and porphyry. It is well mineralized and carries gold values ranging up to thirty dollars per ton. A parallel fissure three hundred feet to the east of the big lode yields ore assaying twenty dollars to one hundred dollars per ton, and a third fissure two hundred feet west of the big lode is ten feet wide and has given assay results of twelve dollars to fifty dollars per ton. There is a crew of eight men working on this property who are well housed and have ample supplies on hand to last until well into next summer.

Near the Independence and on the strike of the same great ore bearing zone the Crown mine is working seventeen men cross-cutting a series of half a dozen veins of ore that range all the way from ten feet wide to a hundred feet wide, that are generally heavily mineralized with pyrites. The tunnel is so admirably situated that it gains a foot in face depth for every lineal foot run. This tunnel has been driven two hundred feet and has passed through an immense body of massive, kindly looking bluish quartz, often carrying half its weight in bright iron pyrites. The Crown company sample their ores very frequently and have a long series of assay results from different assayers, and also varying results from same pulp and same assayer. This discrepancy is supposedly due to the occurrence of tellurium compound in the ore, which is very probable, as there is strong evidence of its occurrence in the ores of that vicinity and is borne out to some extent by occasional very high values obtained, and it is not unlikely under the circumstances that bodies of mineral carrying shipping values even from that remote section may be disclosed.

The Glasgow and Dundee and half a dozen other properties in this section are being developed this winter that have similar great zones of mineralized rock. Further down Big Creek, at Copper Camp, the Diamond Chief Mining Company have a showing of copper mineral that if situated near railway transportation would amount to a bonanza. They have a series of parallel veins three and a half to thirteen feet wide opened by shallow works at a dozen different points showing average values of ten to twelve per cent copper and five dollars to twelve dollars in gold per ton. They are working a crew of six men.

The Big Creek mines promise to develop such a source of mineral traffic as to command a railway, even as remote as the district is. All the ores of this district carry silver, often in excess of gold values and most of them copper and lead minerals, together with a prevailing antimony combination.

The Big Creek district is by no means a new district, for the Cleveland mine, not far from the Silent Friend group, was quite extensively developed by a Spokane company over thirteen years ago and some small lots of ore were shipped out by pack train to the Ketchum smelter on Wood River that sampled over two hundred dollars per ton, but the cost of shipping ate up all the profits, and as

the ore was too base to be turned into bullion on the ground the enterprise was abandoned, but metallurgical science has made rapid advances during that time, and it is safe to say that if big reserves of ore carrying an average value of anything like ten dollars to fifteen dollars per ton gold can be developed, a process will doubtless be found to extract a handsome margin of profit, even in that remote district. The new Thunder Mountain road can be tapped at no very great expense and the present winter's campaign of development will very probably warrant an outlet that way.

It will be seen from the above that Idaho County is a mineral empire of itself. It has a vast area of territory, covering almost the whole northeast quarter of the county, that is virgin territory, practically unexplored, but known to contain some very likely gold and copper-bearing districts, and it is not an exaggerated prediction to suggest that the extensive development of its already well known districts will, within a few years, produce as much gold as the total output of the State amounts to at the present time.

KOOTENAI COUNTY.

This county occupies the extreme northern pan-handle end of the State. It extends from the British Columbia line one hundred and thirty-eight miles south by forty-eight miles wide for half of its depth from the north, and thirty-three miles wide through the southern half of the county.

Kootenai County contains many beautiful lakes, rivers and streams. It is richly timbered over a good part of its area, with some good agricultural land. Its formations comprise great areas of granite, gneiss, bosses and terraces of lava, mountain uplifts of quartzite, limestone and schist. It has a rapidly growing importance in a mining way which is destined to add largely to the State's total production of gold, silver and lead. Rathdrum, situated on the main line of the Northern Pacific railway, is the county seat.

Among the most important mining properties of this county the Idaho-Continental mine stands high and in the dimensions of its ore showings savors of some of the monster deposits of Shoshone County.

This embryo bonanza is situated near Port Hill and is being opened on a wide fissure vein or zone in schist which is thirty feet wide, of ten per cent lead concentrating ore containing half an ounce of silver to the unit of lead.

The development on this property consists of a six hundred and fifty-foot tunnel driven on the vein, which has gained a face depth of five hundred feet, which gives an idea of the abruptness of that section of the county. There is also a shaft two hundred feet deep tapped at the bottom by a cross-cut tunnel.

This great vein or zone carries a pay streak of high-grade shipping ore one to three feet wide that averages sixty per cent lead and thirty ounces silver per ton. Of this first-class ore the company had out and on the dump in December, 1903, sixteen hundred tons ready for shipment and expected to get fully twice that much to market during the winter while the sleighing was good.

This remarkable deposit contains two million tons of ore above the tunnel level, according to the estimates of the company's engineers, based on the showing made by the present development. The vein pitches steeply to the northwest and strikes about northeast; both walls are schist, with a granite country bounding the mountain axis on either hand. The vein can be worked by adit or cross-cut tunnels to a depth of eleven hundred feet and is surrounded with very natural advantages in the water for power, timber and opportunities for handling the ore by gravity which insures economical mining costs and promises to make a producer of very considerable caliber.

This company is figuring on the construction of a large concentrating plant in the spring and a branch railway from the Great Northern to connect with the mines, which are twenty-two miles back from the main line. The survey has already been made for the new branch and a very feasible route and grade has been obtained, and if the present plans are carried out there will be something doing in the lead-silver industry of Kootenai County by the close of 1904.

The Blacktail Mining District, situated ten miles south of Sand Point, carries rich silver ores. It is rapidly coming to the front and promises to make one of the best camps in north Idaho at no distant date. Several important mining deals were made in this district during the year and a good deal of development is in progress this winter.

For the natural beauty of its setting and surroundings, one could look the world over in vain to find a more charming situation for a mining camp than that presented by the Lake View Mining District, on the southern shores of Idaho's most beautiful sheet of water, Lake Pend d'Orille.

The principal mining development at this charming spot is on the property of the Pend d'Orille Mining & Reduction Company, and the Keep Cool mine, adjoining it.

Both of these properties are opened on the same great contact fissure vein, yet they carry distinctly different classes of ore. The Pend d'Orille Co.'s mine carries three thousand feet of tunnel development, which has gained a face depth of two hundred and fifty feet at one point and exposes enormous shoots of silicious silver ore ten to sixty feet wide between perfect walls of slate and quartzite and carrying an average value of twenty ounces silver and one and a half dollars gold per ton, while the Keep Cool mine, with even more extensive development, carries similar enormous shoots of fine concentrating lead-silver ore.

Here is an opportunity for some wandering capitalist looking for a desirable place to live. The combination of these two great mines would form the basis of a smelting enterprise of big caliber, for this district affords every element necessary for a successful smelter charge, including, besides extraordinary reserve of ore, abundance of pure limestone, iron and silica, together with an unlimited source of charcoal fuel. This in practical hands with sufficient means to put the venture on its feet, success would be assured and is worthy the serious attention of investors in this line.

There are several fine tracts of placer ground and associated gold-bearing quartz districts throughout the county which annually yield an important amount of bullion and are attracting a good deal of attention, and as a field for prospectors this county still contains extensive areas of promising virgin territory.

LATAH COUNTY.

This populous little northerly county is situated on the west border of the State directly south of Kootenai and in the famous Palouse country and is noted more for its grain fields, which grow without irrigation, than for its

minerals. Yet it contains mineral deposits of gold and silver-bearing ore, of opals and mica; the mica mines especially exhibit promise of great commercial importance.

Moscow, one of the largest towns in Idaho, is the county seat and the location of the Idaho State University, which embraces a mining school, presided over by Dr. Alfred S. Miller, one of the most capable scientists and able educators in the United States, whose graduates are already occupying prominent positions as assayers and mining engineers in the Coeur d'Alenes and other mining districts. The equipment of the mining department is as follows:

EQUIPMENT.

In September, 1897, the department was assigned a room, 15x30 feet, in the basement of the main building, which was used for a class room, a geological laboratory and museum, an office, a library and reading room, blow-pipe work, a drafting room, etc. The department also had a small corner in room 13, which had no outside window. This room was intended for a wet assay room. To this room is attached a small fire assay room, which was not furnished with furnaces or tools by which an assay could be made. Since that time the department has received, by donation and from appropriations made by the Board of Regents, about \$3,000 worth of supplies and apparatus.

The Department of Geology and Mineralogy receives the leading geological journals and has a library of the best books on geology and mineralogy, the reports of the United States geological survey, many reports of State geological surveys, geological maps, a petrographical microscope (having a circular revolving stage with silvered, graduations and vernier, Bertrand's lens and quadrant eye-piece with revolving prism, quarter undulations mica plate, quartz wedge, gypsum plate red of the first order, eye pieces fitted with cross hairs, and other accessories), prepared slides of typical American rock, a hand machine for the preparation of microscopical sections of rocks, apparatus for blow-pipe work, crystal models and glass cases containing mineralogical and geological specimens.

Among the geological and mineralogical collections are a series illustrating the physical characters of minerals, the United States educational series of rocks, a collection of ore properly grouped, and a collection of fossils arranged according to the geological formations.

The Department of Mining and Metallurgy has samples of battery screens, samples of drill steel, samples of wire rope, a library of the best technical books on mining and metallurgy, the leading mining and metallurgical journals, photographs of mining machinery, maps illustrating methods of mining, drawings of mining machinery and mine plants, mine maps made by mining students, the catalogues of the leading manufacturers of mining and metallurgical machinery, a clinometer, a mining transit, drawing tables and models of mines.

The fire assay room is furnished with rock crushers, samples, sieves, a bucking board, mortars, coke and hydrocarbon assay furnaces, and furnace tools. Adjoining the fire assay room, furnished with a hood, working desks supplied with water and gas, a shaking frame, gravity cells for electrolytic work, a chlorination apparatus, tanks for normal solutions, apparatus for quantitative determinations, analytical, pulp and button balances, an Ingersoll-Sergeant steam drill, an air compressor and a working model of a stamp and concentrating mill made by the students. This laboratory also contains a leaching plant and a cyanide plant consisting of a solution tank, a leaching tank fitted with a false bottom and duck filters, a zinc box and six compartments fitted with wire screens, and a sump tank, all conveniently arranged and fitted with pipe connections.

The Board of Regents have recognized the progress and importance of this department in erecting a new School of Mines building, in which nine rooms are being assigned to the use of this department. The department now has a well-lighted balance room, wet and dry assay rooms, a geological and mineralogical laboratory and museum, a lecture room, and a library and reading room.

Dr. Miller is the author of several mining works; his recent up-to-date work entitled "The Cyanide Process" is one of the plainest, most clean-cut and concise expositions of the wet method of gold extraction that has been printed. It is elaborately illustrated with plans for construction and should be in the hands of every gold producer in the State.

LATAH OPALS.

"In August, 1890, fire opals were found near Moscow, Idaho, on the farm of William Leisure. They were dis-

covered by Mr. James Allen, a jeweler of Yonkers, N. Y., among some rocks taken from a well twenty-two feet deep. In the last four feet the opals were found more or less plentiful in the cavities of the rock. The rock is a basalt in which most, if not all, of the feldspar and pyroxene, as well as the green mass, appears to be altered. Some of the original constituents may have changed, but whether or not it is olivine, it is difficult to determine, because of the crystalline aggregate character of the pseudomorph. The pieces vary from the size of half a pea to that of a hen's egg. The material is found in a vesicular lava; the smaller nodules are very rich in color, but the larger ones often have little or no play of colors.

"The quality of some of these specimens compare well with the foreign variety. If the material is as abundant as supposed, and could be properly worked, this would likely be one of our precious stones, from a financial standpoint. The trouble seems to be that the larger portion of them were broken or cracked in separating them from the matrix.

"One opal, the largest taken from the mine, is about four inches long, and two wide and three-eighths of an inch thick, and at the time it was found was estimated to be worth from \$1,500 to \$2,000 at the Moscow National Bank. It was on exhibition there for a few months from the time it was found. The mine did not pay, so it was abandoned. Last fall a few small opals were found in some rock that was used in paving Main street of Moscow. This rock was taken from the college farm about a mile west of town."

MICA.

The formations of Latah County seen from the car windows would lend the impression that basalt prevailed; but as a matter of fact it only occurs in belts, bosses and knobs scattered over a predominating granite formation, with some small areas of slate and quartzite, placer gold, and gold-bearing quartz veins occur in the Hoodoo district, and in a great uplift of mica schist thirty miles east of Moscow is located one of the largest and most promising mica veins in the world.

The mica mines are situated in the Robinson Mining District, and one of the most extensively developed properties carries a vein eight foot wide that is traced on its

strike for 4,400 feet in length and is covered by three claims known as the Violet, Atlas and Morning Star Consolidated Mica Mines. This vein has been prospected to a depth of fifty-eight feet from the surface, by a shaft, which shows a marked increase in both quantity and quality of the mica at the bottom.

The largest crystals taken out measured 22x26 inches in size, and weighed one hundred and seventeen pounds; crystals weighing from sixty to eighty pounds are not uncommon. The quality of the mica is equal to the best on the market. It is clear as glass, in the thin plates, and of perfect cleavage.

There is also a six hundred-foot tunnel constructed on the property which cross-cuts the ledge nearly five hundred feet deep, from which drifts can be run that will undercut enough mica to supply the United States for years, should the same proportions be maintained along the vein that are shown in the shaft, and the surface exposures along its course strongly indicate that it may. At one point this vein is twenty-four feet wide and produces six hundred pounds of rough crystals, or two hundred and fifty pounds of cut mica per ton.

There are several other very promising mica deposits in this district and it is not unlikely that Latah County may become famous as a large producer of this valuable mineral.

The value of mica depends on its purity, freedom from iron, etc., and the size of the crystals, and ranges in price up to twenty-five cents per pound for the rough product, and from eighty cents to several dollars per pound for the dressed plates.

The White Cross Gold mine, seven miles northeast of Moscow, is opened on a well defined fissure in granite; the vein is seven feet wide between good walls and carries a fairly well defined pay streak of high-grade ore one foot wide. The development consists of a shaft one hundred and fifty feet deep, and the company are now running a seven hundred-foot cross-cut tunnel that will cut the vein at a greater depth and give them a desirable advantage in its further explorations. The values of this property range from six to twenty-five dollars per ton in gold.

LEMHI COUNTY.

Lemhi County is situated along the east central side of the State and is bordered on the east by the Rocky Mountain-Bitter Root divide which forms the line between Idaho and Montana. This section of the continental divide extending in a direction a little west of north, from the southeast corner of this county for a distance of one hundred miles, presents the first clean definition of a mountain range in the continental divide north of Colorado; a sharp, clean cut majestic mountain axis almost the entire distance, that makes into a succession of lofty pyramid peaks reaching numerous elevations of nine thousand to twelve thousand feet above the sea level and form their grandest development directly east of Salmon City. The main range strikes almost due east from a point near Gibbonsville and its general northwesterly direction is continued in the bold, rounded and more heavily timbered summits of the Bitter Root range.

Salmon City, the county seat of Lemhi County, seventy miles from the nearest railway point at Red Rock, Montana, from where it enjoys a very excellent daily mail and stage service, is one of the most substantially built little inland towns in the world. It has a population of about one thousand five hundred, nearly a dozen fine brick business blocks and numerous handsome residences, graded streets and sidewalks, telephone service, electric lights and water works, in fact, every modern convenience except railway transportation, and from all reports is likely to soon have that.

The town is beautifully situated at the confluence of the Salmon and Lemhi Rivers at an elevation of four thousand two hundred feet. The valley of the Salmon River extends north and south twelve miles each way, then closes into narrow box canyons, and the Lemhi valley extends to the southeast for sixty miles. While neither of the valleys are very wide they are covered with valuable farms, which, in connection with a broad belt of foothill grass country that borders each stream, support a thriving farm and stock-raising industry.

Salmon is the natural business center of the whole county, and surrounded as it is by such an extensive and varied mineral bearing mountain country, it only lacks railway transportation to become an important center of population.

The formations of Lemhi County embrace a very extensive development of the most important metal-bearing series of the State, granite and altered crystalline sediments, which fully bear out their reputation as ore carriers.

This county contains one of the famous placer basins of the State in the granite formations of the Leesburg district, fourteen miles west of Salmon, also several other important placer tributaries putting into the Lemhi River from the main range of the Rockies. The total yield of these placer fields has ranked along with those of Warren, Florence and Elk City, and several extensive tracts of ground that have been equipped with heavy machinery still continue to hold the placer gold yield up to an important figure.

The total annual gold yield of this county has never dropped below 10,000 fine ounces and exceeded that amount in 1903, and while the placer product has held first place in the past, from present developments it is pretty safe to say that it will be far exceeded by the quartz gold product during 1904, and the future of this branch of mining is bound to experience a very rapid growth for it is probably no exaggeration to say that there are as many, if not more, gold-bearing fissure veins and ore deposits within the limits of Lemhi County than in any other equal area on earth, and while the various districts of this county contain a number of examples of the rankest kind of mining mismanagement and efforts to do a million dollar business on a thousand dollar capital, there remains some splendid opportunities for profitable investment if the same are conducted intelligently and on practical lines. This county also contains some exceptional examples of economic gold milling practice with small plants.

In addition to its numerous gold districts, Lemhi County contains some of the largest and most important copper deposits in the west that occur in the Blackbird country about thirty miles west of Salmon City, as well defined fissure veins, and great impregnation zones in black mica schist formation underlaid with granite and intruded with dike rocks.

The ores of this section at a shallow depth under the surface are massive, or disseminated copper sulphides, that carry a fairly constant value of about fifty cents in gold for each unit of copper, and concentrate to excellent advantage, and occurring as they do in zones a hundred feet

wide or more, showing average values of three per cent, together with pay veins of massive sulphides that run ten to thirty per cent, it is only a question of railroad transportation when the precious contents of the copper ores of this district will give it an important competitive advantage and prove a very profitable field for investment.

Another important copper district occurs in the high limestone mountains of Spring Mountain district, where the Bruce mine shows some enormous deposits of gold and silver-bearing copper carbonate and oxide ores, associated with massive magnetite and hematite iron ore. These deposits are of the Mackay type, and resemble the ore occurrence of the White Knob mine in both value and extent of surface exposures.

LEAD ORE.

As a source of lead bullion the mining history of Lemhi County contains some important pages. Its great deposits of sand carbonate ore was yielding half as much lead bullion as all the mines west of Missouri combined during the years 1883, 1884 and 1885, and it is not unlikely that similar disclosures of lead will again be revealed in the richly mineralized limestone districts of Texas, Spring Mountain and Nicholia at the southeast end of the county.

Some very fine ore bodies were discovered in the Gilmore Mining Company's property at Texas district during the year, and seventeen carloads of rich mineral were shipped that averaged over fifty-five per cent lead with important values in silver and gold. Some important disclosures were also made on the Winnie mine, in the Spring Mountain district a few miles south of Texas and on the same belt.

The Winnie mine shipped four cars during the year and besides the high lead and silver values it contained one lot gave a result of seven dollars gold per ton. There are dozens of handsome prospects containing fine lead, silver and gold values, strung along a lofty mountain uplift for twenty miles from Texas to Spring Mountain. This great mountain ridge is an offshoot from the Salmon River Mountains and is made up of deeply fractured massive limestone, dolomite and quartzite beds, extensively fissured and folded, and intruded with dikes and massive bodies of igneous rock resembling a fine grained diorite and presents ideal geological conditions for the occurrence of rich and extensive bodies of lead, silver, copper and gold ore.

A number of properties along this belt have good shipping records, yet none of them have been developed deep enough to get below the iron oxide and altered lead carbonate conditions of the ores, so that rich and extensive bodies of unaltered sulphide mineral may reasonably be anticipated with further depth.

Across the valley of Birch Creek from Spring Mountain, near Nicholia, the Viola mine, from which eight-tenths of Lemhi County lead production has been derived, had a flat dipping body of clean sand carbonate of lead ore that was over one thousand feet long and from five to seventy feet wide and was followed down on the dip only two hundred feet, where it merged into a body of soft iron oxide ore fifty feet thick, carrying high values in lead.

This great body of mineral produced 30,000 tons of crude ore the first two years of its operation that averaged seventy per cent lead and was shipped at a very handsome profit. After that a smelter was built on the ground, which was operated very successfully for about three years, and the total output of this body of mineral is reported to have been \$7,000,000. It occurred as a flat bedded vein in a blue carboniferous limestone formation forty feet above a bed of white quartzite. In following the ore on the dip it merged into an immense body of soft brown iron ore sprinkled with lead carbonate. This same iron ore body on the Clipper claim, adjoining the Viola, is proven by shafts and drifts to be fully two hundred feet square, all altered spongy gossan iron ore, and with such a history and such a body of mineral to sink on there is good reason to anticipate even a larger body of lead ore at a further depth than the first one was. This property has changed hands during the year and its further development is likely to be undertaken in the spring.

Lemhi County embraces many deposits of the rarer metals that are likely at some day to furnish an important sources of mineral traffic. Among these are the cobalt, nickle and bismuth compounds associated with some copper ores of the Blackbird district.

Tungsten ore of very fine quality occurs in large fissure veins in diabase scist at Patterson Creek, on the Pahsimori River. This deposit has been quite extensively developed during the past two years and is likely to become an important source of this valuable mineral.

Tungsten ore is used in the manufacturing of high-grade

steel, such as armor plate, on which it has a hardening and toughening effect. When free from sulphur this mineral is in good demand at about the same price paid for copper ore—one fifty to two fifty per unit of tungstic acid contents, but 40 per cent ore is the lowest marketable grade.

Tin has been known to have existed for years at the Minert placers in Prairie basin, thirty-five miles west of Salmon, in the form of stream tin of a very fine quality, mixed with gold-bearing gravel, and lately the parent veins from which it came are said to have been discovered among some large copper-iron-bearing quartz fissures in a schist formation of that district. Copper was conspicuously associated with the upper horizons of the Cornish tin mines and was entirely replaced by tin at depth, and similar increasing values may be anticipated here.

Another important discovery of tin was made within three miles of Salmon City last fall, in good sized fissure veins of quartz and schisty gangue in a formation of eruptive granite.

This ore is associated with gold, silver, lead and copper minerals and the ground was being prospected for gold at the time the tin contents of the ore were detected. The first ore sample tested for tin from this property gave the following results: Tin, 13 per cent; lead, 24 per cent, with \$4.50 in gold and silver. Subsequently the particular rock that carried the cassiterite mineral was selected, and a choice lot amounting to one hundred and forty pounds was sent to a prominent assayer in Denver where it was carefully tested and gave a result of 50 per cent tin, and it is thought that a good sized shipment of this grade of ore can be sorted out of the vein in which it occurs. From the size and strength of the fissure and its geological association with a granite formation, the recognized home of tin veins, there is a bright possibility that a successful tin mining camp may be developed in the suburbs of Salmon City. This discovery has attracted the attention of capital already, and a deal is reported to be on foot for its extensive development.

Immediately overlying the tin-bearing granite formation, within two miles of Salmon City, a series of tertiary sandstones and shales contain a fine bed of lignite coal that is being successfully mined at two properties in a vein eighteen feet wide, of which six to ten feet is clean fuel that finds a ready local market at five dollars per ton. This

is a superior quality of lignite of much lower ash and moisture percentage than the large deposits of North Dakota, which are successfully used in railroad work as well as for domestic purposes. The Pollard mine on this vein is reported to have sold one thousand tons of this coal to local consumers, principally in Salmon, during the past year, and the Edwards mine, adjoining it, with an equal showing of coal, has also entered the market recently with its product.

At Panther Creek, forty-five miles southwest of Salmon City, some very beautiful gem opals have been found in a formation of grey trachyte. These stones occur spotted through massive boulders of the igneous rock on the surface of an immense glacial dump. The parent dike is said to have been uncovered from which these boulders were derived. These gems have been found in all sizes from that of a pea to as large as a walnut. They are of the hydrophane variety, semi-transparent to milky white, displaying a strong volume of rich iridescent colors, and where found unshattered and free from flaws, the best colored ones have been valued at from \$6 to \$10 per carat by gem experts.

The most important mining progress made in Lemhi County during 1903 is outlined in the following items:

At Indian Creek the Kittie Burton Company completed a thirty-stamp mill. This mill had previously been very successfully operated as a fifteen-stamp mill, and the large ore reserves recently disclosed in the mine was such as to justify a larger mill. This plant as at present equipped and the ore reserves in sight to supply it will give this property an earning capacity of \$15,000 to \$18,000 per month.

Developments at the mine show several bodies of ore as much as nine feet wide with average values of \$27 per ton, of which 85 per cent is free milling. Some of the ore bodies in this mine are twenty to thirty feet wide between walls with good milling values all through. This vein occurs in a schistose quartzose formation and is accompanied by a constant little dike of felsite igneous rock that is likely to take it to the deep. This company has employed from thirty-five to forty men and their successful operation should materially increase the Lemhi County gold yield for 1904.

Below the Kittie Burton, half a mile, the Mormon mine

was bonded to Mr. Ward, who employed three men on development work.

The Murphy Company, who own a promising property adjoining the Kittie Burton to the north, are working four men on their mine.

At Shoup Mr. Suydam was working five men all summer on the Clipper Bullion mine, which is equipped with a five-stamp mill that yielded very good results.

The old Kentuck mine has worked two men. This property has a fine clean cut fissure vein in granite associated with large dikes of quartz-porphyry and greenstone and has been worked to a depth of eight hundred feet on one shoot of ore that produced about \$500,000 in free gold worked in a ten-stamp mill. The tailings, which was said to contain an equal amount of gold, were wasted in the Salmon River.

The ore in the Kentuck vein is a massive blue-white quartz heavily sprinkled with iron pyrites and traces of lead and zinc sulphides; the latter, locally called blue sulphurets, are usually very rich and their presence in the ore almost always indicates high gold values.

The Kentuck has a large reserve of low-grade ore with fine stretches of untested territory east and west along its strike from the main ore shoot. The main shoot is still going down strong in the bottom with good values. This vein dips toward the Salmon River and can be opened to a further depth of one thousand feet on its dip below the present bottom level by short cross-cut tunnels driven through the hanging wall granite and should contain a very extensive reserve of pay ore that could be economically handled if a mill was erected on the mouth of Pine Creek, where splendid water power is available within six hundred feet of the lower tunnel site.

The Grunter mine, situated a mile east of the Kentuck on the same vein, is a fine example of one of the most flattering gold enterprises in the State that was butchered by a would-be mining capitalist who, through blundering misconception of the enterprise he was undertaking, started in to put up a first-class ten-stamp concentrating mill for a half interest in the property, and wound up by furnishing a five-stamp mill with a hog-trough mortar and an overshot wheel that was just about as effective as a good sized coffee mill and never gave the property half a chance to show its merits.

The Grunter mine has an ore shoot four hundred feet long and ten to twenty feet wide. The ore is identical with that of the Kentuck and there is 30,000 tons of it in sight, blocked out by short tunnels and quarry-like open cuts, that carries average values of from six to ten dollars per ton in gold, 50 per cent of which is free milling and the balance amenable to cyanide treatment.

This ore body is so situated, dipping toward the river and apexing about seven hundred feet above it, with a shallow covering of hanging wall rock, that it ought to be mined and milled for two dollars per ton if properly equipped and the plant was run by water power.

This property was on the market recently at a very reasonable price and presents an excellent opportunity for a profitable investment to the right party, and one that may develop to big proportions.

At Sage Creek, on the strike of the Indian Creek belt to the southeast, annual assessment work was done on some very promising quartz prospects carrying ore of the same value and quality as the Kittie Burton Company's mines.

At Gibbonsville the mines have practically been shut down during the year excepting for some few leasors. It was reported that the A. D. & M. mines were to be sold in December. These mines have produced a large amount of gold and it is predicted that their new purchaser will work them extensively in the spring.

At the Red Bird Creek district Mr. Lang has bonded his property to an eastern company who expected to work four men on development all winter.

The Oro Cache mine has been idle for over a year, the property being in litigation. This mine is situated near the summit of the Rockies at the head of one of the tributaries of Carmen Creek, sixteen miles east of Salmon. On another tributary of the same creek there were some rich gold ore discoveries made in the fall, near the famous Ajax mine on the Montana side of the divide, but owing to the high altitude and deep snow work was abandoned during the winter.

Considerable work has been done on the Confidence and White Horse mines, owned by Messrs. Sims and Mason; they built an arastra on Kirtley Creek and made a very successful run. This property carries a well defined fissure that can be traced for a long distance on its strike

and shows a good reserve of ore in sight in which specimen gold ore is occasionally found of remarkable richness. This mine is about fifteen miles east of Salmon on the main range.

Further to the southeast along the range considerable development work was done by a Butte company at the heart of Geertson Creek, who worked five men all summer and report good results.

Below the canyon on this stream the Geertson Creek placers were worked during the water season with the usual output of gold.

On the next tributary south, called Bohannon Creek, considerable work was done on gold properties up in the high mountains, while the famous old placer bars down towards the river, now owned by a Boston company, employed twenty-two men during the placer season and made a better bullion product than usual.

Northwest of Salmon seven miles the Queen of the Hills mine is being developed by a cross-cut tunnel that will be nine hundred feet long when completed. This property carries a big, clean-cut fissure vein in granite, fourteen feet wide, on the same strike as the tin veins near Salmon. Its ores carry good pay value in free gold and also cyanide to excellent advantage. This property has been worked through a vertical shaft three hundred feet deep and has produced considerable bullion with a ten-stamp mill equipment. The new tunnel will afford an excellent advantage and prove a great economy in handling the ore and will tap the vein at considerable depth below the bottom of the shaft.

The Pacific Dredging Company, operating a large \$80,000 dredging plant at Moose Creek, had a successful season. They employ about twenty men for about eight months in the year.

The parent quartz veins and mother lodes of the various rich placer tributaries of the Leesburg basin, fifteen miles west of Salmon, have enjoyed a good deal of active development during the past year.

The Gold Dust Company have erected a ten-stamp mill and concentrator and have worked a force of twenty-five men. The Gold Flint Company are working three men. Both these properties are on the same great fissure vein in granite, that is fifty feet wide in places, that crosses one of the richest placer tributaries, and that its erosion

was the source of the placer gold is evidenced by the fact that the pay stopped at the point where the vein crossed the gulch.

The Italian mine, another fine fissure in granite, equipped with a ten-stamp mill and having a bullion record of \$60,000, was sold during the year and a good hoisting plant erected, by which a shaft has been sunk and the vein found filled with rich ore at considerable depth below the old works.

Adjoining the Italian mine the Thomson mine is a quarry of low-grade gold ore worth two to four dollars per ton in free gold, and is successfully worked by its owner in a small Huntington mill.

The Haidee mine, a short distance north of the Italian mine, another granite fissure, was discovered in a flat, swampy bench and had a four-foot vein of twenty-dollar ore at the discovery, but owing to its position it was expensive to work by sinking, and after lying idle for several years has been bonded again by its original promoter for a New York Company, who are running a tunnel eight hundred feet long that will tap the Haidee vein as well as an intervening vein at a depth of nearly three hundred feet below their apex. Placer ground was successfully worked up the mountain side and into the soft croppings of the Haidee vein, where the ground was washed for several hundred feet along its course, and the present venture is well justified from the surface evidences of a profitable source of gold ore.

The Abandoned mine, another fine fissure of large size, was bonded during the year to Lewiston parties and has developed some fine ore; a tunnel is now being run on this property to tap the vein at depth, and four men are employed.

A company of Nampa people have a bond on the Raimy mine at Silver Creek and have made a good payment on the purchase price.

This is an extensive deposit of gold and silver-bearing ore in rhyolite that carries some very rich ore and in some respects resemble the Dewey mine at Thunder Mountain. The new company are working a small force of men on development work.

Four men are employed by the Swan Copper Company on Copper Creek, a property that bears evidences of proving an extensive resource of rich copper ore.

The discovery of monster bodies of gold-bearing porphyry were made during the summer on the headwaters of Owl Creek ten miles west of Shoup, and some sensational newspaper stories have been told of the great width of the deposit and the high values that it contains, stories that savor of the early fairy tales of the Thunder Mountain during the height of its boom. There are several old gold quartz camps within thirty miles of Owl Creek that contain dozens of gold quartz prospectors and arastra men, who are past masters in the art of judging the value of ore represented by colors in the pan. These local experts of the pick and pan do not seem to enthuse over the field on par with the newspaper stories and there are some pretty wise boys among them, too, in a mining way, even if they do not live right on Owl Creek; but, on the other hand, they may be too sceptical, for Lemhi County contains numerous great areas of acidic porphyry and tuff that carry gold values sometimes specimen values, but so far none of them have been found to average enough to be considered pay ore.

It is hoped that the Owl Creek find may contain "pay" and prove as big as its advocates claim. It is situated a few miles north of Shoup, and east of some very promising gold quartz properties, lower down Owl Creek, that have been successfully operated in a small way for years. But then, you know, "familiarity breeds contempt" in mining as in other callings, and the surface symptoms of a bonanza district are sometimes very indefinite. It is said prospectors, cowboys and geologists tramped over Cripple Creek for years waiting "to be showed" by a carpenter, W. S. Stratton, that it was the richest gold district on earth.

Mr. W. D. Cross, the discoverer and promoter of the new Owl Creek district, describes a series of monster belts of quartz-porphyry twelve hundred to two thousand feet wide, in a granite country, and that from one of these big dikes a series of samples made it average \$10.20 per ton in gold for that great width; the lowest sample was \$1.80 and the highest \$201, and it was the intention to work six men on the ground all winter.

The country where this new camp is situated is a very likely one for such a sensational discovery, a country of rough, densely timbered, granite and porphyry mountains, deeply-cut canyons and large streams, a wilderness along the Bitter Root range entirely within the timber reserve

covering this part of the Lemhi and continuing northwest for two hundred miles through Idaho and Shoshone Counties, that have never been prospected to any great extent but where conditions are known to be favorable for the actual realization of such strikes as have been reported from Owl Creek.

NEZ PERCE COUNTY.

Nez Perce County is another of the small northerly counties. It has a large, thickly settled section of the humid plateau area whose surface soil of disintegrated basalt is extremely rich and durable in all the basic elements of vegetation and capable of producing bountiful crops of grain indefinitely.

Nez Perce County is not noted for its mineral resources, although it contains some fine gold and copper prospects around the borders of Craig Mountain and some placers along the Snake and Salmon Rivers, yet the people of Nez Perce County are taking a very active part in the development of Idaho mines.

Lewiston, the county seat of Nez Perce County, with a population of five thousand people, is the natural gateway to a great empire of mineral, timber and agricultural resources of north central Idaho, whose rapidly expanding traffic must bring a constantly increasing volume of business to this growing center of population as inevitably as the channels of the Clearwater, Snake and Salmon Rivers bring their waters.

Situated at the junction of two great rivers, the Snake and Clearwater, with their varied and enormous tributary resources, Lewiston presents a local geographical comparison for, and a miniature vest pocket edition of, Pittsburg, Pennsylvania, and its citizens are very wide awake to the advantages of their location.

The leading business men of Lewiston maintain a mining and information bureau, intended to exhibit and advertise their tributary mineral resources and to give reasonable protection to investors.

The bureau is located in a large, well lighted ground floor room in one of the best business blocks in the city. It is presided over by an able and well informed manager and contains one of the largest and most systematically arranged mineral collections in the State, and while it is a

fact that this rich display of ore exhibits the creamy product of most of the mines represented, yet, to one familiar with the extent and size of the ore bodies from which they were derived and the prospective resources of pay mineral they represent, they become an advertisement of real worth.

While gotten together to promote the sale of stock in legitimate mining enterprises, this exhibit only needs the slight addition of two other elements, limestone and coal, indications of which are also available and close at hand, to suggest an important smelting industry for Lewiston, which with added transportation facilities and mining development can doubtless be successfully attained.

The predominating minerals exhibited in this display are copper sulphide ores from the Snake and Salmon River camps; silicious iron sulphide ore from Buffalo Hump containing rich values in gold; other rich gold-bearing iron sulphide ores from Elk City and Pierce City, which, together with an abundant supply of pure limestone flux, available at Taylor's quarry at Oro Fino, present an ideal combination for a pyritic smelter charge, and the day is not very far distant when a custom smelter could derive a big business handling a large tonnage of rich concentrates from the Hump and Elk City districts.

The fuel question is, of course, an important one, but not so important in a process that utilizes the fuel element of sulphur contained in the ore; besides, it has a probable solution at hand with the intervention of a briquetting machine in some extensive beds of lignite coal on the Grande Ronde, within $25\frac{3}{5}$ miles of the city.

Very superior bituminous coal float has been found in a formation favorable to the occurrence of a coal vein near the railway at Oro Fino, and several other points along the Clearwater near Lewiston. This is an industry that may mean a good deal to Lewiston and its development is worthy of careful consideration.

Lewiston citizens have given a hearty support to the development of the Buffalo Hump mines when that district needed support very badly. Their ground floor investments in the shares of that district have advanced surprisingly in some instances and promise important dividend results at an early date.

OWYHEE COUNTY.

Owyhee County is one of the largest and most sparsely settled counties in the State, and at the same time one of the most important and constant precious metal producers. The gold and silver mines of this famous mining field have been constantly operated for forty years and have maintained an average annual output of fully \$1,000,000 dollars throughout that period. This county ranks first in gold and second in the list of counties of the State in the value of its combined bullion output and the prospects are good for its maintaining that position, for it has a silver-lead belt that can compare in extent of its ore evidences with any district of that class within our borders, except Shoshone County, and there is a bright prospect that this Owyhee County lead belt may be brought into the producing class within the next year or two.

That the gold and silver mines of Owyhee County are by no means exhausted will be appreciated from the statements that two of its principal producers, the Trade Dollar Consolidated and the DeLamar mines, yielded precious bullion during 1903 that, based on the usual method of computing silver at its coinage rate, amounted to a total value of fully \$1,500,000, with a total crew of not to exceed four hundred men. This is probably \$500,000 in excess of what the average annual yield has amounted to from discovery until the present time.

The most productive area of Owyhee County is confined to the relatively small district occupied by the Owyhee Mountains, in the northwest corner of the county.

Silver City, the county seat and principal mineral center, is approached from Nampa over the Boise, Nampa and Owyhee Railroad to Murphy, thence by a good stage service to Silver City.

A very large proportion of this county south of the second standard parallel, including fully three-fourths of its total area, consists of broken lava covered plateaus and is mostly a desert country, bordered by the State of Nevada on the south.

The Owyhee Mountains form a typical desert range of deeply fractured eruptive granite, practically devoid of timber. The granite of this range is later than the carboniferous age. It is not unlikely that it was intruded through, and at the present time partly rests upon a buried

series of altered sedimentary rock like crystalline limestone, slate and quartzite, that contained lead-silver as well as gold minerals. The reason for this theory is that the quartz now found in the veins of the Silver City district, and especially in the DeLamar mine, is partly or completely made up of pseudomorphic forms, a secondary replacement that has changed, atom for atom, the substance of an entirely different original mineral that filled these veins, to quartz, without changing the crystalline forms of the original vein filling, which, in the DeLamar mine, is a mass of crystal outlines of heavy spar and lime spar, minerals more commonly associated with limestone and other sedimentary formations than with granite. And as instances are not uncommon, especially in Colorado, of a vein in its downward course passing from a rich horizon of pay ore into one of greater depth, where the vein was practically barren, and then at still greater depth becoming remineralized with paying values again, it would seem eminently probable that below the drainage level of Jordan Creek some such results might be anticipated in this district, for it is hardly likely that the original filling of the DeLamar vein was devoid of precious values, and that the same may have been transferred to some deeper level in the fissure at the time its gangue was altered seems highly probable.

That the Trade Dollar vein was filled by ascending mineral springs solution, freighted with precious values, will be plainly evident to any one who has examined its structures and is at all familiar with present day mineral spring phenomena. The ore and quartz is built up in banded wavy lines or crusts after the manner of agate structure with open central druses and vugs, studded with quartz crystals and crystals of valencianite, an uncommon variety of feldspar.

The popular theory of the present day, in veins of this class, is that the precious metals were dissolved from the interior substance of the earth under conditions of intense heat and pressure and conveyed up through fissure vents or cracks in the earth, to be precipitated on the walls of occasional open spaces in the fissures in banded layers towards its upper horizon near the surface, where the heat and pressure was gradually released.

The deepest point in a fissure where the metal values have commenced to precipitate out of the ascending solu-

tion in sufficient proportion to form pay ore was still intensely hot and several thousand feet deep below the original surface, is demonstrated in several notable instances, especially the deeper levels of the Comstock.

A vein may have been filled with pay ore to a depth of 10,000 feet below its original crest and subsequently denuded by natural erosive forces during ages of time, through the greater part of that depth, with probably only a remnant of a few hundred feet of the pay portion of the vein left at the present day, which is soon passed through in mining to the original zone of precipitation and the underlying barren gangue of the vein.

At the Silver City district there has been no such deep erosion, is proven from the fact that the granite is not only eruptive of comparatively recent age and contains inclusive belts of sedimentary formations, but the veins pass up through the granite and then through two superimposed sheets of basalt and rhyolite lava that are known to be of very recent tertiary age, and have suffered very little erosion.

Moreover, it has been proven by scientists that the prevalent valencianite crystals, so common to the veins in the lower levels of the Trade Dollar and other mines of this district, have been formed at a comparatively low temperature, which argues very favorably for continued mineralization, and while they may experience barren horizons due to the leaching effect of comparatively shallow water courses, there is encouraging indications that rich ore bodies will be found to great depth on these veins.

The Golden Chariot vein, on War Eagle Mountain, was cut by the Sinker tunnel at a depth of two thousand two hundred feet below the collar of the Golden Chariot shaft, and at that level has produced some altered gold-bearing copper ore and rich native gold specimen ore, which is conclusive evidence that the downward limit of mineralization of this famous fissure has not yet been reached, and while its further exploitation will be quite expensive, it is certainly warranted after running a cross-cut tunnel six thousand four hundred twenty-five feet to reach the vein.

THE MINES.

The Trade Dollar Consolidated Company's property consists of the Trade Dollar, Black Jack and Booneville

mines, combined under one operation. They were worked as three separate properties prior to the consolidation and are operated entirely through adit tunnels, all of which are connected underground and are on the same vein system all through, and an idea of the extent of this remarkable mining development will be conveyed by the statement that the property has at the present time fifteen miles of actual track in service, in addition to the extensive vertical connections between the levels.

This property has been brought into excellent physical condition under the present management and is producing some of the richest ore of its history from some of its deepest levels.

The Trade Dollar vein, passing through the full length of all these properties, has produced \$10,000,000 to date. The main ore course is a persistent fissure that comes up through the granite and penetrates two great dome shaped overflows of basalt and rhyolite. A small dike of basalt accompanies the vein in the granite and is doubtless the vent through which the extensive surface sheet was fed.

The main ore channel is quite constant. It is also accompanied by numerous spurs and parallel stringers that frequently attain commercial proportions and have produced an important tonnage of rich ore.

The width of the ore mined in this property varies from one foot to ten feet, and in one stope the space broken down for a short distance was twenty feet wide, from which bands of rich ore had to be sorted out and the balance left in the stope for filling.

The value of the ore now sent to the mill ranges from ten dollars to one hundred dollars per ton, while small streaks of shipping ore occur that are carefully sorted out and run several thousand dollars per ton.

The ore minerals consist essentially of silver sulphides, chalcopyrite and traces of galena, all of which is rich in gold and silver in a proportion of about one-fourth gold and three-fourths silver.

The shipping ore sorted out runs between two thousand dollars and three thousand dollars per ton. Some of this character of ore recently mined from some of the lowest levels was richly set with bunches of coarse wire silver in soft cavities of disintegration strongly indicating a condition of secondary enrichment due to the deep circulation of surface water, an important indication that the true un-

altered ore of the vein still remains at some indefinite depth, and that all the rich pages of the property's history have not yet been written.

The ore of this mine is now all brought out of the big Florida Mountain adit tunnel and is dumped directly into the twenty-stamp mill at Dewey, where the bulk of the values are saved by direct vanner concentration of the pulp from the batteries. The tailings are treated without further grinding in amalgamating pans and settlers. The extraction is ninety-four per cent of the gross value of the ore. The mill has a daily capacity of forty-seven dry tons, and the cost of treatment is four dollars per ton, including power.

The Florida Mountain tunnel is a splendid adit now being run on the strike of the main vein. It is eight feet wide and seven feet high, already eighty-nine hundred feet long, and is rapidly approaching a point under the north end of the old stopes, and is designed to pass entirely under the Florida Mountain at a maximum depth of one thousand seven hundred feet. It has already passed some very promising virgin ground that justifies cross-cutting and further development. It is expected to undercut sufficient ore reserves under the known ore bodies of the higher levels to keep the mill busy for several years, and at the same time establish a new surface to sink from, by which the vein may be conveniently explored to considerable depth below the drainage level of Jordan Creek, where new horizons of rich mineralization is one of the possibilities to be anticipated.

This company gives constant employment to a force of about two hundred and fifty men. The mine at this date has fully two hundred per cent more ore blocked out than it had when the present management took charge a little over a year ago and the grade of the ore has been materially improved during that period. The whole mining and milling plant is run by electric power supplied by the company's own power plant at Swan Falls on the Snake River. This power is lavishly used for furnishing light for the mine and light and heat for the buildings, as well as motive power for the machinery.

The DeLamar mine, at DeLamar, five miles below Dewey, continues to employ a large force of men and produces an important amount of precious bullion at a good margin of profit.

This property has produced a gross yield of gold and silver amounting to \$8,250,000, of which \$2,750,000 has been paid in dividends. It is owned by an English company who have looked upon it as a dug-out and exhausted proposition for four years. Its continued production and profitable operation during the past four years has been made possible by the introduction of the cyanide process by the former manager, Mr. D. B. Huntley, which reduced the cost of treating the ore by the old pan process from 16 dollars per ton to two dollars and fifty cents per ton by the cyanide process and by the splendid practical mining ability of the mine foreman, the late Thomas Davy, who persisted in keeping the necessary one hundred tons of ore in the mill bin every day for nearly four years in the face of expert reports to the effect that there was not enough ore in sight, to start with, to supply the mill four months. The present staff of the mine feel hopeful of being able to continue the good work for several years to come.

This property is equipped with a cyanide plant of one hundred tons daily capacity. The ore is shattered secondary quartz, usually white and barren looking, or slightly brown stained near the surface. Its present average value is about ten dollars and sixty cents per ton in gold and silver, of which fully ninety per cent is gold.

The ore is reduced by old-fashioned Cornish rolls to about a ten mesh size, in which condition it is cyanided direct. Water power is used during about four months of the year, and steam power the balance of the time. With cord wood fuel at ten dollars per cord, and coal at sixteen dollars and fifty cents per ton, the total cost of treatment including power is now slightly under two dollars and fifty cents, and a total saving of eighty per cent of the gross value of the ore is reported.

The ore of the DeLamar mine is derived from a series of fissure veins and spurs in rhyolite that vary from a foot to ten feet or more in width. In the early years of its operation the ores of this mine, derived from above the fourth level, averaged around thirty dollars per ton, and a good deal of shipping ore was sorted out in the form of rich nodules of argentite and talcy impregnations of the same mineral.

All the development of the property is by adit and cross-tunnels driven into or on the veins above the level of Jordan Creek. Below the fourth level the values rapidly faded.

The main vein was tapped by an expensive tunnel driven into the mountain from the mill level, over five thousand feet in length, where it was found carrying the same size and the same shattered secondary quartz as above, but only an average value of about one dollars and fifty cents per ton in gold and silver. Discouraged with the immediate results, this splendid tunnel was dismantled and abandoned before the vein was given half a chance to show what effect the zone below the drainage level of Jordan Creek would have on its mineralization.

The richest stopes in the DeLamar mine occurred at a point where the veins seem to be cut off or stopped by a flat dipping belt of blue clay, locally called the iron dike, but which is probably not a dike at all but a clay fault cut tunnels driven into or on the veins above the level of Jor-Lindgren of the United States Geological Survey, to be simply altered crushed rhyolite, practically barren of pay value.

It is inconsistent with the theory of the origin of fissures for them to terminate abruptly in the direction of their strike, especially at the point of their widest development, on either a dike or fault. The writer has seen several instances in Idaho mines where dike and fault movements have chosen the richest center of mineralization to cut off and displace a vein, and if such is the case here, the problem of finding the continuation of the rich silver stopes of the DeLamar mine on the opposite side of the iron dike or fault, offers a prize for its solution that is well worthy of an expensive test.

The wages paid miners in the Silver City district and the DeLamar mines are \$3.50 per day for machine men and \$3.00 per day for single-hand men. A large proportion of the ore produced is from hand work, and eight-hour shifts are the rule, the men go in and out of the mine on their own time.

Laborers and trammers are also paid \$3.00 per day and timbermen \$3.50 per day. The usual charge for board in this district is \$1.00 per day.

Among the other mines of the Silver City district the Banner group is held in high esteem by well posted local authorities. It is situated close in to Silver City, just west and parallel to the Trade Dollar vein, and carries large veins of the characteristic ore of the district. It is, as given us, fifteen feet wide, and carries pay streaks of very rich

mineral and has all the earmarks of becoming one of the big producers of the district. It has several hundred feet of development and a handsome showing of ore on the dump and so situated on the steep slope of Florida Mountain as to afford exceptional natural advantages for adit tunnel work.

The Trade Dollar Extension Company owns a large tract of finely located territory on the east slope of Florida Mountain. This property is flanked on the lower slopes by a very extensive stretch of old placer ground that is said to have produced remarkably rich results in early days and its values are supposed to have been largely derived from the erosion of the ore courses that traverse the company's property, which has also scattered float ore that has occasionally been picked up on the mountain slope that was remarkably rich in native gold. This company has recently installed an air compressor plant to be run by electric power supplied by the Trade Dollar Company and it will not be surprising if their winter's campaign of development now in progress should yield some very profitable results.

The Afterthought mine, situated on the south extension of the mother lode that traverses War Eagle Mountain which carries a string of famous bullion producers including the Oro Fino, Ida Elmore, Golden Chariot and Mahogany. The Afterthought is the south extension of the Mahogany. It is developed with a shaft four hundred seventy feet deep, one hundred ninety feet of which was sunk during the past summer, and a drift on the vein sixty feet to the south. The vein in this drift is six inches to two feet wide, and carries values ranging from five dollars to five hundred dollars per ton in gold and silver. Slabs of ore weighing as much as twenty pounds were recently brought down from this new drift, that were richly crusted with matted patches of native silver. This famous old fissure is credited with a gross production of \$25,000,000 and the present development is on a virgin section of it, that has never before been tested, and having gained such a depth and found such high grade ore, the owners are warranted in extensive drifting and in anticipating one of the famous ore shoots for which the lode has been noted.

The Roosters Comb gold mine situated in the granite formation four miles from Reynolds Creek, was the subject of considerable prospect work during the summer and the

continuity of its ore channel was definitely traced out for a distance of one thousand two hundred feet, with evidence of more or less continuous ore all the way. This property carries a total of one thousand feet of tunnels exposing some strong ore shoots, one of which is proven to be four feet wide and one hundred twenty feet long and carries average values ranging from fifteen dollars to fifty dollars per ton in gold. A test run was made on fourteen tons of ore last fall, by the cyanide process at the DeLamar mill, and gave a result of eighteen dollars per ton in gold, showing a high per cent of extraction on the original assay value.

SOUTH MOUNTAIN DISTRICT.

Twenty-five miles southwest of Silver City rises the isolated ridge of South Mountain, which may be considered as a continuation of the Owyhee range. The peaks of South mountain reach a height of eight thousand feet.

The mineral deposits are all contained in schist and crystalline limestone, associated with diorite and eruptive granite masses and dikes. The ore minerals consist of argentiferous galena with some zinc blende, and copper minerals in a gangue of quartz and calcite and schisty gangue.

The main ore zone or lode is upon the average nearly a hundred feet wide; the immediate country forming its walls is schist and quartzite; its course is southeast and northwest, with a dip of about forty-five degrees to the southwest.

The ore shoots of high grade galena and lead carbonates with a cropping of iron oxides occur at frequent intervals upon the surface of the lode. Sometimes these shoots of ore run diagonally across the lode, from wall to wall, and at others follow the course of the wall. A number of smaller veins of the same character as the large lode comes into the latter from either side, and vary in width from five to fifteen feet.

The croppings of the main lode cross over a series of high ridges and intervening ravines for a distance of five miles, all of which is located and a good deal of it patented.

Where a prospect hole has been made in the various croppings in this camp lead carbonates and decomposed galena have been discovered, assaying from a trace to eighty per cent in lead, and from forty to two hundred ounces in

silver, with from eighty cents to eleven dollars in gold are found.

In 1874 a smelter was built near the mines and put in operation; the next year the enterprise failed and there was a decline of all the mines in Owyhee County, the principal reason being the failure of the Bank of California, situated in San Francisco, and the subsequent panic.

At that time the nearest railroad station was Winnemucca, Nevada, two hundred and ten miles distant, and freighting by wagon cost ten cents per pound.

The product of the smelter lead bullion contained from three hundred to four hundred ounces of silver per ton. The work was carried on about sixteen months, and in no instance attained a greater depth than one hundred and fifty feet. Work was not resumed here owing to business complications and the property at South Mountain passed into other hands.

Many of the mines in this locality after having been idle for twenty-seven years are again to be reopened under better management and more favorable circumstances. The principal old mines of this camp at present are owned by the South Mountain Consolidated Mining and Tunnel Company, who own fifteen patented and five unpatented mining claims; G. A. Sonnermann, of Spokane, Washington, is president and manager. George Rasnor, an interested party, is in charge of the work.

A prominent mining expert examined this property last October and is reported to have offered \$300,000.00 for it, but this offer was refused. Several hundred tons of ore carrying high values are extracted. The future policy of this company is not known.

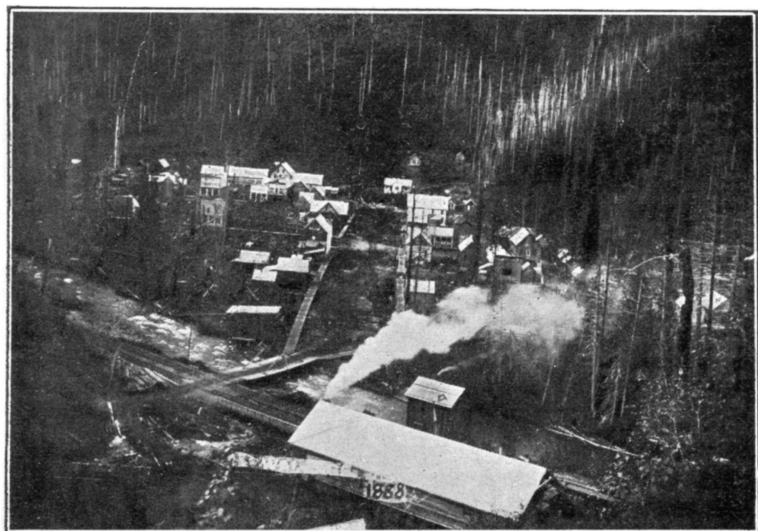
Last season, owing to the increasing value of silver, considerable development work was done and several promising locations were taken up by old experienced prospectors; sixteen new locations were recorded, all located on the big contact lode.

It is reported that the Standard mine, owned by R. M. Lewis, was sold last fall to Mr. Thomas F. Walsh, of Denver, Colorado. This property is one of the best in camp, and contains a large body of high grade shipping ore. There is about twenty tons sacked and ready to be shipped to Denver, Colorado, for treatment as soon as possible.

Mr. Walsh is interested in seven full claims. Mr. F. T. Clemmons, an experienced mining man, will probably as-



**A PROSPECTOR'S CABIN ON THE WALLACE COPPER BELT. SHOWING THE
WEALTH OF TIMBER IN THE CŒUR D'ALENES.**



WALLACE, IDAHO, IN 1888.

sume charge of this enterprise and push its development in the spring.

South Mountain district is situated forty-seven miles from the railroad. Murphy, the present terminus of the Boise, Nampa and Owyhee Railroad, is the nearest station. The district has good roads and an abundance of timber that could be used for mining purposes.

The ores of the South Mountain district very closely resemble those of Park City, Utah, in the value of their base and precious metal contacts, and characteristic mineral combinations and some such bonanza mine development are probable here as resulted in Park City.

Some excellent opportunities for investment are offered here that should prove attractive to investors in this class of ore. South Mountain could be approached from Caldwell by a railroad branch with a very easy grade and an easy country to build over all the way. The distance is about ninety miles, and from the apparent large extent of its ore resources the development of this district is likely to warrant such connection at no distant date and give Owyhee an enviable position as a lead producer, as well as a precious bullion producer.

SHOSHONE COUNTY.

Shoshone County is situated near the north end of the State and roughly resembles it in shape. It is bounded on the east by the Bitter Root divide, which forms the State line between Idaho and Montana.

The timber resources of Shoshone County, still practically untouched, are of enormous extent and value, especially in white pine. Its metal output far exceeds the value of all the rest of the State. Its world-famed Coeur d'Alene district alone from a dozen mines produced ores containing over one hundred thousand tons of lead bullion during 1903.

The predominating formations of Shoshone County are granite and gneiss, with a comparatively limited but very important quartzite and slate area in which the Coeur d'Alene lead and silver mines are located. The granite formations contain numerous placer camps, including the historic district of Pierce City, which gave the State its

first prominence as a gold producer in 1860. The placers continue to produce an important amount of precious bullion and the quartz veins found associated with them are likely to perpetuate the reputation of the county as a gold producer indefinitely.

Wallace, the county seat and business center of the richest lead-silver mining district in the world, is charmingly located in the canyon of the south fork of the Coeur d'Alene River at its junction with Canyon Creek and Nine Mile Creek at an elevation of two thousand seven hundred twenty-eight feet above sea level.

Its site was originally a cedar swamp of about forty acres in extent. The adjacent canyon slopes are so steep and appear so impressively close that you almost feel that you could reach out and touch them, and yet they are not bluffy, but generally rounded smooth, and were originally covered with a fine forest growth which the ruthless axe of necessity has destroyed; this, however, is rapidly being renewed by a new growth of trees which cover the hillsides with the rich green of young pines, a pleasant contrast to many mining camps.

Many western mining towns are shantytowns, where people are reluctant to put up substantial buildings, owing to the proverbial uncertainty and often rapid exhaustion of ore bodies. The reverse is the case with Wallace, however, which is one of the most substantially built little cities in the west and reflects the eminent faith of its citizens in the permanency and lasting qualities of the ore bodies of the Coeur d'Alene mines.

Bedded deposits of lead-silver ores, associated with limestone formations are often noted for their large size, but also for their irregular shape and uncertain extent. The Coeur d'Alene deposits are unique in that they are not associated with limestone at all, and to a very limited extent with intrusive dike rocks, which was considered so essential at Leadville, but occur in nearly vertical fissure veins in quartzite and slate, and in this respect compare more closely with some noted European mines. There are lead-silver deposits in Spain and Bohemia, of the fissure class, that have been successfully operated on quite a large scale for more than one hundred years, and in one instance to a depth of nearly four thousand feet, over one thousand six hundred feet of which was below sea level.

This is the type of deposit that the Coeur d'Alene district contains, and in spite of the rapid pace of modern American methods, the extent of this district is such that new ore bodies will continue to be discovered and it is likely to maintain its present eminent position for fifty years.

The accompanying cuts, numbers one and two, show Wallace as it was before the fire and as it is at the present day. The present city is about fourteen years old. Its present population is about three thousand. It is divided into four wards, has numerous handsome business blocks, smooth, well paved streets, an opera house, several hotels, two banks and four local papers that are very much alive to the important natural resources that surround their city.

Wallace enjoys exceptional transportation advantages and can be reached over two lines of railroad, the Oregon Railroad and Navigation and the Northern Pacific, which reach all the important producing mines, and in spite of the cramped and narrow canyons and steep grades they handle the enormous tonnage of the district without congestion.

The mining industry of the Coeur d'Alenes enjoyed the most prosperous year of its history during 1903, with the prospect of still greater output in the future. The gross lead and silver contents of the concentrates and crude ore shipped out of the district during the year was 213,520,000 pounds of lead and 5,751,613 ounces of silver, with a gross bullion value of \$12,147,975, and a total output from discovery in the early eighties to date estimated at \$80,000,000.

The notable events of the year were the consolidation of the Standard Mammoth, Tiger-Poorman mines at Canyon Creek and the Empire State properties at Wardner by the Federal Mining and Smelting Company and the taking over by the same people of the Wallace Sampler, which handles the bulk of the ore produced in the district.

This consolidation admits of a centralization of management and reduction of administrative costs. The mines now under this company's control produced very nearly fifty per cent of the total output of the district in 1903, which fact should give this company a commanding position with the lead markets and smelter people.

There was completed during the year a power transmis-

sion line from Spokane Falls to Burke. This line has a total length of one hundred and one miles and at present is transmitting 1,400 horse power. It is a three phase system and can be operated at a maximum capacity of 60,000 volts, and a great economy will be effected to the Coeur d'Alene operators as compared to the cost and uncertainty of coal for steam power.

There were 2,000 men employed during the year in a dozen producing mines and probably 1,000 more scattered among the smaller operations, which include many promising new properties now undergoing development. In several of these handsome ore bodies have already been disclosed, which, in this remarkable district, usually means a producing mine of large capacity when properly developed and equipped.

The big mines of this district are mostly managed by pushing, energetic young men and manned by bright up-to-date American miners, or English-speaking American citizens, with very few foreigners. The ore bodies are almost invariably large, ranging from five to sixty feet in width and one hundred to two thousand feet in length. They occur in steep pitching fissure veins or shattered zones in quartzite and slate that range from a forty-five-degree pitch in the Wardner mines, to nearly vertical in most of the mines of Canyon Creek and Mullan.

The ore bodies are mostly mined by back stoping with machines and the stopes kept very securely and closely timbered with square sets, or heavy stull sets, according to the width of the ore, with three inch plank for flooring. The space mined is usually filled with waste or low grade ore sorted from the vein, with the exception of the first floor above each level, which is usually kept open for convenience in handling timbers.

The bulk of the ore so far mined in the Coeur d'Alenes has been extracted through tunnels without hoisting or pumping, and from the topographic conditions of the district this is an advantage that will be maintained for years.

There are a number of fine well-constructed and equipped tunnels in the district, among which are the Kellog tunnel of the Bunker Hill & Sullivan Company, at Wardner, which is 12,000 feet long; the Reed tunnel, on the same property, is five thousand five hundred feet long; the Sweeney

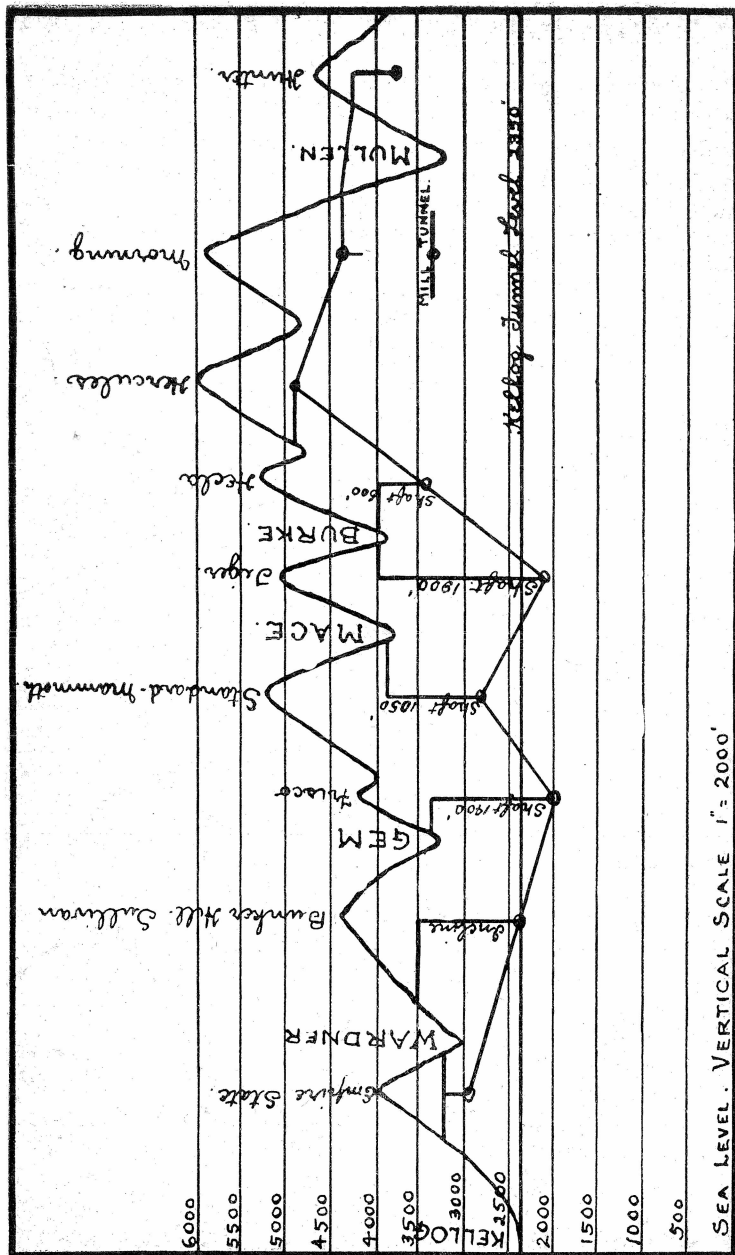
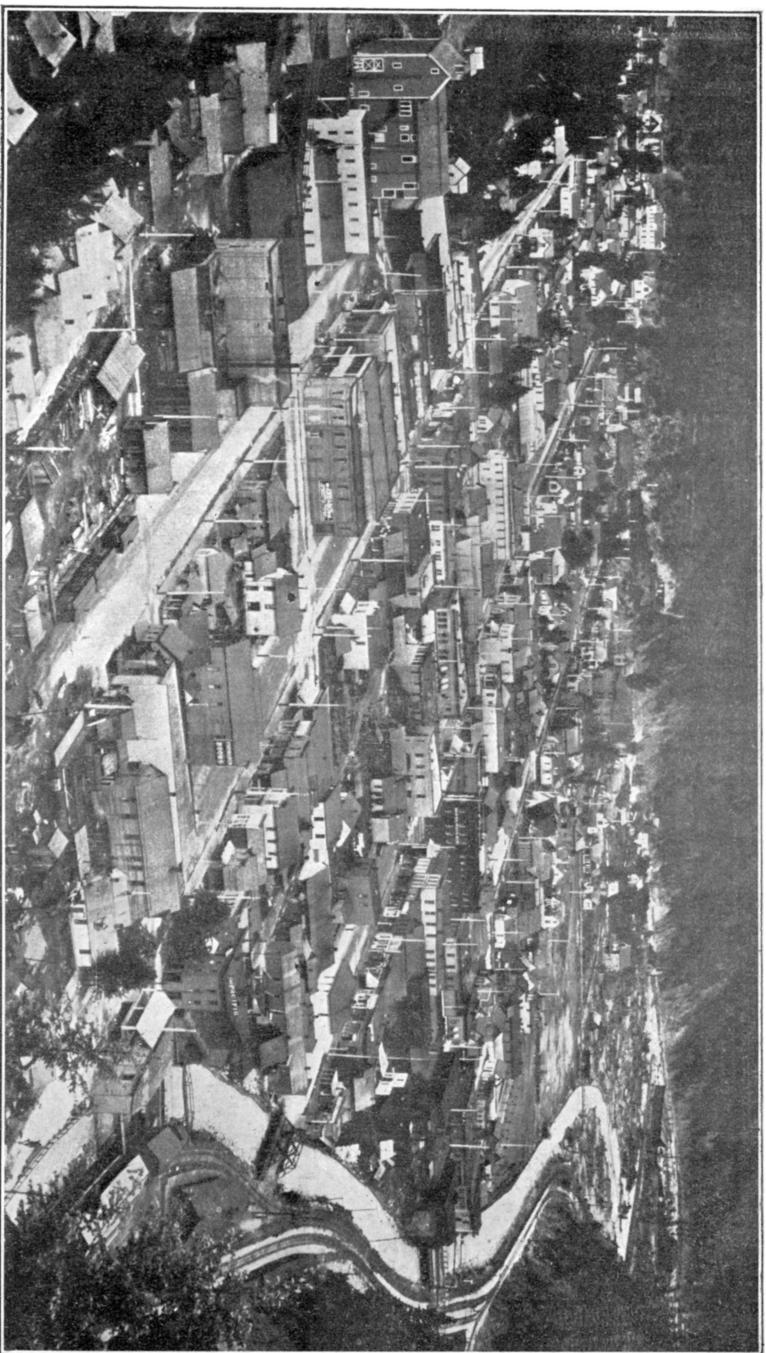


DIAGRAM REPRESENTING RELATIVE HEIGHTH AND DEPTHS OF THE PRINCIPAL ORE BODIES
IN THE COEUR D'ALENES.



WALLACE, IDAHO, 1903.

tunnel, Federal Company, at Wardner, five thousand feet long; the Frisco, at Gem, one thousand two hundred feet long; the Standard, at Mace, three thousand feet long; the Mammoth No. 6, three thousand feet long; the Hecla No. 5, at Burk, two thousand four hundred feet long; the Hercules No. 3, above Burke, three thousand feet long, and the Morning No. 6, at Mullen, now being driven, which is in six thousand feet, and will be over 10,000 when finished.

There are only two mines in the district operated through shafts sunk from the surface, the Tiger and the Hecla. The former, started in the canyon bottom at Burke, is one thousand nine hundred feet deep, and the latter six hundred feet and still sinking; besides these there are two other fine shafts in the district, the Standard, in Campbell tunnel, three thousand feet in, and one thousand and fifty feet deep, and the Frisco, in Frisco tunnel, one thousand two hundred feet in and one thousand four hundred feet deep.

The future possibilities for production of these already extensively developed properties are enormous. The veins vary in strike from east and west to southeast and northwest, and dip generally at a steep angle to the south or southwest.

The Canyon Creek veins have been cut by the erosion of the canyon since their formation to a vertical depth of more than a thousand feet, and in the Tiger, Frisco and Standard Mammoth veins developed to a depth of one thousand to one thousand nine hundred feet below the bottom of the canyon.

If the experience of these deep developments are any criterion or guide for what may be expected at depth in similar strong fissures of the district then the future of some of them are enormous. The Hercules ore body, for instance, is four thousand feet vertically above the bottom of the Tiger shaft, and as it is opened on a similar strong vein and has one of the largest and richest bodies of clean ore in the district, there is no reason to doubt that it may continue to be productive to the same depth as its neighbor, which would mean about a mile on its dip, and fully three thousand feet of this great depth can be undercut to advantage by tunneling from the surface.

The general elevation of the towns in the Coeur d'Alenes is about three thousand feet and the highest points seldom exceed six thousand feet, and although the snowfall is

heavy in the winter the climate is healthy and average temperature very mild.

It is a country of deep narrow canyons and high ridges of sharply folded metamorphic rocks that verge from a true vitreous white quartz of fine grain, near Wardner and at numerous other points, to a smooth grained grey slatey rock, a cross between quartzite and slate, called greywack.

In a cut at the depot at Wallace the formation is a greenish grey crumpled schisty looking slate, showing incipient ripple marks. At the Morning mine No. 5 tunnel it is a heavy bedded quartzite that has been compressed into a silicious schist with a very thin vertical cleavage. At the Hercules mine the formation near the croppings, and for the last two thousand feet on tunnel No. 3, is a smooth grained grey argillite speckled with fine iron pyrites.

There are very few dike rocks in the lead district. Some small intrusions of basalt, a digested igneous rock resembling the Wood River diorites, occur in the foot wall of the Hercules vein No. 1 tunnel, and quite an extensive belt of eruptive granite or syenite occurs near Gem.

The present productive center of the district is embraced within an area of about ten miles square northeast from Wallace, and about half that area in the vicinity of Wardner. The lead-bearing quartzose formations of the Coeur d'Alenes extend from the Bitter Root range west for about forty miles by ten or fifteen miles south and north of Wallace and are continued in a narrow belt along the main divide to the north of Eagle Creek.

These formations are bounded to the north, west and south with gold-bearing granitic formations. They have never been classified by any of the government geologists but are locally considered to be of silurian age. A similar series of quartzose formations to those of the Coeur d'Alenes have a very extensive development along the main Rocky Mountain range west of Salmon City, in Lemhi County, and have been provisionally assigned to the Algonkian by G. B. Eldridge. They are immediately overlaid with an extensive development of lead-bearing carboniferous limestone further south.

The ore in the Coeur d'Alenes consists of medium grained to a fine steel galena, in a shattered quartzite gangue, and is associated with spathic iron, a little blend and pyrite, and occasional spots of chalcopyrite and grey copper.

The silver contents of the ores vary from one-half ounce to one and one-half ounces per unit of lead, except in some instances altered surface ores run several hundred ounces per ton, but the bulk of the shipments from the district do not exceed three-quarters of an ounce of silver to each unit of lead.

Contrary to popular theories that lead ores will become more zincy at depth, some of the highest ore crests in the Coeur d'Alenes contain the largest percentage of zinc and some of the deepest developed ore bodies are most free from it.

The ore in the Canyon Creek mines occurs in thick bands of fairly clean mineral two to ten feet apart with disseminated ore sprinkled through the intervening space of sheeted and shattered country rock.

In the Wardner mines the main foot wall of the vein is always clearly defined and the ore rarely forms below it. Above the foot wall a shattered zone of quartzite three hundred feet or more in width in which the ore occurs in great pipe shaped bodies one hundred to four hundred feet long and ten to sixty feet wide. These shoots follow somewhat the habit of great pipe veins in limestone but have been remarkably persistent in their downward extension. It frequently happens that one ore shoot along the foot wall of this great lode will be overlaid by another one in the hanging wall country, and separated from it by a hundred feet or more of practically barren ground.

About half of the material broken in these great shoots is considered too low grade to be sent to the mill. It is sorted out and used for filling in the stopes, and as this lode is the largest tonnage producer in the district, its operations involve the employment of a small army of shovelers to handle over the material after it is broken down onto the stope floors.

Of all the ore produced in the Coeur d'Alenes none of it is smelted there but it is nearly all concentrated and shipped to other States to be reduced to bullion.

There are many fine concentrating plants in the district ranging in capacity from one hundred and fifty tons to one thousand tons of crude ore a day. The prevailing plants consist of rock breakers, belt conveyors, high speed rolls, graded jigs, Wilfley tables, revolving buddles, true vanners and canvas tables. Most of the big mills are run by water power.

The bulk of the ore treated runs about ten per cent lead and from one-half an ounce to one ounce silver per unit of lead, and the average loss is twenty per cent of the gross value of the feed in lead, and a trifle more in silver. This seems like a large loss but it is a high saving compared to the big Australian plants at the Broken Hill district, where only ~~forty~~^{65.57} per cent of the lead and less than fifty per cent of the silver contents of the ore is saved.

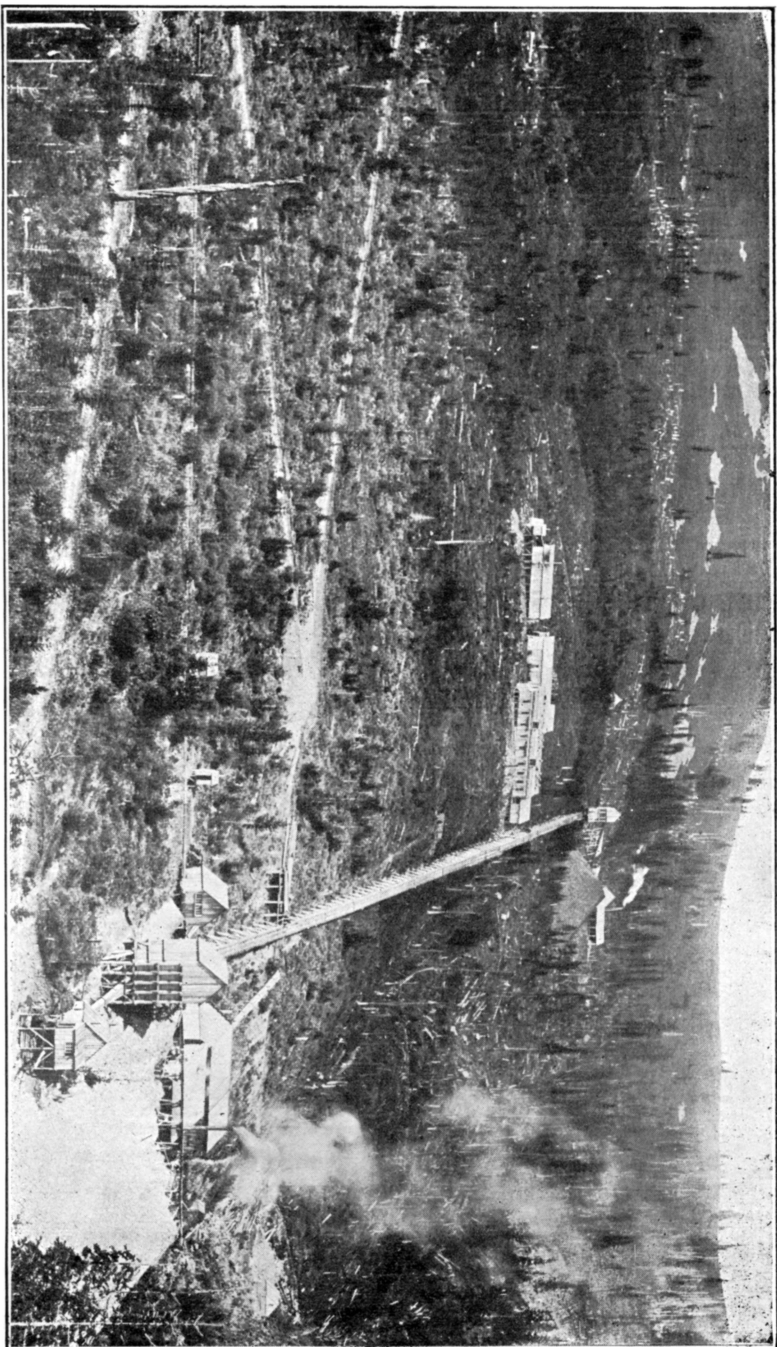
The principal loss in the Coeur d'Alene method is in the coarse jig tailings and in the fine slimes. At the slime end an important additional recovery can doubtless be made and is being diligently figured on by the operators.

The Daily-West mill at Park City, Utah, makes a lead saving of ninety-five per cent on a much more complicated ore of the same grade in lead, and this remarkable high result is arrived at by the intervention of a simple slime tank device invented by Mr. T. W. Sherman, the mill superintendent. It is cheaply constructed, works automatically without power, and may find special application in the Coeur d'Alenes. The cost of concentration in the Coeur d'Alene district ranges from eighteen to thirty cents per ton and the cost of transporting the crude ore from the mine to the different mills varies from five to twenty cents per ton.

The prevailing wages for miners all through the Coeur d'Alene is \$3.50 per day of ten hours, and usually \$4 per day of eight hours in wet shafts or other rush work or bad places. The men generally go in and out of the mines on company time.

All other underground men in the Canyon Creek and Mullen mines receive \$3.50 per day, but as a matter of fact they are mostly miners, and able to turn a hand to any part of the work. Timbermen receive \$4 per day throughout the district.

In the big low-grade stopes of the Wardner mine, that involve so much straight shoveling work, laborers are paid \$3 per day. The men are well housed and fed. Some of the big company boarding houses are complete hotels, steam-heated and include a large dining hall, sitting room, commodious lavatories and bath rooms, provided with plenty of hot and cold water, and separate numbered lockers to hang clothes in. They are generally divided into small sleeping rooms in the second story with two single beds,



SURFACE EQUIPMENT, HERCULES MINE, NEAR BURKE, IDAHO. NUMBERS ONE, TWO AND THREE TUNNELS.

and while they are not noted for plush finish and frescoes, they are usually kept scrupulously clean by regular attendants, and afford comfortable quarters.

Charges for board and lodging at these places are from \$32.50 to \$35 per month, or \$30 per month for board without lodging.

The bulk of the ores treated in the Coeur d'Alenes is low-grade. They yield net profits of from 50 cents to \$2.50 per ton, after mining, concentrating, shipping and treatment charges are figured out, and the large aggregate profits the mines pay is only made possible by the large tonnage their enormous ore bodies afford. It will be readily appreciated that on such small margins, any serious drop in bullion values or increased cost of production must have a depressing effect on the industry.

The most important ore developments during the year among the producing mines was the undercutting of the great ore shoots of the Bunker Hill and Sullivan mines at the Kellog tunnel level and finding them still clean and unimpaired as to size and lead-silver contents, and affording six hundred and fifty feet of virgin ore channels between the big tunnel and the old works above.

The expansion by two hundred feet along its strike to the north of the great ore body of the Standard mine in the two lowest levels at a depth of one thousand feet below the bottom of Canyon Creek, where this remarkable body of mineral, the most productive in the district, now shows a continuous stope of ore that is eight to twenty feet wide and nine hundred and fifty feet long.

The cutting of the famous Hercules ore shoots in their number three tunnel three thousand feet long, where it was encountered at exactly the point called for by the survey and at a depth of one thousand three hundred and ninety feet below the surface, where a solid body of galena five to six feet wide was disclosed, carrying proportionate silver values with the ore above and a similar great width of concentrating ore.

This splendid tunnel is adapted for electric haulage and after reaching solid ground was driven in the record time of twelve feet a day. It was run by liner drills and has developed a remarkable flow of water that maintains an average discharge, at the mouth of the tunnel, of one thousand gallons per minute, a marked evidence of the permanency of, and clean cut nature of the fissure.

The Hercules has all the earmarks of developing into a mine of the first rank among the bonanzas of this district. During the year this property shipped 10,000 tons of first class ore that averaged sixty per cent lead and eighty ounces of silver, which, in addition to four thousand nine hundred and eighty-nine tons shipped in 1902, was all mined from a space on the main ore shoot above the second level that was equal to about eight floors high by three hundred feet in length and twenty-five feet wide. In addition to the ore shipped there remains stored away in the stopes and on the dump a rich concentrating ore tonnage estimated at \$500,000 in value.

The number two tunnel is connected with a raise on the ore all the way through the number one, which is three hundred and seventy feet, or forty-six eight-foot floors above. The ore shoot in the number one tunnel has not been fully explored; it is three hundred feet below the crest of the mountain where the vein crosses into Nine Mile Creek slope. The exposed croppings of this bonanza ore body is an insignificant streak of quartz six inches thick with some spots of iron oxide and lead carbonate, very low grade in lead and silver.

The Hercules fissure strikes about east and west and dips fifty-five degrees south. In structural appearance it resembles more closely the Wardner fissure on which the Bunker Hill and Empire State mines are located than any other in the district. It has a solid regular foot wall, but the shattered country rock of the hanging wall is ore-bearing for one hundred feet out from the main body on the foot wall, and from its many evidences of strength there is every reason to believe that this great vein may continue productive to a depth equal to that at which the adjacent Canyon Creek mines are now being successfully worked, and probably deeper. The Hercules is still in the hands of its original locators who have handled its development in a masterly manner.

The ore body above the No. 2 level of the Hercules exhibits some very handsome examples of secondary enrichment. Great kidneys of steel galena occur with thick crusts of hard grey carbonate and an outer crust of snow white crystalized lead often topped out with matted native wire silver.

The number three level on this property is at present the

highest producing ore development in the district. The Morning number five level, with a continuous ore shoot two thousand feet long, is the second highest. The Tiger and Frisco mines have the deepest development in the district, and they are only two or three hundred feet below the level of the Kellog tunnel at their lowest point.

Over on the north side of the lead-silver belt there are a number of lead-silver properties being developed in the vicinity of Murray, and while they are a little remote from railway transportation at present, if actual tonnage in sight will induce a railway to tap this promising section of the Coeur d'Alenes, it is likely to be able to enter the market with its product at no distant day.

That there is something doing over on the north side in the way of lead-silver ore development will be manifested from the following brief description of one of its principal properties.

The Monarch mine, operated by the Monarch Mining Company, Limited, is situated five miles east of Murray. It consists of twenty-three lode and five placer claims. This property is opened by and developed from six adit and cross-cut tunnels and one shaft on the apex of the main lode of the mountain, called the Monarch lode. There are also four other lodes or veins known respectively as the Atlantic, Pacific, Barton and Lucky Joe, showing lots of good ore.

The total amount of development to date on this ground amounts to seven thousand feet of underground work, most of which has been done on or in connection with the Monarch lode. This lode has been developed to a vertical depth below the apex of three hundred and fifty feet, yielding lead carbonates on and near the surface, while on the three hundred and fifty-foot level there has been opened up a fine body of steel galena four feet wide on hanging and about three feet on foot walls, with about twenty feet of concentrating ore between. This immense shoot of mineral has been opened for about two hundred and fifty feet in length and its boundaries have not yet been reached on the strike.

This ledge has an easterly and westerly strike with a dip of seventy-eight degrees to the south. The long cross-cut tunnel now in course of construction is being run from the Pritchard slope and is intended to develop this big ore

shoot at a vertical depth of one thousand four hundred feet below the apex. It has reached the three thousand-foot point and is expected to cut the ledge in about one hundred feet, or near the three thousand one hundred-foot mark. This cross-cut was started about September 1st, 1902.

There are several other properties that have developed handsome lead ore showings on the north side. The first class ores of this part of the Coeur d'Alenes are remarkably clean and free from foreign sulphides, and while generally low grade in silver carry very high lead values, together with the added advantage of important amounts of gold in some instances.

SHOSHONE COUNTY COPPER MINES.

A stranger visiting Wallace for the first time if at all interested in minerals, cannot help being struck by the elegant displays of copper minerals on exhibition in the front windows of the several mining and real estate firms. They almost equal the lead-silver ores in number of samples and display some fine varieties of copper carbonate, chalcopyrite and variegated sulphide ores. They are not borrowed from a foreign source, either, for this remarkable mineral field has one of the most promising copper belts in the State.

The Stevens Peak copper belt is within ten miles of Wallace, carries a copper-iron gossan lode that is ten to forty feet wide at the croppings and can be traced across the mountains for thousands of feet, along which there has been considerable work done and shipping ore reached at several points.

The development along this belt is still mostly in the oxidized surface zone. The ores all carry fair values in gold and silver and from the size of the veins and amount of leaching that must have taken place, when the enriched sulphide zone is reached at water level, Coeur d'Alene is likely to become noted for its gold and silver-bearing copper bonanzas, as well as for its lead bonanzas.

At another point in Shoshone County there is a copper mine about a quarter of a mile east of Murray that produces specimen copper ore very high grade. It is a very large vein and has been developed with a 300-foot tunnel and a 70-foot shaft.

Other fine copper prospects carrying very high-grade ore occur on West Eagle Creek up near the Bitter Root

divide, and on the north fork of the Coeur d'Alene River in what is called the lower copper camp, there are some very promising resources of the red metal, associated in one property with rich silver-bearing galena ore.

GOLD RESOURCES.

The gold resources of Shoshone County are quite extensive and important. The gold belt at the north end of the county along the drainage of Beaver, Pritchard and Eagle Creeks experienced a slack year of production during 1903 from one cause or another with a total gold yield of a little less than \$100,000.

This section has a number of fine properties, both quartz and placer. Several of the latter have recently been equipped with large hydraulic elevators and dredging plants and at several points are expected to get into the producing class the coming season, which will add materially to the gold output of this part of the county.

Some quite important placer mines are worked along the tributaries of the St. Joe River on the north fork of the Clearwater, at Hughes Creek, and in the vicinity of historic old Pierce City.

South of the Coeur d'Alenes granite formations prevail throughout a greater portion of the balance of the county, with some lava and underlying sedimentary formations at the south end near Oro Fino, among which fine samples of bituminous coal blossoms have been found.

Near Pierce City some very important gold quartz veins occur in granite. The most prominent of these is the Wild Rose, which pays dividends with a small three-stamp prospecting mill.

This mine is opened on a well-defined vein in granite 28 feet wide that contains \$8.00 average values in free gold all through its width and only needs a big mill to become a big producer. The present ore supply from the little mill is derived from a regular pay streak along one wall that is twelve inches wide and runs \$100 per ton in gold.

The Klondike mine in this district worked four months during the season, opening a fine vein of ore from eight to twelve feet between walls that carries good average values.

The Western Native, another large vein, was worked to some extent. This property shows forty-two feet of low grade ore accompanied with an eighteen-inch pay streak of \$25 rock.

The Crescent Consolidated Company also have a strong vein quite extensively developed and produced some bullion during the year.

Among the most important placer producers of this district during the past season was the Rich Hill placer, the Snake Creek placer and the French Creek placer, all of which produced important amounts of gold.

The gold statistics obtainable from the south end of the county are very incomplete and the total output is probably considerable in excess of the amount given.

In spite of its enormous bullion yield Shoshone County has about as large an area of virgin territory as any county in the State. Along the western slope of the Bitter Root range, from the south end of the Coeur d'Alene Mountains through to the extreme southeast corner of the county, there exists a practically unexplored region, a wilderness of densely timbered mountains, drained by the head waters of the St. Joe River and the north fork of the Clearwater River where placer gold occurs in every little tributary stream and in which valuable ore resources may be discovered and important new camps established at any time.

WASHINGTON COUNTY.

Washington County occupies a western central position in the State, and while not large in area, is exceptionally rich in mineral resources and made a more important advance in the matter of metal output than any other county in the State during 1903, over the previous year.

Weiser, the county seat of Washington County, is a rapidly growing little city located on the Oregon Short Line Railway at its junction with the Pacific and Idaho Northern Railway, extending from Weiser to Council in the very heart and center of the county and graded for the better part of the way for twenty miles beyond Council into one of the finest and most accessible yellow pine timber belts in the State.

A ride from Weiser in the early summer over the Pacific and Idaho Northern Railway in connection with a most excellent stage service from Council to Payette Lakes is one of the most delightful trips to be found in the mountains. The railroad follows the Weiser River through richly

cultivated orchards and fields, in the vicinity of the city, but soon leaving, it enters a deep cut lava canyon which it follows for miles. Here are encountered varying phases of rugged scenery that present difficult engineering feats, successfully overcome; thence on through the cottonwood groves and softening landscape of Middle and Salubria Valleys, with occasional glimpses of high mountain summits, beyond rolling pleateaus that intervene, to the present terminus at Council, situated in the broad open area of Council Valley.

From Council a splendid four-horse stage service takes the traveller to Salmon Meadows, through waving beds of wild sunflowers and rosin weed, that form a carpet of golden glory for miles. Ten miles beyond Council the stage road enters the timber belt and follows the river to Price Valley, and over a low divide through a magnificent forest of yellow pine studding the open rounded hillsides, then on down the sedgy lake-like meadows of the Little Salmon, over another densely timbered rounded mountain summit, to the shores of the Payette big lake whose natural beauty must be seen to be appreciated.

The timber resources of this central portion of Washington County are enormous. They can easily be made available by a little further extension of the Pacific and Idaho Northern Railway from Council, which has already been graded most of the way to Price Valley twenty miles out and could be completed for a very reasonable outlay of money. Its completion would admit of the establishment of a lumber industry of very considerable magnitude that would bring a very important business tribute to Weiser.

The principal mineral districts of Washington County are along the east and west slopes of the Seven Devils range of mountains at Mineral, Bear, Cuprum, Helena, Black Lake or Mountain View mining district at the head of Rapid River and the Heath district. The principal product of these mines are gold and silver-bearing copper ore and straight gold ore.

The southeastern portion of the county is largely occupied by lava covered plateaus and some unaltered sedimentary formations, in which important prospects of lignite coal have been found near the southeastern corner. A high granite ridge along the eastern border of the county forms the divide between Long Valley and the Weiser drainage.

The northwesterly portion of the county is largely occupied by the rugged Seven Devils range that is made up of old eruptive rocks with included slates and schists and some heavy belts of crystalline limestone, great dikes and intrusive masses of porphyry, rhyolite and diorite, associated with an extensive area of granite at Cuddy Mountain.

BLACK LAKE.

The predominating formations of the Black Lake gold district at the head of the different tributaries of Rapid River are diorite and diabasic igneous formations occurring in great mountain masses and including a wide belt of blue and gray crystalline limestone.

The Black Lake district is approached from Council by stage, via Bear, near the Seven Devils copper mines, then over a road built at private expense to the mine through the rugged summits of the Seven Devils range.

The principal operations at this district during the year were those of the Idaho Gold Coin Mining Company, who operated a fifty-ton cyanide mill until October, when the plant was unfortunately destroyed by fire. This plant is reported to have produced a total of \$75,000 in gold bullion during 1903.

The two principal veins opened by this company are nearly vertical fissures in diorite and greenstone; one of these fissures, known as the Summit, is developed by adit tunnels to a depth of four hundred sixty feet, exposing a good strong vein of ore for a long distance on its strike, that varies from two feet to five feet wide and carries average values ranging from ten dollars to twenty dollars per ton. The ore in this vein is completely oxidized and shattered quartz down to the lowest point opened, and in spite of its good average values rarely shows a color in the pan. A soft ash colored sintery ore contains the richest values. Selected samples run up to several hundred dollars a ton. What the original composition of the ore was before it was oxidized is not known; tellurium has been suggested, and it is thought that it may make its appearance at water level in this vein and probably afford a resource of very rich shipping ore.

The Maid of Erin vein, belonging to this company and situated a little lower down the mountain, is filled with

milk white quartz quite thickly sprinkled with iron pyrites. It is five feet to ten feet wide and contains average values of eight dollars to twelve dollars per ton in gold.

These mines are situated near the head of a very rugged canyon and were connected with the mill by an overhead traveling wire rope tramway six thousand feet long, with one span across Black Lake of two thousand feet. Some detailed experiments had just been completed that would have greatly increased the capacity of the mill when it was burned down. It is reported that the mill will be rebuilt in the spring as the mines have a large reserve of ore developed.

Five miles north of the above described property the Iron Springs Mining Company, Limited, are opening up a very promising and extensive gold property in another rugged canyon tributary of Rapid River.

The property of this company consists of thirty-three claims and bears the earmarks of developing into a gold producer of large caliber. The principal ore developments consist of a wide fissured zone in greenstone that is as much as 25 feet wide, filled with a silicious schist, as twenty-five feet wide, filled with a silicious schist, gangue richly impregnated with gold-bearing iron pyrites that has been opened by an adit tunnel five hundred feet long. There is also a cross-cut tunnel on the property four hundred eighty feet long and a fine three-compartment shaft eighty feet deep that is equipped with a large new Allis-Chalmers hoisting plant good for fifteen hundred feet deep.

This hoist was only recently completed. The company worked a big force of men all fall and put up a number of substantial camp buildings. It is the intention to carry the shaft down on the vein several hundred feet and make sure of the true nature of the ore that will have to be handled below water level before erecting a milling plant, which is a very wise policy to pursue. The Pactolian Mining Company, who own a section of the same fissured zone to the south, have done considerable tunnel work on their property. Five miles still farther north, on still another tributary of Rapid River, the Rankin-General Mining Company are experimenting with a nitric acid process, by which it is proposed to oxidize a base sulphide ore by acid manufactured from the atmosphere. What success the

company have had with the process the writer was unable to learn.

This company has been operating a fine group of claims near their mill under lease and bond from Potter Brothers, that has a large vein of good ore developed by two tunnels, aggregating four hundred ten feet in length. The company also owns a large vein known as the Jackley, on the northwest slope of Jackley Mountain, that is forty feet wide, developed with a hundred-foot tunnel and is reported to contain pyritic ore with paying values in gold throughout its width.

There are a number of very fine ore showings in this vicinity and the Dorie G. and Telluride claims, located by Mr. Hugh Kern, are reported to carry rich gold-bearing tellurium ore.

Lower down Rapid River a wide belt of crystalline limestone is included in the massive diorite, and along the contact of the two formations the Oregon and Johnson mines were being developed to considerable extent and both had good strong showings of pay ore.

This is a very promising district and when more fully developed is likely to become quite a factor in the total gold output of the State. Its fissures are usually large and well defined and some of them have produced small lots of ore containing sensational values in gold, while the natural conditions for their economical development by adit and cross-cut tunnels are exceptional for Idaho. The mountains are well timbered and the numerous tributary streams afford fine water power privileges.

From the Black Lake, back over the road to Bear at a point called Placer Basin, some quite extensive development work has been done by sinking short incline shafts on a vein of quartz in a formation of schist and porphyry. This property carries high values in gold. On the Weston group a small shipment was taken out that ran seventy-five dollars per ton. The vein is reported to have faulted under ground, but from the evidence of its extent along its strike, indicated by a string of handsome boulders of rich float ore, the chances are it can be recovered without much trouble.

Bear Creek has some rich placer ground that is successfully worked each year and quite an extensive gold quartz district above the placers that has some very promising prospects.

At the Seven Devils copper camp there was very little doing this year and the bulk of ore shipped from these mines was ore that had been stored from former work. A large part of Washington County output of copper bullion for the year, amounting to the sum of 2,000,000 pounds, was from the new works of the Ladd Metals Company at Mineral, whose new matting plant was successfully operated towards the close of the year and made some large shipments of valuable matte. This company has very extensive reserves of copper-iron sulphide ore and are likely to become a permanent factor in the copper world.

Some of the great bodies of copper ore in the Seven Devils are commencing to attract the attention of outside capital owing to their important precious values and to their large iron percentage; they are more desirable ores to treat than those of a drier nature and can be reduced to a high grade matte at a very low cost. One of the largest and best developed groups in the district was bonded during the fall by some Utah capitalists, who are connected with some of the big copper properties of Bingham. The appearance of this class of investors in this field should be hailed with delight, for these people have been very successful in handling this particular class of ore. At the Heath district some important deals were made by Mr. A. G. Stephens for the Carter White Lead Company, with a prospect that extensive development will follow.

This is one of the most promising districts in the State and contains a number of large ore-bearing veins or lodes, in places one hundred feet or more wide, lodes that in some instances carry rich silver ore in small pay seams traversing great bodies of porphyritic gangue; some of this class of ore was worked in an arastra by the Mexican patro process years ago, and some of the evidences are still to be seen.

One of the best copper showings in the State is at the Held mine, in the Heath district; this mine is better known as the Railroad group. It carries a mineralized zone of concentrating ore eighty feet wide, between walls of limestone and porphyry, and is a type of several others in the Seven Devils. There are two tunnels on this property; one of them one hundred eighty feet long follows a belt of rich ore ten feet wide that averages twenty per cent copper, three dollars gold and five ounces silver per ton. A

small pay streak twelve inches wide was followed for some distance; it was well splattered with grey copper and sampled one hundred seventy-five ounces silver, six dollars in gold and twelve per cent copper.

The ores of this mine carry rich carbonates near the surface and chalcopyrite with some grey copper at a short distance under the surface. Treated in a matting furnace a product would be derived that would run to very high values in copper, gold and silver.

There are some placer diggings on the tributaries of the Weiser River that lead up along the granite range of the eastern border of the county, associated with which are large quartz veins and gold-bearing porphyry dikes which have been worked to a small extent, and some quite extensive prospecting work has been done near the stage station at Price Valley that is said to yield good assays in gold. Considerable gold is also mined along the Snake River border of the county.

CONCLUSION.

In conclusion, I wish to acknowledge the use of valuable suggestions from the works of other State Mine Inspectors, especially those of Mr. Harry A. Lee, of Colorado and Mr. James Byrne of Montana. *Commissioner of Mines.*

In extenuation of the optimistic strain in the report as applied to the undeveloped resources of the State, I quote the following paragraph from a recent issue of the Denver Mining Reporter, as it has a special application to some recent important ore discoveries in this State, especially those of Pine Grove, Elmore County; Buffalo Hump, Idaho County; Loon Creek, Custer County, and Bellevue in Blaine County.

"Optimism, which runs to recklessness, is an unsafe factor in connection with mining operations; but the optimistic spirit is even more essential in mining than in other lines of industry. The hopeful mind and energetic hands have often demonstrated that gold is where you find it, when others have failed to find it 'where it ought to be.' The true miner who likes the occupation has an optimism which is seldom stifled by adverse experience."

Idaho's position at the head of the list of the lead producing States is doubtless secure, and if it were not for its geographical disadvantages this State could dominate

the lead markets of the world. There are five other lead-producing counties in Idaho in addition to Shoshone County, whose mining districts, still remote from railway transportation, indicate extensive resources of lead ore associated with important silver values, and their further development can doubtless be made to yield double the present lead bullion output of the State.

The wide distribution of placer gold over the State, its enormous yield, and the fact that its original sources has as yet barely been scratched in the way of development, the nature of the formations, and evidence at several points of the association of tellurium compounds with the gold ores, combine to form a very inviting field for gold mining exploration and investment.

Rich placer camps are not always an indication of profitable quartz camps, but in three notable instances in Idaho the veins discovered as a result of extensive placer mining operations have yielded precious bullion to the amount of fully \$50,000,000 in value. These instances are the bonanza ore bodies of Custer, Atlanta and Silver City districts, where the ore occurred in, or in close association with, porphyritic rocks of tertiary age.

These famous producers belong to the same class of deposits as the Comstock lode in Nevada, and contain the same class of dry ores—combined gold and silver values in a silicious gangue, and are of the same geological age. Some of the large porphyry contact lodes of the Big Creek section of the Thunder Mountain country are also believed to belong to this particular class of deposits.

None of the Idaho veins of this class have been developed to any extent below a depth of one thousand feet. The greatest bonanza ore body ever discovered in the world, that of the Con. Virginia on the Comstock lode, was found at a depth of fifteen hundred feet below the apex of the lode, and by following up a mineral seam in the vein that amounted to little more than a pencil mark for hundreds of feet, without any definite connection with the surface ore bodies except the intervening barren fissure spaces.

The opportunities for advantageous deep tunnel work in the Idaho mines of this class, and the prospect of finding bodies of rich minerals similar to what they produced from their upper levels is exceptionally fine. This is especially true of Atlanta and Custer districts.

At Silver City two long tunnels have been run, one for

the War Eagle vein which cut the vein at a depth of twenty-two hundred feet on the dip, and one for the DeLamar vein which was cut at about twelve hundred feet, but both of these enterprises have fallen short of their purpose from the fact that the work in each instance was discontinued with only a limited amount of exploration on the vein after it was cut.

The discovery of other high grade ore bodies at depth in these veins is of course problematical, but where the veins can be reached at a great depth by cross-cut tunnels of reasonable length, the venture is warranted and affords the basis of a legitimate speculative mining investment.

If bonanza values are not disclosed in these veins at depth there is a bright prospect, at least, of undercutting extensive bodies of ore worth \$10 per ton or over. This latter class of ore was considered waste on these properties in the early days when treatment cost averaged sixteen to twenty dollars per ton, but with a two-dollar to two and a half treatment cost and a higher result of extraction from the same class of ore, as practiced at the present day at Custer and Silver City districts, an extensive development of this lower grade of ore would mean a good margin of profit.

In the review of the mining developments and resources of the various counties, Canyon, Lincoln and Oneida Counties as yet contain no extensive underground mining operations. Each one of these counties, however, borders on the Snake River and produces a small amount of placer gold. Canyon County contains an important undeveloped portion of the Pearl district, and in fact a part of the works of the great Lincoln mine overlaps the county line. Near its northeast corner Canyon also contains some very promising croppings of lignite coal that occur in the same horizon of tertiary sedimentary rock as the deposits at Salmon City are found in, and may develop a similar important source of domestic fuel.

Some important deposits of soda nitrate (Chili saltpetre) that may prove of commercial importance have been discovered in the desert plateaus of Lincoln County, and also deposits of fire opal have been found in its lava beds.

Oneida County has several very likely looking coal prospects near Bannock peak. This county also contains some fine bodies of lead and copper-bearing iron ore. In

the Bannock range, now included in the Fort Hall Indian reserve, and towards the southwest corner of the county, handsome deposits of marble and onyx have been reported to occur.

Ada County.

Gold, fine ounces, 191.86	\$ 3,965 59
Silver, fine ounces, 46.84	60 80
Total value	\$ 4,026 80

Bannock County.

Gold, fine ounces, 280.87	\$ 4,750 46
Silver, fine ounces, 12.15	15 68
Total value	\$ 4,766 14

Bingham County.

Gold, fine ounces, 143.95	\$ 3,178 33
Silver, fine ounces, 17.45	22 97
Total value	\$ 3,201 30

Blaine County.

Gold, fine ounces, 639.32	\$ 13,224 79
Silver, fine ounces, 385,193.58	496,906 46
Lead, pounds, 6,157,956	261,463 13
Total value	\$ 771,594 38

Boise County.

Gold, fine ounces, 15,323.51	\$ 318,080 15
Silver, fine ounces, 3,409.26	4,397 95
Total value	\$ 322,478 10

Canyon County.

Gold, fine ounces, 373.70	\$ 7,724 42
Silver, fine ounces, 36.63	47 25
Total value	\$ 7,771 67

Cassia County.

Gold, fine ounces, 332.21	\$ 6,866 86
Silver, fine ounces, 32.83	42 35
Total value	\$ 6,909 21

Custer County.

Gold, fine ounces, 5,903.32	\$ 122,021 59
Silver, fine ounces, 115,051.77	148,416 78
Copper, pounds, 500,000	60,000 00
Lead, pounds, 480,000	20,400 00
Total value	\$ 350,838 37

Elmore County.

Gold, fine ounces, 6,079.62	\$ 127,165 76
Silver, fine ounces, 2,309.12	2,978 76
Total value	\$ 130,144 56

Fremont County.

Gold, fine ounces, 75	\$ 1,550 25
Silver, fine ounces, 90	116 10
Copper, pounds, 24,000	2,880 00
Total value	\$ 4,546 35

Idaho County.

Gold, fine ounces, 14,687.60	\$ 301,648 95
Silver, fine ounces, 2,837.21	3,659 99
Total value	\$ 305,308 94

Kootenai County.

Gold, fine ounces, 1,700	\$ 35,139 00
Silver, fine ounces, 20,000	25,800 00
Total value	\$ 60,939 00

Latah County.

Gold, fine ounces, 550	\$ 11,368 50
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Lemhi County.

Gold, fine ounces, 11,388.89	\$ 235,426 37
Silver, fine ounces, 22,132.39	28,540 78
Lead, pounds, 700,000	29,750 00
Total value	\$ 293,717 15

Lincoln County.

Gold, fine ounces, 282.92	\$ 5,847 98
Silver, fine ounces, 58.40	75 34
Total value	\$ 5,923 32

Oneida County.

Gold, fine ounces, 424.04	\$ 8,764 91
Silver, fine ounces, 59.33	76 54
Total value	\$ 8,841 45

Owyhee County.

Gold, fine ounces, 23,897.23	\$ 493,954 96
Silver, fine ounces, 829,078	1,069,511 62
Total value	\$ 1,563,466 58

Shoshone County.

Gold, fine ounces, 6,298.06	\$ 130,180 90
Silver, fine ounces, 5,751,613.20	7,419,581 03
Lead, pounds, 213,520,000	9,074,600 00
Total value	\$16,624,361 93

Washington County.

Gold, fine ounces, 4,416.52	\$ 95,694 72
Silver, fine ounces, 92,043.42	118,736 01
Copper, pounds, 2,000,000	240,000 00
Total value	\$ 454,430 73

Totals for State of Idaho.

Gold, fine ounces, 92,938.42	\$ 2,085,993 76
Silver, fine ounces, 7,224,021.58	9,318,986 41
Lead, pounds, 220,857,956	9,386,213 13
Copper, pounds, 2,524,000	336,954 00
Total value	\$21,056,076 37

Coinage value of silver is given in the above estimate. Based on bullion values, the total output of the metals will be \$15,658,176.40.

