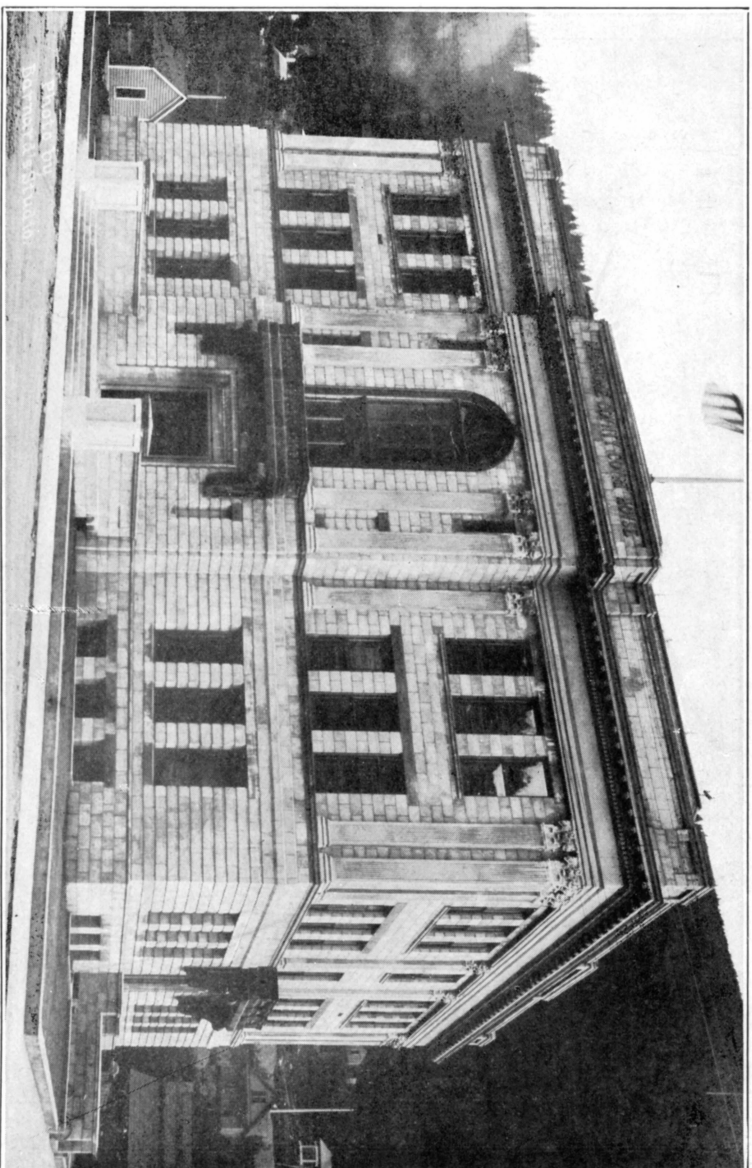


# **Notes about this document**

20181105 Christopher Tate, Idaho Geological Survey

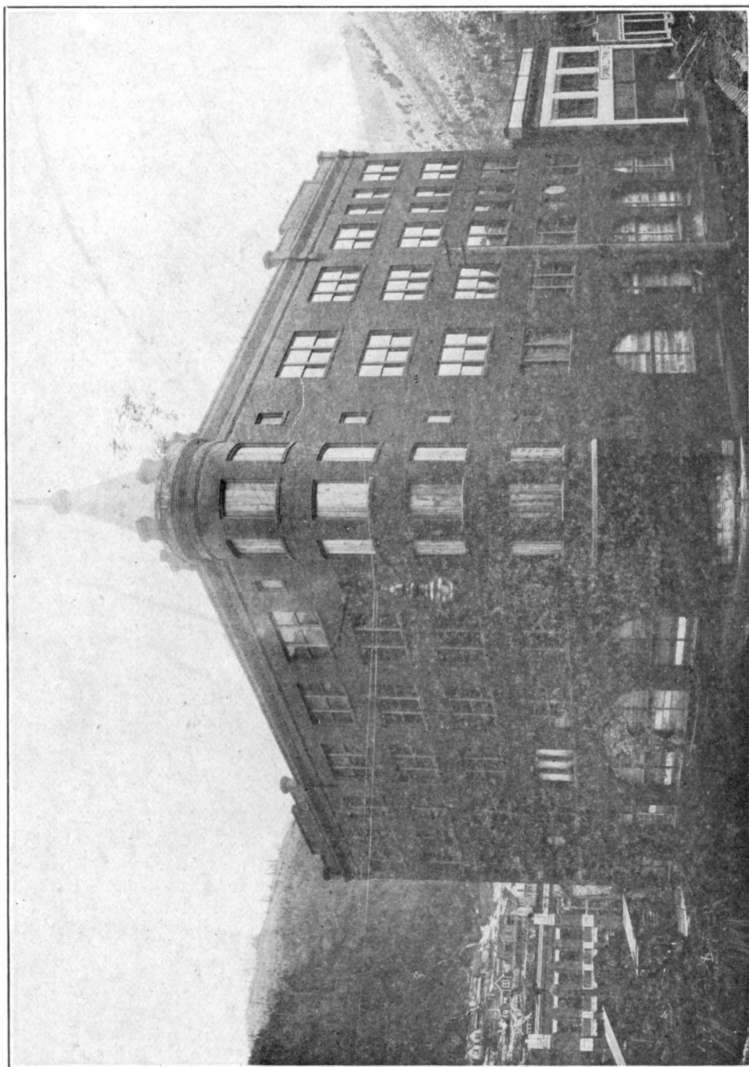
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Idaho Geological Survey's annual reports from the Idaho State Mine Inspector to the governor for years 1903-1908, originally in a single bound volume, are divided by year. A digital facsimile of the volume may be re-created by removing this page and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



SHOSHONE COUNTY COURT HOUSE AT WALLACE, BUILT WITH MILL TAILINGS AND MINE PROFITS, PRINCIPALLY,  
AT A COST OF \$100,000.





HOTEL SAMUELS, WALLACE, IDAHO, COMPLETED IN 1907 AT A COST OF \$250,000. A SUCCESSFUL MINER'S MONUMENT.

Ninth Annual Report

OF THE

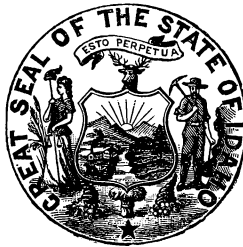
Mining Industry of

Idaho

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FOR THE YEAR 1907

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ROBERT N. BELL  
STATE INSPECTOR OF MINES

BOISE, IDAHO, JANUARY 1, 1908.

TO HIS EXCELLENCY, FRANK R. GOODING, GOVERNOR OF  
IDAHO:

DEAR SIR:—I have the honor to submit herewith my report as State Inspector of Mines for the year ending December 31, 1907.

Very respectfully,

ROBERT N. BELL,

*State Inspector of Mines.*

# INTRODUCTION

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The Idaho mining industry during 1907, was seriously affected by the varying industrial conditions for which the year was noted, and had it not been for these conditions, the year's production of mineral and mining profits would have made another record breaking showing. As it was, in spite of a serious car and fuel famine during the first half of the year, a serious labor famine during its middle period, the rapidly increasing cost of material and supplies, together with the panic in metal values that came about in September and October, and resulted a little later in the closing down of several of our principal producers, the total mineral and metal output of the year is only slightly under that of 1906, and, with the average high prices received for the products of our mines, the net profits earned will make the splendid total of approximately \$6,000,000 on a gross output valued at \$21,578,219.52.

The Coeur d'Alene District still continues pre-eminent in the matter of production and shows some interesting new developments in its old and new mines. In the south end of the State, the gold and silver mines of the Silver City District were not so seriously affected by the drop in values. They enjoyed a very prosperous year and made a large output of precious bullion at a good profit; also several important ore disclosures in both smelting and milling mineral were made throughout the south-central part of the State that give eminent promise of future profitable results.

On their face, the prospects for 1908 seem rather omi-

nous on account of the present depressed appearance of the metal markets. The present prices of lead and zinc are low compared to what they were in the first half of 1907, but still a fair figure, compared to what they were only a few years ago. At the commencement of the year, the United States was absorbing more than its own domestic production of lead, and with a return to the normal prosperous business conditions of the country, will doubtless be rapidly resumed, as there is too much vitality to the industrial life of the nation to warrant the anticipation of any permanent check to its forward progress so well under way a year ago, and so well warranted at the present time. The panic of 1907 may prove a useful check on a too rapid pace, but was probably assisted in its arrival by the big monied interests. With the resumption of general business, it is likely that lead and zinc will make a more rapid recovery than the other metals, as their sources are confined to a much more restricted territory. I am reliably informed that the present depressed value of these metals is probably partly due to manipulation as well as to the lack of demand. Big eastern users of spelter who have recently offered to buy in large quantities at the present market have been refused more than sufficient supplies to cover their absolute current needs, and it will not be surprising if before the close of 1908 prices of zinc and lead will again be as high as they were in the early months of 1907.

The action of the smelter trusts during the panic months of the closing year in going after the last "pound of flesh" in the matter of increased treatment charges and discount selvages on ore shipments from independent producers, have put the latter up in arms with resentment in

the States of Idaho, Montana, Utah and Nevada, where independent smelting companies are springing up like mushrooms. This is a healthy sign of the times and should result in the utmost good to the advancement of the mineral industry of the West. There is plenty of independent wealth, as well as independent mines, in the West for enterprises of this kind, and no need to go East to the trust centers for capital to push such enterprises, as western operators well know the enormous margin of profit there is in the smelting business, and the absolute results to be obtained. The smelter trusts have no monopoly on the technical skill of the country, their opinion to the contrary notwithstanding. The mining schools, where they got theirs, have been busy turning out graduates ever since, and there are no serious, exclusive patents on the smelting processes, which are simply a matter of fire concentration of metals. It is true that the trusts have extensive and some of the most important resources of the desirable ores tied up, but there are lots of magnificent loose ends available that can furnish an enormous tonnage of mineral, and with the experience gained in smelter location difficulties, a series of independent smelters can feel assured of a very profitable business from the start, especially if the States mentioned get together and form a refining and metal selling company of their own, which should be made "trust proof." The action of the smelter trusts, coming at the time it did, has certainly given the shorts in stock operations the opportunities of their lives, and opened the way for the installation of new, independent smelting plants that should prove, if judiciously inaugurated, the greatest blessing that western ore producers have ever experienced.

**FATAL ACCIDENTS.**

The list of fatal accidents reported, due to underground mining operations during 1907 exceeds that of the previous year by one and makes a total of 18, against 17 in 1906 and 20 in 1905. They were due to the following causes:

Falling ground .....	5
Falling down chutes and other openings.....	7
Falling from mule train .....	1
Drawing old fills .....	2
Premature powder explosions .....	2
Contact with live wire .....	1
	<hr/>
	18

**CAUSE OF ACCIDENTS.**

The total number of men employed in Idaho mines in 1907, as nearly as can be gotten at (for the majority of the crews varied almost daily), was about 7,000, from which it would appear that the number of fatal accidents per thousand men employed would approximate 2.55.

It was a notable fact that several of the fatalities reported happened to men who had only been employed at the work where they met their death a short period of time, and would indicate lack of experience or unfamiliarity with the positions they were filling. The accidents from falling down holes continue to be deplorably numerous, in spite of all precautions taken. The Coeur d'Alenes mines keep their shafts, chutes and other holes as well fenced off with guard rails as is practicable, but in spite

of these precautions, and constant warnings on the part of the operators, men seem to get preoccupied and repeatedly make fatal missteps. A miner's business is to make holes underground and he can not expect to be tied to his work to keep from falling while doing so. With ordinary care, all of the fatalities under this head might have been avoided.

### **FALLING GROUND.**

The accidents due to falling ground were mostly cases of taking too long chances in barring down after blasting, and the victim often exposing himself too recklessly in trimming off high backs. Two of the accidents reported were blamed to the effects of liquor. A man should never go underground in a big mine feeling the effects of a tapering jag, however slight, for if there is any alcoholic fumes remaining in his system, the lack of oxygen in the mine air will intensify their effect. This is not a tip to put a miserly inebriate on to where he can obtain a cheap drunk, but it is a fact that can not be too seriously considered by miners who indulge in liquor.

### **DEFECTIVE SENSES.**

Men with seriously affected senses should never be employed in underground mining operations. A man that can not smell, taste, hear, or see well has no business in the capacity of a miner in a big mining operation. Especially is it dangerous for the two latter senses to be defective. I consider that a man who has to wear specta-



cles has no business in filling an underground position in a big mine, as a steady thing.

It would further be desirable that everybody filling these positions should speak English, or if foreigners at least should have a shift boss who speaks their language, if they do not speak English, as situations often are liable to occur in a big noisy stope where it would be impossible to warn a man against pending danger if you could not make him understand at some distance, and which do not give any time for pantomime language.

### CAP CRIMPERS.

It is gratifying to note the low proportion of accidents from the premature explosion of blasting compounds during the past two years, for while several serious non-fatal accidents occurred, only one of the fatalities in the Coeur d'Alenes was reported due to this cause, which is a very favorable showing when it is considered that 8 of the principal producing mines of that district, employing a force of 2,000 men and producing a million and a half tons of ore, use over a thousand tons of dynamite during a 12 months' operation. I am confident that this immunity from such accidents, as compared to previous years, is largely accounted for by the systematic methods of thawing and distributing the powder, and by a more general introduction and use of the broad bitted cap crimper used in making primers. This crimper makes a parallel lug on the side of the cap when it is placed on the end of the fuse, or a series of parallel pinches and evenly tightens the copper around the fuse, as against the narrow bit crimper often used which presses a ring around the upper

end of the cap when in position on the fuse, leaving a cup shaped opening. This ring crimp is more apt to choke off the powder train in the fuse and result in either causing a missed hole with its subsequent dangers of repriming, or in reducing the explosive effect of the detonation. It would seem to an ordinary observer that if a cap exploded at all, that it would explode with its maximum force, but it has been absolutely demonstrated that by tight ring crimping the fire is often choked off, or the delicate spark passing through the end of the fuse produces a slower detonation and seriously reduces the effect of the powder, often leaving half of it unburned in the hole, a serious menace to subsequent operation and a loss in labor and cost of drilling, as well as in powder. In view of these facts, which have been amply borne out by repeated experiments at the works of the California Powder Company and those of the Dupont Company, operators should insist that only the most desirable cap crimpers are employed, as it not only means economy in operation, but added immunity from this serious cause of mining fatalities—missed holes.

The broad bitted crimper is objected to by some miners on the score that it leaves an open channel for water to get in and kill the life of the fulminate. If a drill hole is wet, the cap has to be additionally covered by grease or other water proof material, no matter what kind of a crimper is employed, and if dry holes, the broad bitted crimper made by the California Cap Company, or some similar device, gives as tight a result on the primer as does the thin, knife blade crimpers with none of its other bad features, and should be insisted upon until some better method is devised.

### ELECTRIC HOISTS.

There has recently been put upon the market electrically operated hoisting engines that are very effective and economical machines and are becoming quite popular with operators. For shaft sinking, however, and hoisting men away from a blast, electrically driven hoists present a new source of danger, as a power line one-eighth of an inch thick is too delicate a thing to depend upon at such critical periods, and where shaft sinking is in process under an electric hoist, the utmost precaution should be taken against blasting accidents, as the power is much more liable to fail at the critical moment as a round of holes is being spit after the blasting signal has been given, than would be the case with a steam or air-driven hoist, and in an ordinary sized plant, carries absolutely no reserve power. Bulkheads or refuge holes at convenient distances should be provided in cases of this kind, and the use of chain ladders insisted upon by operators. It has been my experience that miners employed in shaft work often show a reckless disregard for precautionary measures and depend too much on the man at the winding engine, who is only a human being like themselves and not infallible. He would be helpless to assist them should his power run off after the blasting signal has been given and answered. Chain ladders in this work are frequently neglected, and when provided, often are left hanging in the timbers unheeded but should always be hung down for emergencies with any kind of a hoist.

In big shaft work a device was used at the Hecla mine at Burke for spitting holes, which is highly commendable where electric hoisting is employed. By this method, the

holes were loaded and primed with cap and fuse in the usual way, and the fuses spit by wires through an electrically operated cable at a safe distance at the first level above the bottom of the shaft. With this device, the fuses can be spit in rotation as desired, as they are all attached by a separate fine lead wire from the cable to an iron wire ring loop, attached to the outer end of the fuse which is made to glow from the little hand battery in the hands of the operator above, and burns off the end of the fuse attachment, absolutely insuring the spit in the wettest kind of ground. When all the holes are spit, the cable containing the fine lead wires is wound up on a hand reel and set aside. This method of spitting holes is well worthy of investigation where electric hoists are employed, as it is absolutely safe and eliminates even the ordinary risks of hoisting men away from a blast.

### DANGER FROM MINE FIRES.

Another constant menace to life and property in Idaho mining operations, that can not be too religiously guarded against, is the danger from underground fires, which, while of rare occurrence, if they do happen, are liable to be the cause of disastrous results. Underground temperatures in Idaho mines vary to a marked degree, often in the same mine, and are sometimes very high in mines of comparatively shallow depth and development, due to varying natural causes.

In southern Idaho, especially in the mines of Boise and Owyhee Counties, abnormal rock temperatures are encountered that rapidly affect timbers. In a crosscut tunnel on the Nellie mine on Horseshoe Bend in Boise Coun-

ty, which is now 1,800 feet long and is ventilated by electrically driven Buffalo blower and a 6-inch air pipe, the normal temperature of the tunnel is over 90 degrees. The tunnel is a crosscut through a formation of fine grained diorite locally called black granite. This rock varies from a schist to a hard blocky structure and contains an excess of black mica and hornblend and probably a minute dissemination of radium minerals as was found in the formations of the famous Mont Cenis tunnel in Europe. The walls of the tunnel are perceptibly warm to the touch and the small amount of water that is flowing from the tunnel is also warm. The same condition was experienced in the Kentuck mine near by in a tunnel of similar length, which tapped the vein 900 feet deep and was subsequently connected through to another outlet above and the temperature considerably reduced.

In the Pearl mines occasionally pockets of sulphuretted hydrogen or stink gas are encountered and the massive arsenical pyrites, zinc blend and galena minerals found in the veins probably result in a slow oxidation that produces high temperatures, and in spite of fair ventilation produces rapid dry rot in the timbers and some warm stopes wherever the air current has not a direct connection to the surface. The same is true of the DeLamar mine in Owyhee County, and in numerous stopes of the well ventilated Trade Dollar mine. Similar conditions are also found in the dry lead carbonate mines of the Gilmore belt in Lemhi County, and in the deeper workings of the Wood River mines. In all the big mines of the Coeur d'Alenes, occasional dry hot stopes are found, due either to heat emanations from the fissure or its mineral, or the

waste products from the lights, men and animals, and where the timbers are dry, due to such causes, they will readily take fire from a carelessly left snuff, if a sliver develops on the wick and the grease runs down and forms a pool. The utmost precaution should be taken against such neglect on the part of the men. Fortunately, the effect of a blast at quitting time has a tendency to douse all lights, but in dry places, where no blasting happens to be in progress, a candle left burning under such conditions is liable to result in a serious mine fire, which is frequently a very bad thing to fight and get at on account of the rapid development of poisonous and suffocating gases.

Very few mines in the State are provided with means to meet such an emergency. Wherever such conditions exist, it would be the wisest kind of insurance to have an eye open for such emergencies and provide the mine with a breathing hood of the Vagen type, or some similar device with which the scene of the trouble can be approached.

While enjoying the courtesy of a visit underground with Mr. William B. Orem, the Deputy State Mine Inspector of Montana, among some of the big Butte mines last summer, my attention was called to a simple home-made device for this purpose, which is very effective, and, in fact, considered more so by the operators of that camp than are some of the expensive, patented appliances now on the market. This arrangement was employed by the manager of the Boston & Montana Company's Leonard mine to fight an underground fire that had developed spontaneously in the adjoining Minnie Healey ground, and was seriously menacing the whole productive area of this great property with poisonous gases. In building bulkheads to

seal off the fire gas, they used a simple hood made of heavy canvas that fit completely over the miner's head and neck with a flare down on to his shoulders, and a puckering string to tighten the hood around his neck sufficiently to hold it in place. It was provided in front with large mica peep holes, and attached to the hood at the back of the head was a socket for connecting a small rubber air hose. This in turn was connected with the compressed air line valve and a graduated current of air turned in which was deflected over the wearer's head at sufficient pressure to amply offset the gaseous condition in which he was working, and gave him a free current of good air to breathe all the time and drive away the noxious gases by its discharge under the loose neck band. With this a man could work with considerable freedom for hours with little danger.

This simple contrivance can be made for two or three dollars and is said to be more effective and safer than any of the patented devices that have been tried for the same purpose, and as most mines in which fires are likely to occur are equipped with air lines, this little contrivance is well worth noting as it might prove a valuable assistance in an emergency of this kind for bulkhead construction, etc.

### PROGRESS REVIEW.

The following review of the year's progress in Idaho mines is only semi-official and embraces information gathered personally and from the most reliable sources available. In making the review, I aim to cover the principal properties whose development results may prove of gen-

eral interest and assistance in solving the knotty problems of mineralogy, geology, mining and ore deposition that confronts newer enterprises.

There are 600 live mining corporation properties in Idaho, besides the privately owned properties, some of them only having enough life left to wiggle out an indifferent annual assessment work, and their operations range from that up to a single crew of as many as 400 men on one mine.

Half of these properties are in the Coeur d'Alenes and the balance scattered over the rest of the State's 84,000 square miles of territory, and the year would have to be 600 days long for a man single handed to visit and inspect them all. Add to this the 365 days of office work which the department calls for and it will become apparent how necessary a deputy or field assistant is to more properly comply with the duties, and why many of them seem to be slighted.



# IDAHO BY COUNTIES

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## ADA COUNTY

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While none of the mines of Ada County were equipped during the past year for gold production, except some small testing mills, important progress was made in their exploitation and development and ore resources were put in sight of such magnitude and promise as to warrant the anticipation of a considerable yield in gold during 1908.

*Big Giant.*—The most extensive development of gold ore of this county is that of the Big Giant mine, situated on Shaw Mountain. This property embraces 400 acres and the group overlaps the Boise County line. It is near the Idaho city road, about 10 miles northeast of Boise, and is very favorably situated for economic development and ore treatment. The property carries an immense quartz-bearing fissure vein in granite that strikes northwest and southeast and has a steep dip to the southwest. The gangue is a white massive and shattered quartz, richly impregnated, especially along the margins of the vein, with gold-bearing iron pyrites, while some fine gold occurs in the straight quartz gangue. The ore is oxidized and comparatively free near the surface but changes rapidly at a comparatively shallow depth to the original sulphide condition. The vein is of great width and appears to be accompanied in places with inclusions of black porphyry and possibly may be a replacement of an original dike-filled fissure. It is fully 50 feet wide in places, and carries values across its whole width, and throughout the total length of its extensive ore shoot, whose lineal extent has not been proven; it has been drifted on continuously underground at considerable depth for a distance of 1,100 feet and traced out on the surface by shallow work for a thousand feet further.

The ore, unlike most of the deposits of this district that have been developed, is comparatively free from lead and zinc minerals. It runs to high values in places, but as a whole is low grade, and according to the average of num-

erous samples taken as the work has progressed, is found to carry an average value of between \$4 and \$5 per ton all through, and it is believed from experimental tests on the ore, that 90 per cent of the values can be extracted by amalgamation and cyanide treatment. The machinery for a small mill of about 25 tons daily capacity has been purchased for the mine for the purpose of demonstrating in a practical way the best method of extracting the gold. It is the intention of the company to follow this with a much larger plant, as an enormous tonnage of ore is blocked out that it is believed can be treated at a handsome margin of profit on a large scale.

The total development on the property, in the shape of crosscut tunnels, drifts and raises, the bulk of which is in the ore body, amounts to 7,000 lineal feet, of which 2,642 feet were driven during 1907. The force of men employed at the property varied from 4 to 24 during the year, and the wages paid for miners was \$3 for 8-hour shift.

The property is incorporated as the Big Giant and New Year groups, with 30,000 shares capital stock of a par value of \$100 per share, and the present value of the treasury stock is given at \$40 per share. Mr. O. E. Jackson is President and Manager; Mr. W. H. Gibson, Secretary, and W. S. Walker, Treasurer. These, with I. V. Howard, form the board of directors, all of Boise City, Idaho.

*The Picket Pin Mine.*—About half way between the Big Giant mine and Boise City, a short distance south of the stage road, the Picket Pin Gold Mining Company, Limited, are operating an interesting group of claims with a crew of three men, who are working on contract. This property carries a system of three parallel veins with a general strike northeast and southwest and a dip of 45 degrees to the southeast. The formation is granite and the veins are gold bearing quartz-filled fissures that vary in width from 2 to 12 feet and contain average values of \$4 to \$7 gold, with occasionally pay streak samples that run up to \$100 per ton. They are associated with intrusive dikes of fine grained diorite or syenite. The quartz is richly impregnated with pyrite and arsenopyrite and a strong sprinkling of lead and zinc minerals. Two of the principal veins are connected by a cross course from one to three inches wide that contains very rich pannings in

free gold and high values by assay, and is likely to form a continued enrichment of the two main veins at its intersection as depth is attained.

The property has several hundred feet of shallow adit tunnel development, which has not progressed far enough, however, to warrant economic stoping and handling of the ore bodies. The surface croppings of these different veins are strong and promise to contain an important tonnage of profitable ore when more thoroughly developed.

*The Lubkin Mine*, a short distance above the Picket Pin, has considerable preliminary prospecting work, and several tons of selected ore on the dump that will mill from \$30 to \$50 per ton in free gold. It is located on an extension of one of the Picket Pin veins and is a meritorious prospect.

*The Celtic Mine*.—This company is operating a large group of claims at a point half a mile below the Picket Pin and five miles east of Boise. Its property also carries a series of strong fissure veins in granite, accompanied, not in contact, but in close association with parallel dikes and cross dikes of fine grained blue syenite rock that very closely resembles the intrusive igneous dikes accompanying the Minnie Moore and Croesus ore bodies in the Wood River District. The main vein has been worked in a desultory fashion off and on for years, and from some shallow tunnel development is reputed to have produced several tons of high grade shipping ore and is credited with a considerable output of gold. It is traceable on the surface and is opened at intervals of about 100 feet for fully 3,000 feet along its strike, which is nearly north and south with a dip of 45 degrees to the west, and from these openings a series of 105 samples give an average assay result of \$9 in gold. The width of the vein varies from 1 to 10 feet and will probably average 4 feet. It is often associated, however, with a considerable width of mineralized granitic wall rock that is found to contain paying values in places.

This interesting deposit was tapped by a diagonal cross-cut tunnel 900 feet long during December at a point 400 feet deep on the dip of the vein and nearly under where the best values were said to have been taken out in the shallow surface work. Where intersected, the vein was

found to carry a pay streak from 6 to 12 inches thick that samples from \$20 to \$100 per ton in gold. It is a well defined band of yellow stained hard quartz, in places richly impregnated with iron, lead and zinc minerals, and containing coarse, visible free gold that gives rich panning results. The position of this pay streak is several feet above a defined foot wall, carrying 2 to 3 inches of white talc where the vein was penetrated. The crosscut had been carried through this pay streak beyond the foot wall for a distance of 13 feet, the whole width of which was talcy mineralized granite, and gave an average assay value (leaving out the high grade streak) of \$5 per ton in gold. From the appearance of the ground in the face of the crosscut it is evident that the true hanging wall has not been encountered, and it is not unlikely that by continuing it, other pay streaks of equally rich ore may be found. Drifts have been started each way on the strike of the best ore, and it appears to be maintaining its width and value, and it is probable that the tunnel did not cut it in its widest place and that the extension of the development along its course will disclose much wider shoots of this high grade ore, as the vein proves to be a strong water course where it has been tapped, and it is loose, kindly looking ground that may develop into a valuable and productive mine.

Near the mouth of this long tunnel a zone of altered granite 50 feet wide carries paying values in gold. An 8 ton sample tested from across this zone by cyanide treatment yielded an extraction of \$3 per ton, which was reduced to bullion. This is of itself an interesting deposit that may warrant treatment on a large scale. This important piece of development work has demonstrated to a degree the permanency at depth of the veins of this district, and the fact that they carry their free gold values down a good deal deeper than they have been expected to. As a matter of fact, this section is a little too close to Boise to be appreciated, and it has a good deal more evidences of merit as a probable source of valuable ore deposits than it is credited with.

The Celtic Company has recently purchased the Delhi mill and are moving it on to the property at the present time. This is a very complete plant of five stamps capac-

ity, and should reduce 15 to 20 tons of ore a day of this class. While it is too early to state what the magnitude and importance of this deposit is going to be until some drifts are run out on the vein from where it has been intersected, it certainly makes a splendid showing and gives eminent promise of shortly becoming a valuable mine and an important producer of gold bullion.

A crew of 12 men is now employed on the property and Mr. J. J. Oberbillig is the president and general manager of the company, and also manager and chief promoter of the neighboring Picket Pin and Twentieth Century mines. The Celtic Company has a million shares of capital stock with a par value of a dollar, and a present selling value of 35 cents per share.

Rich ore has been found at a number of points over its quite extensive area in the direction of Highland Valley, to the southeast, and across Cottonwood Creek, to the northwest. The Celtic development has greatly increased the interest of claim owners in the district and considerable activity is now being manifested in its numerous prospects.

*Twentieth Century Mine.*—This property embraces an extensive group of claims covering a total of approximately 700 acres. It is situated 9 miles east of Boise on the slope towards the Boise River, opposite the Barber dam. It has 2,000,000 shares of capital stock of a par value of \$1 a share and a present selling value of 5 cents a share. It covers a zone of mineralized granite that strikes north and south and dips west at an angle of 45 degrees. This zone is 100 feet wide and is impregnated throughout its width with iron sulphides and carries average values of from \$3 to \$4 per ton in gold with very little free gold but is believed to be a fine cyanide deposit, by which method it has been tested and found to yield a high extraction of its total values.

Its total development, consisting of crosscut tunnels and drifts, amounts to 4,000 feet, of which 1,000 feet was run during 1907. The longest tunnel is 1,000 feet in from the portal and taps the zone 400 feet deep on its dip. Another tunnel 600 feet long, at a point 2,000 feet further south, is nearly completed and will tap the vein at 300 feet in depth. In addition to these main openings, there

are a number of shallower tunnels and considerable open cut work, and wherever the zone is penetrated it is said to carry fairly uniform values in gold of about the tenor mentioned, and is believed will make a big source of concentrating and cyaniding ore that will warrant a large milling equipment.

These properties embrace the most active development of this district during the past year, but a number of other claims were worked to a lesser degree and some promising ore showings were made.

*June Mine and Others.*—Some milling tests were made on the June mine, near the southeast end of the district, where a considerable body of \$4 to \$5 ore is reported that yields \$3 per ton as free gold by recent tests.

*The Ironsides Mine,* in the same vicinity, with considerable development, and with a record of rich ore production, remained idle during the year, but negotiations are now in progress for its equipment with a good size milling plant.

The ore deposits of this district are closely akin to those of Pearl and Neal, and with a like amount of development may prove equally valuable.

*The Golden Eagle Mine.*—Just inside the Ada County line, really forming a part of the Neal District to which it was erroneously credited last year, the Golden Eagle mine was operated during part of the year. This property is developed by an incline shaft 400 feet deep, with 4 levels. It carries a big fissured zone in granite, containing some good sized lense shaped shoots of high grade shipping ore, and has yielded several carloads of massive, hand picked sulphide mineral and concentrates that were shipped to the Salt Lake Valley smelters, where they sampled at the rate of \$70 to \$100 per ton in gold, in addition to which considerable bullion is saved by amalgamation in treating the ore, and minted in Boise. In addition to its lenses of rich ore, this deposit carries a wide body of the lower grade milling ore that ranges from \$4 to \$6 per ton, and the development on the property is said to disclose gross ore resources approximating half a million dollars in value. The mine ceased operations early in the year, owing to the coal famine and the unsatisfactory recovery of the values in the milling plant with which it is

equipped. The ore is rather refractory, but its principal base is iron sulphides, and it is believed with proper milling equipment it can be treated by cyaniding to high degree of extraction. The shaft is now being pumped out for the purpose of sampling the ore reserves by an intending purchasers' experts, and these investigations are likely to result in a transfer of the property to some prominent Montana operators, in which event it will doubtless be equipped with a much larger and more complete milling plant.

*New Cyanide Plant.*—There has recently been launched a small metallurgical enterprise in Boise which is likely to give this State and city as much advertising prominence in the near future in the mining world as some other notable events connected with its mining history recently. This consists of the Boise Ore Testing and Cyanide Company, who have ordered a plant and will commence the exploitation of a new cyanide process for the recovery of gold and silver that has some unique points of originality that I have never before seen referred to in the numerous variations of the cyanide method of extracting precious values from ore.

The principal feature on which this process is based is the introduction of a current of free hot air, which is carefully watched so as not to cause a too rapid consumption of cyanide. This is said to greatly intensify the solvent power of the cyanide. An agitating machine, shaped and acting somewhat like a tube mill, is open at both ends and is supplied with burrs in place of crushing devices, that simply lifts the pulp and solution, that is kept not too wet, over and over, dropping it through the current of hot air passing through the longitudinal cylinder.

Another feature of the process is to dry out most of the moisture from the crushed ore before introducing the cyanide solution, so that the solution does not have an excess of free moisture to replace in the structural cells of the ore particles, and commences to act in dissolving the values immediately, and this action is greatly facilitated by the oxidizing effect of the hot air current passing through the falling pulp.

The method is said to have been tried out on some extensive laboratory tests with ton lots, and to have given

astonishing results on some very refractory ores. If these claims can be made good, it means the saving of 50 per cent of the present tankage capacity required in cyanide plants, and the elimination of excessive fine grinding in costly tube mills, etc., for the process is said to act very rapidly on pulp ground to 40 mesh.

This process also embraces a simple suction filter vat that seems to have some superior points of efficiency and economy, even excelling those of the vacuum filters of recent successful application. The whole process carries several points of originality that I have never before seen expressed in cyanide literature.

It has been gotten up by a German chemist named J. J. Gerster, and Mr. Eagle, a graduate of the Moscow School of Mines, and the practical plant for trying out the method now being constructed in the suburbs of this city, is of 25 tons daily capacity and is backed entirely by Boise capital.

It should be in operation within 90 days and it is believed by its promoters that it will solve the knotty problem of extraction of a high percentage of the values in the notably refractory gold ores of this neighborhood, which are of extensive development but so far have been found very hard to treat.

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## BOISE COUNTY

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Boise County continues to hold a leading position in the matter of gold production, and the old placers of the famous Boise Basin still maintain their lead in the matter of output over the underground diggings of the county. The different hydraulic operations of the Basin country enjoyed an exceptionally good water season during 1906, and their output was materially increased over the preceding year.



*Placer Mines.*—Among the principal contributors of real money were the Woodburn diggings, the Granite Creek and Ranch claims, the Oakes Company of Centerville, the Moline Company's dredge at Granite Creek, and the property of the Boise Basin Hydraulic & Power Company, operating the Reed diggings at Placerville.

This latter company has a splendidly equipped property with 15 miles of new ditch, which gave considerable trouble getting settled down to business during its first season, in spite of which a large output of gold was made, and with ordinary luck another season will be largely increased as this company owns the largest reserve of high grade virgin ground in the Basin.

The Harwood Glen Gold Mining Company, Limited, under the management of D. H. Richardson, formerly of the Nippissen mine, at Cobalt, Ontario, and incorporated under the laws of Canada, with a capital stock of 60,000 \$1 shares, have acquired some fine placer ground on Grimes Creek and expended \$34,000 during the past year in its purchase and equipment.

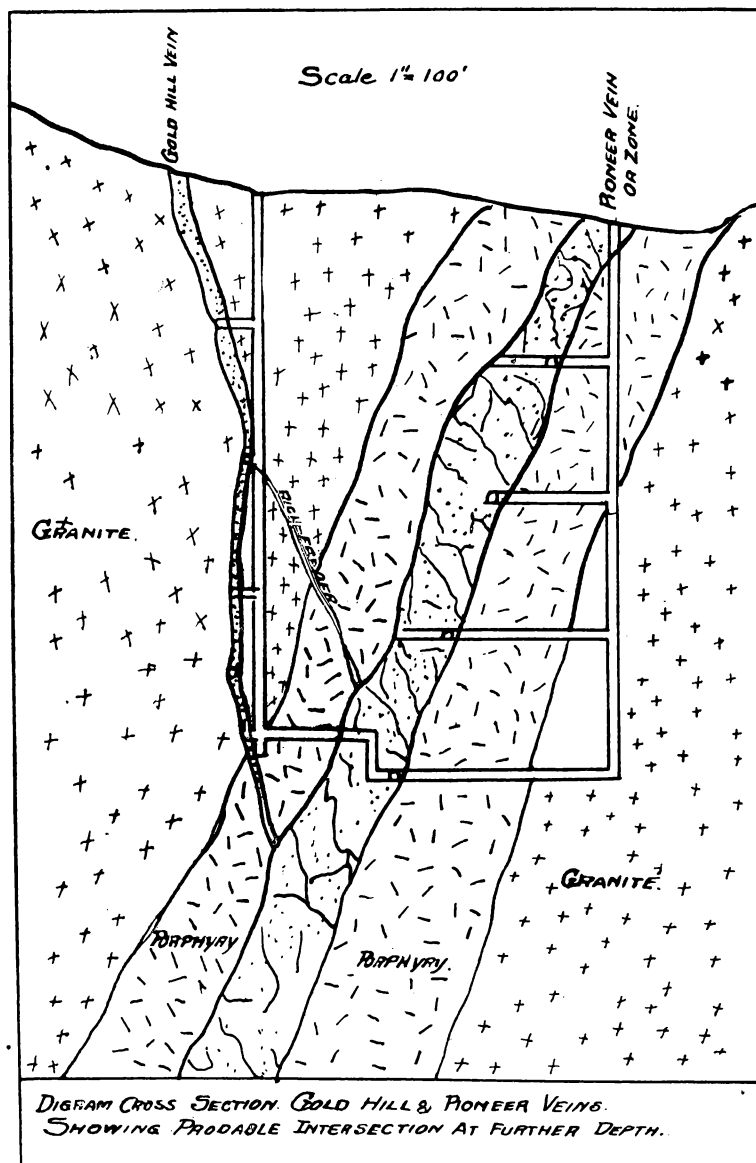
The principal work done during the past season has been the rebuilding of the Goldtrap ditch, which included 3,228 feet of new flume; 3,722 feet of new ditch, and 157 feet of tunnel work.

The property covers some high grade placer ground that will be worked next season and should add materially to the gold output of the Basin.

The lode mining operations of the Basin were limited to prospecting and developing work, with an interesting yield of gold from the property of the Golden Age Mining Company, who are operating near Grimes' Pass and have a fine showing of good milling ore, which is being more thoroughly developed and put in shape for economic handling. This property now has a total of 1,200 lineal feet of work, of which 800 feet were accomplished during the year on a strong vein in granite and porphyry walls, carrying gold bearing quartz and talcy vein matter averaging about \$8 per ton. It is equipped with a small hoist and a 5-stamp mill. A new tunnel is now being driven to strike the vein at another point, which will greatly facilitate its drainage and economical operation.

*The Buffalo Mine.*—The Buffalo mine, on Elk Creek,

was developed by tunnels on a strong vein in granite and porphyry, carrying good milling values. This company is contemplating the sinking of a 500-foot vertical shaft and erection of a mill of 100 tons daily capacity during 1908.



*Gold Hill and Pioneer Mines.*—The most important lode gold producer of the Basin country continues idle. This is the Gold Hill and Iowa groups at Quartzburg. A movement was started to finance the enterprise and undertake its development on an extensive scale during the summer, but the financial panic upset these plans and the enterprise will probably rest until more favorable money conditions prevail. This property carries one of the most attractive gold deposits in the State. It was formerly developed through two vertical shafts, each 400 feet deep. Its equipment consisted of an old-fashioned 25-stamp mill which was run continuously for 25 years under the management of Mr. W. A. Coughanour, now of Payette, Idaho, and produced gold to the total gross value of \$3,000,000 from this comparatively shallow depth. The probable future importance of this property as a gold producer will be appreciated from the accompanying diagram. The Gold Hill vein was a spur fissure in granite. It had two ore shoots, each 900 feet long, that varied from a few inches to 6 feet in width, and consisted of quartz and mineralized granitic gangue, richly impregnated with iron sulphides and a little antimony. The average value of the ore produced by this vein was \$20 per ton in free gold.

The Pioneer vein is a lode or zone in an immense belt of porphyry that was mined to the same depth as the Gold Hill and carried bodies of altered porphyry, impregnated with iron pyrites and a net work of quartz seams very rich in free gold, and was mined in great chamber shaped shoots or bodies from 20 to 60 feet wide. It probably forms the mother lode of the two, and the Gold Hill vein was doubtless a rich spur and will unite with the Pioneer at a little further depth, as shown in the diagram, for the Gold Hill is pitching strongly towards the Pioneer, and while they were over 200 feet apart at the surface, a cross-cut between the two at the 400-foot level shows them to be within 70 feet of each other, and they should unite at a further depth of about 100 feet, where it is likely a bonanza horizon of enrichment will be encountered and all the pay be confined to the larger vein or lode from that point down.

The Pioneer ore body carried remarkably rich values in its combined quartz seams of native wire gold, associated

with live bright iron pyrites, but the whole mass had to be mined to get these values, and is said to have yielded free gold at the rate of from \$6 to \$10 per ton, while the concentrates, containing good pay, which would form a valuable product for secondary treatment by present methods, were formerly run down the creek and wasted, which is also true of the rich tailings of the Gold Hill operation.

The occurrence of native gold with live sulphide in the bottom of this development on both these veins is a strong argument for a continuance of free gold values to considerable further depth, and it is not unlikely that by extending the development of the deposit here described to a further depth of 400 feet below the bottom level, may yield similar splendid results in precious bullion to those derived from the upper levels as the surface oxidation of the ore was very shallow.

#### THE PEARL DISTRICT.

The principal lode mining district of Boise County is situated only 20 miles north of Boise City, at the south end of Boise County. This district has made more progress in the past year or 18 months in the matter of ore development, and also in ore treatment, than it did in all its previous history. Four years ago, in describing the geology of this district and the future of its deposits I compared it as to the nature and permanency of its ore deposits, with those of Gilpin County, Colorado, whose fame as a large and steady source of gold is world wide. I said at that time that all that the Pearl District needed was more development and a process to treat its ores, which are undeniably refractory. A good deal of experimenting has been done in the treatment of the ores of this district since that time and considerable expensive experience has been gained in an effort to cyanide them. It is only within the last month or two, however, that any definite progress has been made in this respect, and the credit for the apparent solution of this vexed problem is largely due to the insistent efforts of the Black Pearl Mining Company and its manager, Mr. R. B. Anderson, who has kept at the problem until a high degree of success seems to have crowned his efforts in extracting a very high percentage of the gold values of the Black Pearl ore, which

is practically characteristic of the whole district, and the property is now well developed and equipped with a very complete plant of 100 tons daily capacity.

*Black Pearl Mill and Mine.*—This plant consists of 8 Nissen stamps, Dorr classifiers, a 20-foot tube mill, 4 feet in diameter, lined with 4-inch Selix blocks, a Hendryx agitator and rapid acting Kelley filter press. The ore consists of a talcy quartz and granitic gangue, containing about 20 per cent of its weight in arsenical pyrites and strong traces of lead and zinc with an average gold value of about \$10, together with 1 ounce silver per ton. The ore is first crushed through a roll jaw Studevant crusher, then stamped to a 12 mesh, passing through Dorr classifiers to the tube mill, delivering a product of which 65 per cent passes 200 mesh, the whole passing 100 mesh. This slime pulp is carried to dewatering tanks, thence to a Hendryx agitator, where it is agitated in solution for 8 hours, which time is sufficient to dissolve the values. It is pumped with a centrifugal pump to storage tanks, thence to a rapid acting Kelley filter press, after which the pulp is trammed to the dump, on account of the lack of water to wash it away in launders. The whole milling process is in a weak solution of cyanide. The pregnant solution is precipitated with zinc dust after being standardized. The extraction of values, so far as its treatment of Black Pearl ores by this method has gone, has shown an extraction of 92 per cent of the gold and 76 per cent of the silver, according to fire assays of the heads and tails.

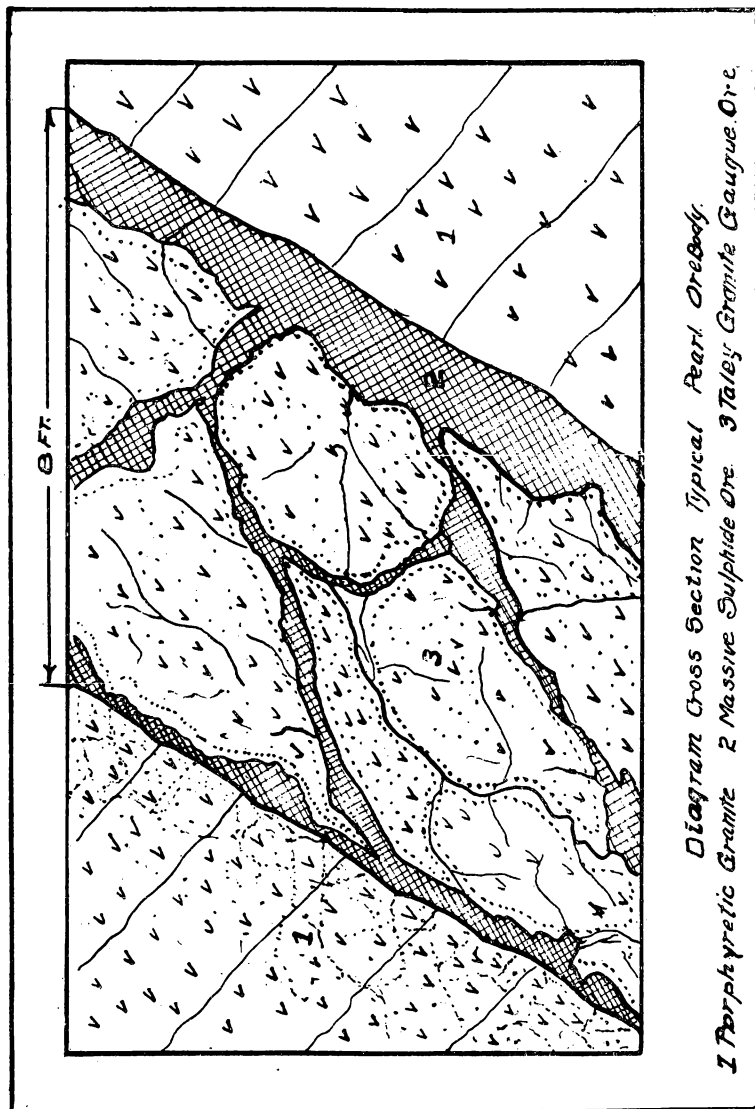
The Black Pearl mine is developed through a vertical shaft 400 feet deep with three extensive levels and cross-cuts, exposing three parallel fissure veins. The central vein, known as the Leviathan vein, is the most extensively opened up and shows a large reserve of ore available for stopping. The ore of this vein carries less zinc and lead minerals than do several other veins in the camp.

*The Whitman Mine.*—The best vein on the Black Pearl is opened on the adjoining Whitman property where it has been under process of development for several years with a small crew. At this property it is known as the Leviathan vein and presents the earmarks of one of the master fissures of the district and has the largest reserve of ore blocked out and the highest average values. On the Whit-

man property this vein has been cut with a crosscut tunnel at a depth of 90 feet near the west end line of the group. From this point a drift has been run on the vein east for 1,300 feet, to the Black Pearl line, in which length it gains an extreme depth of 363 feet, undercutting a body of ore of an average height of about 200 feet that is continuous throughout the entire length of the drift and carries an average width of about three feet, varying from 1 to 7 feet, and in value from \$5 to \$100 per ton in gold. Six hundred tons of roughly sorted ore from this development work, without any stoping, has been carefully sampled and gives \$26.31 per ton total values, as follows:

Gold, \$21.91; silver, \$3.52; lead, a trace; copper, two-tenths of 1 per cent; zinc, 2 per cent.

This mine was worked in the early days of the camp through a shaft 152 feet deep, and a number of carloads of high grade shipping ore was sent to market. The present company in the course of its present plan of development have shipped one-half dozen cars of hand picked crude ore that has netted from \$40 to \$100 per ton. The vein carries more continuous and richer ore in its present lowest level than in any other. The accompanying diagram will give an idea of the structural appearance of this deposit. A band of nearly clean iron sulphide mineral follows the foot wall of the vein, which is usually very well defined and throws out a coarse net work of stringers of the same kind of mineral and is often accompanied by a similar but smaller band of clean mineral next to the hanging wall. In places a fine net work of rich sulphide mineral penetrates the hanging wall granite. The vein is pinched in places, or, rather, filled with horses of less mineralized granitic gangue, but it has been demonstrated that where the drift was carried for 50 feet in a narrower stretch of the vein, where it was apparently reduced to a foot or even down to 6 inches in width, a short raise has shown an immediate expansion to its full width and normal high values within a few feet above the level of the drift. These pinches seem to run in more or less defined horizons and are of limited extent, as proven by the continuous air course now connecting the bottom of the old shaft with the new adit level. This connection was successfully made against a big body of water by the present



superintendent, Mr. William Hutchins, who personally engineered the tapping of the water without accident or mishap. This gives the mine excellent ventilation and greatly facilitates its further operation and the preservation of the timbers which rot rapidly in the close air in

this formation, probably due to the oxidation of the heavy sulphides or gaseous emanations from the vein.

The Leviathan vein strikes nearly due east and west and dips north at an angle of 50 degrees, affording a nice pitch to stope on. Before reaching the Leviathan vein, the crosscut tunnel intersects a parallel vein known as the Red Warrior, 80 feet further north, on which a drift has been extended east 600 feet in length with crosscuts every 50 feet, which show an average width between walls of soft, talcy granitic gangue with disseminating sulphides of iron, zinc and lead that average 15 feet in width for the full length of the drift, and careful average sampling shows the whole mass to contain \$5 per ton in combined values, of which about \$3 or \$4 is gold. The faces of both of these extensive drifts at each end, on both veins, is in good ore, and the present horizon of development is at an elevation of about 50 feet above the creek bottom, and at this comparatively shallow depth exposes ore to the gross value of approximately \$1,500,000, according to the careful efforts of the company in sampling the work as it has been carried along. This puts the property well within the ranks of the important gold ore resources of the county, as its development is yet comparatively shallow. The clean cut fissures in which these important ore bodies are contained are likely to continue fertile to very considerable depth and promise to develop into a gold mine of considerable magnitude.

The property is equipped with a 3-drill Liner air compressor and a 40 horse power electric motor, taking power from the line of the Payette River Power Company nearby. The Whitman Company are now erecting a 4-foot Hathaway mill. This is a new grinding device and amalgamator combined, which is an experiment. It is supposed to have 25 tons daily capacity.

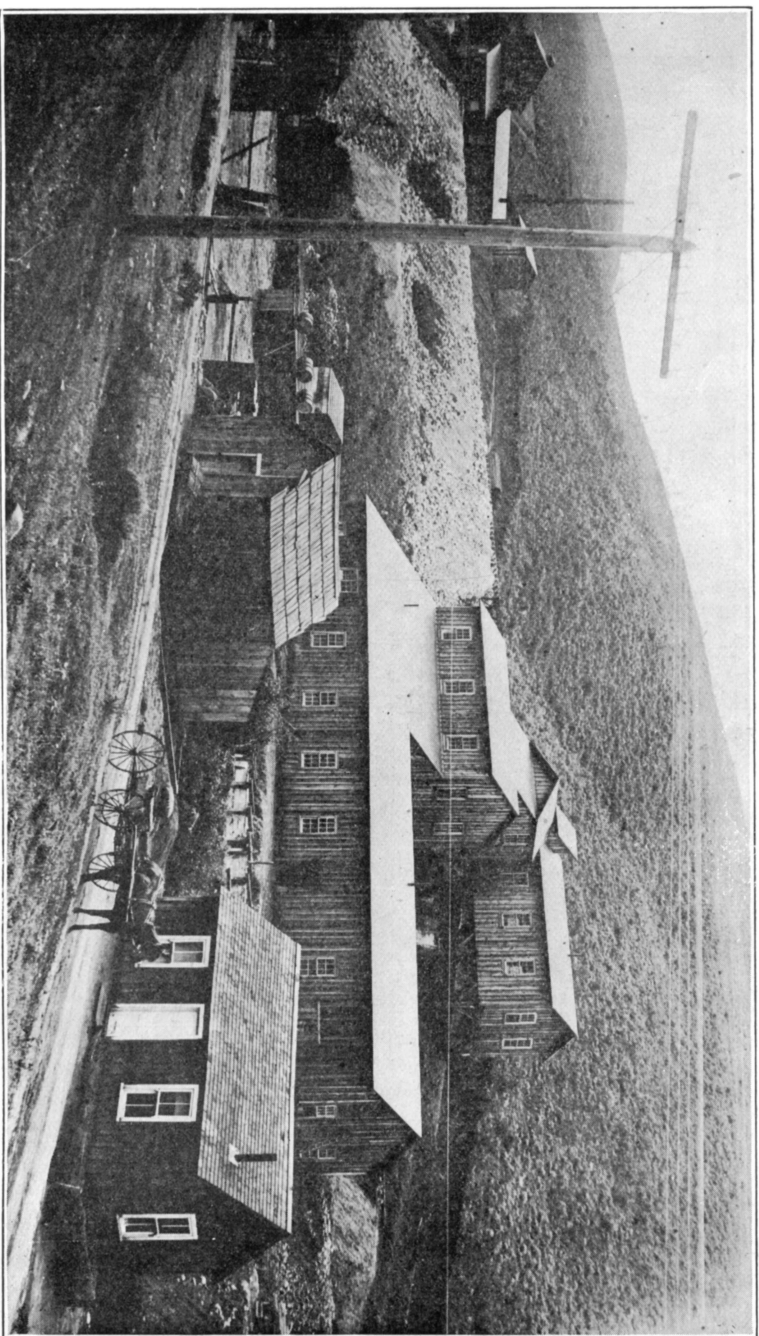
*Hecla-Checkmate.*—Adjoining the Whitman property, the old Checkmate group has been taken over and added to in area by the new Hecla-Checkmate Mining Company, who are driving a long crosscut tunnel, now in 900 feet, from the Checkmate mill, south, for the purpose of intersecting the Red Warrior and Leviathan vein, which is believed to traverse the entire length of their group for fully 3,000 feet on their strike to the west, and the



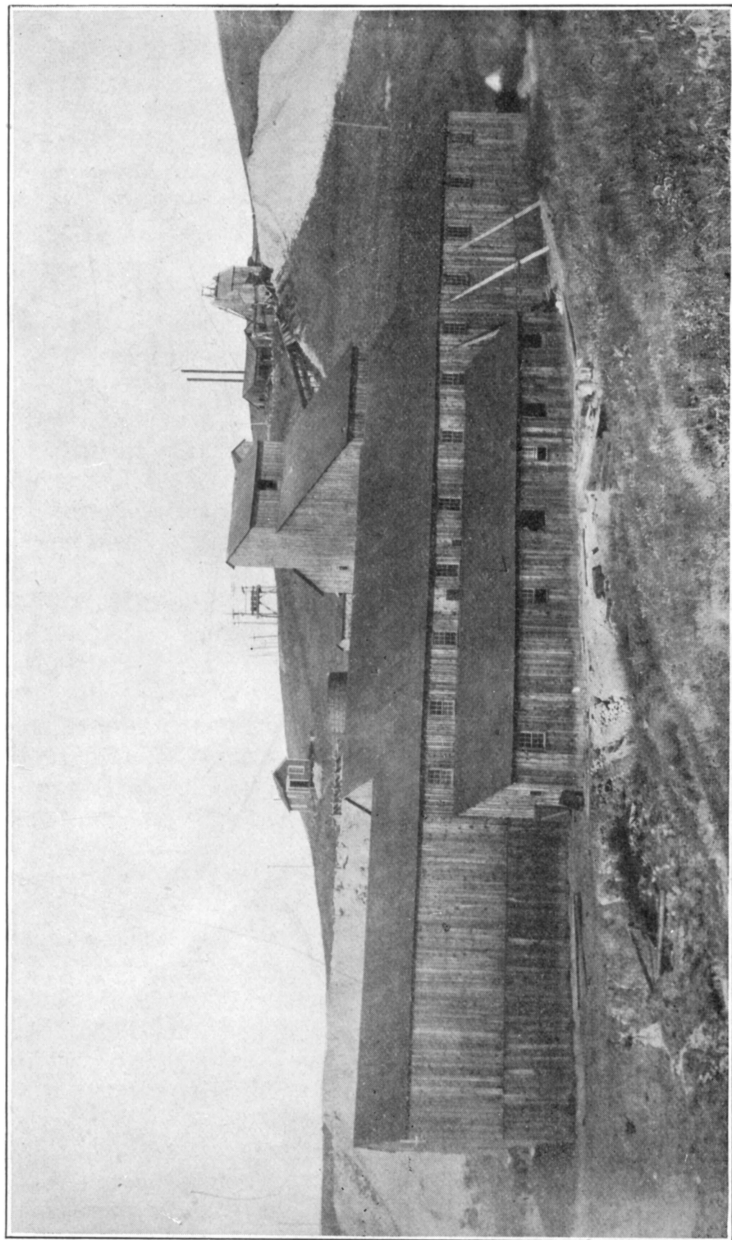
company have good reason to anticipate important results on this particular tunnel, as the Leviathan and Red Warrior vein carry rich ore right up to the end line of the Hecla-Checkmate property and float ore and vein croppings have been found that line up with these ore courses at several hundred feet distant on their group. The Checkmate vein embraced in this property has the largest record of production of any vein in the Pearl District and is credited with a total gold output of something over a half million dollars. It was developed through a vertical shaft 600 feet deep, with five extensive levels and had some handsome stopes of the same class of ore as described in the Leviathan. The Checkmate vein has about the same strike and dip as the Leviathan but is situated about 900 feet further north. It varied from a foot to 10 feet wide and had practically continuous ore bodies for 900 feet in length at the No. 5 level, where the east half of the ore shoot was largely left unmined on account of its carrying a little higher silver values and more arsenical iron that was harder to treat.

This mine was equipped with a 10-stamp mill in which about 10 per cent of the values were saved as free gold, and the balance in concentrates which were shipped to Salt Lake Valley smelters and averaged two to four ounces gold per ton.

At the sixth level of this mine the vein was lost by faulting or pinched up small and passed through by mistake in the crosscut, as a small vein was found there representing its position, a few inches wide and very rich in gold that was never drifted on, and it is more than probable that this was the pay vein being sought for, and that when reopened will prove as productive as in the levels above, as the veins of the Pearl district are subject to local fault displacements and intersections of porphyry dikes which are an accompaniment of the ore courses, sometimes in contact directly with the ore, and again passing through the vein and departing from it at a shallower or steeper dip. In the Leviathan drift, a blue porphyry dike forms the foot wall of the vein for 30 feet, or such a matter, then crosses it and forms the hanging wall for a like distance, when it passes off into country rock and both walls are granite. Similar occurrences are found in the Checkmate



TEN STAMP MILL, CHECKMATE MINE, PEARL. PRODUCED \$500,000. SUBSEQUENTLY DESTROYED BY FIRE.



LINCOLN MINE AND MILL, PEARL. DAILY CAPACITY 100 TONS.

mine and in the Lincoln mine, and while these igneous, intrusive rocks will doubtless cause some complex problems in ore development, they no doubt have a valuable relation to the genesis of the ore bodies. They vary all the way from a light colored diorite porphyry to a blue-black diabase. The new tunnel on the Hecla-Checkmate, now being run, has passed three parallel ore courses in addition to the Checkmate vein. One of these is 8 feet wide and carries a pay streak 2 feet wide of the characteristic sulphide ore of the camp, that averages about \$10 in value and is well worthy of development by drifting. The present objective points of the company, however, are the Leviathan and Red Warrior veins lying further to the south, which it is anticipated will be encountered shortly in the main crosscut tunnel. This property carries the prospect of extensive ore resources when more thoroughly reopened and developed, and has eminent prospects of again becoming one of the most valuable producers of the district.

*The Lincoln Mine.*—The Lincoln mine is situated about a mile southwest of Pearl and is at present the largest and most successful operation of the district. It is employing a force of 60 men and is developed to a depth of 430 feet, with an ore resources undercut that is conservatively estimated at \$1,000,000 in gross value. This property has suffered from lack of capital, gouging and poor management from its inception. Its vein has been operated intermittently for several years, formerly through an incline shaft 300 feet deep, which has since been abandoned as a working shaft and the mine has been opened through a vertical shaft 430 feet deep, placed in the hanging wall. The great mistake always made in its development was a lack of faith in the continuity and permanency of the ore deposit. Even after the second level had been run in the vein and proven the existence of a continuous ore shoot 1,200 feet in length by 4 feet average width, and \$10 average value, the 300 and 400-foot levels were also run on the soft vein matter with the faithless purpose, of course, of prospecting its values as the work progressed. With such size, length and even distribution of ore values at the 200, it would seem that sufficient faith should have been developed in the deposit to have carried out the work on a

more permanent plan from that point down. The nature of the deposit is very similar in effect to that of the old DeLamar mine in Owyhee County, although the formation is of a different variety. It acts the same way when mined, and that is like a slow moving clay bank which it is impossible to hold in shape by timbering. The drifts run on the Lincoln vein in the soft swelling talcy porphyritic and granitic vein matter, commence to squeeze and close in before they have been opened a month, with the result that when a drift gets 200 feet away from the shaft on the course of the vein, the timbers near the crosscut commence to take weight and have to be replaced or supported right along; whereas, if the drifts were run in the foot wall granite, which is firmer and of a non-swelling nature, they would always remain open and could be carried sufficiently close to the vein to test it at intervals to nearly the same advantage as at present, besides always being open and permanent. The policy of the past operators of this property has been to mine the ore by open stopes with stulls and square sets, and the result has been that the stope would not get up one-third of the way from one level to another before the formation would commence to crowd in and it would close up and be lost. In this way, all the development of the mine, excepting the present lowest level, has gone to pieces and is in bad shape so far as showing up the ore resources is concerned, but the surveys and mine maps show conclusively that not more than one-third of the ore undercut has ever been extracted.

The foot wall of the vein is generally firm and well defined; the hanging wall usually rotten and porphyritic but not of such a nature as to be dangerous to an intelligent miner with any experience in soft ground, as it swells slowly and can be readily retained by proper methods of stoping, timbering and filling, yet it is no place for a hay digger.

The present manager has recently put an experienced Cornish miner in charge of the underground work, who is handling the ground in a much more intelligent manner than it was formerly done, and he has inaugurated a sub-block retreat method of taking out the ore. By this method a raise is put through from one level to the other with ore shoots every 25 feet along the drift, and manways every 50 feet, and

the ground cut into three blocks by two horizontal air courses. The upper block is worked out by ordinary back or breast stoping and filling in behind with waste sorted from the vein. If sufficient waste is not available in the vein, short raises are put into the soft hanging wall to supply the deficiency. In this manner the ground can not move far, is held in place and the levels and raises protected all the time. Formerly, by commencing to stope from the level up without filling, the ground would get so heavy that the manway and chute timbers would commence to creep in and would get out of shape before the stope was one-third worked out. The 330-foot level of the Lincoln mine was run in the soft vein 1,600 feet and was stopped in a face of good ore. The ore body expanded at one point in this level to 36 feet in width and at this point contained the richest average values found at any point in the mine. The 430-foot level now being opened under the present management, from the vertical shaft, is being run in the foot wall immediately under the vein, with short crosscuts for raises or shoots at 25-foot intervals, by which the value of the vein can be sampled and ascertained as the work progresses. This drift is already 500 feet in length and will be continued to the east in the direction of the Log Cabin stope, which is the immense swell described above. The development of this vein is still limited, considering its great strength and apparent permanency. It was critically sampled by a buyer's expert, down to the third level, to which point 228 samples, representing an average width of 6 feet, yielded \$8.53 per ton, and under the present method of mining, which means sorting out about 2 feet of lower grade material and leaving it in the stopes, this result would be materially increased. Where the vein was intersected by the crosscut from the shaft at the 430-foot level, it was 18 feet wide and averaged better than \$8 per ton its full width. The third level contained the richest ore found in the mine and there is no doubt but that the values will be maintained as work progresses to very considerable further depth.

Twenty dollar ore is exposed on the course of the vein at the surface 900 feet west of the present furthest westerly development. The easterly extension of the ore body is still undetermined. It has been proven in a shallow

surface tunnel to be continuous for several hundred feet beyond the face of the long third level. The company control an immense group of claims, and it looks as if a thousand feet vertical shaft with levels 200 feet apart, was warranted by the present showing, and that such an amount of development with drifts carried out to the full length of the ore body might put \$4,000,000 or \$5,000,000 worth of ore in sight.

A new double drum hoist, a 40-foot gallows frame, together with a 6-drill air compressor and 125 horse power electric motor, are now in process of installation at the mine, and it is the intention of the company to continue sinking after the lowest level is a little further extended. The property is equipped with a concentrating mill of 100 tons daily capacity. The present battery feed is averaging \$13 to \$14 per ton, of which about 15 per cent is silver and the balance gold. Of the gold value, about 18 per cent is saved by copper plate amalgamation, the balance going into the concentrates. The mill as it stands consists of a No. 2 Austin crusher, 14-inch Cornish roughing rolls, and a 6-foot Chilian mill of the Manadnock pattern, which works admirably in this class of ore, 2 5x10-foot copper plates, and 9 Wilfley concentrating tables, and "V" tank classifiers. Under the present mill management, the free gold saving is nearly 100 per cent higher than formerly and can probably be still further increased by extending the plate area. The mill feed now being delivered, which is derived entirely from the 2 bottom levels of the mine, carries nearly 20 per cent of its weight in concentrates, consisting of iron sulphides with 1 per cent lead, 2 per cent zinc and 1 per cent antimony. These concentrates are hauled by wagon to Emmett, 12 miles distant, from where they are shipped to the Salt Lake Valley smelters. In an effort to eliminate the high cost of shipping and smelting charges, the Lincoln Company have spent a great deal of time and money experimenting with cyanide processes attempting to treat the ore on the ground. They have been unfortunate, however, in getting into poor hands and obtaining very negative results, as about 40 per cent of the values is the best recovery that has been made in practice, and the extensive cyanide tank equipment was torn out during the summer and the concentrating method that had

formerly been employed re-established. It is possible that the Black Pearl process will handle the Lincoln ores. However, they carry considerably more lead and zinc than do the ores of the Black Pearl Leviathan vein, and it is questionable what results can be obtained. If a decent extraction of the values could be made on the ground by a cheap wet method of treatment, the mine should become very profitable, as the ground is soft and easily mined and by proper handling and filling would not require excessive timbering costs.

Since starting the mill last summer it has been run irregularly, but an accurate record has been kept of the number of hours, and the results in bullion and concentrates derived indicate that the mine under steady operation of 24 hours a day can make an output of bullion and shipping product that would amount to fully \$300,000 a year, with the present plant and process, which is now saving 75 per cent of the gross values. At present the ore is conveyed from the mine to the mill over a link belt conveyor, unprotected, which gives considerable trouble in cold weather. This is to be replaced by the construction of a storage bin of 500 tons capacity at the back of the mill and a short gravity tram, as the distance is only about 300 feet from the mill to the collar of the shaft.

The property is paying a nice margin of profit under the present method of operation and with its added equipment now in process of construction and under steady operation and careful, intelligent management, should become a good dividend payer, and is likely to develop into one of the big gold mines of the West.

The Lincoln Mining Company, Limited, has 500,000 shares capital stock, with a par value of \$1 per share. Its principal office is located at the mine, with branch offices at Kingston, N. Y., and Jersey City, N. J. Charles M. Preston is President and William D. Brenner, Vice President; Gilbert F. Kennedy, Secretary, and E. B. Kennedy, Director, all of Kingston, N. Y. Kenneth K. McLaren, No. 15 Exchange Place, Jersey City, N. J.; R. B. Kennedy, Palmer House, Chicago, Ill., are other prominent members of the company, and David Kennedy of Salt Lake City, Utah, is general manager at the mine.

There were 60 men on the pay roll of the company at



the close of the year. Miners' wages are \$3.75 and \$4; car men, \$3.50; timbermen, \$4; laborers, \$3; engineers, \$4; blacksmiths, \$4; carpenters, \$4; mill men, \$4 and \$5, all 8-hour shifts.

It is the intention to electrify the whole plant; but at present steam is used for running the air compressor, etc. Coal costs \$9.75 per ton laid down at the mine, and mining timbers, 12 cents per foot. Lumber costs \$23 per thousand. The cost of transporting the concentrates to the railway is \$3 per ton, and back freight \$3 per ton.

The Pearl District is a treeless one and all the lumber and timber used has to be hauled for a considerable distance and is quite expensive where heavy stuff is used. The new vertical shaft of the Lincoln is of three compartments, very substantially timbered, and in good line. The mines make enough water to materially help the milling operation, but not sufficient to involve much pumping costs. It is handled with a Knowl station pump of 250 gallons capacity at one lift of 430 feet, which is only required to operate about 4 hours in the 24 to keep the mine well drained. The total development of the mine at the present time is 6,000 lineal feet of shafts and drifts, not counting the raises and stope work. In this direct development work, 100 feet of shaft was sunk during the past year and 885 feet of drift work accomplished.

The Lincoln, Whitman, Black Pearl and Hecla-Checkmate are the four principal operations of the Pearl District at the present time. There are a number of other very promising deposits, however, adjoining these properties, that carry more or less development and in several instances important ore showings and encouraging evidences of valuable mineral resources with further work.

#### ROCK CREEK MINES.

*El Paso Mine.*—Over the Willow Creek divide on the head waters of Rock Creek and other tributary gulches putting into the Payette River, there are several interesting deposits of mineral on the same series of veins as those at Pearl, opening on their extension to the north and east. The principal operation on this side of the mountain, nearest Pearl, is the Granite State Mine Company, operating the El Paso group, which comprises a large area of

well fissured ground that carries several thousand feet of tunnel work containing some extensive reserves of fine milling ore, a good deal of which is equal in quality to the values found in the mines above described. The numerous fissures traversing this group have been cut by a deep crosscut tunnel 1,800 feet long which is now being connected with the big ore shoots disclosed in the old workings, higher up, and the main raise is going up on a fine body of mineral at the present time. The management of this company has always been conservative. It has kept steadily at work with a small force for several years, and in the meantime, has watched the process results of its neighbors, from which it will be able to profit in the matter of installing milling equipment, which is likely to be undertaken within the next year from the present ore showings manifested in the property. A crew of 6 men are now employed in the mine.

*I. X. L. Mine.*—Adjoining the El Paso to the southeast, the I. X. L. group of claims carries some fine showings of milling ore in its upper development, which are being sought for an considerable depth by a long drainage tunnel. It was anticipated that these ore bodies on their downward course would have been encountered before this, as the company have been steadily at work on this lower development for some time, but it is evident that faulting has displaced the principal vein and caused a rather complex problem in its recovery at depth. Three small veins recently cut and aggregating a total of 4 feet of good looking ore are showing a tendency to converge and may form the downward extension of the main ore body mined above.

*Hi Henry Mines.*—Adjoining the El Paso and I. X. L. groups to the east, west and north, a number of handsome ore bodies and clean-cut fissure veins have been developed to considerable extent by Mr. Hi Henry, the famous minstrel man, especially on the Knutsford, whose operations are temporarily suspended at the present time, but will be taken up again, it is anticipated, in the early future.

At Horseshoe Bend, about 3 miles east of the El Paso, Mr. Henry is developing a series of coal veins with a crosscut tunnel. These coal deposits are of the lignite variety and occur in a basin of tertiary sediments of shale and

clay, about two miles in diameter, and rather circular in form, that is entirely surrounded by granitic formations. The main deposit is said to be 9 feet thick and was formerly opened by an incline which, however, was caved in and inaccessible at the time of the writer's recent visit. The crosscut tunnel to tap this body of coal was in a distance of 100 feet and had penetrated one of the small beds which was disclosed near the face of the crosscut and showed 16 inches of clean, high-grade lignite coal with slippery structure planes due to compression and movement. This fuel was being used in a coal stove in Mr. Henry's new building at the mine, and gave excellent satisfaction for that purpose, producing a hot, steady fire and apparently quite free from sulphur and low in ash and moisture, for coal of this variety. If the 9-foot vein should prove as clean as the smaller vein recently encountered when it is opened and developed, it will prove a valuable source of domestic coal. No analysis of the fuel was available, but its position in tertiary formations fixes its age and variety. The enclosing shales and clay beds, however, are associated at one or two points in the basin with igneous eruptions that may have had the effect of evaporating some of the combined moisture in the coal and enhancing its quality as a fuel. Beds of pure clay suitable for the finer qualities of brick manufacture, are associated with the coal deposits, and with railway transportation, may afford the source of an important industrial enterprise.

*Osborne Mine.*—About a mile below Horseshoe Bend, right on the bank of the Payette River, the Osborne mine, owned by the Osborne-Idaho Gold Mines Development Company, was operated during part of the year with a force of 25 men. This property is developed through a vertical shaft and equipped with a milling plant of 50 tons daily capacity, all substantially housed and attached to the gallows frame of the hoist. The mill embraces a Sampson crusher, 50 tons capacity, Elspass mill with Wilfley concentrating tables and a small tube mill and cyanide equipments, the latter arranged for compressed air agitation. The mine equipment embraces a small Rand air compressor hoisting engine and pumps operated with compressed air. The compressor is run by electric power derived from the Payette Power Co. plant near by. The

property carries two well defined fissure veins in a black diorite granite. They strike easterly and westerly and one of the veins dips north and the other one south at steep angles. They carry some good shoots of heavy sulphide ore that range from 2 to 17 feet wide and yield average assay values of about \$8 per ton in gold. These veins probably intersect each other at some point only a short distance ahead of the main east drift at the 200-foot level. They each carry a different class of ore. The north vein contains considerable lead and zinc sulphides mixed with arsenopyrites, while the south vein carries only a trace of zinc and lead with its heavy iron sulphides. Their point of intersection is likely to afford an interesting condition and should be developed and investigated by further drifting to the east. This company have had the same adverse experience in trying to treat their ore by cyaniding as have the other companies in the near by Pearl District, and while great promises have been made by the different cyanide men that have been employed, none of them so far have made good and their recovery of 20 per cent to 40 per cent of the values is the best that has been obtained thus far. The ore carries some free gold, but it is of a rusty nature and while quite coarse, is difficult to save by amalgamation. A new man is expected shortly to take charge of the mill and endeavor to unravel the problem of the ore treatment, and pending his arrival the mine was temporarily shut down at the close of the year.

The wages paid by this Company are \$3.50 for miners, \$3 for car men, \$3.50 for timber men and \$4 for engineers. Mr. Robert H. Lilley is manager in charge, and the business affairs of the company are administered at the eastern end by the McKeever Bros., of No. 170 Broadway, New York.

*Nellie Mine.*—Half a mile further west from the Osborne property, the American Exploration Company own a large group of claims, carrying a big fissure vein well filled with good milling ore, in some shallow surface work. For the purpose of tapping this fissure at a depth of 800 or 900 feet, a crosscut tunnel has been run, starting at a convenient elevation above the level of the river and is now 1,800 feet in length. It has penetrated three different fissure veins, each of which carries good values in gold,

ranging from \$5 to \$30 per ton, but none of them have been accepted by the management as the vein being sought for.

The formation through which this tunnel runs is a variety of diorite—a fine grained granitic looking rock, very dark colored, that is remarkable for the rapid increase in temperature it develops as penetrated. This tunnel is ventilated with an 18-inch Buffalo blower operated by an electric motor. The temperature of the tunnel, with the blower in operation, is between 80 and 90 degrees and the rocks are warm to the touch, which is also true of the small flow of water that has been developed. This remarkably rapid increase in temperature at a comparatively shallow depth and in a horizontal tunnel is probably due to a minute dissemination of radium minerals, as was experienced in the famous Mont Cenis tunnel in Europe. The small fissures cut in this tunnel are well defined and are well worthy of drifting on, as it is not improbable that one of them may represent the ore body being sought for in a locally pinched condition, as there are numerous points in the development of the principal mines in the Pearl section near by where a crosscut tunnel would have struck the vein in a condition representing a mere stringer of mineral that expanded to a big commercial ore body within a few feet of that point by drifting or raising.

*Kentuck Mine.*—Adjoining the above described property to the west, and opened by a similar crosscut tunnel at about the same elevation, the Kentuck mine, owned by the United Mines Company of No. 36 Wall street, New York City, has an extensive plan of development. The main vein on this property was cut at a depth of 900 feet and has been connected through to the surface with raises. It contains an extensive reserve of milling ore of a fair grade in gold, varying from \$5 to \$7 per ton, of the same nature as that of the Osborne and other veins of this vicinity, a refractory mixture of arsenical sulphides with traces of lead and zinc. This property has remained idle during 1907, but the company have been spending considerable money in practical working tests with a view of arriving at a method of treating the ore by some of the cyanide processes, and, I understand, have gotten such encouragement as to warrant the erection of a milling plant in the near future.

*Lucky Boy Mine.*—The next adjoining property to the west is that of the Lucky Boy group of claims, which has a series of fissure veins fairly well developed and, according to the opinion of a prominent expert, has ore to the value of \$150,000 in gold and silver blocked out. This ore is of the same general character of mixed sulphides as the other properties of this section, with probably a little more zinc and lead than the adjoining Kentuck mine. The lead occurrence generally indicates higher gold values, and selected samples run up to several ounces gold per ton. Negotiations are in progress for the purchase of this group by an eastern company at the present time. It embraces 7 claims and makes a very attractive showing.

There are a number of other promising properties in this vicinity and occasionally some very rich ore has been found in their shallow surface developments. The Kentuck and Osborne developments indicate the permanency of these veins to very considerable depth, and with the metallurgical problem solved, there is no reason why this part of the West View District, which also embraces Pearl, should not become a scene of considerable mining activity and gold production.

*Hall Bros. Mine.*—Aside from its gold mines, one of the most important ore developments of the year in Boise County was the disclosure of an extensive deposit of lead-silver mineral, carrying good gold and copper values in addition, at Deadwood Basin, where the Hall Brothers succeeded in running down the source of some rich float, the source of which had been a prospector's problem for years. This discovery was made by sluicing off the deep surface debris with water conveyed through a long ditch dug for that purpose, and disclosed a lode or zone of rich concentrating ore 100 feet in width, of which 20 to 30 feet is said to carry lead values of 10 to 20 per cent with masses of clean galena mineral that runs 60 to 70 per cent lead.

Numerous samples have shown from 1 to 2 ounces silver to each unit of lead, together with several dollars per ton in gold. The situation of this mine is rather remote for a base ore proposition, but it is of such magnitude and promise that if its present size and values are maintained for any important length along its strike, its extensive development would doubtless warrant railway construction

for no other purpose than to handle the mineral traffic it could produce, and it will doubtless receive the attention of mining investors as important new discoveries of lead mineral have been very few and far between during late years.

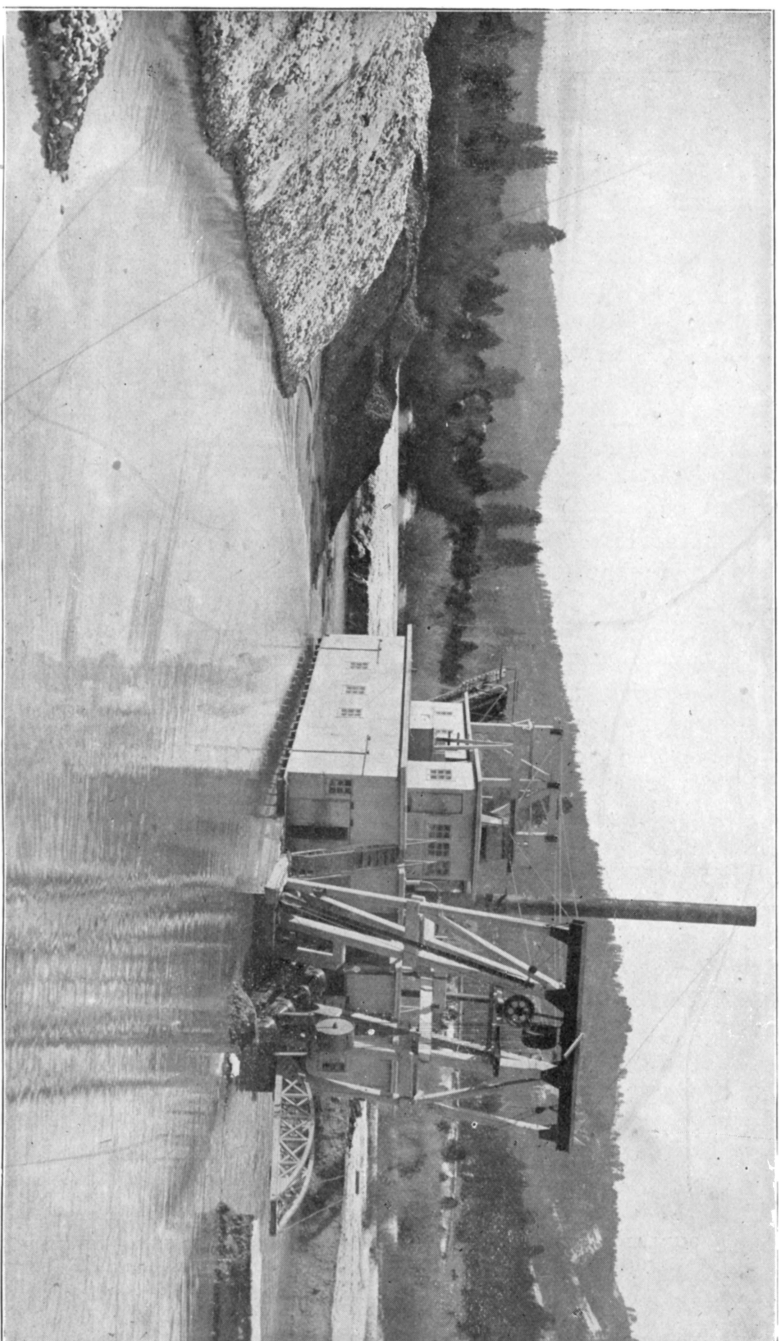
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## BINGHAM COUNTY ✓

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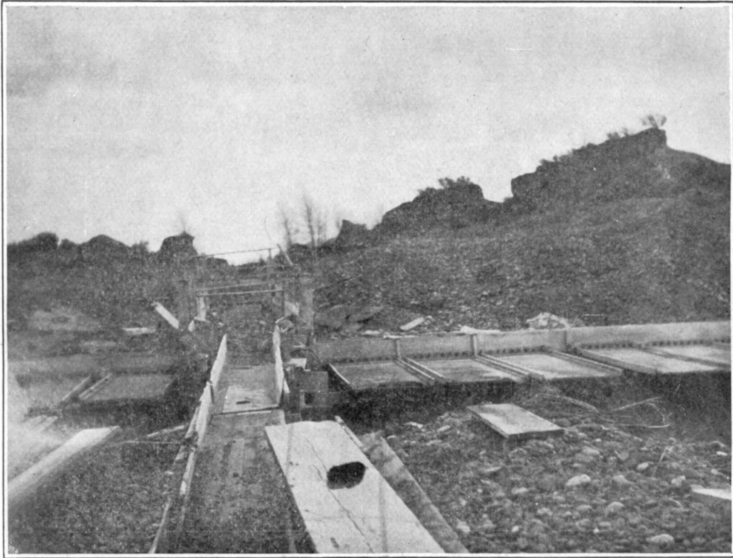
*Cariboo District.*—The most interesting mineral district of Bingham County is properly called Mt. Pisgah, but is better known locally as the Caribou District, situated near the east end of the county at Gray's Lake Precinct. It has attracted the attention of capitalists during the past year, and one of its principal properties, formerly known as the Robinson mine, is reported to have been taken over recently by the Corona Consolidated Mines Company of Boston, Mass. This mine was formerly equipped with a 20-stamp mill, which was unfortunately destroyed by fire. The mine is opened on a flat dipping bedded vein of altered limestone, in a series of limestone and conglomerate beds, associated with intrusive sheets of igneous rock related to diorite. The vein was worked by the former company for a width as much as 20 feet and is said to have yielded \$5 per ton in free gold and to have left considerable values in the tailings, which were not susceptible of recovery by simple plate amalgamation.

The geology of this district somewhat resembles that of Mercur, Utah, but the ores are not nearly so refractory,



RIDEN DREDGE SUCCESSFULLY OPERATED DURING 1907 AT THE PROPERTY OF THE MOLINE MINING COMPANY  
NEAR PLACERVILLE, BOISE COUNTY





**BURLAP TABLE "MACHINE" USED FOR SAVING SNAKE RIVER FINE  
GOLD AND BLACK SAND. THE BEST CONTRIVANCE EVER  
EMPLOYED FOR THIS PURPOSE.**

although they are by no means entirely free milling, and while a considerable proportion of the values may be recovered by plate amalgamation, other methods will have to be restored to for a more complete extraction of the values.

In addition to the Robinson mine there are several other properties on the same contract and on the parallel overlying and underlying bedded veins, and a series of cross fissures that carry good values and in some instances have considerable development. Some of the properties show good copper values, which are also associated with high grade native gold specimen ore. One of these, The Monte Cristo mine, has a carload of high grade copper ore sorted out waiting a favorable market.

Below the outcrops of these bed veins on the McCoy Creek side of Mt. Pisgah placers have been worked for a short water season for a number of years past and considerable coarse, high grade placer gold has been extracted by this method.

The American Placer Company in this district worked a force of 10 men last season and washed about 50,000 cubic yards of gravel, which yielded good paying values.

*Snake River Placers.*—In addition to the placer operations of this district, some small sluicing operations were carried on along the Snake River below Blackfoot, and a few hundred dollars worth of high grade fine Snake River gold was shipped to the Boise mint. The accompanying illustration shows the simplest and most efficient method of recovering the Snake River fine gold that has ever been devised. It is locally called a "Burlap Machine," and with this device, the simple construction of which will be appreciated from the pictures, fully 90 per cent of the fine gold contained in the flood bars and low gravel terraces of Snake River can be recovered by intelligent handling.

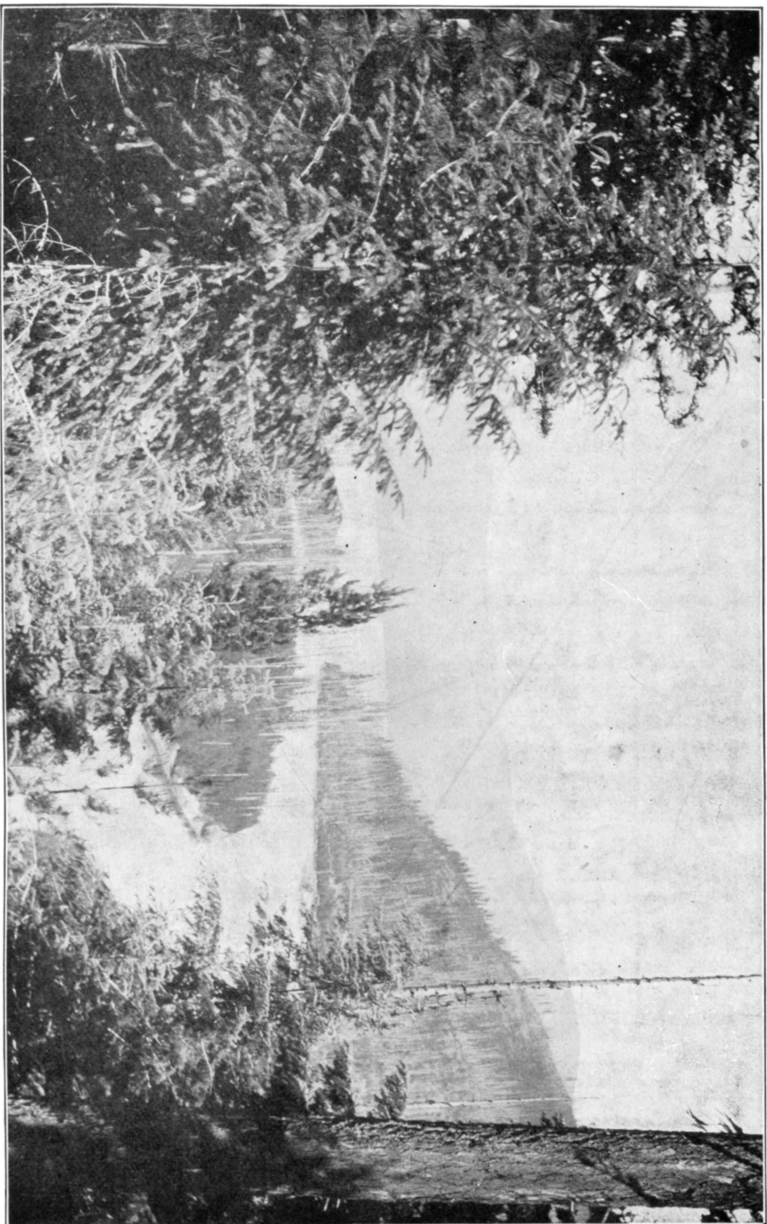
Bingham County has some interesting coal prospects a few miles east of Idaho Falls and is likely to blossom out in coal production from that section at any time, as the territory lying between Willow Creek and the South Fork of Snake River is largely made up of cretaceous coal-bearing formations.

## BONNER COUNTY

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Bonner County, formed by the north half of Kootenai County by the last session of the Legislature, contains an extensive area of mineral bearing territory, but as yet no steadily producing mines have been opened up, although occasional shipments are made from mining operations around Lake Pend d'Oreille of high grade smelting ore, usually running to silver values principally, although at Trestle Creek and Clark's Fork some very fine prospects for profitable gold and copper bearing deposits occurs, which is also true of the section around Priest Lake at the north end of the county, and north of Priest Lake some very handsome deposits of lead ore are found, but this latter region is rather remote from railway transportation and still in the development stage.

The most conspicuous connection with the mineral industry of the State for which this county was noted last year, was the fact that it contains at Sand Point the site of the Panhandle smelter. This is a lead smelter of 200 tons daily capacity, which, after several years of stock jockeying preparation, was finally gotten into a condition of actual bullion production during the past season, but the enterprise went to pieces in the early fall for lack of capital and a number of shippers were badly embarrassed by having their ores tied up and being unable to get a settlement on them. The enterprise has always lacked sufficient capital to put it on a proper independent basis. Recent reports indicate that some very substantial capitalists and practical smelter people have bought control of the stock of this enterprise and will go ahead and enlarge the plant, and the chances are that it may develop into a very important smelting point, as there is not a more ideal situation for a plant of that kind than is afforded at Sand Point, as this rapidly growing city is quite a railway center, having three lines of railway and an immense tributary mineral territory, including the Coeur d'Alenes nearby.



PRIEST RIVER, NEAR THE IDAHO MINE AT THE OUTLET OF KANITSU (PRIEST) LAKE, BONNER COUNTY.

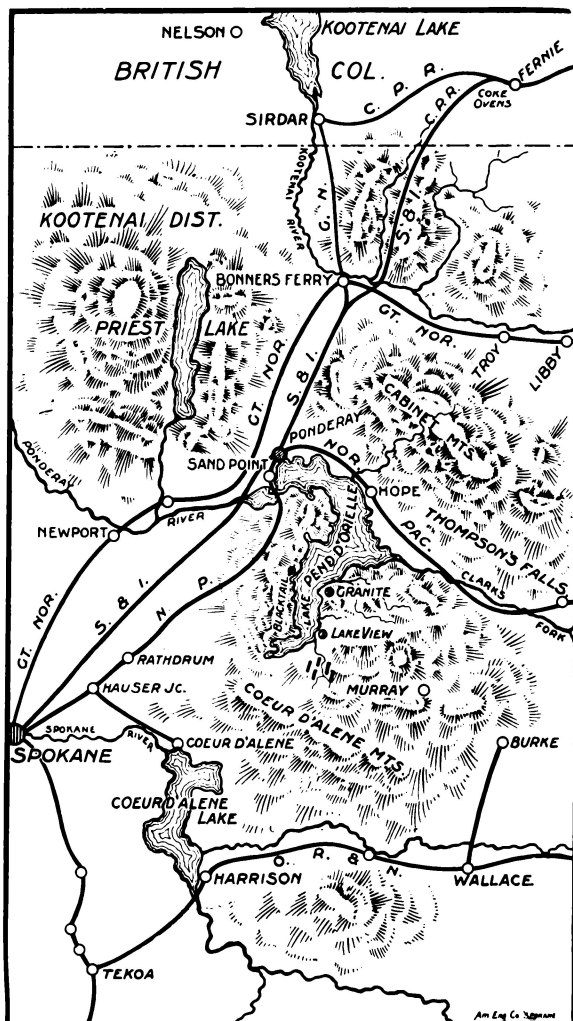


DIAGRAM ILLUSTRATING THE ADVANTAGES OF SAND  
POINT AS A SMELTING CENTER AND ITS  
TRIBUTARY MINERAL FIELDS

## BANNOCK COUNTY

*Fort Hall Mine.*—The principal point of mining interest of this county during the year was the development of the Fort Hall mine situated a few miles south of the city of Pocatello, near the mouth of the Portneuf canyon.

This property is being developed through a crosscut tunnel over 4,000 feet long, in which there was cut a zone of copper-iron bearing mineral 150 feet thick, carrying light values all through that great width of material. A sub-zone 60 feet wide is better mineralized and is believed by the owners to contain an average value of 40 pounds of copper bullion to a ton of ore, together with a little gold and silver, on which basis, under such favorable conditions as it is situated, that it can be profitably handled and afford the source of a big mining and milling operation that will pay a decent margin of profit.

This is a very interesting deposit of beds of argalite and altered dolomite, carrying deposal lines and disseminated crystals of iron pyrites mixed with chalcopyrite. The ore bearing formation is thin bedded and the zone apparently stands at a steep angle, probably 60 degrees. It is locally crumpled so that a specimen band of the richest ore half an inch thick will sometimes show a right angle bend in a piece no longer than a man's hand. The mineral appears to follow the original deposal lines of the enclosing formation so distinctly that it was manifestly laid down with its enclosing sediments and affords a very interesting problem in sulphide copper ore genesis and promise of permanency. The wall rocks are slate or schist and basalt conglomerate.

The point at which this ore body was cut is 800 or 900 feet vertical under its apex. Drifts were being run along its strike in each direction on the richest bands of the mineral and the values seem to be well maintained in the rock, and present the appearance of resulting in an enormous deposit of mineral of the grade above mentioned. The gangue is light and easily crushed and the minerals should separate clean from the waste in concentration and make a 10 or 15 per cent copper-iron concentrate car-

rying excess in iron which should command a very reasonable smelting charge.

The convenient situation of the mine within a mile of the Portneuf River, where it can be reached by a short tramway at very light cost, and the handsome mill site on the railroad which would afford cheap fuel for power and shipping facilities, this, together with the chances for gravity handling the low grade material from the mine, when copper prices again recover to about 18 cents per pound, and conservative, competent management given sufficient capital for proper equipment, the deposit promises to pay a nice profit and form the basis of a mining and milling enterprise of considerable caliber.

This mine is owned by the Fort Hall Mining Company, and Mr. William Odell of Pocatello is secretary and business manager of the enterprise. The company works a force of 4 to 8 men during the greater part of the year and have accomplished a large amount of development work.

*Moonlight Mine.*—At the Moonlight a small force of men was carried throughout the year and quite a large amount of development work accomplished on a fissure vein in schist and trassic conglomerate and a carload of high grade bornite ore extracted. This was not gotten out, however, until the slump came in the values of copper along in the fall, and is being held for a better market.

There were several prospecting enterprises in progress in the Pocatello district during the year and some interesting ore disclosures are reported from different points.

A handsome deposit of pure clay has recently been opened near Pocatello of such fine quality as to be suitable for terra cotta work, and a stock company has been formed to exploit it.

## BEAR LAKE COUNTY

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The mineral industry of Bear Lake County enjoyed quite an impetus of new development during 1907. This small county, situated at the extreme southeast corner of the State, adjoining Utah and Wyoming, contains a variety of mineral deposits, including gold, silver, lead, copper and phosphate rock. Its phosphate deposits are of comparatively recent development but have proven of such extent as to compare favorably with the most important deposits of this mineral in the United States, according to recent investigations of the United States Geological Survey. Unfortunately the market for this material is on the West Coast, and owing to the stress of railway traffic and the lack of continental roads it has so far been impossible for companies operating these deposits to get a favorable freight rate that would justify shipping the material extensively. Two thousand eight hundred tons of high-grade phosphate rock was shipped during the past year from the property of the San Francisco Chemical Company at Montpelier. Five dollars a ton is the lowest rate that has been obtained in transporting this material to San Francisco, where it has to be treated in combination with sulphur for the manufacture of fertilizer. This figure is practically prohibitive on raw material of such low value and leaves but little margin of profit to work on. With a more favorable shipping rate, an extensive industry could be built up at this point.

An admirable preliminary paper has been issued by the United States Geological Survey on the phosphate resources of this field, giving the results of recent investigations by F. B. Weeks and W. F. Ferrier. This paper is entitled "Investigations Relating to Phosphate and Phosphorous in 1906. An Extract from Bulletin 315, Contributions to Economic Geology for 1906." It can be had on application to the director of the United States Geological Survey at Washington, D. C. A full study of this excellent paper, and the more complete bulletin to follow, on the same subject, will give valuable information to interested parties.

Copper ores are widely distributed in the carboniferous



formations that border the Bear River valley and some interesting showings have been made at several points. Among the more prominent operations during the past year were those of the Bonanza Mining Company, the Golden Gate Smelting Company, the Humming Bird Copper Company and the Blackstone Mining and Power Company. These operations employed crews ranging from 4 to 20 men and report the development of considerable high grade ore. The Blackstone Company's deposit carries high grade lead carbonate and galena ore and has produced three car loads of lead ore that sampled over 80 per cent metal, which is probably the highest grade lead ore shipments ever made from the State. This deposit occurs in limestone and has large bodies of good concentrating ore that run about 27 per cent lead, 50 cents gold, 4 ounces silver per ton, and with further intelligent development should make an important producer of very desirable smelting mineral.

Bear Lake formations embrace a variety of fine building materials and some very interesting deposits of sulphur. Its mineral resources are about as varied as those of any county in the State, and as time advances will doubtless cut a very important figure in its industrial development.

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## BLAINE COUNTY

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The Wood River District, which is the principal source of the mineral wealth of Blaine County, was seriously hampered in its ore production and mining development during 1907 by the fuel and labor famine, and while the output is not as large as formerly, due to these causes and the fact that the Minnie Moore was entirely eliminated from the shipping list, there nevertheless was some very important ore developments made during the year, that

with the resumption of a little better metal values, are going to bring this famous old district rapidly to the front in the matter of ore production in the near future.

*Croesus Mine.*—One of the most important producers of the year was the Croesus mine, three miles west of Hailey. This property was formerly considered a gold mine and has had an indifferent career as such. It is developed by a 3-compartment vertical shaft 800 feet deep, with 8 levels, and made a production during the past year of 40 cars of high grade mineral taken from and below the sixth level, of which 20 cars were rich lead-silver ore, and 20 cars of high grade gold bearing pyrrhotite mineral. This interesting yield of sharply contrasted smelting ores from the same shaft comes from the development of two distinct veins which have fortunately made their best ore manifestations very close to the main shaft, and the remarkable strength of the ore bodies so far disclosed in them and the fact that their richest values are mined from the deepest points in the property, and the further fact that there is now a reserve of mineral undercut in the mine conservatively estimated at a million and a half dollars in gross values, puts the Croesus well within the list of demonstrated ore sources of very considerable importance, and opens definite prospects of bonanza possibilities in the matter of further large ore resources with continued development at further depth:

On the sixth level of this mine there is now disclosed a body of massive pyrrhotite ore, 6 to 10 feet wide by 125 feet long, that will stope down crude shipping ore values for that width and length that run \$50 per ton in gold, with a high excess in iron and some copper. Accompanying this magnificent pay streak, there is a body of milling ore that expands in one place to 10 sets wide, containing average values of \$10 per ton in gold, a considerable portion of which is available to free plate amalgamation, and in addition to its shipments of crude smelting ore and concentrates this property produced, with a light imperfect stamp mill, several thousand dollars in gold bullion, which was sent direct to the mint, during its intermittent concentration operations of the past year.

The formation at this point is the regional grano-diorite mass that overlies the Minnie Moore, and the ore body in

the gold vein is accompanied by an intrusive dike of dark colored, fine grained igneous rock like diabase or basalt. This vein stands nearly vertical and strikes nearly east and west, and has been drifted on for several hundred feet in continuous pay ore at some of the upper levels.

The lead bearing fissure is also of good size and strength; it was discovered at the seventh level and has subsequently been opened at the eighth level and up to the sixth level, where it crosses the gold vein. It has a strike southeasterly in the direction of the Minnie Moore, with a dip of 60 degrees towards the northeast; drifts have been carried out from 2 to 500 feet on the lead vein at the 700 and 800-foot levels, in which it proves continuous and its ore bearing limits still remain undetermined but show every prospect of continuity and a repetition of the present splendid ore shoot, which varies from 5 to 8 feet wide of high grade concentrating ore that contains average values of from 5 per cent to 20 per cent lead with nearly an ounce of silver to each unit of lead, and a massive pay streak of clean shipping mineral in some places up to 2 feet thick along the hanging wall. An interesting feature of this ore is the fact that it is quite free from pyrrhotite, although it carries occasional kidneys of clean copper sulphide ore, and the shipments already made from it run from \$5 to \$8 gold per ton, in addition to its silver and lead values.

This is a remarkably interesting contrast of minerals in such close association, the formation being the same in both veins, but the ore distinctly different, and indicates a separate period of mineralization and a different source of ore solutions. Its occurrence at such considerable vertical depth has greatly enhanced the faith of other operators in this district, and in the ore deposits found in connection with the eruptive granite and diorite areas, and is a strong supporter of the argument put forth in my last annual report that the principal fissures of the Wood River District warrant development at great depth and are likely to reward their investigation in that direction far beyond the anticipation of their owners, as has been found in other silver-lead districts.

The Croesus has made such a marked improvement in the ore resources and in evidences of permanency in the hands of the present manager, Mr. S. A. Riggs, who is also

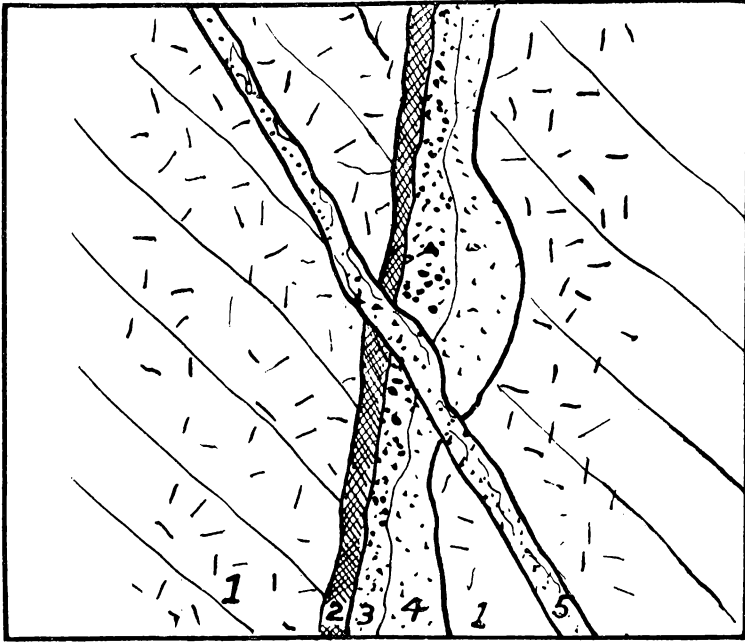


DIAGRAM CROSS SECTION CROESUS VEINS AND DIKE, 600 FT. LEVEL.

1.—Diorite. 2.—Intrusive Dike. 3, 4.—Pyrrhotite Gold Vein.  
5.—Lead-Silver Vein.

a large stockholder in the company, as to warrant the company in going ahead with its further extensive development and equipment with a large milling plant, and plans are now being drawn for a mill of 250 tons daily capacity, which will probably be erected and put into operation during the coming year. The company have already installed an electric power line and will take power from the Cramer plant at Hailey, and in this manner try and get away from the embarrassing experience encountered in the past on account of the unreliability of their coal fuel supply for steam making purposes.

*Idaho Consolidated Mines.*—This property, situated near Bellevue, now embraces the old Minnie Moore bonanza and covers a magnificent stretch of the Minnie Moore contact, embracing 300 acres of some of the choicest mineral territory in the Wood River District, that is credited with a yield of high grade mineral aggregating over \$8,000,000 in value, the bulk of which was derived from the Minnie Moore claim.

The Idaho Consolidated Company, Limited, is incorporated for 3,000,000 shares of \$1 per share par value. Its president is Mr. J. P. H. Cunningham of New Castle, Pa.; its vice-president, Edwin H. Ohl, of Pittsburg, Pa.; treasurer, Charles R. Carpenter, of Racine, Wis.; secretary, C. L. White of New Castle, Pa., and Mr. Irvin E. Rockwell, the original organizer of the enterprise, continues as general manager.

Mr. Rockwell's mining experience commenced at the Minnie Moore mine 6 years ago. He came to the enterprise with a lot of native business talent and energy and has made good use of his time in the acquisition of mining knowledge, and has taken out over a million dollars worth of ore from the Minnie Moore, which had been abandoned by its former owners as a worked-out and exhausted proposition, and this in the face of some very discouraging conditions that had to be first overcome in the matter of unwatering acres of worked-out ground and solving some very knotty geological problems.

The Minnie Moore ore bodies terminated at a pronounced fault below the thousand foot level while the mine was in charge of the management of Charles M. Schwab of New York, and it was insisted upon by high geological authorities that the ore bodies originated on the same side of this fault and would never be found beyond it. In the face of such adverse opinions, Mr. Rockwell has carried on an extensive campaign of development on the opposite side of the fault, further northwest, and as far as it has progressed it has made a most interesting revelation of ore and geological conditions that explains unsolved problems in the older property near by and makes available for handy proof with short crosscuts some extensive stretches of ground overlying the bonanza stopes of the Minnie Moore that may contain important ore bodies that have been passed by in the former operation of that mine.

A new roomy, 3-compartment incline shaft is being sunk on the Relief claim 1,200 feet north of the Minnie Moore shaft that is opening an entirely new zone of ore deposition and is showing eminent promise of successful results. This new shaft was not started blindly, as under Mr. Rockwell's management the Idaho Consolidated formerly did a large amount of development work on the Relief claim

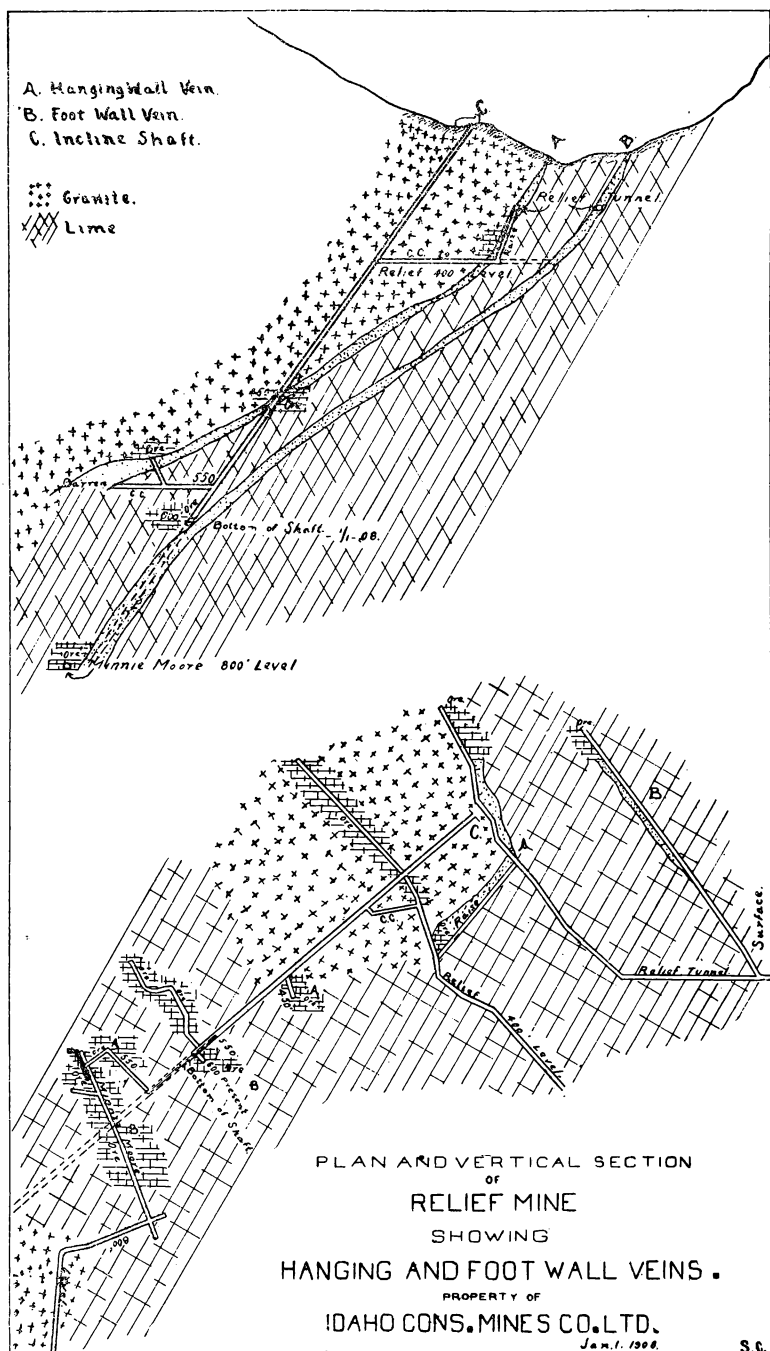
and disclosed considerable milling ore. This development also included a drift extended on the course of the Minnie Moore vein from the 800-foot level to a point directly under the dip of the new shaft, where a fine body of milling ore was found.

This new shaft has disclosed two distinct veins where only one was expected and proves the occurrence of important ore values in a well defined vein in actual contact with the overhanging diorite, as well as the original Minnie Moore vein at its normal distance in the limestone formation underneath the diorite, where it has recently been tapped at the 600-foot level. Its identity is complete and shows splendid evidence of mineralization, including the usual iron spar gangue and an undetermined brown, jaspery mineral with some rich galena ore that was one of the marked characteristics of the rich galena shipping ore bodies in the Minnie Moore development.

In addition to these sparry associations, the vein recently struck in the bottom of the new shaft is further absolutely identified as the proper Minnie Moore vein by the fact of its being associated with a narrow included dike of intrusive igneous rock, like that at the Croesus, and which was formerly a sure indicator of pay ore. This dike is a smooth grained, blue-gray rock that may be altered basalt or diabase. It so much resembles the blue-gray limestone walls of the fissure as not to have been a conspicuous feature or even recognized in the earlier history of the Minnie Moore, but this association with the rich ore bodies of the Minnie is the one thing which the geologists brought out, and incidentally, I would mention, is a connecting feature of rich ore deposits of marked importance in Idaho mining history, notably in the Coeur d'Alenes and in Owyhee County, where the famous Hecla mine and the Trade Dollar mines are conspicuous examples.

The accompanying diagrams will give a general idea of importance of the new shaft development of the Idaho Consolidated Company's Relief claim.

I personally examined the conditions there presented and thought with the management, when the first vein was struck at the 500-foot level, that it was the Minnie Moore vein which had made to the contact at this point. Instead



of this being the case, however, it proves to be an entirely new vein and the one on which the extensive shoot of milling ore is developed from the surface crosscut on the Relief claim.

This ore shoot has been developed 420 feet in length, and varies from 1 to 18 feet wide, containing average values of between \$8 and \$9 per ton in gold, silver, lead and zinc. When the shaft was carried to the 600-foot level, however, and the true Minnie Moore vein encountered in its normal position 85 feet under the contact, its characteristic markings were so distinct as to put its identity beyond question.

At this point the old vein has been drifted on over 200 feet since it was cut and continues to carry the characteristic little dike of intrusive, igneous rock, iron spar, and a strong showing of the brown jaspery mineral and white calcite bands for which the bonanza ore channel was noted, together with a good minable width of fine concentrating ore and occasional kidneys of clean, high-grade galena.

These interesting disclosures greatly magnify the property's chances of success with further development and warrant all that the management has so far done and an energetic continuance of its plans.

The intrusive dike rock accompanying the last vein cut is a particularly interesting feature, as it became a by-word with the later operation of the Minnie Moore mine that where there was no dike rock in the vein, no ore need be expected, but that its occurrence in the ore channel was a synonym of rich mineral values near at hand.

I have frequently argued that it was unlikely that the profitable mineralization of this famous contact, which can be plainly followed for miles in length with numerous splendid surface manifestations of other ore bodies, would be confined to the original Minnie Moore claim, and it looks now as if this suggestion was well warranted and may soon result in very profitable realization of new ore bodies.

The recent panic has affected the plans of this company like those of other development enterprises throughout the State, and resulted in a temporary suspension of the operation at the mine, at least until the new hydro-electric power plant of 750 horse power capacity, with which the



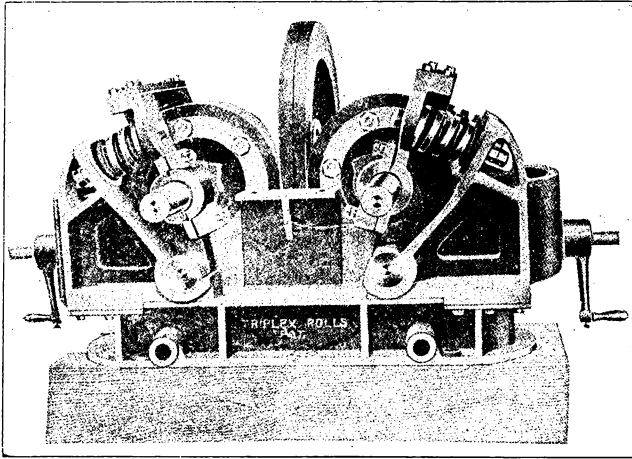
property is being provided, is completed, which will probably be along towards the early summer. This installation is being made under the direction of Mr. A. J. Wylie of Boise, one of the ablest hydraulic engineers in the West, and the machinery is being supplied under contract by the Westinghouse Electric Company and is of the latest and most substantial pattern. This plant is situated between Bellevue and Hailey, only a short distance above the new mill, and embraces the whole flow of Wood River under a 38-foot head, which will give an ample independent power for all requirements of the enterprise, with some to sell for the operation of neighboring mines.

In the meantime the property is undergoing equipment with a new milling plant of 250 tons daily capacity, the building for which is already completed and the machinery already on the ground and now in process of installation.

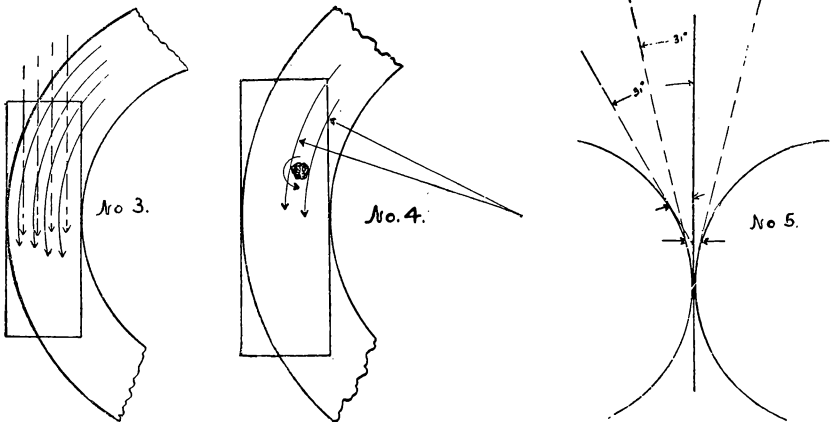
This new mill presents another bold and original move on the part of the management, as it embraces new principles in ore concentration. Besides the extensive body of milling ore exposed in the contact vein above the 400-foot level of the new shaft, which embraces a uniform mixture of massive coarse grained iron sulphides with lead and zinc sulphides, the Idaho Consolidated Company have on hand 140,000 tons of old mill tailings for immediate use in the new mill when completed. Forty thousand tons of these tailings will run 2.2 per cent lead, 6 ounces silver, and 11.5 per cent zinc, and 100,000 tons will run 2 per cent lead, 6 ounces silves, and .03 ounce in gold, with very little zinc. The better grades of milling ore now exposed in the mine at the 500, 600 and 800-foot levels will, of course, have to await its further development, but a good margin of profit can be figured out of the mineral available for the milling plant now in process of construction, according to exhaustive investigations and practical tests. This new mill is divided into two units. On one end it embraces an ordinary wet process of crushing, close classification and concentration on Wilfley tables, and one James slimer that is 35 feet long and is said to really separate slime.

The greatest innovation at this end of the mill is the introduction of new triplex rolls built by the Triplex Roll Company of Denver, Colorado, which is a simple, plain Cornish roll with a third roll running in a vertical position between the two main crushing rolls and called an

idler, as its motion is entirely applied by the main driving and crushing rolls. The virtue of this third roll is to increase the capacity of the rolls, extend the life of the shells and make a more uniform product, and an automatically balanced face which wears uniformly smooth without any chance of grooving. This device has been successfully tried out and operated steadily for over 2 years. Its simplicity is its greatest recommendation, together with the feature of wearing itself and the crushing rolls with a smooth face free from grooves. The accompanying cuts will illustrate this new device.



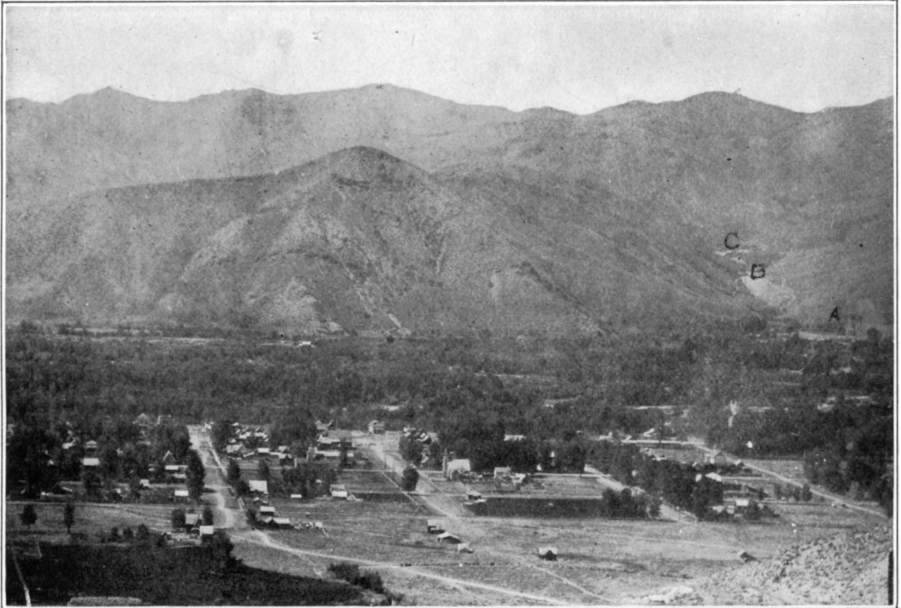
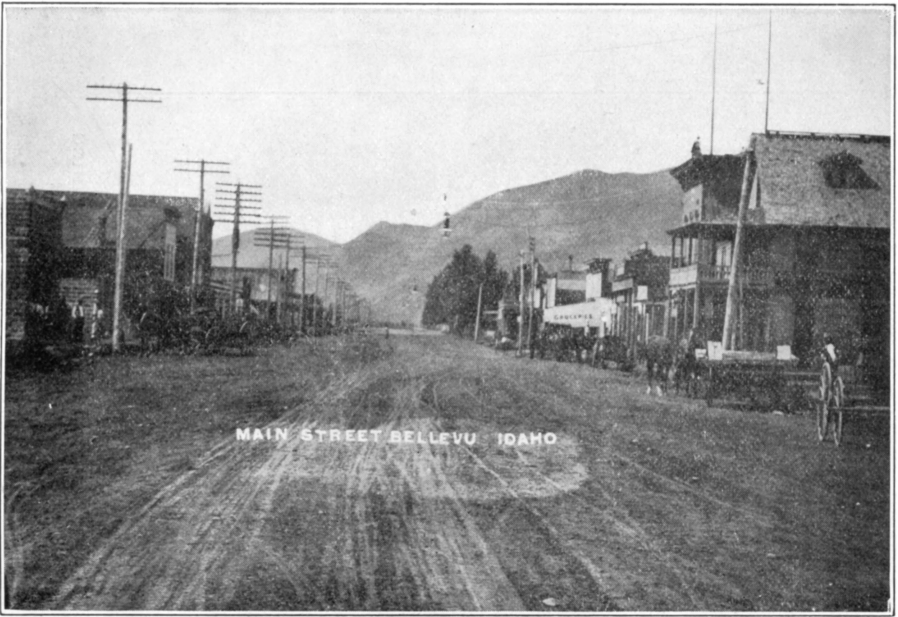
THE TRIPLEX ROLLS, HOUSING REMOVED.



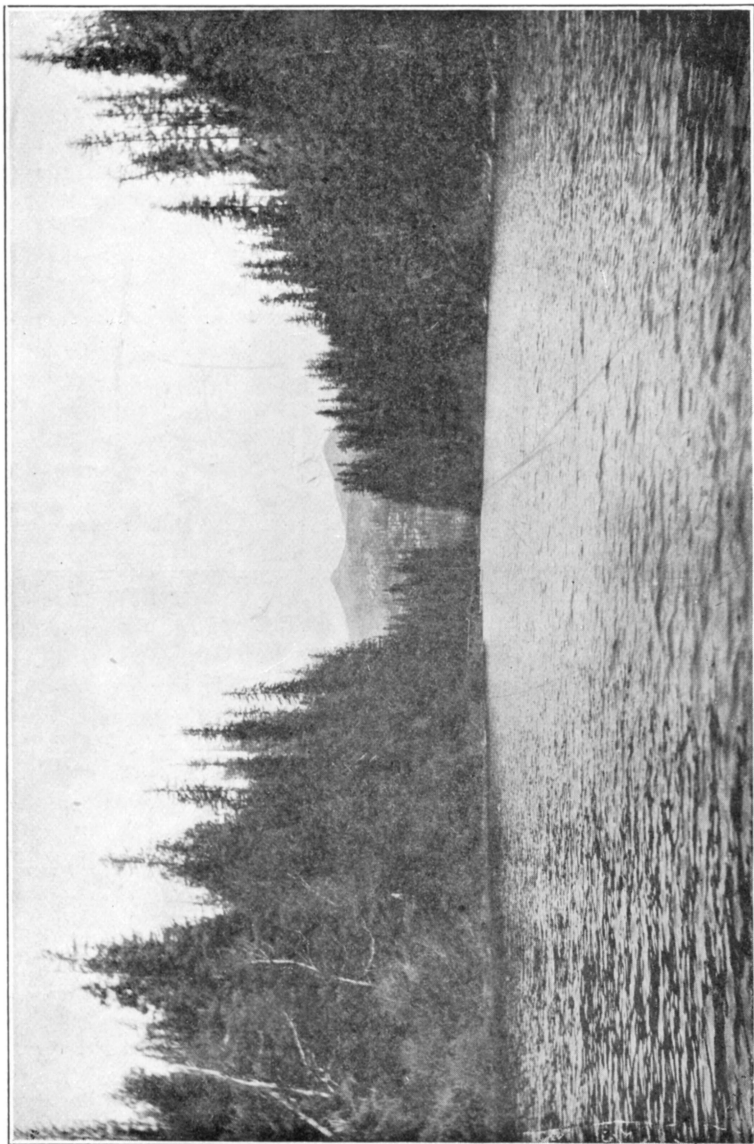
DETAILS OF TRIPLEX ROLLS ILLUSTRATING THE CROSSED LINES OF CRUSHING AND SMOOTH WEARING EFFECTS OF THE IDLER.

On the opposite side of the mill a Dry Process of concentration is being installed which embraces, besides the same crushing devices, a Bartlett-Snow revolving dryer and Sutton, Steele & Steele dry concentrating tables and classifiers. This is something also brand new in ore separation, but is being built on an absolute guarantee that it will discount any wet method of concentration heretofore tried. It embraces a classifying device called a vibromoter ore sizer that furnishes an evenly sized product in 7 to 10 classes of pulp, ranging from 40 to 173 mesh and finer, using silk mesh cloth in place of wire screens, and which is treated on a dry concentrating table that differs from all previous attempts at dry concentration, according to the statement of the manufacturer, in the fact that it accomplishes the results for which it is designed and will make a clean separation of mineral varying only 1-2 of 1 per cent in specific gravity.

This new table resembles in appearance an ordinary well known type of wet concentrating tables, the separation in this case being effected by the reciprocating movement of the tables with the introduction of a mat of air under slight pressure, the air being used for cushioning the ore particles and to give perfect mobility so as to permit of the most exact separation. It is said to be easily controlled and cheaply handled. A common domestic cloth top was used which is said to show practically no wear after months of use on the finer sizes of product, on account of the protecting cushion affected by the air filling. In addition to the sizer and concentrating table, the complete process embraces a di-electric separator for cleaning zinc and iron. This, however, is not considered necessary in the present installation. This process has been thoroughly tried out at Butte, Montana, where a 150-ton plant was equipped and has been in successful operation for 6 months at the La France mine, on ore that averaged gold, .09 oz.; silver, 5.54 oz.; copper 1.09 per cent; zinc, 28.07 per cent; iron, 10.1 per cent; silica, 25.6, and has produced a very much cleaner and superior product from this complicated mixture of base sulphide than has ever been approached by any wet methods tried, making a clean high grade marketable product of both the lead, zinc, iron and copper, in spite of the low percentages of



**BIRDSEYE VIEW OVER BELLEVUE.**  
A—New Mill. B—Minnie Moore Shaft. C—New Relief Shaft.



PHEBES MOUNTS FROM THE "THOROUGHFARE," PRIEST LAKE, ONE OF THE MOST PICTURESQUE MINING SECTIONS IN IDAHO. THE IDAHO CONTINENTAL COMPANY'S RICH LEAD-SILVER DEPOSITS ARE NEAR THE HIGH SUMMITS.

the lead and copper shown and with a percentage of extraction that is nearly complete and discounts any wet method known. These results seem incredible but are vouched for by the highest authority. If they can be repeated here, they will mean a revolution in the concentration methods of the West where high precious values prevail associated with the base ores and will certainly be watched with a great deal of interest. As this mill embraces a splendid unit of up-to-date wet concentration machinery, the two processes will make an interesting battle ground for superiority at this point. Literature on this dry process, which seems to be based on the flour milling, bolting cloth method of separation, can be had from its manufacturers, Messrs. Sutton, Steele & Steele of 194 North Jefferson street, Dallas, Texas.

The Grasselli Chemical Company of Cleveland has under construction a 50-ton mill employing this identical process at Park City, Utah, for the treatment of the zinc middlings thrown out by the Daly-West plant in their regular operation on lead-silver-zinc ores.

The new Idaho Consolidated mill has been built near the Wood River valley bottom at Broadford, at the mouth of Galena gulch, and about half a mile below the mine. Everything about it and the company's other equipment is very substantially done with first-class material and is well warranted, as the enterprise, in my opinion, makes a sufficient mineral showing at this date, considering its past history, and the fact that so far it has been the principal source of Wood River's mineral wealth, to justify the continued expenditure of a quarter of a million dollars in further development. From its appearance I should say that the present showing in the principal workings when opened up in mining condition should yield a product sufficient to carry the future development required and supply a handsome margin besides.

#### BULLION DISTRICT.

*Eureka Mine.*—At the Bullion District, the Eureka mine, while on the ragged edge of having to shut down for lack of fuel all summer, made a very creditable record of development and production and now has a handsome showing of mineral in the bottom of its shaft, which is about at the lowest point of development in the Bullion

District and a fine indicator of the permanency of the veins and ore of this district at depth, for while the ore shoot in the Eureka is short it is of considerable size, carries a fine quality of ore and has such a strong appearance in its present condition as to warrant the anticipation that it can be depended on to go down to considerable further depth.

The shaft of this property starts near the level of Bullion Creek and is sunk on the steep dip of the vein, which has an angle of about 60 degrees, to a depth of 365 feet. The property is equipped with a concentrating mill of 50 tons daily capacity and by capable, close management, is made to pay a nice margin of profit.

*Red Elephant Mine.*—The Red Elephant Mine, under the same management, a short distance further west, also made a nice yield of mineral and shipped a good many cars of concentrates during the season. The results of its year's work give promise of new ore bodies in the eastern end of its territory, and the company were considering the feasibility of their further development under the leasing system.

*Democrat Mine.*—The old Democrat mine, a short distance northwest of Hailey, was operated during the year with a crew of 10 to 15 men and shipped several car loads of high grade mineral. This is an old mine that has been worked almost constantly for 20 years and has made quite a large output of high grade ore in the aggregate. It is opened on a narrow fissure in granite, on which 1240 lineal feet of work was done during 1907.

*Other Properties.*—Three or four of the principal properties of the Bullion District that have been practically idle for several years, including the May Flower, Jay Gould and Bullion mines, credited with a combined yield of \$5,000,000 worth of high grade silver-lead ore at a comparatively shallow depth, were undergoing some further development under option to Mr. Robert Tustin, who is figuring on an extensive plan of deep work from a long tunnel now tapping the veins near the creek level.

The ore of these veins was continuous for hundreds of feet and their courses are well defined by open stopes mined right to the surface on the steep mountain side. The values range from 50 to 70 per cent lead, from 100 to

180 ounces silver, together with several dollars gold per ton, and the properties well justify further extensive development at depth as they carry clean-cut fissures that should remain productive to an indefinite depth when more thoroughly explored.

*Muldoon Mine.*—In the Muldoon District, twenty-five miles east of Hailey, Mr. Tustin has also been carrying on an extensive plan of development on several interesting properties. The most important ore disclosures are on the old Muldoon mine, which was equipped in the early history of the district with a smelter and a large concentration mill. A new milling plant of 200 tons daily capacity is being erected on the Muldoon mine at the present time, and recent reports from there say that the property has an immense reserve of high grade milling ore in sight.

The ore of this property is zincy but carries proportionately high values in lead, silver and gold, and the precious values are fortunately largely confined to the lead mineral, and it is believed can be separated to excellent advantage, as the zinc, lead and iron minerals occur in coarse loose crystal aggregates. With decent metal prices, this property should become an important source of shipping mineral, and in connection with the new mills of the Idaho Consolidated and Croesus mines will give Blaine County quite an important milling capacity within another year or so.

*Nay Aug Mine.*—At Deer Creek, the Nay Aug mine was very successfully handled during the past season and afforded a splendid example of close, capable management. The property carries a small vertical fissure in granite with several short ore shoots that range from a few inches to 2 feet in thickness, and 30 to 100 feet in length, developed through adit tunnels. The ore is quite zincy as it comes from the mine, but the only milling equipment on the property is 2 stationery Cornish trough buddles, each operated by one man, and a stream of 3 or 4 inches of water and built at a cost of \$25, with which a shipping product of fairly clean lead concentrates is made that run from 40 to 50 per cent lead, and 40 to 50 ounces silver, with about 5 per cent zinc. The property produced ore to the gross value of nearly \$90,000 with a crew of from 10 to 20 men during the past year and affords, under its



present management, a fine example of intelligent handling and is well gauged to its capacity.

*Boston-Idaho Company.*—Considerable development was in progress around Ketchum and several new enterprises started. Among these, one of the most prominent was that of the Boston-Idaho Company, who took over the old Ontario group of mines, and established a splendid new camp equipment, including a readjustment of an old mill that was on the property, which I understand is to be enlarged. The company are now reopening the mine in new ground below its old development, and 10 men were employed during my visit to the district in November.

This property is reputed to have produced several hundred thousand dollars worth of high grade lead-silver ore, carrying good gold values in its early day operations. I am acquainted with responsible miners who worked in the ground years ago who have a very high opinion of its possibilities when it has been properly reopened and new levels run out on the veins. It carries several distinct fissures in granite and limestone and is well worthy of extensive development to prove its merits at further depth.

*Fetish Company.*—Another interesting development enterprise at Warm Springs Creek, above Ketchum, is that of the Fetish Mining Company, which carries a good fissure vein in quartzite and porphyry walls, containing some fine sulphide minerals, embracing carbonates and oxides of lead and copper, associated with good values in gold and silver. This property has 2,500 feet of development, principally in the form of crosscuts and tunnels, of which 600 feet were run during 1907.

*Hattie Group.*—On the opposite side of Wood River, at Trail Creek, the Hailey Mines Development Company, Limited, own the Hattie Group of claims and some surface work by this company during the past year disclosed a strong vein of galena bearing ore. This company intend making a crosscut of about 100 feet to cut the vein lower down. The upper development has several carloads of good zinc mineral in sight and the property warrants further work as it carries definite prospect of becoming a producer of some importance.

*Silver Fortune.*—This company also owns a half interest in the Silver Fortune group of mines on the East Fork

of Wood River, where a strong bedded vein in limestone is being developed with a small crew of men. This property carries a strong mineral showing of sulphide ores, containing zinc, lead, iron and antimony. The development is not sufficiently advanced to determine the extent of its ore bodies, but from the size of the vein some important ore shoots are likely to be encountered as the work progresses. Two hundred and sixty feet of cross-cutting and drifting was done on the property and 27 feet of raising, during the past year, by the present owners.

*Other Properties.*—Several other properties were operated with small crews of men in this portion of the district, which, however, the writer was unable to visit in person last season.

The ores around Ketchum are noted for high values in silver and lead, together with considerable gold, which is also true of all the Wood River smelting ores, and this county is likely in the future to make a very interesting total gold production from a more extensive treatment of its baser ores of milling grade and other sources of gold.

#### LITTLE SMOKY DISTRICT.

The Little Smoky District of Blaine County, 35 miles west of Hailey, carries some very interesting gold deposits, both quartz and placer.

*Five Points Mine.*—The Five Points mine, near Soldier, was bonded late in the year to Mrs. E. C. Atwood and is likely to be equipped with a milling plant during the coming season.

This property has several adit tunnels driven on a well-defined fissure vein, and, according to the estimates of capable men, has ore to the gross value of \$150,000 at this time blocked out.

This mine is opened on a clean-cut fissure in granite and carries a heavy iron sulphide ore associated with a little steel galena, the lead values showing a marked increase in the lowest level, and are of such a nature as can be readily separated by concentration, and make a good shipping product.

The ore bodies average 5 to 15 feet in width, and \$10 to \$15 per ton in value and should be handled, when equipped with a proper mill, at a handsome margin of profit.

The Schwab & Nelson mine is another gold bearing fissure vein that has considerable adit tunnel development, and a thousand tons of \$10 ore on the dump.

*Hollister Placers.*—Below this property on Little Smoky Creek, the Hollister Placers embraces a long stretch of bar and creek bed gravel deposits, from which a small connected area, not exceeding 6 acres in extent, has been piped off during past years and is reported to have yielded fully \$30,000 in gold bullion. The gravel banks exposed are from 6 to 10 feet deep on a bed rock of soft andesite tuff, which forms ideal conditions for cleaning, as it is easily picked and not seamy. A pay streak from 1 to 2 feet high above the bedrock is well worn rusty gravel and contains handsome pannings in coarse gold, together with a heavy residue of black sand and occasional cubes of clean galena and brown iron concentrates, definitely indicating the source of the gold from the numerous gold bearing veins that traverse the formation further up the creek. The black sand from this property, when thoroughly cleaned of its visible native gold, still gives high assays up to several ounces gold per ton, and is likely to prove a valuable by-product in the operation of the property.

Negotiations are in progress for the purchase of this property and its extensive equipment with modern placer mining machinery. It makes a splendid appearance, has a fine water supply, and with proper management, is likely to prove a valuable source of precious bullion.

*Lignite Discovery.*—An interesting discovery was made late last fall near these placers of some blossom croppings of lignite coal in a bed 3 or 4 feet thick. The work on this discovery was limited to 2 or 3 shallow open cuts in no place exceeding 4 feet deep, and it was difficult to determine its merits, but the showing was sufficiently entertaining to warrant a little further development with the hope of finding an area of domestic fuel, for which there is a big market at high prices in the adjacent region to the south.

The financial panic has seriously affected the Wood River mining enterprises in common with the other districts of the State, but the progress made during the past year has been of such substantial nature at several points

as to warrant the anticipation that when business conditions right themselves that this famous old field will again take on a period of prosperity that may equal its palmiest days of past history.

*Lava Creek District.*—Towards the northeast corner of Blaine County, in the Lava Creek District, the Ella Group of mines, under the management of W. J. McConnell, was operated during part of the year, and had just gotten into a position to ship ore when the smelter panic struck the country and the smelters refused to handle the mineral.

This property carries a large vein of good concentrating lead-silver-zinc ore in a porphyry formation, which also contains appreciable values in gold. There is a small mill on the property which, however, needs some additional equipment that will probably be installed in the spring, when the company are planning a new line of development by sinking 200 feet from the lowest adit level with drifts at 50 feet intervals, which seems well warranted by the ore showing.

Two cars of ore were gotten on the market before the panic came that yielded \$3,424.64.

*Little Lost River Mine.*—Further east on Little Lost River, near Howe, the Wilbur Mining Company, Limited, worked a force of 8 to 10 men throughout the year and made a handsome development of high grade concentrating lead-silver ore, together with a fine pay streak of clean shipping mineral. Two 30-ton cars of crude ore were shipped to market from this property that yielded 600 ounces silver and 60,000 pounds of lead, and \$40,000 to \$50,000 worth of rich concentrating mineral was put on the dump from the development work.

Another property of this same section, known as the Automatic Mine, and owned by a company of Rexburg, Idaho, people, of which Mr. James Shail is manager, were developing a very interesting deposit of copper bearing ore. This is a good sized contact vein in quartzite and lime walls and carries rich green and black copper oxide. It produced and shipped 66 tons of mineral during the year that contained an average value of \$48 per ton in copper, gold and silver, and has the appearance of developing an important resource of this class of mineral with further work.

## CASSIA COUNTY

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*Cumora Mine.*—Cassia County is more noted for its resources of fertile agricultural land and irrigation enterprises than as a source of mineral. It, nevertheless, has a large area of mountain territory containing at least one excellent mining district, known as the Conner Creek District, situated about 10 miles south of Albion, the county seat. In this district there are several very promising prospects and one fairly well developed mine. This is the Cumora mine and it has been operated with a crew of 10 men during part of the past year, who accomplished 115 feet of winze and raise work, together with 100 feet of crosscutting and drifting. This, added to the work formerly on the property, makes a total of 1,100 lineal feet. The development work extended on the mine this year produced several carloads of crude mineral containing average values of \$50 per ton in gold, silver and lead. The property carries a perfect fissure vein that cuts a formation of quartzite, schist and granite. It strikes northeast and southwest and has a dip of 60 degrees to the northwest. The vein varies from 2 to 5 feet wide. The principal gangue is quartz with disseminated sulphide minerals. There is a fairly good pay streak of high grade galena accompanying the quartz vein, from a few inches to a foot or more in width, and the balance of the vein is good concentrating ore.

There are a number of other properties in this district with excellent surface showings of gold, silver and lead minerals. In fact, several carload lots of ore containing values of from \$50 and upwards have been shipped from the shallow development of several different claims adjoining the Cumora. The recent work of the Cumora Company has shown their vein to carry a marked improvement as depth is gained in sinking, which fact has strengthened the faith of other operators in this neighborhood and is likely to encourage much more activity during the coming year. The shipping mineral produced by the Cumora is a desirable smelting mixture but the operation

of the mine has been suspended temporarily on account of slack market conditions for ore, owing to the panic in the smelting industry of the country.

Cassia County has usually reported at the government assay office from \$200 to \$300 worth of placer gold mined from the Snake River fine gold bars, but does not show up with any output of that kind this year unless its identity has been lost by being forwarded from some other county.

*Lignite Deposits.*—Another very promising mineral resource of this county is an extensive deposit of lignite under the Goose Creek plateau, where considerable prospecting has been done and a number of short openings made. This lignite area is quite extensive and a part of it now lies in the new county of Twin Falls, formed by the division of Cassia County at the last session of the Legislature. As far as development has progressed in this deposit, the quality has not proven of a marketable grade, owing to its excessive ash and moisture contents. It is more than likely, however, that considerable areas will be found in this extensive field, if intelligent prospecting is followed out, that would be much more free from ash and contain valuable resources of good lignite coal suitable for domestic purposes, which would be a great boon to the rich agricultural section lying immediately south, as the region is poorly timbered and fuel costs are very high.

The deposits exposed in the deep narrow canyon cutting this plateau a few miles south of Oakley, range from 5 to 9 feet thick and are nearly horizontal, with a slight dip towards the Snake River. They are exposed at a number of points along the toe of the nearly vertical bluffs that border the canyon and are readily accessible by adit tunnel or entry work. Some development was in progress during the year on one of these properties, but with what results I have not been able to learn. Horizontal beds of soft, silty sandstone and lava sheets, constituting the nearly vertical bluffs above the coal vein, are from 500 to 1,000 feet high, and at the time of the writer's last visit the development had in no place gotten under this higher accumulation of overburden, but was simply run in the shallow toe of the bluff where surface moisture conditions would be apt to have deteriorated the quality of the deposit. If

after extending the work under the main bluffs on these veins, the quality does not sufficiently improve in reduced moisture and ash contents, the best method of testing the field would be to go back at some distance on the plateau and drill the field with an oil well outfit for a cleaner area of coal, which is likely to be found in such an evidently extensive accumulation of carbonaceous matter.

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## CUSTER COUNTY

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The mining industry of Custer County enjoyed one of the most prosperous years of its history during 1907, and among its principal districts some extensive and important ore developments were made, including several new discoveries of great promise. The total output will closely approximate that of 1906 in spite of the fact that the industry of this county was hit hard by the slump in copper, which occurred during the early fall, and the bullion yield represents less than 9 months of production, and would have made a record breaking showing had the main producer filled out a full year.

*White Knob Mine.*—The principal operation this year, as last, was that of the White Knob mine at Mackay, which was handled by the Macbeth lease until June 6th, when this association was succeeded and the entire White Knob properties taken over by the Empire Copper Company of New York City, of which Mr. Frank M. Leland of Mackay, under whose able management this property was rescued and transformed from a dismal failure to a large and profitable producer of copper, is president and general manager, with Mr. John H. Hobbs, vice-president, and Robert Leslie Moffet, secretary and treasurer, both of New York City.

This new company is incorporated with 1,200,000 capital stock of a par value of \$5 per share, and during the first eight months of the year employed a force of about 275 men. The ore of this property is low grade on the average and needs very close management for its successful treatment. The mine is quite extensively developed by adit tunnels and is equipped with a smelter containing two stacks, each of about 300 tons daily capacity, by which the ore was reduced to high grade matte under the Macbeth lease, using the sulphide from Bingham, Utah, to supply the deficiency of sulphur in the ore. Under the Empire Copper Company's management, an arrangement was made with the Bingham smelter and the railroad people for a shipping and treatment rate that warranted sending the ore direct to the smelter in Utah, and under this method shows a better margin of profit than did the necessarily expensive smelting operation on the ground, where freights both ways on fuel, sulphur and matte ran the cost of treatment up too high to leave much of a margin of profit.

The awful slump in copper values in September, however, made it unprofitable to ship the grade of ore available, which, while occurring in large bodies, is low grade on the average containing about 60 to 80 pounds of copper and a few dollars in gold and silver per ton. The property was completely put out of commission by the 1st of October, and the crew reduced to a watchman. At the close of the operation, however, the mine was in better shape for ore production and had as large a number of ore faces in sight to work on as ever before, and if copper prices recover to 17 cents or 18 cents per pound the property will doubtless resume operation and can then be handled at a decent margin of profit.

The geology of the White Knob ore deposits have been ably reviewed by Professor Kemp, of Columbia College, in a technical paper read before the American Institute of Mining Engineers, who compares them to a tree with prominent but irregular pipe shaped branches in a belt of porphyry lying between limestone and granite.

So far only the irregular branches of this mineral tree have been mined and they represent a rather knotty species of growth, but in the aggregate have produced ore of such



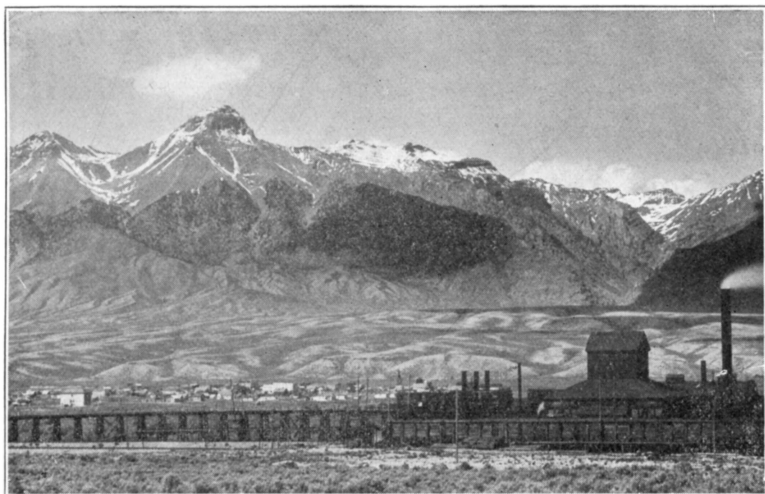
volume and value as to indicate that when the trunk of the deposit is disclosed with further digging it should contain an ore resource of bonanza proportions.

The wages paid by the Empire Copper Company were, miners, \$3.50 and \$4.00; laborers, \$3.00; engineers, \$4.25; blacksmith, \$4.00 to \$4.50; carpenters, \$4.00 to \$5.00.

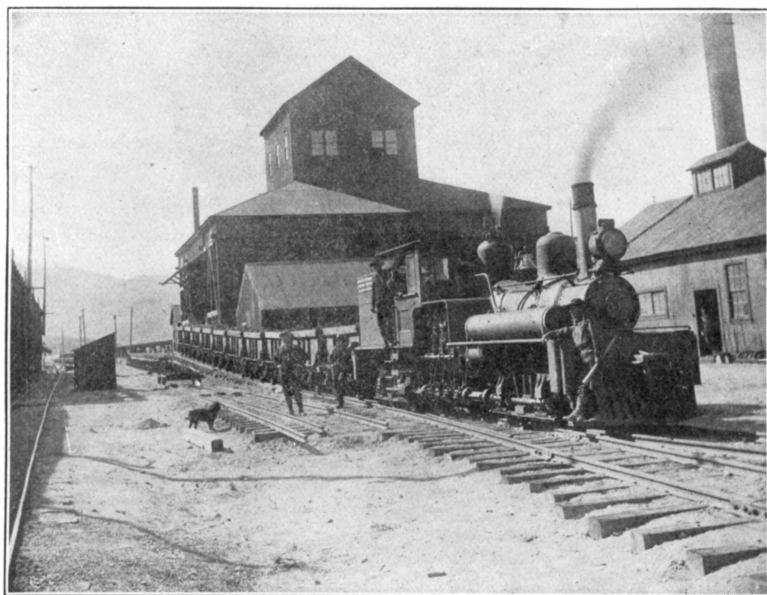
The full operation of this property affords a lively business for the handsome little town of Mackay, and the closing down of the mine, of course, had a serious effect on business conditions there; but Mackay is also the present terminus of the Salmon River railway, an O. S. L. branch, and enjoys an extensive transfer trade for the majority of the other mining operations of Custer County.

There are numerous handsome prospects in the vicinity of Mackay carrying gold, silver, lead and copper values, several of which made small shipments of ore during the year, and in the upper Lost River tributaries there are a number of other rich lead, silver and copper prospects. Several of these smaller properties are now under process of development by small crews of men, and in the aggregate afford quite an important trade to the business houses at this point in connection with the quite extensive tributary agricultural and stock interests.

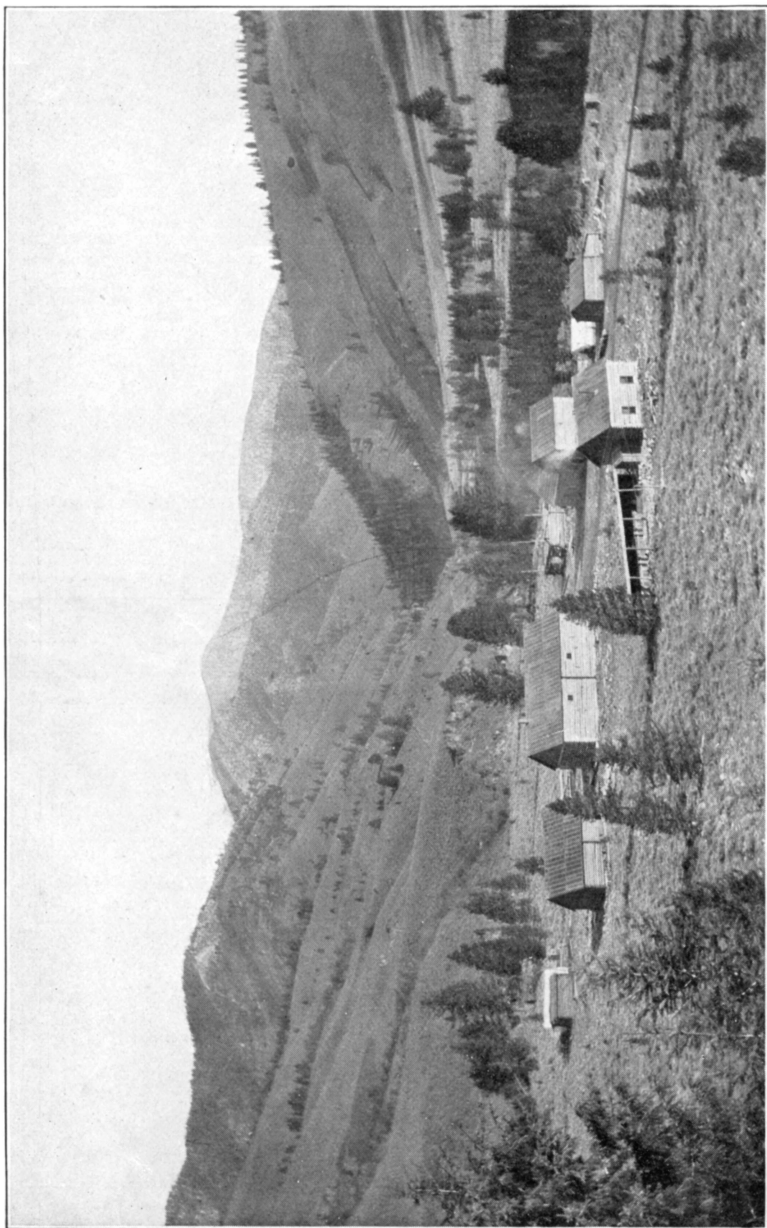
*Lost Packer Mine.*—Next in importance in the matter of bullion production among the Custer County mines during 1907 was the operation of the Lost Packer Mining Company at Loon Creek. Although hampered by a short hauling season and the serious difficulty of getting in coke and supplies, this company was enabled to run its 100-ton hot blast pyritic smelter 34 days and made a gross output of high grade copper matte in that limited time of 430 tons, containing an average value of 51 per cent copper, 10 ounces gold and 70 ounces silver per ton. This mine underwent steady development during the year and 3,612 feet of drifts, raises and crosscuts were run. It has a splendid reserve of high grade mineral in sight, with several thousand tons ricked up on the smelter floor and broken loose in the mine, and with a more favorable hauling season and decent metal prices, should make a much larger output during 1908 than it did last year. The smelting plant, under the management of Mr. P. Sheahan, proved a marked success and made a very high grade



**EMPIRE COPPER COMPANY'S SMELTER, THE TOWN OF MACKAY AND  
MT. M'CALAB, 11,000 FEET HIGH, CUSTER COUNTY.**



**SHAY GEARED LOCOMOTIVE AND ORE CARS AT EMPIRE COPPER  
COMPANY'S SMELTER, CUSTER COUNTY.**



M'GOWAN. AT THE FORKS OF LOON CREEK, THE NATURAL CENTER OF THE LOON CREEK DISTRICT, SHOWING UPPER  
END OF LOON CREEK HYDRAULIC PLACER COMPANY'S PROPERTY.

matte, and slag losses that were insignificant, the average slag assays running .2 of 1 per cent copper, .3 of an ounce in silver, and a trace of gold, or a net saving of 99 per cent of the values in the ore treated at a smelting cost of about \$6 per ton.

In addition to its main mining operation, the management of the Lost Packer Company acquired and opened an immense body of iron oxide ore in limestone a short distance south of the smelter, which afforded a very desirable and convenient source of fluxing material, the iron ore containing almost enough gold and silver to carry its cost of mining. This great gossien body is 40 feet wide and in such a well mineralized country is likely to prove the capping of a valuable deposit of more important lead or copper mineral as development in depth progresses.

*Loon Creek Placers.*—Another interesting mining enterprise at Loon Creek, at which considerable preliminary development work was accomplished last year, was that of the Loon Creek Hydraulic Placer Company. The property of this company embraces nearly all the old noted placer diggings of the Loon Creek district which were worked in a very crude manner in early days and produced a large amount of precious bullion. The plan of development is that of constructing a hydraulic plant, which will include a ditch and flume a mile and a half long, with a capacity of 4,000 inches or 80 second-feet of water, that will give a 200-foot head and cost about \$20,000. This work is already half completed and several test pits of considerable area worked on the ground have recently proven it to contain average values of about 25 cents per cubic yard. These gravel beds are noted for their coarse high grade gold. Single pieces have been found in these old diggings by the early operators that weighed as much as 10 ounces, and nuggets of from \$10 to \$20 have been taken out during recent operations. The company aim to work the main creek channel of Loon Creek, which is rather flat and was only worked in the richest spots by the early operators on account of lack of dump. This dump feature will probably be overcome by the introduction of a Ruble elevator, a very simple and efficient device for creating dump, which is fully described under Nez Perce County. A good deal of the ground embraces high bars and after the creek bed

has been worked sufficiently, these bars can be run off into the worked-out portion and afford a splendid natural dump. The proposition has considerable merit and is likely to prove a good paying venture when completely equipped.

YANKEE FORK MINING DISTRICT.

*Golden Sunbeam Mine.*—In the Yankee Fork Mining District, the principal mining operation of the year was that of the Golden Sunbeam Mines Company, operating the Golden Sunbeam mine on Jordan Creek, 7 miles west of Custer City. This property embraces 100 acres in area. The company is incorporated for 30,000 shares of a par value of \$10 per share, and has a present selling value of \$25 per share. It carried a force of 30 men during the year and the wages paid were as follows: Miners, \$3.50 to \$4.00; car men, \$3.50; timber men, \$4.00; top men, \$3.00; blacksmiths, \$4.00; carpenters, \$4.00; mill men, \$4.00.

Mr. C. E. Gable of Custer, Idaho, is president and manager; Mr. John A. Rush of Pittsburg, Pa., is vice-president, and Mr. O. K. Lewis of Salt Lake City, Utah, is secretary and treasurer.

The property is equipped with a small Elspass mill, but late last fall a Chillian mill of the Manadnock pattern of 100 tons daily capacity, was added. The property carries an immense deposit of gold bearing andesite tuff that is said to carry values ranging from \$2 to \$5 through a width of 500 feet. This great zone of mineral, striking into the steep slopes of Bismark Mountain, is ideally situated for economic development and operation and it is believed that the whole mass can be handled at a profit and mined very cheaply by the "glory hole" or open-cut steam shovel method. The present operation is conducted on some richer pay courses and the property was mined underground by the overhead stoping method with square sets for a width of 30 to 60 feet along its best pay course, which is said to average \$10 to \$12 per ton in free gold through that great width, and yields a saving of 80 per cent of its values as free gold on the plates. The deposit is a soft, grayish yellow volcanic mud rock that contains no base minerals perceptible to the eye, excepting an occasional pebble or crystal of iron pyrite. In places, vertical frac-

ture lines, carrying a thin blue selvage, apparently due to movement, are associated with exceptionally high values, and it is no trouble to select samples that will pan coarse native gold at the rate of 25 cents to 50 cents a pound. The gold is light colored, due to a natural alloy of silver, and is worth about \$9 or \$10 per ounce. Some kidneys of pure brittle silver have been found in the upper workings of the mine and there is no telling what development may result in on a property of this kind, as bonanza assays are found along its strike for several hundred feet in length; with further development at depth, it may lead to some sensationally rich ore.

The whole surrounding district is of volcanic origin and comprises immense mountain accumulations of rhyolite and andesite rocks with their accompanying tuffs and breccias. The region is well watered and timbered and there are several handsome water power sites available of considerable volume.

Adjoining the Golden Sunbeam, the North and South Sunbeam Companies, and the Combination Mining Company's group of claims, cover the entire area of Bismark Mountain, carrying similar deposits of gold bearing andesite and rhyolite tuff, and on the adjoining properties mentioned, pockets of very rich native gold and silver ore have occasionally been found, and with further development other great zones of milling ore, similar to that of the Sunbeam, may be disclosed.

*Montana Mine.*—On the opposite side of Jordan Creek from the Golden Sunbeam, on the steep slopes of Estes Mountain, the Montana group, embracing an extensive area of rich mineral territory, is undergoing development through a deep crosscut tunnel under the management of Mr. A. J. Czizek. This tunnel is designed to cut a series of half a dozen well known fissures that have been developed at shallow depth, and have each produced ore containing bonanza values. This is especially true of the Montana vein, which is credited with producing several hundred thousand dollars worth of shipping ore that ranged in value from \$100 to a \$1,000 per ton in gold and silver. This big tunnel is equipped with an air compressor and has gained a total length of 1,800 feet. At 1,700 feet in from the portal it encountered a well-defined fissure

vein at a point 1,000 feet vertically under the surface. This fissure was 4 feet wide, where it was intersected by the tunnel, and carries average values of about \$40.00 per ton in gold and silver, with a pay streak a foot wide that yields \$150.00 per ton. This vein, however, is only one of the series which the tunnel was started to develop, and not the most important one by any means. The great depth at which it was penetrated, however, should mean an extensive reserve of valuable ore between that point and its apex, and demonstrates that these fissures carry their values to great depth.

The Yankee Fork District has some famous old producers and a great reputation for the high value of its ores. This is the deepest point at which any of its fissures have been cut, and is a demonstration that the veins carry their values to great depth, a feature that has previously been open to doubt; but with this illustration of permanency, the other operators who have encountered pinches and lower values in their veins, after enjoying large productions of rich ore at comparatively shallow depth, have good reason to feel encouraged and undertake their further exploration to the deep.

*Oxarna Mines.*—On Custer Mountain, near Custer City, the Oxarna mines, under the management of Reginald Coryell, operated an average crew of 15 men throughout the greater portion of the year on development work. This property is a combination of interests, including the old Black mine, and carries a total development of 6,700 lineal feet, principally in the shape of adit tunnels. Of this amount, 1,100 feet was run during 1907, and there is now disclosed on the property on several distinct veins, hundreds of feet of oxidized ore shoots carrying average values in gold and silver of from \$10 to \$30 per ton. The company are now running a 1,500-foot adit tunnel from the back of the mill, which had already gone a length of 750 feet at the time of the writer's visit in October, and had disclosed a handsome body of mineral along its course that had not been anticipated so soon. When this long tunnel is completed and connections made with the upper tunnels of the mine by raises an extensive resource of milling ore will be available that can be very cheaply handled. The operation is situated at an elevation of over 8,000

feet, and owing to the fact that the adjacent properties have largely exhausted the convenient supply of timber, steam power costs are very high, and the open hauling season very short, the management is praying for the installation of an electric plant at some of the convenient tributary sites by stronger interests that would afford a cheaper source of power.

The mine is equipped with a 10-stamp mill, which was being increased by the addition of 10 more stamps, and should shortly become a good producer of profitable ore.

*Other Mines.*—The adjoining Lucky Boy, Custer and Badger mines, on parallel fissures of the same series to the northwest, have produced gold and silver bullion to the gross value of \$10,000,000, and it is believed, since the demonstration at the Montana, that their further development at great depth by a crosscut tunnel from Yankee Fork which would tap the system at 1,900 feet below their highest crest, is well warranted and would probably disclose ore resources of equal magnitude and richness to those already mined.

This district has always been noted for rich ores. It has a number of very flattering prospects in addition to the properties mentioned, in several of which valuable ore disclosures were made during the year. This was notably so on the Kirtly property and of the Runover Mine. The latter was only discovered last October, and was so named from the fact that it had been "run over" for years, although the ground was noted for rich float ore and surface dirt that panned big results in free gold high up on the steep mountain side. This property is situated nearly at the mouth of Jordan Creek, and about on the strike of the famous Charles Dickens vein, which has the banner record for rich mineral and made one shipment that netted \$10,000 a ton in gold and silver.

The Runover carries a small talcy vein in porphyry, in places 2 feet wide, that contains average values of 5 to 15 ounces gold per ton, and produces specimen ore in chunks as large as walnuts that are 50 per cent gold. It is being developed by a small force of men and is likely to be heard from during the coming season with a very interesting output of precious metal.

*Stanley Basin.*—In the Stanley Basin District, the Wor-



maks dredge was successfully operated during the year, and a new placer enterprise with a mechanical excavation equipment started on the Wallace and Waters placers. Six miles north of Stanley Creek, the Valley Creek Mine, owned by the Fort Pitt Mining Company, was operated during part of the year and its ore resources greatly improved, while some successful test runs were made with the mill with which it is equipped, and considerable bullion produced.

*Greyhound Section.*—In the Greyhound, Sheep Mountain and Sea Foam Districts, embracing a territory about 15 miles square, covering the headwaters of the middle fork of Salmon River, and connected with the Loon Creek District, was a scene of considerable prospecting activity during the past summer. This is one of the most interesting smelting ore districts of the State, and carries a variety of minerals, embracing high grade gold, silver, lead and copper ores, that with convenient railway transportation would afford a handsome site and a convenient mixture for a big custom smelting operation. This field was examined by some capable technical men during the year, and the chances are if the serious financial depression that struck the country early in the fall had not occurred when it did, some important deals would have been consummated in this section.

*East Fork Mines.*—At Washington Basin, near the head of East Fork of Salmon River, the Empire group of mines, under the management of Mr. Joe Montgomery, were operated throughout the year with an average crew of 10 men. This property carries an immense deposit of rather refractory gold ore. It has a total of 2,000 feet of adit tunnel development, of which 1,500 feet were run during 1907. The Washington Basin and adjoining Germania Basin mines, were worked quite extensively in early days when silver was worth \$1.29 an ounce, and made quite a large output of high grade shipping mineral, and are likely again to be developed to an important productive state, as their ore resources were by no means exhausted.

*Clayton Belt.*—Custer County's lead-silver belt in the vicinity of Clayton and Bay Horse, suffered a very dull season. Nearly all the important producers of this section were idle and nothing was shipped but some small lots of

lease ore. The mines of this belt have extensive reserves of high grade lead-silver and dry silver ore and were large producers in early days before the drop in silver values. They are quietly awaiting the day of better prices or transportation facilities, as their distance from the railroad at the present price of silver, leaves little profit for their operations.

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## CANYON COUNTY

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Canyon County, until recently, has not boasted much of its mineral resources, but late events seem to indicate that it may shortly take high rank as an important source of mineral, oil and natural gas, especially the latter. The accompanying half-tone cut made from a photograph taken at the new well of the Oregon Oil & Gas Company, at the city of Payette, within three blocks of its main business center, on October 18th last, will present substantial indications of the truth of this statement. It represents a gusher of gas struck in the well of the above company at a depth of 740 feet. The flow of gas was encountered after passing through an almost continuous body of smooth, blue-gray shale, with occasional thin layers of sandy material containing smaller flows of gas. At 740 feet the drill penetrated a soft clay, then a layer of hard formation that produced a very "drummy" sound. When this was penetrated the gusher broke forth with a mighty roar, sending a volume of gas, water, sand and shale to a height of 150 feet in the air, which lasted for over an hour. The heavy string of tools, weighing over 2 tons, were temporarily abandoned in the well, which was cased with 8-inch pipe, and were with difficulty recovered as the pressure slackened through a subsequent choking of

the hole with sand and gravel. They were, however, finally gotten out and the hole was plugged and it has since been emitting a constant flow of strong gas bubbles through the deep wooden plug. This well has been abandoned and a new one started with a larger casing, as it became evident to the management that it would be impossible to attain sufficient depth to fully satisfy its purpose with such a small bore.

When the great western oil excitement was in progress, five or six years ago, and wells were being sunk south of Nampa, the writer was very skeptical in regard to the probabilities of finding oil in the Snake River Valley in a formation so manifestly embraced and associated with rocks of molten volcanic origin, which constitute the bed-rock borders and with soft sedimentaries largely the structural layers of this great basin filling. It seemed improbable that such combustible material as oil and gas could exist in formations that were manifestly laid down in a hot molten condition.

Recent study of this problem, however, throws a different light on the subject, and taken in connection with its lake-bed deposits, I am now convinced that the lower Snake River basin affords an ideal field for the occurrence and development of these great commerce building products of nature.

In a paper read at the meeting of the Canadian Mining Institute at Montreal in March, 1903, which embraces a study of all the principal sources of natural gas and oil in every important field in the world, Professor Eugene Coste, of Toronto, practically demonstrates beyond dispute that the bulk of the natural gas and oil of the world is of volcanic origin, and is derived from the heated interior of the earth in a gaseous form and partly distilled to oil in natural tanks or reservoirs of porous rock of various kinds and various horizons, ranging through all the geological series from the Archean granite to the very recent seashore sand and shale beds, and is held in place where it is found by favorable overlying strata of impervious rock like shale or clay, and rises to its present position through fissures, fractures and fumaroles, or geyser-like pipes in the earth's crust, and it is always found associated with great faults or other earth crust disturb-

ances, as above described, and almost invariably accompanied by volcanic products, such as salt, sulphur, gypsum and other evidences of dying vulcanism.

The volcanic evidences of the lower Snake River basin are everywhere manifest, and these, taken in connection with the enormous accumulation of lake-bed sediments, consisting of shales, clays, sandstones and conglomerates, with interbedded layers of lava and spongy, porous volcanic tuffs or igneous mud rocks and ash beds, afford ideal conditions for the existence of an important and extensive gas and oil field. The Snake River valley in early tertiary times, had an entirely different contour from its present one. It was much narrower and deeper and bordered on the Idaho side of the river by steep granite slopes and on the Oregon side with a series of carboniferous limestones, slates and quartzites resting on granite. The valley was subsequently dammed up by an enormous flow of Columbia basalt lava that was piled up in horizontal layers above the older formations to an elevation of over 6,000 feet. This dam has since been eroded and its walls of lava masonry can be observed in the canyon below Huntington.

This great dam of igneous rock created a fresh water lake that at one period covered the whole Snake River valley to a maximum elevation of 6,000 feet above the present level of the ocean. The tributary streams were of much larger volume then than now, and vast accumulations of sedimentary material were eroded from the neighboring mountains to be deposited in and sorted by this great body of water, which has left shore line deposits of sand and gravel with included fossils of animal and plant life that are conspicuously developed at several different horizons, representing the different levels of the lake at which it was stationary for long periods of time, and probably influenced by pronounced climatic changes. The highest horizon at which this great inland sea stood is exhibited by definite shore line deposits half a mile south of the Democrat mine near Hailey on Wood River. The sandstone conglomerate and shale beds at the level of Idaho City and Pearl, and especially at Table Mountain, back of Boise, represent other periods of lake levels where enormous horizontal and slightly tilted de-

posits of sedimentary material, with their contained fossils of the same series, are in evidence. These are called the Payette formations by the government geologists, and the lake that covered the valley at that time is classed in geological history as the Payette Lake period of the valley. At a later period, this lake was drained to an elevation of about 2,800 to 3,000 feet, at about which level it was stationary for a long period, and in it was accumulated vast beds of sedimentary material, including the erosion of the previous sedimentaries or Payettet formation, and the finer material carried in suspension from the erosion of the high mountain masses bordering the valley to the east and north. This lake, in turn, was subsequently drained by the complete and deeper erosion of the Snake River barrier to its present level. The result of this later lake period was an accumulation of much finer sediment with a different class of fossil remains, which are known to geologists as the Idaho formations, and consist largely of fine, blue-gray shales and clays and extensive beds of tripoli stone, together with occasional sheets of black lava and thin beds of gravel. The total depth of this accumulation of more recent sedimentary formations is indeterminable, but the Payette series is known to be 1,000 feet in stratigraphic depth, and the Idaho formations are probably nearly as deep. These sedimentaries are not limited in depth by the present outlet horizon of the Snake River valley near Huntington, where the primary formataions are exposed under the lava dam, for the reason that the whole Snake River valley, besides at one time being covered by an inland lake, is also a continental depression, attended by a pronounced faulting along its borders, and probably due to a gradual subsidence as a result of the phenomenal outflow of molten lavas which have occurred during its lake periods. Consequently, it is possible that wells drilled in the lower valley will pass through fully 1,500 feet of these recent sedimentary formations before reaching the solid underlying bedrock series of the country.

While all of these sediments described belong to the most recent age in the geological scale, known as the Tertiary age, the Payette formations are much older and more disturbed than are the Idaho formations, and con-

sist of coarser and more porous sandstone deposits, and are more likely to contain natural tanks, pools or reservoirs of oil and gas when penetrated by the well driller's tools than are the Idaho series of finer grained shaly material, which are of more recent date and less disturbed, and will act as an ideal impervious cap to retain the hydrocarbons in the more favorable formations that lie immediately below them.

Experience in drilling for oil and gas, the world over, has shown that the most favorable point to start a well is on an anticline, which means an upward bend in the strata of the earth, and is generally more favorable for the accumulation of gas and oil on account of its more open and shattered condition than is a syncline, which means a corresponding depression or trough in the strata, where the formation is likely to be tighter or more apt to contain the water which generally underlies the oil and gas. In this respect, then, while the Idaho series is an ideal formation to cover and retain the gas and oil reservoirs that may occur in this locality, it is usually nearly horizontal and does not give much evidence at the surface of the crumpling and disturbances that exist in the older formations underlying it, which means, in such an enormous field as presented by the lower Snake River basin, that a good many dry wells are likely to be sunk before a profitable one is found, and that the point of initiating enterprises of this kind is largely a guess, as oil and gas, especially the former, does not occur in a horizontal sheet under an extensive area of territory, but is invariably localized to pools or defined channels representing the crest or middle slopes of an anticline or upward crumple in the strata. There is no more evidence at the surface of a source of gas or oil where the Payette gusher was found than there is over 50,000 acres of neighboring territory; in fact, not as much as at some other points.

The most practical evidences in the lower Snake River basin of deposits of hydrocarbons so far discovered outside of the Payette well, are at Ontario, Oregon, 6 miles southwest of Payette, on the opposite side of Snake River, where at the Boyer residence a steady flow of gas of gradually increasing volume, through a well 215 feet deep, cased with a 3-inch pipe, has been furnishing a small gas

plant with 12 jets for lighting and a large cooking range with high grade natural gas for 7 years, and there are 40 other wells in the town of Ontario and immediate vicinity that will give a strong gas flame at the spout of an ordinary hand well pump whenever it is operated by a few strokes and a lighted match is applied. A similar flame can be obtained by opening the numerous hydrants throughout the streets of the town, fed from a 6-inch well of about the same depth.

No analysis of the gas at the Boyer residence is available, but it is unquestionably of a very high quality, as it gives a beautiful white light under a Welsbach burner and an intense heat and brilliant clean blue jet in the cook stove, with no perceptible smoke, which means that it is of a high combustible nature and more comparable to the best Pennsylvania gas than to the smoky gases of Ohio, Texas and California. The fact, however, that a well was sunk at the Ontario hotel, and another one at a point a short distance above Weiser on the Oregon side and several miles northwest of Payette, both of which struck similar gushers of gas to that recently encountered at Payette, at a depth of 1050 feet, would indicate that the Payette well had accidentally dropped down on a buried anticline, as its gusher was struck at 740 feet, and consequently may mean the top of a gas reservoir representing the difference in the two elevations given, that may be underlaid by an extensive pool or channel of oil. All three of these wells choked themselves to a more limited flow in a few hours after their first outburst, which may be due to a bad condition of boring with a casing too far behind the drill, or may mean a local accumulation of pressure in a water course fed through fractures in the strata from a deeper and more important source. It, however, is a good indicator that the condition will be repeated at further depth at some point in the field where a steady volume of gas and probably an underlying pool of oil of commercial volume and extent will be found, as the Boyer well proves conclusively that the gas is not derived from localized pockets, or it would have been exhausted long ago. The Boyer well flows a small stream of water constantly which wastes a considerable volume of gas through lack of sufficient separator capacity, the one in use being only a 25-gallon barrel.

In a new field like this, all sorts of expert opinions are volunteered, both favorable and unfavorable. The writer has not had any practical experience in the business at all, only reviews it from a geological standpoint and does not presume to say definitely what may be expected, but believes from a comparative study of the subject, as outlined above, that the chances for success in this field, including both the Oregon and Idaho sides of the river, are exceptionally good.

Some critics push the question aside with the statement that the gas encountered is only marsh gas and of no importance and never will be, and these criticisms seem to affect people who are sufficiently interested to be better informed on the subject, and should have no regard for such adverse opinions, for, as a matter of fact, marsh gas is the principal element of natural illuminating gas, and constitutes 67 per cent of the average natural gas produced from the Pennsylvania field around Pittsburg, Pa., and over 90 per cent of the enormous gas flows of Ohio and Indiana fields, and is itself, according to the advanced theory, of volcanic origin, as well as being derived from local sources of rotten vegetation. It is unlikely that the Idaho formations in the central area of the lower Snake River basin ever accumulated much vegetation, as that portion of the lake area was always the deepest and last to be drained, and whatever vegetable accumulations were formed were more apt to be confined to the vicinity of its borders and shore line, which is amply proven by the occurrence of a series of lignite deposits and silicified drift wood, now found as petrified wood, at defined horizons around the borders of the valley representing its lower lake levels, and while thin layers of vegetable matter will doubtless be found throughout all the sedimentary area, they will be of insignificant importance excepting near the borders of the valley.

Men of oil well experience are often biased by the particular class of conditions under which they have operated and look for certain definite formations that they are most familiar with. In Ohio and Indiana the most productive oil bearing formations are Trenton limestones, a group belonging to the lower Silurian age, and stratigraphically thousands of feet deeper and millions of years older than



the Pennsylvania formations where the gas and oils occur in rocks of the carboniferous age principally, which, in turn, is thousands of feet lower and millions of years older than the Beaumont field in Texas, where the surrounding formations are very recent clays and sandy sediments of the same geological age as the lake bed sediments of the Snake River valley.

The surface evidences of natural gas and oil are various and embrace several mineral manifestations besides the oil seeps themselves. Oil seeps have been reported to the writer at numerous places in the Snake River and Payette valleys. I have personally run down a number of these reported occurrences but have never yet found the actual evidence of crude oil at the surface that came there naturally. This manifestation, however, is not essential to the existence of an oil pool. Salt springs, natural deposits of salt or saline earth, sulphur, gypsum, gas springs, mud springs and warm water springs may all be surface manifestations of underlying sources of natural gas or oil, and of these there are numerous substantial evidences in the Snake River basin. My investigations of the field, however, have been very limited, and definite oil seeps and more favorable surface evidences of underlying oil pools in the form of anticlines, associated with some of the above deposits, may exist.

Gas springs and emanations from numerous shallow wells in the vicinity of Payette and Ontario are very numerous, and the same is true of the whole sedimentary area of the Payette valley, where numerous mud springs also occur. Strong flows of gas have been encountered as far up as the east side of Squaw Butte near Sweet, whenever wells have been sunk. Numerous low dome shaped hillocks in the circular basin back of the Marsh and Ireton ranch are probably due to mud springs that have choked up and dried out into their present form. Similar manifestations, including open mud springs, occur at several places further down the Payette valley along the bottom lands, and to the north of Emmett in the direction of Bristol Creek and the two Willow Creeks, lignite beds, gypsum and other favorable indications are reported.

More or less gas has been found in nearly all the water wells sunk in the Payette valley. At Ontario the water

freshly pumped from ordinary depth has a milky cast and shows ebullitions of fine gas bubbles. It clarifies itself in a few minutes and makes a clear, healthful drinking water. When it first comes out of the well, however, it has a faint sulphur taste, but otherwise is excellent domestic water, with some local exceptions where a strong solution of glauber salts are encountered.

Definite oil seeps are reported at the south border of the valley, a short distance southwest of Vale, where a company of Union, Oregon, capitalists are now drilling a well that is said to have reached a depth of 1400 feet, and according to California expert drillers in the employ of the company, is exceptionally favorably located for striking an important flow of oil.

Deep oil wells cost lots of money and promiscuous drilling of a broad territory of horizontal sediments like the Snake River basin presents is likely to prove disappointing in most instances and afford plenty of dry holes, and every advantage should be taken of the surface manifestations outlined.

The well at Payette is injudiciously placed within 3 blocks of the business center of the city, on a flat flood plain of the Payette and Snake Rivers near their confluence. Its chances of success a mile away from the town would have been just as good, so far as surface manifestations go, as at the point it was started. If a gusher is struck of the volume hoped for and anticipated by the different promoters of that and other neighboring wells about to be started, about the first thing that will happen will be to saturate the town with oil and burn it up, and both the city council and the operators themselves should take the precaution of providing efficient capping devices before proceeding to much further depth, for oil wells take fire spontaneously. The great gushers at Beaumont, Texas, spouted oil of a natural temperature of 110 degrees Fahr., which was followed subsequently by immense volumes of hot mineral water.

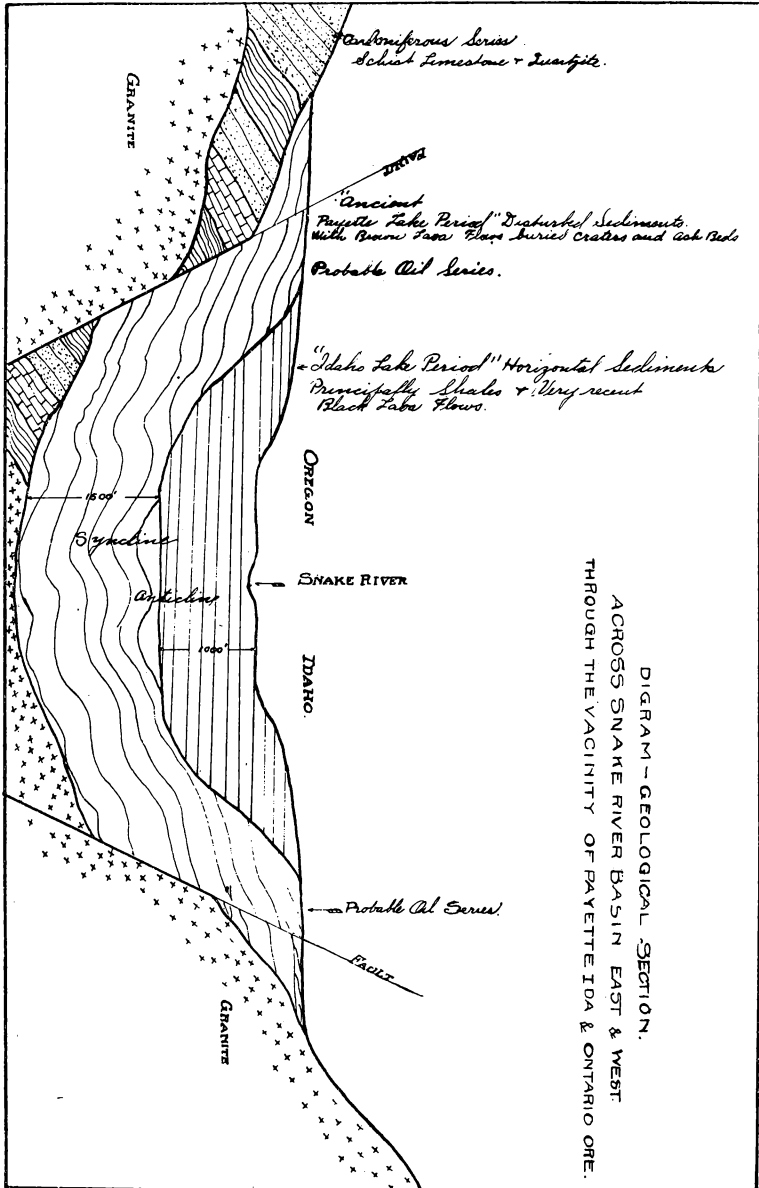
The Beaumont field affords an apt illustration of the necessity of a disturbed strata to provide a natural tank or reservoir for oil. Spindle Top Hill is simply a low swell or mound only 200 acres in extent and only 10 feet above the general elevation of a level costal plain or prairie, and

represents a monster fumerole or volcanic pipe that was filled with volcanic products, including salt, sulphur, gypsum, etc., with which the oil and gas are found associated, and not in the surrounding formations of sands and clays, and all the millions of barrels of oil that this field has produced was confined to the area covered by this low swell, and all the numerous wells sunk off the area of this elevation, on the surrounding plains, were dry, and while as previously outlined, the Snake River field presents the natural conditions for the existence of profitable deposits of natural gas and oil, it will be advisable to go at the business with a conservative purpose and not to lose heart on temporary disappointment, as I firmly believe that ultimate success will reward the efforts of intelligent search for these substances in this interesting region.

Idaho can use a big oil and gas field to excellent advantage in its future commercial development, as the price of ordinary fuel is becoming almost prohibitive for domestic purposes, let alone manufacturing, but the State has no use for an unwarranted wildcat boom based on oil or anything else, and I will pursue the proposition of the probable existence of a profitable field based on the volcanic theory of its origin a little further for that reason.

I am firmly convinced of this theory of the origin of hydrocarbons and further convinced that if it is wrong, then the prospect of a successful resource of these elements in this section are very limited, as I believe that the bulk of the older formations underlying the lake bed sediments on the Idaho side of the river are granite and a hard rhyolite whose crystalline structure is unfavorable for the occurrence of hydrocarbons in commercial quantities.

The existence of the carboniferous series on the Oregon side of the river underlying the lake bed sediments, as shown in the hypothetical cross section, are figured from their actual outcropping in Owyhee County and Malheur County borders of the basin, and this series itself has never proven oil bearing in the far West, and it seems to me that unless favorable discoveries of hydrocarbons are found before the older crystalline bed rock formations are entered underneath the sediment, that the search will be



hopeless below that horizon. But, as above stated, accepting the volcanic theory of the origin of these substances in a gaseous form, the conditions for commercial deposits are ideal, and in further support of this argument, I will call attention to the fact, as shown by Professor Coste, that hydrocarbon gases have been collected emitting from the live crevices of Mount Vesuvius; that the famous Baku oil field on the Caspian Sea, in southwestern Europe, is associated with volcanic rocks and immense intermittent mud volcanoes; that the pitch lake at Trinidad, on the south shore of the Carribean sea, the largest source of clean hydrocarbon exposed at the surface in the world, occupies the crater of a volcano, whose encasing formations are lava with no sedimentary rocks in connection with it.

Numerous other instances of this nature are given in the work on this subject referred to, and I consider it essential to accept the argument presented for the success of the Snake River field where volcanic action has continued through all the tertiary age.

Some advocates of the origin of these substances attribute their source to dead animal matter, especially marine life. Their position is hardly tenable, for any oil there would be set free from the carcass of dead fish would, owing to its inferior specific gravity to water, immediately rise to the surface and float away to be gradually evaporated and dissolved to its constituent gases and disseminated into the atmosphere.

The geological structure of the world shows some wonderful regional accumulations of lava flows that cover territory in areas equal to 500 miles square. The Columbia and Snake River lava fields present one of the largest areas of this kind in the known world, but this vast accumulation of molten rock, even if it did flow into an ocean covered surface, which is doubtful, did not occur in a minute, but took long periods of years for their accumulation. The Snake River lavas have continued to flow from local vents until very modern times, placed by some geologists to as recent as a few hundred years ago, and there is no reason to assume that they resulted in encasing any body of animal or vegetable matter that could have resulted in any important deposit of liquid hydrocarbons, and it is a matter of world experience that no important natural veins

of coke have been found in the coal mining regions of the world, whose distillation by attending heat could have produced such valuable pools of gas or oil, which have been found, which eliminates the probability of that being its source; and I think the matter of going below the level of the ocean, by boring in the lower Snake River basin, would not cut any figure at all so far as ancient marine influences may have affected the situation. As a matter of fact, some of the richest hydrocarbon deposits in the West are found at elevated regions up to 5,000 or 6,000 feet above the present level of the sea, and everything tends strongly to indicate the source of these carbonaceous deposits as gaseous emanations through volcanic fissures or ruptures in the earth's crust to favorable repositories near its surface, especially if the nebular hypothesis of the earth's origin is accepted.

Some critics argue against the prospect of favorable deposits in this field owing to the fact that in the Salt Lake basin similar gushers of natural gas have been encountered at numerous points that never resulted in anything of commercial value, in spite of the fact that wells have been sunk for the purpose of testing the field, to the depth of over 2,000 feet, near Salt Lake City.

The condition of the Salt Lake valley is very similar to that of the Snake River Valley in this respect, and I do not believe the problem there has been solved. The gas in the Salt Lake valley sedimentaries was probably derived from volcanic vents, or the famous Wasatch fault, which traverses the western foot of the Wasatch range for miles and is one of the most notable earth movements known to science, with a throw of something like 30,000 feet. That basin also has its sheets of lava and crater cones, and it is not unlikely that a large proportion of the sodium chloride in its famous Salt Lake, from the fact that it carries such a large proportion of other salts, is itself principally due to volcanic emanations, which is also probably true in a measure of the ocean salt, as salt is unquestionably of plutonic origin, and the islands and pipes of solid rock salt found in Texas and Michigan and the briny waters found in the deep workings of the Lake Superior copper mines in eminently igneous surroundings cannot be attributed to any other source, and I believe when more thoroughly explored, the Salt Lake valley will

produce valuable deposits of hydrocarbon of considerable commercial importance. Like this valley, the older sediments there are covered by horizontal beds of recent lake deposits and steam gravels that afford little guide for the initiation of oil well development, but it is possible that if the great Wasatch fault is tapped on its dip at sufficient depth, or buried anticlines are tapped, that success will reward the effort in that field. And the fact that the limited amount of development work of this kind at that point has not, so far, been successful in its search, is no argument at all that success will not be attained in the Snake River basin.

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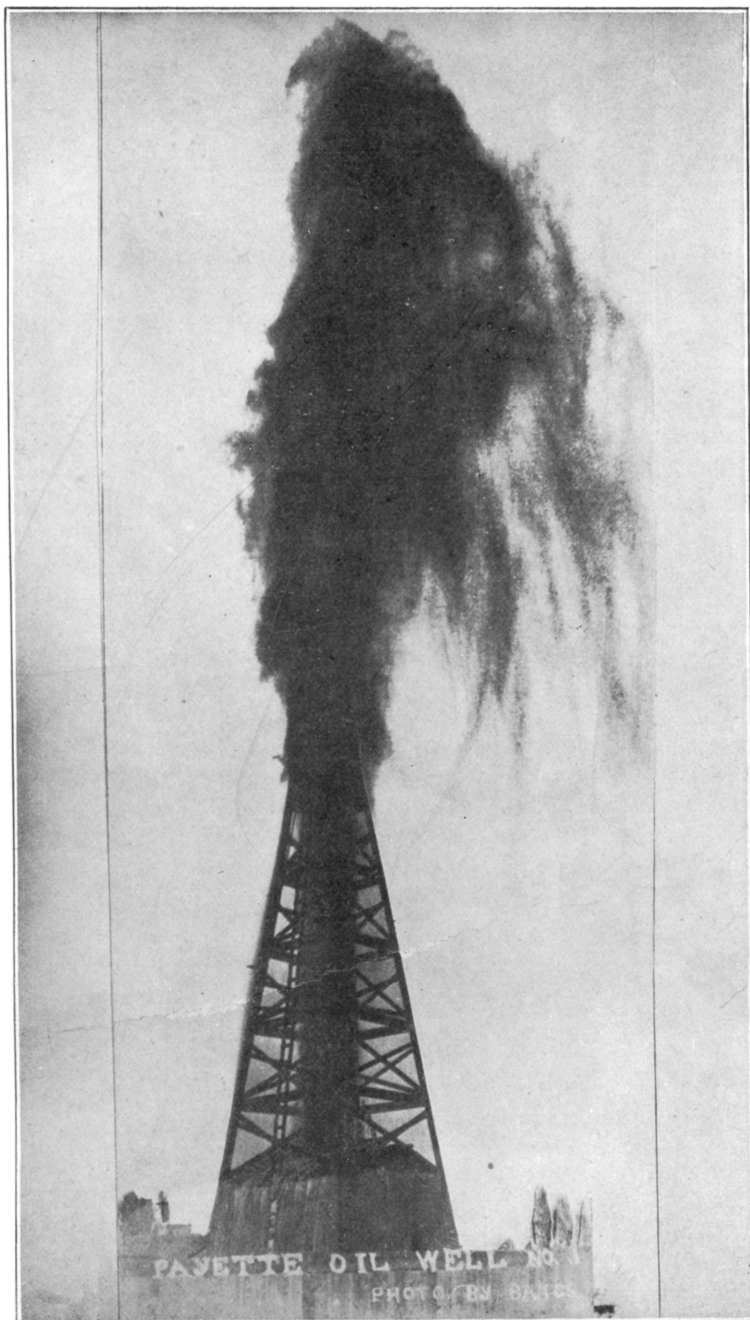
## ELMORE COUNTY

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The new page turned in Elmore County's progress, at the beginning of 1907, is still unfinished, but unless some very capable, technical men are badly disappointed, it will record when finished a large yield of precious metal, and there is hardly any question but what this county will, before the close of 1908, rank among the principal gold and silver producing counties of the State.

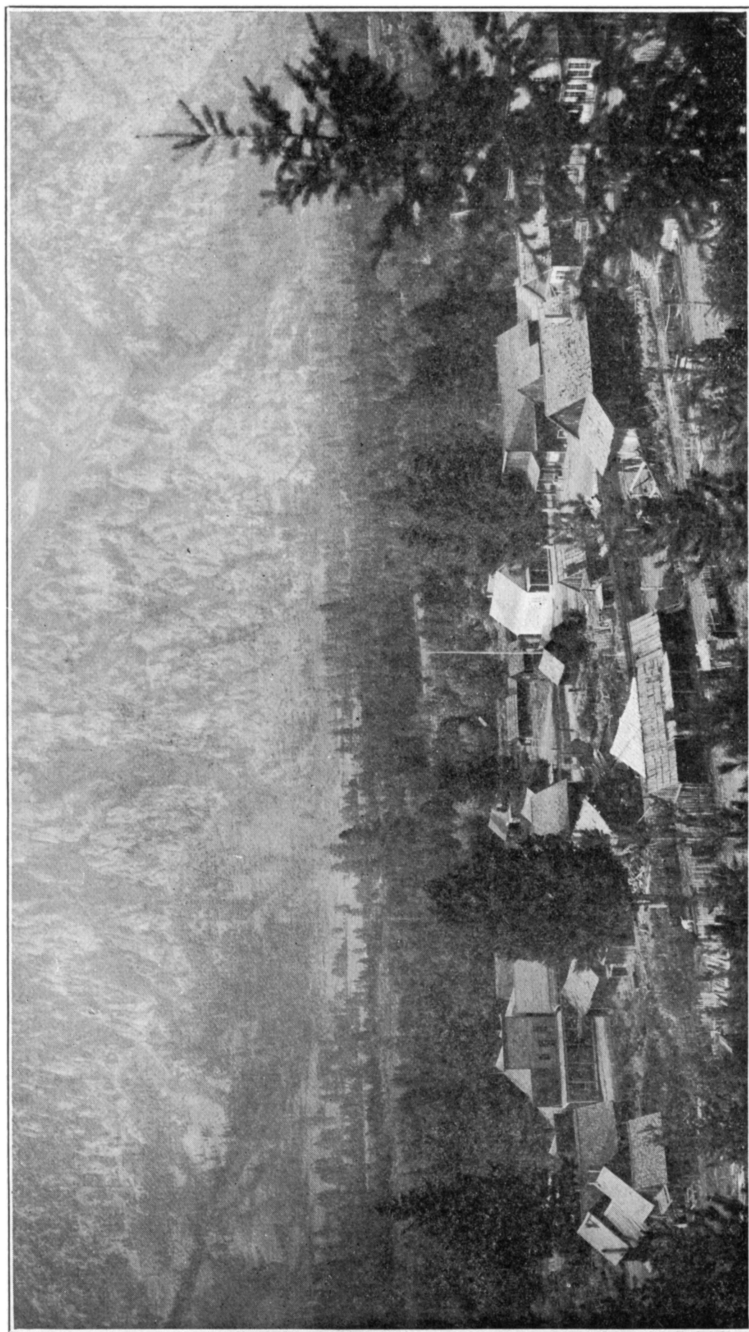
### ATLANTA DISTRICT.

The most extensive resource of developed ore in Elmore County is in the famous Atlanta District, where the Atlanta Mines Company and the Pettit Mines have immense reserves of fine milling ore blocked out, containing gross values in gold and silver of fully \$6,000,000. Both of these properties have been undergoing extensive milling equipment and it was anticipated that their two new mills would have been in commission by this time, but the tardiness of the common carriers and their inability to handle freight with ordinary despatch, has greatly retarded these enterprises.



GAS GUSHER OREGON OIL AND GAS CO'S. WELL, PAYETTE, IDAHO.





ATLANTA, ELMORE COUNTY.

*Monarch Mill and Mine.*—The mill on this property which is owned by the Atlanta Mines Company is now completed. It embraces some of the most modern and up-to-date milling appliances adapted for this class of ore, and was designed and constructed under the direction of Mr. W. T. Sherman of Park City, Utah, whose reputation for the recovery of elusive mineral values is world-wide. This mill has a capacity of 150 tons of ore a day, and will be put in commission about the first of April. It embraces a wet crushing method of amalgamation and fine concentration and cyanide treatment for the tailings. The ore is rather refractory and contains a light dissemination of sulphides of iron, arsenic and antimony, together with rich silver minerals in the form of argentite and ruby silver in shattered quartz gangue. Extensive preliminary tests on carload lots of the ore were made before the mill was designed, and the management are very confident of extracting a high percentage of the values. The plant is to be run by electric power developed at a magnificent power site on the Boise River near the mill, owned by the company, and the mill is connected with the mine by an aerial tram a mile and a quarter long.

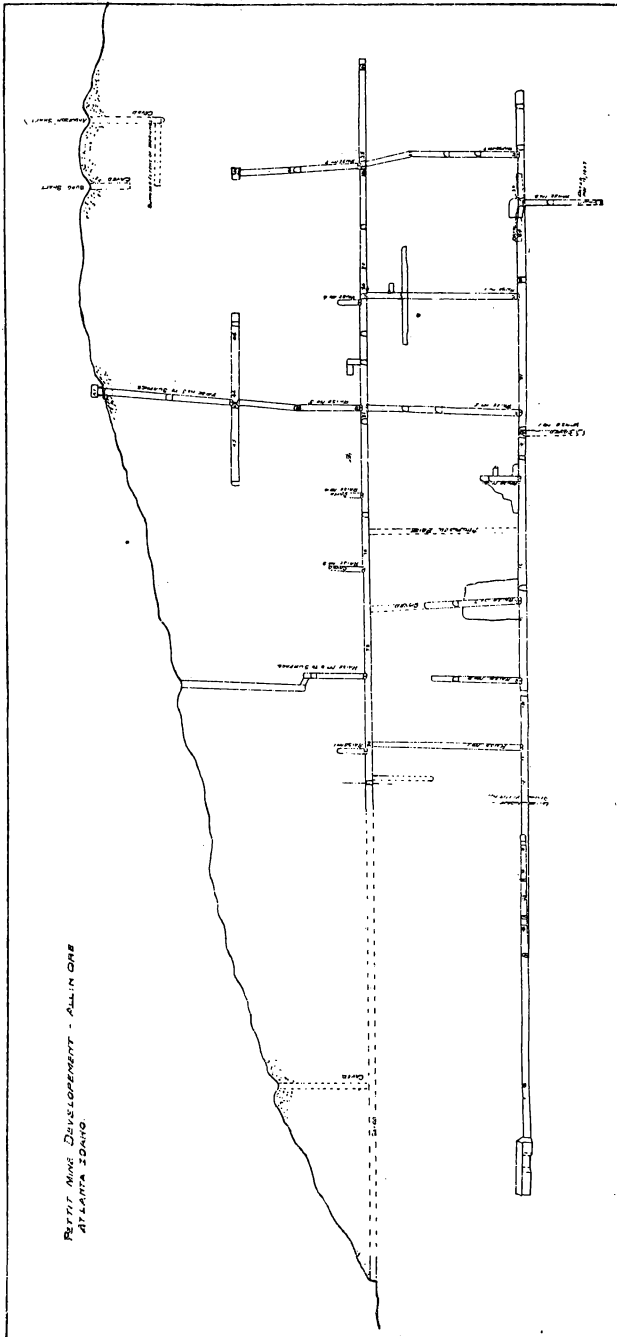
The ore resources of this company embrace the old Monarch and Buffalo mines on the famous Atlanta lode, which are reputed to have yielded shipping ores from their surface horizons to the value of \$5,000,000. Their present development is through a vertical shaft 600 feet deep, with 6 extensive levels, in which there is now disclosed new ore resources estimated at \$5,000,000 in gross value, that carry gold and silver at the rate of from \$5 to \$30 per ton, while extensive pay streaks of mineral, containing the higher values mentioned, are in sight in the mine. The ratio of values runs about 60 per cent gold and 40 per cent silver, and the property can be depended on to ultimately become an important dividend payer. Mr. T. N. Barnsdale of Pittsburg, Pa., is sole owner of this splendid property, and it has been undergoing steady development for 6 years under the management of Mr. Daniel Kirby.

*Pettit Mine.*—The Pettit mine adjoins the Monarch mine on the same great lode to the east, but its development is only half the depth of that of the Monarch as yet, and entirely through adit tunnels. The Monarch develop-

ment, however, right up to the end line of the Pettit claim on the same ore shoot, and developed to a further depth of 300 feet, practically proves the continuity of the values in Pettit ground at that much further depth, and there is no reason why, in such a powerful lode, the values will not be maintained for a thousand feet in depth or more. The ore resources of the Pettit mine, completely blocked out by numerous raises, a short crosscut and two main levels are shown in the accompanying plan, and aggregate over a million dollars in gross value of a grade ranging from \$12 to \$15 per ton. At this end of the lode the gold values are stronger and amount to fully 90 per cent of the total values in the Pettit ore. This property also carries much higher grade ore, but the values given are what it is shown by thorough sampling can be depended on in good, big minable widths. The treatment of the Pettit ore has been the subject of extensive practical tests, and its milling plant of 100 tons daily capacity, now receiving the finishing touches, is designed and expected to recover 90 per cent of the contained values. The mill is connected with the mine by an aerial tram 3,600 feet in length and has an independent power plant of its own on the Boise River, a short distance above Atlanta, and should be in the market with a good yield of precious bullion within 90 days.

The Pettit mine is being operated by the Bagdad-Chase Gold Mining Co. of Rochester, N. Y., of which Mr. J. N. Beckley is president, Mr. J. H. Steadman, secretary and treasurer, both of Rochester, and Mr. Wayne Darlington of Boise, Idaho, is general manager. The company has carried a force varying up to 50 men during the year, the bulk of which, however, were on construction work. Miners on this property are paid \$3.50 per day, and timbermen, engineers, electricians, carpenters an average of \$4.00, all of 8-hour shifts. The company owns its own sawmill and makes lumber cheaply. Mining timbers cost 8 cents per foot. Electricity will furnish power and heat for the whole plant, which has involved a total cost of something over \$100,000, and will have about 100 tons daily capacity.

The Minerva mine, adjoining the Atlanta lode to the south, is opened on a large lateral vein, carrying fine



PETTTT MINE DEVELOPMENT, ALL IN ORE. BOTTOM LEVEL 300 FEET DEEP.

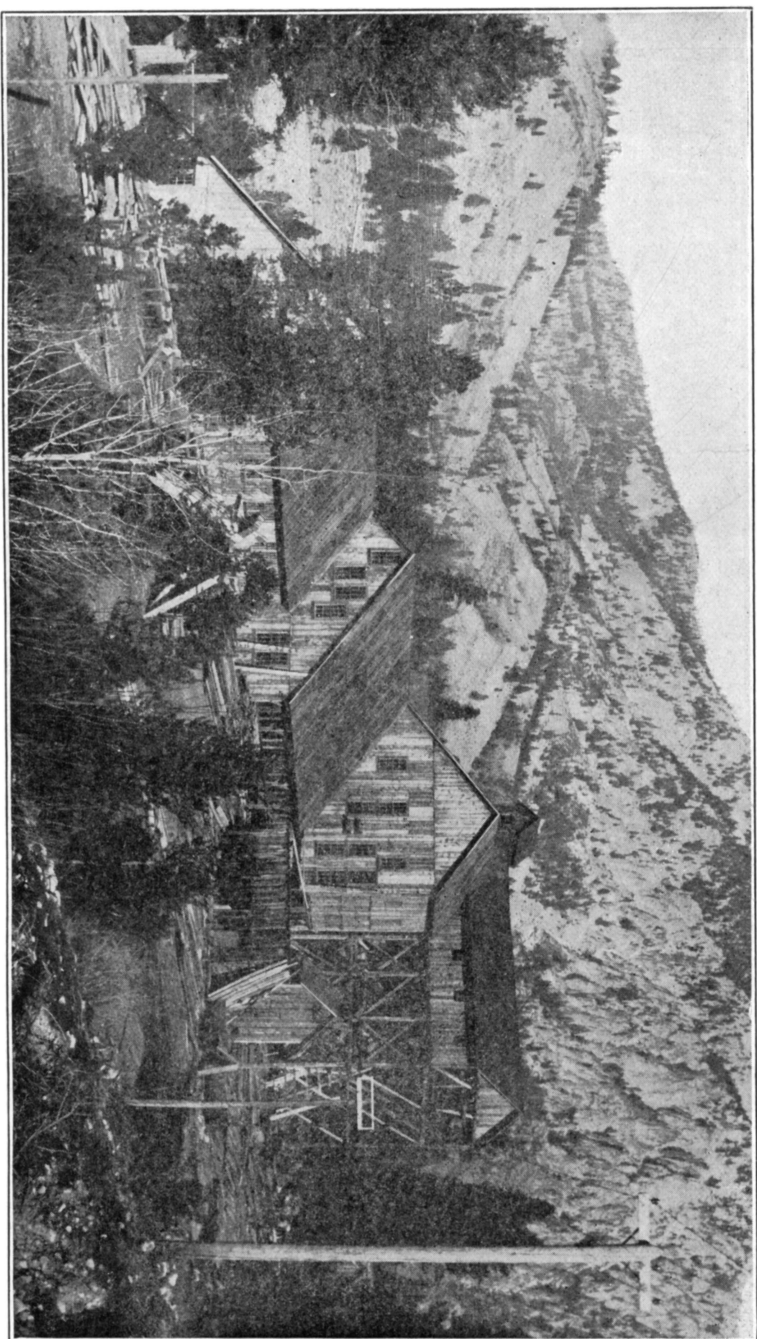
values in gold and silver, of which 50 to 60 per cent are saveable by simple plate amalgamation. This property is equipped with a 10-stamp mill, which, however, still needs additional equipment for a more complete saving of the values, and to provide for the dividend end of the operation. This company will probably be able to profit by the experience of its neighbors on secondary methods of saving, as the ores are very similar in character.

Atlanta has numerous other handsome prospects and mineral deposits that will doubtless be heard from in the future as a result of the successful treatment of the ores in the two elaborate plants just completed.

The development of these deposits have been seriously retarded by the inaccessibility of the camp over the present means of access from Mountainhome through Rocky Bar and across the high divide between the south and middle forks of the Boise River, involving a tedious, expensive wagon haul and a very short season between snows.

This is one of the prettiest camps in the State, situated in a beautiful mountain basin on the banks of the middle Boise River and surrounded with high mountains on every hand. It will shortly be made much more accessible by the completion of the state wagon road up the Boise River from Boise City, and while the distance over the present route of access will not be reduced, there will be no high summits to cross, as the route follows the river level most of the way. This work has recently been assisted by the National Forest Reserve administration, and this assistance, together with that of the citizens of Atlanta and Boise, and with the State appropriation, will, when completed, result in a road to Atlanta that should be a pleasure to travel over, and greatly reduce the cost of freight and supplies for that important district.

*Rocky Bar District.*—South of Atlanta, the old Rocky Bar District, with a past bullion record running up into millions of dollars, has been dormant for a number of years for various causes, but is again taking on considerable life and activity, and during the past season some important development work and prospecting operations were in progress. At this point, the Bassler Mining Company have fully 1,500 feet of development work accomplished and report several shoots of good milling ore, in-



MONARCH MILL, ATLANTA.



PETTIT MILL, ATLANTA.

cluding some beautiful native gold specimen rock. The property has been equipped with a 10-stamp mill, which, it is expected, will shortly be put in operation and commence the production of bullion.

The Vishnu vein, in the same locality, has been quite a producer in the past and has recently been developed into pay ore again, and its operators will rebuild its milling plant, which was destroyed by snow last winter.

Considerable new placer development in virgin ground was in progress during the year. A stretch of Bear Creek bottom, right in the town of Rocky Bar, was tested by several pits sunk to bedrock and found to contain values up to \$2.00 per cubic yard. Considerable drill sampling was also done on the deep placers in the vicinity of Junction Bar during the year.

The old Ida Elmore bonanza, with a gold production record aggregating \$3,000,000, and a lost ore body, was also operated with a small crew during the past season, with the result of discovering new ore resources that it is believed will yield handsome results when more thoroughly developed, and it is the general impression with mining men locally familiar with the conditions of this district that it will again take its place as a source of profitable gold mining operations.

The Feather River Mines Company worked a small force of men during the year and have accomplished 200 feet of development work on a 40-foot zone of mineralized granite, carrying numerous stringers of rich ore, and are anticipating the erection of a mill, and good paying results from their present development.

The old Bonaparte mine, east of Junction Bar, is also being reopened under new management and worked a large force of men during the year. This property has a good record of production of high-grade shipping ore and carries a large vein, from which only the surface cream was taken in its early day operation. It is believed that it can be readily developed into a state of profitable production again and the ore successfully treated on the ground by cyaniding.

At Skeleton Creek, 20 miles east of Junction Bar, the Frazier mine was recently incorporated as the El Oro Gold Mining & Milling Co. by its owner, Mrs. Erv. John-



son, and a milling equipment of 10 stamps capacity is planned for the treatment of its valuable ore resources. This mine is opened on a well defined fissure in granite, that is from 3 to 10 feet wide, by a crosscut tunnel that taps the vein at a depth of 240 feet, from which drifts have been run in each direction along the course of the vein several hundred feet, revealing average values of \$10 to \$20 per ton in free gold, and there is every prospect that with intelligent management this enterprise will make a winner.

*Pine Grove District.*—At Pine Grove, the Franklin mine carried a force of 30 men through the greater part of the year, and made quite a large yield of gold bullion from its 10-stamp mill and cyanide plant. This property has been profitably handled for the greater part of the past 4 years by its owner, Mr. R. P. Chattin, of Mountain-home, and has made a large total bullion yield. It is developed to a depth of 400 feet by crosscut tunnels on a nearly vertical fissure vein in pegmatite granite, accompanied by a small dike of intrusive diabase. It carries good values to the bottom level, although the ore in the lower horizons of its development are much more refractory than formerly, but a good saving is made by cyanide treatment of the tailings after the free gold is extracted by amalgamation.

*Neal District.*—In the Neal District, 15 to 20 miles southeast of Boise City, in the extreme southwest corner of Elmore County, the principal mining operations of the year were those of the Daisy and Homestake mines, owned by The George F. Roth Company of Rochester, N. Y. This property has been operated lately with a force of 20 men. It carries some nice shoots of rich free milling gold ore and has been equipped with a 10-stamp mill, with which a good output of bullion can safely be anticipated in the near future.

## FREMONT COUNTY

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By virtue of its extensive resources of high grade bituminous coal, Fremont County seems destined to cut a more important figure in the industrial development of the State at large than does any other county in the State, as a good article of mineral fuel is about as essential and necessary to the welfare and upbuilding of the industrial enterprises of a new community as any other natural resource can be, and the development of the coal fields of this county have progressed so far as to prove beyond a question that they contain coal resources in sufficient quantity, when properly opened up, to put the State entirely independent of foreign sources for its fuel supply, and of a quality that is not excelled by any Western or Eastern bituminous coals now shipped into Idaho, which are supplied at exorbitant famine prices that seem to be constantly increasing.

During the first nine months of the year the demand on the Wyoming mines by this and other States was such as to create a coal famine in the middle of the summer, and the local commercial bodies had to go into the problem extensively as early as July and August, with the result that they had to reach out as far east as Illinois and Indiana to obtain a supply of fuel with which to keep business moving. The coal shipped in from Illinois is far inferior, in respect to its excessive ash contents, to the Fremont County article, and the easiest solution of this vexed and oft recurring problem of fuel supply would be for the different commercial clubs of the State to investigate these Idaho resources, thoroughly satisfy themselves of their merit and support their acquisition and extensive development by Idaho capital.

These properties will bear investigation; they have been favorably passed upon by coal mine operators and experts of wide experience, and such a move should result in settling the fuel problem and reducing the present exorbitant prices paid for coal 30 to 50 per cent.

The recent development of these Idaho coal deposits has been of such a nature as to attract the attention of the Short Line officials to the extent that they put a

large corps of engineers in the field and spent several months last summer surveying for the purpose of getting a favorable line for a railway spur from the National Park branch to the mine. The intervening country is a comparatively easy one for railway construction and favorable routes were found on very light grades right up to the dump of the principal coal development, from Sugar City, Chester and Ashton, and the chances are that if the financial panic had not come on when it did, a transfer of the principal coal properties would have been made into strong financial hands and a big coal mine industry inaugurated.

These coal deposits are situated about 25 miles due east from St. Anthony and about the same distance from Sugar City and Rexburg. Looking east from any of these points the peaks of the Grand Tetons are obscured, excepting their highest crests, by a long, low range of hills locally called the Big Hole Ridge, that raise to an elevation of from 1,200 to 1,500 feet over the general level of the Snake River plains and form a horn shaped spur about 30 miles in length from the Teton range that dies out in low hog backs, between Canyon Creek Station and Haden on the stage line from St. Anthony to Teton basin. The deposits are connected by a wagon road around the point of the ridge on easy grades, by which route it is 35 miles from the railroad towns mentioned. The Big Hole Ridge is an anticlinal fold that is badly broken at its south exposure in the direction of the main Teton range. Near its northerly termination, however, it seems to be less disturbed and to have a rather uniform structure. A cross section of this uplift from west to east discloses a flat dipping series of rhyolite lava sheets that cover the entire western slope of the ridge and extend nearly to its crest. This igneous accumulation aggregates 800 feet in thickness and is exposed by a fault in the Snake River canyon near Heise's Hot Springs. In stratigraphical order, underlying this immense accumulation of igneous rock, there occurs a series of heavy beds of pink quartzose sandstone and pure blue limestone for a mile in width. Underneath these beds again is a wide series of unaltered fossiliferous sandstone, blue shales and occasionally thin beds of shell limestone and numerous

veins of coal lying parallel, one under the other, through a width of about 2,000 feet, as proven by considerable surface and underground work.

The development on the different coal properties that have been located has disclosed 13 different veins that range from 2 feet to 10 feet thick. The most extensive development has been on a 10-foot vein owned by the Horseshoe Coal Association, a 5-foot and 4-foot vein owned by the Brown Bear and Boise Coal Associations, and a 9-foot vein owned by the Pack Saddle Coal Association. These veins are exceptionally free from bony matter or waste material. In the Horseshoe vein, 11 feet wide, a band of white clay 10 to 12 inches thick is the only waste this wide vein contains, the balance being clean, high grade coal. The Brown Bear vein, which is the most extensively developed of the three, embraces a crosscut tunnel which taps the deposit at 100 feet in depth, and has a main entry 800 feet long, from which over 4,000 tons of coal have been mined. This vein is 5 feet wide and carries about 3 inches of black carbonaceous clay as its only waste accompaniment. The Boise vein has been opened at considerable depth on a 4-foot vein that is entirely free from bone or waste of any kind; and the Pack Saddle vein, at the time of the writer's visit last fall, was 9 feet wide and did not show any bone streaks.

An average of a series of analyses, over 20 in number, from these different openings, shows the following result:

Fixed Carbon .....	55.65 per cent
Volatile Carbon .....	36.62 per cent
Moisture .....	3.13 per cent
Ash .....	4.10 per cent
Sulphur - .....	50 per cent

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100.00 per cent

Actual Fuel Contents..... 92.27 per cent

These 4 properties cover the strike of the coal bearing series for 4 miles, through which great distance their continuity has been practically proven. The walls of the Horseshoe vein are blue shale and rather soft as yet at the shallow depth at which it has been developed. This condition, however, shows a marked improvement

and toughening of the roof at the face of a 500-foot entry started and driven on the vein. The Brown Bear vein has perfectly smooth, hard, sandstone walls and the same is true of the Boise vein. The walls of the Pack Saddle development, which is a new enterprise, only having been started last summer, are also sandstone and promise to form the same good roof and floor as the Brown Bear and Biose as the development is extended in.

The strike of these veins is about 40 degrees west of north and their dip varies from 45 degrees to 50 degrees from the horizontal. Their position on the east slope of the ridge affords a crosscut drainage tunnel site at the end of the railroad survey that would drain and make available a resource of coal aggregating 10,000,000 tons that could be extracted by gravity handling and could be very cheaply mined. There is no geological reason why this great vein series which aggregates a total width of 40 feet of clean high grade fuel, as far as proven, should not go down several thousand feet. The tunnel site referred to would cut the series at a maximum depth of 500 feet and could be run and equipped for \$10.00 a foot. From such an opening entries could be run on each vein as it is intersected and their position, several hundred feet apart in most instances, would permit of a great number of working faces and an extensive output.

Below this series of veins, about a mile and a half further down Horseshoe Creek from the Brown Bear mine, the Idaho Fuel Company has done quite a little development work on another promising piece of territory. This property is locally known as the old Flamm mine and was first worked about 15 years ago by Mr. Henry Flamm, a prominent merchant of Rexburg, who was the original coal discoverer of this district, but abandoned the enterprise before developing it into a profitable state. The veins that have been opened on this property, 2 in number, are 2 and 4 feet thick, respectively, and have a flat dip of about 10 degrees from the horizontal at this point.

These veins underlie a low bench or terrace with little over-burden, and the work has not been carried deep enough to get below the surface influences, but in the bottom of the deepest opening the quality of the coal is im-

proving very rapidly. These veins are free from bone and I am of the opinion that they form a part of the upper veins of the same series shown so strongly further up the creek and have been faulted down or left in their present position by block faulting on north and south lines. A little drill work on the dip side of this property would probably reveal larger veins of the series underlying the smaller ones. Their position near the edge of the broad Teton valley, and much flatter tip, indicate the probable extension of the coal series under the valley in a nearly horizontal position.

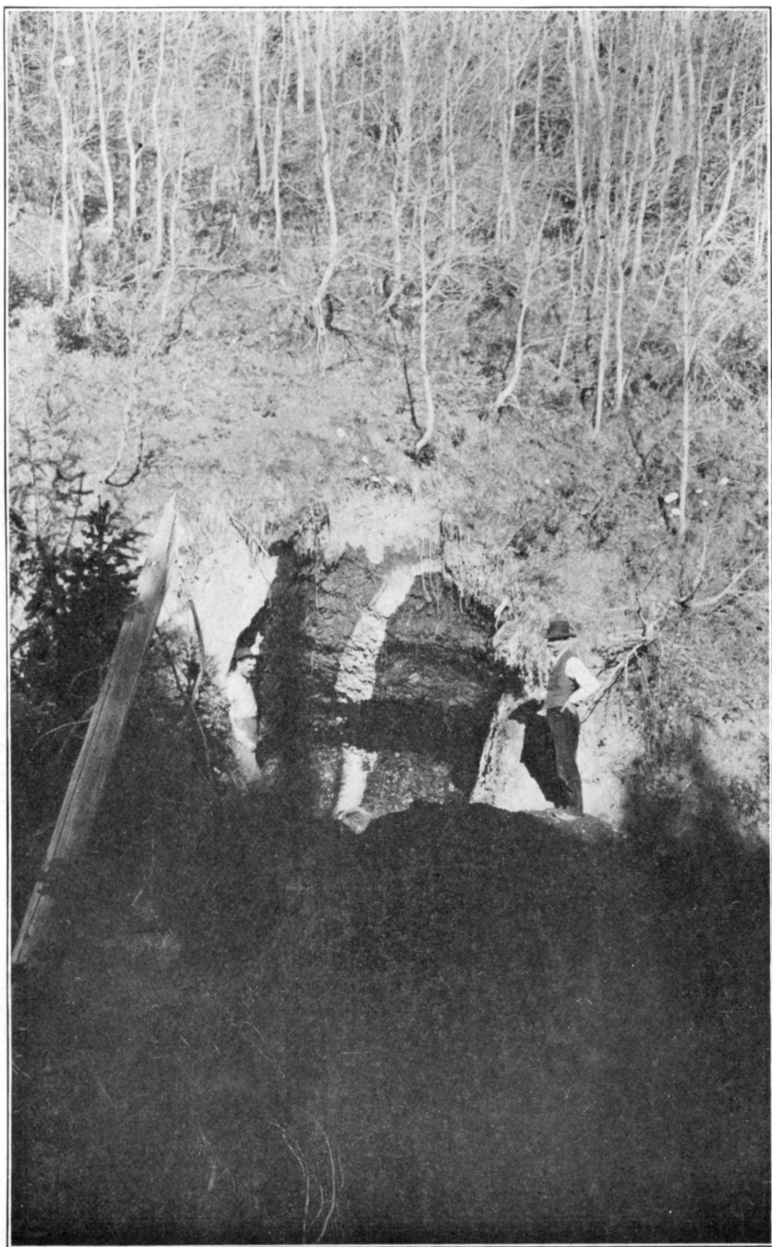
At the Breckenridge ranch, near Haden, and near the center of the broad Teton valley, a company was formed several years ago to sink for oil, as numerous oil seeps can be found along the boggy margins of the Teton River from one end of the valley to the other. This well was equipped with a 75-foot derrick and had 90 feet of 10-inch casing and 260 feet of 8-inch casing. It was put down to a depth of 660 feet but was abandoned 4 years ago without definite results. Last fall the Teton Valley Coal Association obtained leases on a very extensive area of patented valley lands and undertook to put this well deeper and investigate the reported discovery of a 12-foot vein of coal which was supposed to have been cut at 640 feet down. The well was carried to a point 720 feet deep and careful sampling tests along its walls in 20-foot sections by an especially designed scraper, made for the purpose, have failed to reveal the reported coal vein. The drill has passed into what appears to be the coal bearing series at the bottom and there is strong hope of encountering important coal veins at further depth that may be conformable to the valley bottom, as the Idaho Fuel Company's veins in Horseshoe Creek just above Hegsted's ranch occur at a horizon not to exceed 200 or 300 feet below the east leg of the rhyolite anticline that formerly covered the Big Hole Ridge. The drill hole in the valley passed through a considerable thickness of this pink rhyolite formation before entering the softer beds now in the bottom of the well, and if the coal series underlies the valley it should be encountered at a further depth of 200 or 300 feet.

The present market for the coal production of this field

is, of course, confined to the settlers who live within hauling distance of the mine. It is sold at the mine for \$3.50 per ton for lump coal, \$2.50 for run of mine and \$2.00 for small nut and \$1.00 a ton for slack. A good deal of the lump coal is hauled to St. Anthony and the other railroad settlements, where it commands \$1.00 a ton premium over the coal that has been shipped in from the East during the famine periods, and it has apparently far better heating power, contains very much less ash and is, consequently, in good demand.

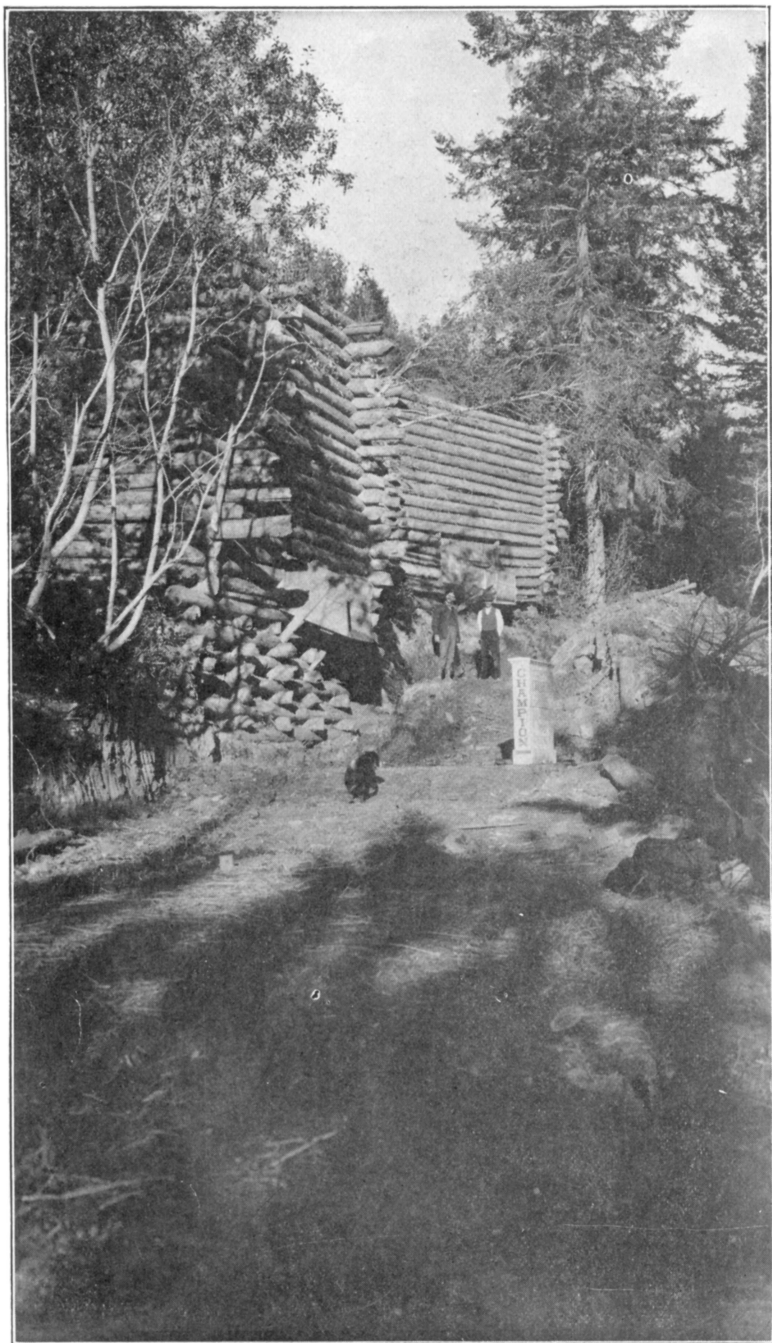
In addition to the coal deposits, the Boise claim carries immense beds of pure blue limestone and shale, which, together with the pure coal, form the principal elements of Portland cement manufacture, and can all be mined from the same section of land, which would afford a big commercial advantage over other Western cement manufacturing sites, which generally have to assemble one or more of their raw materials from a distance at considerable transportation cost. Such an enterprise, owning its own coal, that could be supplied at the cost of mining, could doubtless manufacture this important building material at less cost than many competitors in the West, and this feature of itself, aside from the coal mining, would afford the basis of a very important industrial enterprise and traffic proposition.

*Weimer Copper Mine.*—At the opposite end of Fremont County, on Birch Creek, near Kaufman postoffice, and 50 miles west of the Short Line at Dubois, the Weimer Copper Company worked a force of 30 men during the past year in the development of an extensive deposit of copper carbonate and oxide ores, in a pronounced contact of blue carboniferous lime and brown quartzite. This property carries an immense deposit of smelting ore in places as much as 50 feet thick, that is said to average from 3 to 8 per cent copper. In addition to the general mass of lower grade ore, the deposit carries numerous flat dipping shoots and vertical cross-fracture courses of high grade mineral, in places as much as 3 or 4 feet thick, that contain values up to 50 or 60 per cent copper. The company shipped a number of cars of hand sorted ore during the past season that sampled 16 to 18 per cent copper at the Salt Lake smelters, and made a gross yield



**HORSESHOE COAL VEIN, TEN FEET WIDE, WITH WHITE CLAY BAND IN CENTER. DISCOVERY CUT, FREMONT COUNTY.**





COAL BIN AND SCALES, BROWN BEAR COAL MINE, HORSESHOE CREEK, FREMONT COUNTY.

of 200,000 pounds of the red metal, together with some values in gold and silver.

The enterprise was shut down late last fall, owing to the contraction of the copper market, but plans are being made to establish a smelting plant and treat the ore on the ground. The deeper workings of the mine show considerable massive chalcopyrite ore, including patches of pure copper glance; and it is likely that with further depth the deposit will afford sufficient sulphur for a matting process.

Extending from the Weimer property for 20 miles, along the same slope of the range on which it occurs, and clear down to the point where the mountains lose themselves in the broad Snake River desert, near Reno postoffice, there is an almost continuous string of mining locations, a number of which were made during the past summer, carrying splendid surface manifestations of mineral in both copper and lead, but principally in lead.

*The Old Scott Mine* is situated about 10 miles southeast of the Weimer property. This mine was recently equipped with a small hoist and has been quite extensively prospected and has shipped a number of carloads of high grade lead ore in the form of sand carbonate during a former operation. It carries a wide deposit of soft manganese and brown iron gossens in a contact between limestone and quartzite, but accompanied by a regular dike of igneous rock. The ore body at the bottom of the shaft, at the time of the writer's visit last fall, was 20 feet wide, and would run from 5 to 10 per cent lead concentrating ore. It contained big kidneys of pure galena that sampled up to 80 per cent lead with several ounces of silver and some gold.

Idaho Falls business men are largely interested in this and other promising properties, carrying the same gossens surface manifestations of lead ore. The belt is a continuation of the Lemhi lead belt, described under Lemhi County, and has a bright prospect of becoming an important and productive mining section.

About 30 miles south of the Weimer property, on the southwest slope of the Little Lost River range, the Great Western group of claims is being worked by an incorporated company of that name. This property carries some

very interesting ore deposits which are still in the prospect state of development. They consist of silver-lead ore with some gray copper occurring in a contact of limestone and quartzite, and associated with porphyry dikes. The property shipped one 20-ton lot of ore during the past year that sampled \$45.00 per ton in combined values.

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## IDAHO COUNTY

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Idaho County passed a rather slack year in mining development during 1907, and several of its former prominent camps fell off in production. The most active district in this county, the one that now shows the greatest promise of permanency and success in both quartz and placer mining, is that of Elk City, 60 miles east of Grangeville, and about the same distance from the terminus of the Northern Pacific Clearwater branch railway at Stites. From this point the State has been assisting the citizens and interested people along the route and in the Elk City District in rebuilding the wagon road, which was a very commendable move and one highly necessary for the welfare and progress of that fine mining region. This road work was not completed but gotten well under way and will doubtless be finished during 1908 in a way that will greatly facilitate wagon transportation and prove a boon to the new period of substantial mining activity that has struck that well known old field.

The advent of Mr. Fred W. Bradley, with his associates, J. H. McKenzie and Mark L. Requa, three of the top-notchers in modern Western mining development and mining judgment,—in taking hold of the Buster mine at Elk City, has established a standard of merit for its ore deposits that while intrinsically warranted, has gone a

long way to establish the faith of other investors in the district's many important ore deposits and placer resources.

The Elk City basin is an extensive area of densely timbered and deeply eroded and weathered formations of archaen gneiss and schist, extensively fissured with big, strong quartz veins accompanied with numerous dikes of igneous intrusive rock, and extensive areas of flat placer deposits, the creamy features of the places, of course, which were easily accessible to crude methods of mining, were exhausted years ago, and are reputed to have yielded gold bullion to the gross value of \$10,000,000.

The district, including Orogrande and adjacent Dixie section, is ribbed with innumerable veins and lodes varying from defined fissures filled with gold bearing quartz, to immense zones of low grade gold bearing granitic and schisty gangue. The latter have been explored to considerable extent, and it is believed by some competent judges that these larger bodies of low grade material may be made to pay with proper equipment and intelligent, conservative management.

The Buster mine, owned by Mr. Bradley and his associates, is a large quartz filled fissure 10 to 20 feet wide in schisty gneiss that can be traced continuously for several hundred feet. It makes its richest ore development on each side of a pronounced fault, where high milling values are found. The battery feed now going to the new 10-stamp mill with which it is equipped, averages over \$20 per ton in gold, and yields about 80 per cent of saving as free gold, and for the recovery of the balance of the values, a concentration and cyanide plant is attached. This interesting property worked a force of 35 men during the year, and its present milling equipment was completed and put into commission about December 1st and will doubtless have a steady career of important and profitable gold production as the ore reserves exposed in the mine are quite extensive.

The Buster vein is a type of several others in the district that are being developed, and it is a safe prophecy to say that several of them will be brought to a state of production at no distant date. In some of these veins, where water level has been approached, very rich patches

of high grade gold bearing tellurium ore have been found, associated with the iron sulphides common to the quartz ores, and with their further development at depth this class of ore is likely to cut an important figure and provide some rich shipping material.

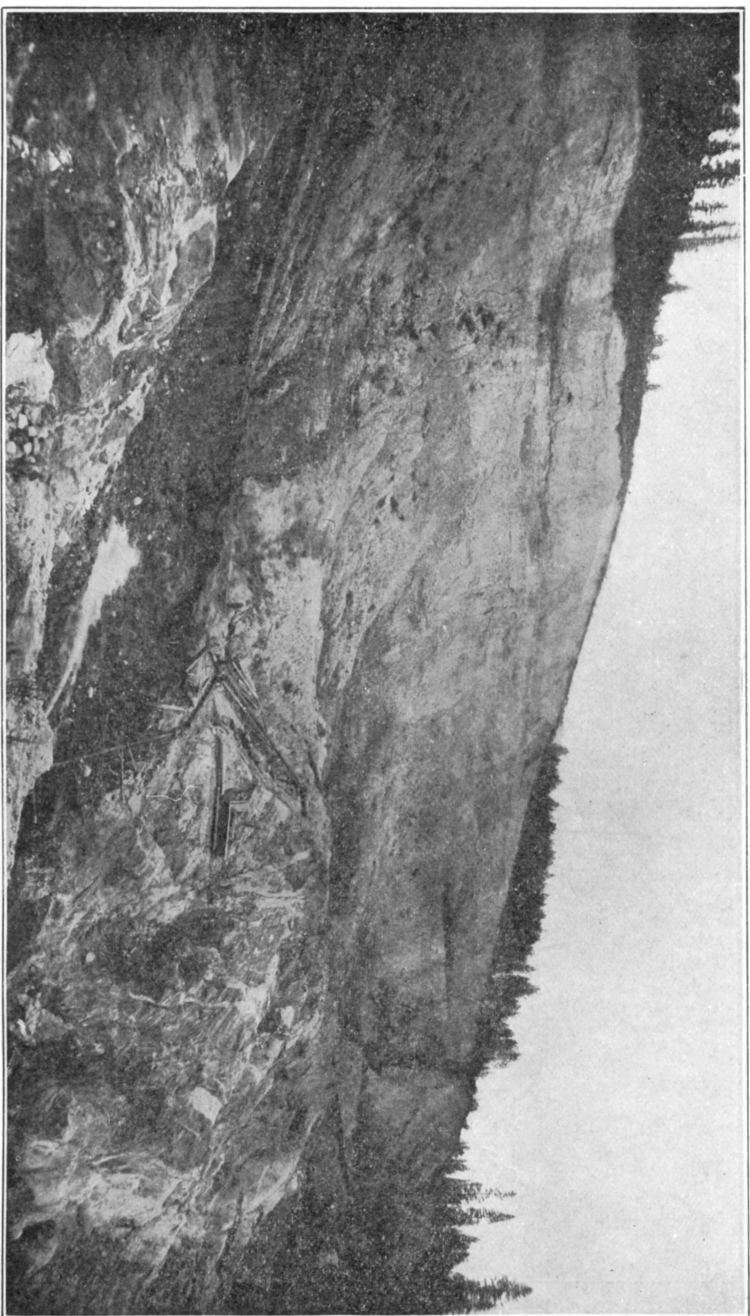
Several good placer enterprises were in progress during the year and a new equipment lately installed and in prospect will make available for profitable treatment several extensive tracts of flat placer gravel that carry fine values but have waited a more modern method of handling than they were formerly accorded. At the Elk Trail mine a Ruble elevator has recently been installed. The advantages of this dump making device are illustrated under Nez Perce County. There is more mining activity in Elk City and vicinity at the present time than there has been since the palmy days of its placer gold output, and rich strikes of importance will doubtless continue to be made among its numerous ore deposits.

*Buffalo Hump.*—The Buffalo Hump District suffered a dull year. The Jumbo and Cracker Jack were both worked for a short period and produced some gold, but nothing like their former yield. The rather refractory nature of the ore is largely to blame for this condition, as the problem of extracting the values still wants solution. A sale of the Big Buffalo was reported in the papers, but it did not seem to result in any activity at the mine, which is one of the largest and most valuable groups in the camp. The Mother Lode No. 2 developed quite an extensive resource of ore but has not been equipped for profitable production so far.

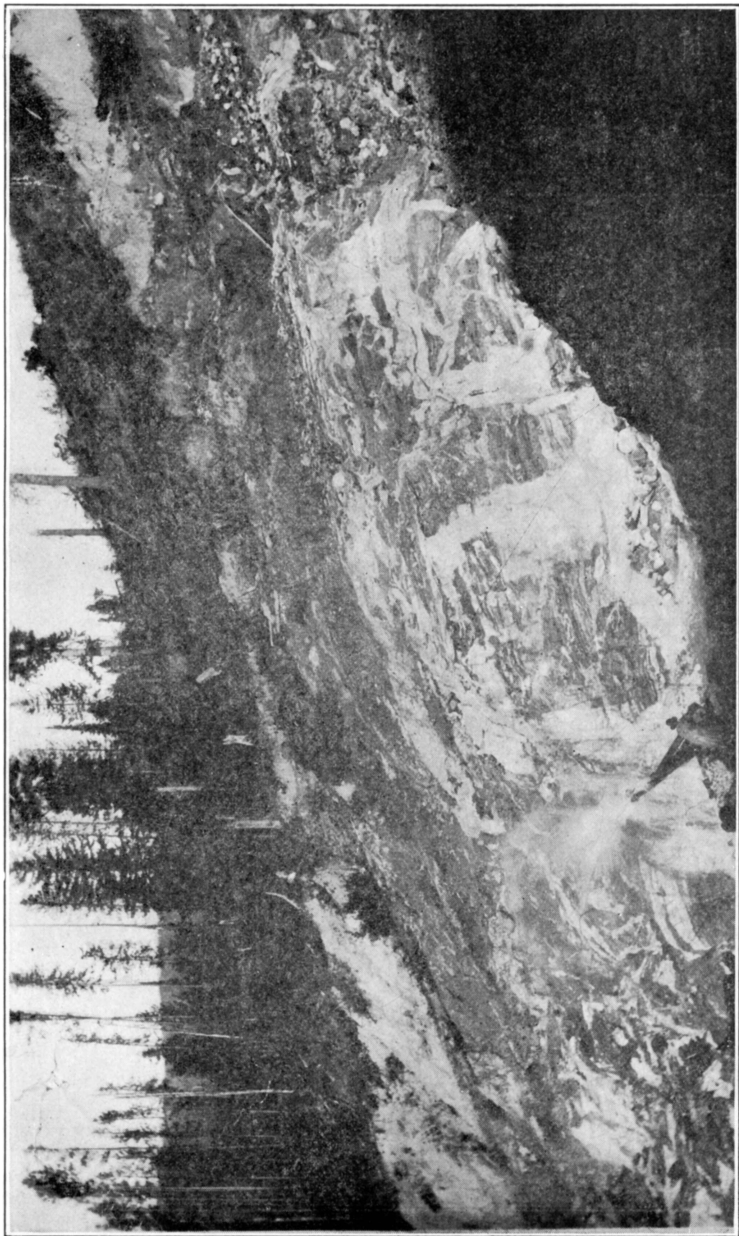
This district has numerous monster fissures carrying good values and would make a good field for the process man. Its rather remote position and bad roads have been a great drawback to its development, but it will doubtless ultimately become a scene of considerable mining activity and a good source of gold.

*Newsome District.*—Several of the old placer properties of the Newsome District were operated during the year and enjoyed a good water season with a considerable output of gold. This district has some phenomenal deposits of old channel gravel.

At the property of the Sacajawea Company, locally



OLD MONTANA PLACERS, NEWSOME. BANK 234 FEET DEEP.



SCHIST BEDROCK WITH PEGMATITE VEINS, OLD MONTANA PLACERS.

known as the "Old Montana Placers," considerable new development work was done during the past year and preparations made for extensive operation another season. This property has been added to by new purchases lately and now embraces 740 acres of ground covering a bank of fine gold bearing gravel 278 feet high on a high rim bedrock of schist and pegmatite vein, as shown in the accompanying illustration. This phenomenal body of gold bearing material is said to average 15 cents to 18 cents per cubic yard, and with a splendid dump and a thousand inches of water during quite a long season, should make a profitable yield of gold. It is a type of several other properties in the same district that embraces millions of yards of good pay gravel, and if sufficient volume of water was available, could be made to yield an immense output of precious bullion. As it is, under present conditions, an extensive yardage of ground is washed each year, which will be increased as development progresses and better facilities of handling the material are attained, and New-some is likely to be the principal source of Idaho County's placer gold yield in the future, as its resources of gold bearing gravel are practicably inexhaustible.

*Blue Jacket Mine.*—The most important results in the development of Idaho County's copper ore resources was at the Blue Jacket mine in the Cook's Corral District on the Snake River slope, near the southwest corner of the county, about 6 miles west of Lucile postoffice. At this point the Northwestern Mining Company has been steadily developing the Blue Jacket mine for the past two years and now has a total of 2,650 lineal feet, of which 1,150 feet were driven in the form of drifting and cross-cutting, together with 175 feet of raising, during 1907. This development discloses great zone of schisted diorite 50 feet wide containing a fine grade of concentrating copper ore, a good deal of which runs 4 1-2 per cent copper, with \$4.00 gold and \$2.80 silver per ton, and includes some well defined pay shoots from 4 to 10 feet wide of black oxide and native copper with massive sulphides at the point of greatest depth. The richer shoots carry values ranging from 10 to 90 per cent in the red metal. Some beautiful native copper ore has recently been found in chunks all the way from the size of a walnut to some of



several pounds weight, of almost the pure metal, and the property is apparently assuming bonanza proportions as a copper deposit in the matter of size and quality of its ores. With the completion of the Short Line extension down the Snake River canyon, now well under way, this property will be put within 3 miles of railway transportation, which will greatly facilitate its further development and operation.

#### THE MARSHALL LAKE DISTRICT.

*Goodenough United Mine.*—The Marshall Lake District, situated on the head of Bear Creek, about 10 miles north of Resort, a station on the road to Warren, enjoyed a season of unusual activity during 1907, and one of its properties was operated for a short period with a small 5-stamp mill and produced considerable bullion. This was the property of the Goodenough United Mining and Milling Company, which embraces a large group of claims, carrying 5 distinct fissure veins. The principal vein of this group is known as the Daisy and is traceable for hundreds of feet. It is developed by a succession of adit tunnels, one of which has attained a vertical face depth of 400 feet. The Daisy vein ranges from 18 inches to 12 feet wide, and its greatest virtue lies in the fact that it carries some of its highest values where the ore bodies are the widest.

The ore is mostly massive white quartz with oxidized cavities near the surface and containing heavy concentrates of iron and a little lead mineral as depth is attained, associated with free gold values that range from \$10 per ton up into picture figures. As selected pieces can be obtained that will run thousands of dollars per ton. As a general mining proposition, however, the experience during the past season's work in treating ore, principally from development tunnels, show an average mill value of \$20.00 per ton from the full width of the vein. The mill now on the property has a sectional mortar which proved leaky and gave considerable trouble. The output, however, was such as to warrant the company in deciding to put the property into the dividend list of producers last season, but more conservative judgment prevailed and resulted in using the season's surplus

output for the purchase of a new mill, and the machinery for an up to date 10-stamp plant was purchased and delivered on the ground, which will be put up and in commission next season, when it is believed that a steady yield can be made that will warrant the payment of regular dividends, as the ore resources of the property of the average grade mentioned are said to be such as to keep such a plant in steady operation for a long period.

The company is carrying a crew of 14 men on development work at the mine throughout this winter, and by the time the mill is completed in the spring should be in splendid shape to furnish it with rich feed for an indefinite period, if the ore bodies continue to show up as they have in the past.

*East Goodenough.*—Another property working a small force this winter is that of the East Goodenough, which already has 700 feet of tunnel development on 3 different adits, carrying ore of similar values to its rich neighbor.

*West Goodenough.*—The West Goodenough is still another company which is working 4 men on contract. This company is opening an extension on the Daisy vein above described, which carries similar big swells of good ore and demonstrates its continuity for over 3,000 feet in length.

*Maxwell Company.*—At the property of the Maxwell Mining Company, 4 miles from the Daisy, considerable development work has been done on a well defined vein containing rich gold bearing iron oxide ore, 1 to 4 feet wide that is said to average \$50.00 per ton in gold.

*Mt. Marshall Mine.*—At the Mt. Marshall Company's property a large force of men were employed during the year and accomplished a lot of surface improvements, including a 6-stamp Merrill mill that is believed can handle 50 tons of ore per day. This property also carries a strong vein and good values and should become one of the new producers next season.

*Washington Company and Others.*—Another promising deposit on which several hundred feet of development work has already been done and a crew of 10 men was employed during the year, is that of the Washington Mining & Milling Company, where some valuable ore reserves are being undercut, containing some of the characteristic high values of the district.

In addition to these there were numerous other mining development enterprises under way in the Marshall Lake District and some wonderfully rich ore disclosed at several points.

*Geology.*—The geology of this section is of such a nature as to warrant the anticipation of the deposits proving permanent and carrying their values to considerable depth. It is cut by deep canyons exposing a formation of schist and granite, the bedding planes of which run north and south and the steep pitching fissures that traverse them east and west. The ore bearing belt is fully 4 miles wide and its many prominent fissures can be traced out for long distances along their strike, and being cut to great depth by the erosion of Bear Creek and its tributaries, afford magnificent opportunities for adit tunnel development, which is the general method of opening up their ore resources.

This camp produces as rich specimen ore as is found in any gold mining section of the West, and has a splendid prospect of becoming a source of large and profitable production of precious bullion as development progresses and more mills are built.

*The Thunder Mountain District.*—The Thunder Mountain District experienced a very dull season that marks the dying struggles of a misplaced and unwarranted boom. The Dewey mine still remains the only property that has produced any gold amounting to as much as a thousand dollars. Its 10-stamp mill was started on the 10th of April and lost 10 days in July. It ran until October 28th and crushed 8,920 tons of soft ore that averaged \$5.03 in gold per ton, from which a saving of 86 per cent was made by straight plate amalgamation. Forty-five to 50 tons of ore per day were put through, using a Tyler slotted crimp wire screen, with 38 holes to the square inch. The gold in this deposit is contained in the cleavage and structure lines of a soft rhyolite tuff, and its maximum values can be extracted with coarse crushing of this kind, which accounts for the amount gotten through such a small mill. The mining costs were \$2.05 and the milling costs \$1.04, a remarkable result, considering the isolation of the district and a creditable example of the efficient management of Mr. Burt Haug.

The property was shut down October 28th and left in the hands of a watchman, in which condition it is likely to remain for some time, as the ores now available in the mine are of much lower grade than the values given, which is true of most of the properties of this district, and until these treatment costs can be improved upon, which is unlikely to happen in the present generation, the dividends from the Thunder Mountain mining operations are likely to continue to be of the Irish variety, for while there are probably large reserves of \$2.00 or \$3.00 ore in the camp, higher values are rather scattering.

*The Sunnyside mine*, on which such enormous sums of money have been spent in an effort to make it pay, remained idle throughout the year in the hands of an unpaid watchman and seems to be a complete failure, although there are men who still think that if it were worked on the same principle as the Dewey deposit and as efficiently handled, that it could be made to yield a margin of profit.

There are a few men still left in the district who have faith in its ultimate outcome, but the chances are that the millions of shares of stock issued, as a result of the boom year of 1902 in this district, will continue to be a dead asset to their holders.

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## KOOTENAI COUNTY

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The principal mining district of the present area of Kootenai County is that of the Tyson District on Tyson Creek, a tributary of St. Maries River. At this point the Tyson Consolidated Gold Mining & Milling Company has extensive quartz and placer holdings which have been in process of development for 2 or 3 years, and their prop-

erty is now equipped with a 10-inch pipe line 8 miles long, connected with a reservoir and hydraulic giants with which to operate the placers, and to furnish power for operating their quartz mines. This equipment was only gotten into working order late in the season, and a very short run was made on the placers, which resulted in a considerable output of gold, the total amount of which is not obtainable at this date, but one shipment of \$6,500 was reported, representing only a short period of piping.

The company's quartz properties embrace several well defined fissure veins in a schist formation that vary from 1 foot to 10 or 15 feet in width, and carry good milling values on an average, which it is believed can be successfully treated by cyaniding. In one of their smaller veins, which has been drifted on to considerable extent, some very rich tellurium ore is occasionally found, and this feature of the company's holdings is likely to produce profitable results when further developed and equipped with milling machinery. An average of 10 men were employed on these properties during the year.

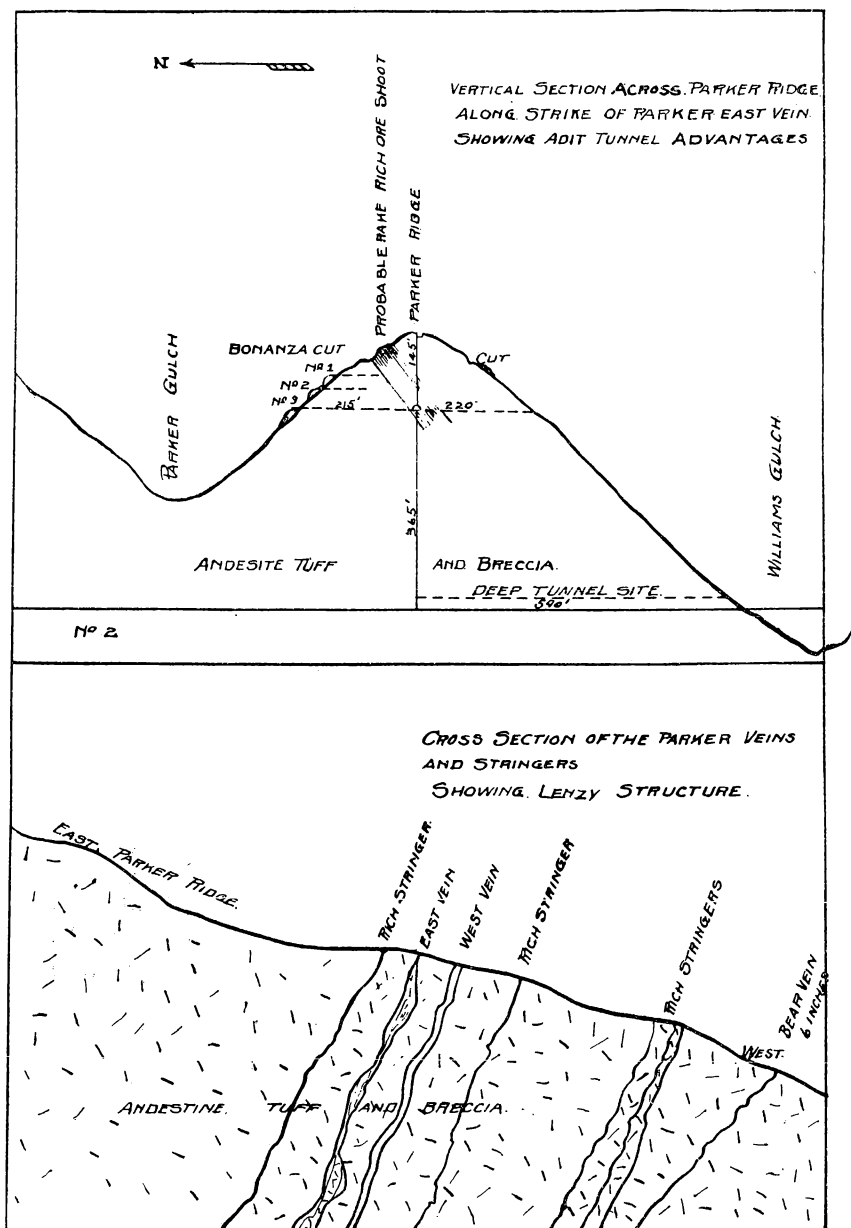
The Green Mountain Company's White Elephant mine is another good quartz property adjoining that of the Tyson Company, and has a large vein containing some high grade ore and good average milling values. It was operated during the year with a small crew, as also were several other promising quartz and placer deposits in this district.

In the Wolf Lodge District, the Home Builder Mining Company has spent \$10,000 on a large body of low grade, free milling gold ore, and are anticipating the erection of a large plant in the future for its reduction.

## LEMHI COUNTY

The mining industry of Lemhi County during 1907 enjoyed a season of more than usual activity in new development, and while the total metal and mineral output of this county for the past year will be slightly under that of 1906, due to the closing down of one of its principal producers early in the season and the inability of some of the others to market their ores on account of the panicky condition of the metal market towards the close of the year, there is, nevertheless, a bright prospect for future improvement and increased output.

*Parker Mine.*—One of the most interesting gold ore developments of this county was in the Parker Mountain District, where the Parker mine has recently developed an important resource of high grade gold and silver ore, and shipped a carload of selected mineral that sampled \$150.00 per ton in gold and silver, of which about two-thirds was gold. This property is still in a prospect stage. It has 4 short tunnel openings, exposing a lensy vein of chalcedonic quartz that varies from 6 inches to 8 feet wide, and carries average values ranging from \$10.00 to \$150.00 per ton. The virtue of this deposit is the fact that the widest swells in the vein carry the richest average values. The ore consists of a hard, chalcedonic quartz with wavy lines of black argentite thickly sprinkled with light colored native gold. The ore has not been analyzed, but probably carries some tellurium, as experienced in the Singiser mine, which ore it very much resembles. In addition to the main vein there are a number of parallel stringers carrying equally rich ore. The company is working a small crew on development and is planning the erection of a milling plant in the early spring. Selected ore from this property runs up to as much as a dollar a pound, and good size specimens of this high grade mineral can be obtained from the deepest tunnel. It is not unlikely that with further work a big zone of ore of fair milling grade will be developed between the pay streaks and warrant the erection of a large mill. In fact, one zone or dike on this property 15 feet wide gives an



average value of \$20.00 per ton in a shallow surface cut, and forms by itself a very attractive proposition for further development.

The formation of this district is almost entirely andesite tuff. It is situated on a tributary of Warm Springs Creek, near the dividing line between Lemhi and Custer counties, and the nearest supply point is Challis, 25 miles distant.

*The Ed Williams Mine.*—Adjoining the Parker mine, the Ed Williams mine has been opened on a similar irregular fissure, carrying some remarkably high values. While doing the assessment work on this property last fall a sack of selected ore was taken out that sampled \$5.00 per pound in gold and silver. This rich ore is found in an irregular vent up near the crater cone of Parker Mountain summit; it also consists of chalcedonic quartz containing thick wavy bands of black argentite richly matted with fine, light colored gold worth about \$10.00 per ounce. The Williams property has a 500-foot cross cut tunnel, which, however, seems to have stopped short of its objective point by about 100 feet, and there seems every evidence in the ground that, if continued, this tunnel will open up an important source of rich mineral. The surface of this district carries considerable debris and involves a lot of surface work to find the ore, but from the number of places where rich pannings in free gold have been found in the neighborhood of the two properties mentioned, it is more than likely that other important discoveries will be made.

The district is a very rugged one, of sharp ridges and deep, narrow canyons; it is well watered and timbered, however, and the formations are generally soft, and it affords a promising field for the prospector. With such high values and identical geological conditions with some of the bonanza camps of Nevada, it is likely to prove the scene of considerable mining activity the coming year.

*Rabbit's Foot Mine.*—At the Rabbit's Foot mine in the Gravel Range District, on Silver Creek, 50 miles southwest of Salmon City, in similar volcanic surroundings to those of Parker Mountain, consisting of light colored igneous rocks, principally rhyolite and other acidic lavas, there is another important mining enterprise in progress.



The Rabbit's Foot deposit consists of a great zone of altered rhyolite that has been proven gold bearing for a width of 700 feet. It carries parallel lines of fissuring that are nearly vertical and vary in width from 2 to 6 feet, and contain average gold values of from \$5.00 to \$20.00 per ton, with occasional pockets and streaks of much higher grade material. A sub zone included in this great body of mineralized rock is fully 100 feet wide and has been developed by a crosscut tunnel 1,400 feet in length, with a vertical face depth of 180 feet and connecting with a 10-stamp mill on the property. This sub zone is said to contain gold values all through its width that vary from \$3.00 to \$5.00 per ton and can be very cheaply mined by the "glory hole" method to considerable depth. It will be more extensively developed this winter by drifting and crosscutting, and it is not unlikely that higher average values may be disclosed, and an enterprise may possibly be developed of the same extent and value as the Golden Sunbeam mine in Custer County, of which this deposit appears to be a geological counterpart.

*Singiser Mine.*—Five miles west of the Rabbit's Foot mine the old Singiser mine at Meyer's Cove, owned by the Oregon-Idaho Gold Mining Company, is another interesting deposit of gold and silver bearing silicious milling ore. This deposit consists of a fissured zone of igneous breccia and white quartz that varies from a soft, sandy silicious scinter to a hard chalcedonic structure, with wavy lines of argentite, and a complete analysis by the company is said to show a variety of telluride minerals in the ore as well. This property worked quite a large force of men during the past year, which was largely employed, however, on mill construction and surface improvement. The mine is opened by an inclined shaft 300 feet deep, from which 4 levels have been run, exposing a pay streak several feet wide in places, that carries average values of from \$8.00 to \$12.00 per ton in gold and silver, as it is mined in bulk. The best ore is a very hard chalcedonic quartz, from which selected samples showing strong lines of argentite can be taken that run into high values. Extensive bodies of soft, sugary quartz occur in the levels; these, however, are rather low

grade. The ore is difficult to treat and a good deal of money has been spent in experimenting with different milling methods. The present plant, completed last fall, is of 50 tons daily capacity and consists of 6 Hendy quadruple discharge stamps in separate mortars, and 2 Bryan mills for fine grinding. Below this is a cyanide plant, in which agitation is employed, and 75 per cent of the values are said to be extracted in about 6 hours treatment. Ahead of the crushing plant there is a brick-constructed gravity roaster with which to roast the quartz before going to the stamp, to facilitate its crushing and subsequent treatment. Owing to faulty design of the roasting plant the whole mill was out of commission during my visit late last fall. This feature of the process can probably be adjusted and the mine should enter the producing list another season. In the meantime, the company is extending the development of the mine and will run a new level during this winter from the bottom of the shaft for the purpose of increasing the ore reserves.

*Yellow Jacket District.*—This old district experienced a rather dull season and very little new development of importance was recorded there.

*Blackbird Copper District.*—This extensive copper district also continues dull, principally from lack of railway transportation. It has some extensive deposits of concentrating copper ore, carrying proportionately high grade gold values and associated with rich shoots of cobalt sulphide ore. Some of the most extensive bodies of cobalt ore in the United States occur in this field, and if metallurgical science develops a market for this class of mineral, this should ultimately become a prosperous camp.

*Leesburg District.*—This old placer district, situated 15 miles west of Salmon City, continues to receive considerable attention in the way of lode mining development, and while progress is slow, the results obtaining are of a very interesting nature.

*Thompson & Hibbs Mines.*—At the Thompson & Hibbs mine on Arnett Creek a zone of gold bearing granite 60 feet wide was operated with a small force of men, and a practical mill run made during the year. This great body of mineral is said to average from \$4.00 to \$6.00

per ton, and the milling test, recently made, to have produced \$3.00 per ton in free gold.

*Gold Ridge Mine.*—Another interesting development in this district is at the Gold Ridge mine, within half a mile of the old town of Leesburg. This property carries an enormous deposit of gold bearing quartz. It has 1,200 feet of tunnel development, exposing a body of kindly looking, milk white quartz about a hundred feet wide in a granite formation, and bounded by one very well defined wall, carrying a thick band of blue talc. This great body of quartz is said to contain average values of \$4.00 per ton in gold. Some of the quartz is richly impregnated with iron pyrites and oxidized honeycomb mineral near the surface, which makes a splendid appearance, and if the average values reported are proven to exist, it should warrant an extensive milling plant and a profitable operation, as the deposit can be very cheaply mined by the "glory hole" method. The property has recently been equipped with a 10-stamp mill and cyanide plant, which is yet hardly completed, but is expected to be in shape for operation by early spring.

There are a number of other interesting gold quartz prospects and mines in the Leesburg Basin country that warrant the attention of investors. Nine miles north of Leesburg, on Moose Creek, the Mullan dredge on the old McNutt diggings, was successfully operated during the past season, and made a considerable output of precious bullion.

*The U. P. Mine.*—Just over the crest of the Leesburg range, within 9 miles of Salmon City, the U. P. mine has recently been quite extensively developed and equipped with a 10-stamp mill. This mine is opened on a contact fissure vein in granite walls, which stands nearly vertical and strikes into the bold steep face of a granite mountain, affording exceptional advantages for adit tunnel development, by which method the mine is being opened. This fissure was originally filled with a dike of basic igneous rock, resembling diabase, which has been reduced to schist by subsequent fissuring and movement, and mineralized by gold bearing solutions that now form a vein of ribbony to massive quartz, containing iron oxides and pyrites and good values in free gold, that occur

in defined courses on one or both sides of the dike rock. This vein is exactly of the same type as the Hecla vein at Burke, Idaho, and the Trade Dollar vein at Silver City, Idaho, and unquestionably originated in the same way. The Hecla is a silver-lead deposit, one of the richest in the Coeur d'Alenes, and the Trade Dollar, a high grade silver-gold deposit, with a production of about \$12,000,000 to its credit.

The ore in the U. P. mine is low grade on the average, but in the lower tunnel, connecting with the mill, which is now 800 feet long and has attained a face depth of over 400 feet, occasional patches of massive iron sulphide ore have recently been encountered that carry gold values ranging from 5 to 8 ounces per ton. This richer sulphide mineral is characterized by a bluish cast, probably due to a lead sulphide bloom. The vein is still considerably oxidized at this level, but as the tunnel progresses the sulphide ores are becoming rapidly more manifest, and it is possible that more extensive bodies of this higher grade mineral will be encountered when the zone of oxidation is passed as the tunnel extends under deeper ground.

*The Queen and Crescent Mine.*—This property, situated about 3 miles northeast of the U. P., has been undergoing steady development with a small force of men for several years, and now has a total of 5,000 lineal feet of underground work, which cuts some very large bodies of fair grade milling ore at several hundred feet in depth. It was formerly worked through a shaft and equipped with a 10-stamp mill. The mill is now being removed to a more convenient site below the mouth of the long crosscut tunnel, through which the mine has been opened and drained at considerable depth. The property has an extensive acreage and carries several strong fissures in addition to the main vein and will probably make a considerable addition to the gold output of Lemhi County next season, as late accounts from the mine report a marked improvement in the value of its ore resources in the recent development.

*The Ulysses Mine.*—This property, situated on Indian Creek, 40 miles north of Salmon City, has been operated for several years and has produced a large amount of precious bullion. It is equipped with a 15-stamp free

gold mill and a Leschen gravity tram. The ore body is several hundred feet in length with a flat dip and has been badly faulted, the faulting, however, occurred in definite blocks and was readily figured out. It had the advantage of oxidizing the ore and affording a free milling product, making 85 per cent of the values available to simple plate amalgamation. This oxidized condition, however, has been exhausted and the ore in the present lowest level is quite massive sulphides of iron with a little copper, and while it still retains its values in gold, the mill was shut down early in the summer, in spite of the fact that the property still carries a magnificent body of mineral. As the saving possible with the present milling plant on the sulphide ores was not sufficient to warrant its further operation, and this fact has put one of the principal gold producers of the county out of commission. It is hoped, however, that a means of treating the ore on the ground will be devised, as the Ulysses is looked upon still as one of the most promising resources of gold ore in the county.

*Shoup and Pine Creek.*—The Grunter mine, at Shoup, was operated during the year with a small force of men under option, and important improvements in its extensive ore reserves are reported.

*True Fissure.*—At Pine Creek, the old True Fissure mine has been taken over by a Denver company and considerable new mechanical equipment is under way for the treatment of its ores. This property carries some high grade gold milling and concentrating ore and is likely to be one of the producers of the coming year.

*Gibbonsville.*—At Gibbonsville the extensive group of claims formerly owned by the American Development & Mining Company has been undergoing steady development with a small crew for some time past, together with some cyanide experiments for the better treatment of its ores, which are said to have been very successful. The property carries a series of true fissure veins in a formation of magnesian slate, from which the free and oxidized surface ores have been largely exhausted. In the sulphide horizons of these fissures, however, the characteristic high grade gold values are retained. The property is credited with an output of \$1,500,000 to date, and

with its new development and improved treatment, is likely to again soon enter the producing list. The present company had the misfortune to lose its 30-stamp mill by fire, but it is reported that another plant will be erected shortly.

*Bohannen Creek Placer Bars.*—The rich placer bars of Bohannen Creek, 15 miles east of Salmon, owing to the unusually favorable water season, enjoyed one of the most successful years of their history in the matter of production, and the output would have been still further increased had it not been for the labor famine in the early part of the season, which made it impossible to retain a sufficient crew for a full operation during the best part of the water season.

*Climax Mine.*—Ten miles east of Bohannen Bar, at the head of Pratt Creek, the Climax mine and mill was successfully operated during a part of the year with a considerable force of men. This property is equipped with an air plant and has quite an extensive plan of development on a steep pitching fissure in a formation of ancient sedimentaries and contains some good values in gold.

*Copper Queen.*—At Agency Creek, 30 miles east of Salmon City, the Copper Queen mine has steadily developed during the year and several cars of high grade gold and silver bearing copper ore were shipped, and a good reserve of fine mineral undercut for future treatment. This mine is opened on a true fissure vein with several shoots of high grade bornite copper ore, carrying good values in gold and silver, and is noted for the production of remarkable specimens of coarse, native gold in its clean bornite mineral.

*Junction District.*—This district marks the commencement of Lemhi County's important lead-silver belt, and lies on the east side of Lemhi valley in the vicinity of Junction settlement, about 50 miles southeast of Salmon City, and the same distance west of Red Rock, Montana, the nearest railway shipping point. Its principal ore development is owned by the Junction Mines Company and is known as the Leadville Group, so called from the similarity of its ore occurrence and geological surroundings to the famous Colorado district of that name, with which it has several features in common. The Junction

district proper covers the southwest slope of the main range of the Rocky Mountains, extending from the border of the broad Lemhi valley to the crest of the continental divide, 6 miles further north, and is made up of a series of flat dipping beds and blue carboniferous limestone quartzite and carbonaceous shale with alternating sheets and immense bodies of quartz porphyry, forming defined contacts, with which are found several extensive outcrops of iron and manganese gossens, associated with rich lead carbonate and galena ores that carry proportionately high values in silver and some gold. These contacts can be traced for long distances and at several points have produced carload shipments of high grade smelting mineral. These interesting geological conditions argue favorably for the development of a very important mineral district that is well worth the attention of capitalists and prospectors alike.

*Leadville Mine.*—The Leadville mine is situated at the foot of the range within a few hundred feet of the edge of the Lemhi valley at an elevation of 6,300 feet above sea level. It has been developed through a vertical shaft 117 feet deep, from which 2 levels have been run that are connected with an upraise to an adit level started on the vein at the surface a short distance west of the shaft. These levels are 225 feet and 275 feet long, respectively. They disclose one clearly defined vein wall selvage of red clay, from an inch to a foot or more thick, and the immediate hanging wall above the clay band through most of the development is a glacial or lacustrine drift of lime pebbles, which seems to have replaced the original limestone hanging wall through erosion down to the ore body, and this erosion has probably wasted a large area of the upper horizons of the vein.

The width of the vein, or the true nature of the deposit, is not as yet determined, and it looks as if the body of blue limestone under the clay with its accompanying beds of altered gray, ashy lime gangue carbonate and galena ore, for a width of 80 feet, constitutes a great lode more or less impregnated with lead-silver values through its whole width; at least as far as it has been crosscut good lead values have been found for a distance of 30 feet under the hanging wall clay bands, and it is possible that

the handsome showing of rich mineral, now in sight are diagonal cross courses originating at the underlying quartz-porphyry contact where still larger ore bodies may be disclosed. This feature is a matter to be determined. The virtue of the property in its present state of development rests in the fine ore shoot exposed in all the openings of the mine, that is 150 feet in length, carrying a pay streak of clean galena ore from a few inches to 2 feet in thickness. Immediately under the red clay hanging wall and next to this rich pay streak there is an accompanying course of soft altered gray lime, richly saturated with lead carbonate ore for a width of 4 to 6 feet, which shades into the harder blue lime and shows bunches of rich carbonate mineral for a distance of 30 feet away from the pay streak towards the footwall.

In addition to this handsome shoot of ore, which is proven to the surface by the 3 levels, an additional shoot further east near the end of the drifts is 40 feet long by 1 to 5 feet thick, with a stronger development of rich sulphide mineral.

At the collar of the shaft, at the time of my recent visit to this property, there was 200 tons of high grade mineral piled up ready for shipment, and a carload had already been sent out.

This consisted of separate piles of massive, black steel galena, and clean, high grade gray carbonate of lead of a sandy nature, with a pronounced yellowish stain, due to antimony or lead oxide. I have since learned that the property has marketed 260 tons of ore all told that has yielded an average value of 56 per cent lead and 45 ounces silver and \$2.00 gold per ton.

The shape of the ore bodies in this deposit and their apparent inclination to make away from the hanging wall to the underlying porphyry contact, presents an interesting problem of its future possibilities.

The formation underlying the limestone bed in which the ore occurs is a wide sheet of quartz-porphyry probably 300 feet thick, and at the contact of the porphyry and lime the surface indications, including rich mineral stain and crop-pings of iron oxide together with some rich lead mineral on this same group, are such as to warrant the anticipa-



tion of this lower contact being as important a source of ore bodies as the vein now opened, and probably more so.

The ore deposits, so far disclosed, as well as their enclosing formations, seem to promise to follow the habit and shape of the famous flat lying chambers and shoots of rich mineral mined in the Leadville district of Colorado, and it is not unlikely that under the flat, valley surface the light dip of the vein now disclosed will be still more modified, and very important pools or irregular shaped bodies of rich ore discovered, and as an evidence that this is not a far-fetched suggestion, I would call attention to the great body of high grade sand carbonate ore mined in the Viola, in the same rock series, which was as big and rich in lead and similar in shape and action to several of the noted ore bodies for which the Leadville district was famous, and gave Idaho its first eminence as a lead producing State.

There are several other properties of eminent promise in the district, including some deposits of high grade copper ore. The district has received comparatively little development, as a whole, so far. Shipments of 300-ounce silver ore have formerly been made from the Grizzly Hill mines, a short distance north of the Leadville, and when its important contacts are more thoroughly investigated, it is not unlikely that they will afford some interesting surprises in ore development and become the scene of a number of active and profitable mining operations.

*Gilmore District.*—Twenty miles southwest of Junction, on the opposite side of the valley and near its head, the most productive lead-silver ore district of the county occurs, and extends from the foot to the summit of a bold mountain range made up of limestone quartzite and intrusive dike rocks that reaches elevations of 10,000 to 11,000 feet and along the northeast slope of the range for 10 miles in each direction from the Gilmore postoffice, embracing a score of very promising ore discoveries and prospects.

*Gilmore Mine.*—The Gilmore mine is the principal operation of this district and made an output of 40 cars of high grade lead-silver mineral during the past year, about half of which was crude ore shipped direct from the stopes.

This output could have been doubled had the teams been available to haul it to the railroad, as the ore resources of the mine have developed up in a very handsome manner during the past season's operation.

This property is opened on a nearly vertical fissured zone of altered blue and gray limestone, and carries 2 parallel dikes of diorite at a distance of 200 to 300 feet away from the ore. The development is through a vertical shaft and an adit tunnel. The shaft is 400 feet deep from the adit tunnel, and from it 3 short levels have been run. The last 100 feet of the shaft was sunk during the past year, and the vein has not been cut or drifted on from that point as yet. The total output of the mine during 1907 came from between the 200 and 300 foot levels. At the 300-foot level a flat dipping vein, ranging from 6 inches to 16 feet wide, was opened by a drift a year ago and made a very handsome showing of mineral, from which the larger part of the production during 1907 has been taken. The dip and shape of this ore body was in such contrast to the position of the ore in the levels above as to make the superintendent in charge suspicious that it was not the proper ore channel on which the mine had been previously developed, and in working out his doubts on the subject he picked up a thin, brown iron stained seam in the footwall side of the drift and followed it out a short distance, which resulted in the development of a nearly vertical ore shoot 125 feet long that ranges from 5 to 25 feet wide and averages about 12 feet wide, nearly all clean 35 per cent lead carbonate ore, carrying about 20 ounces of silver and 50 cents gold per ton, with excess of free brown iron oxide. This handsome body of mineral has been raised on through to the next level and remains practically intact, giving such a strong showing to the property in its bottom level as to indicate that a very important resource of ore may be put in sight at a couple of hundred feet of further development in depth, and that the flatter dipping ore course on the third level may simply be a web connecting with another steep pitching parallel ore body in the hanging wall country, as indicated by the diagram of this deposit I published in my annual report of 1904. A short crosscut west in the hanging wall country from the No. 2 and No. 3 levels would readily prove this idea and is well warranted.

Associated with these 2 rich paystreaks the lime is rotted and partly altered to iron and manganese for a width of nearly a hundred feet. The ground is absolutely dry to the present bottom of the shaft and has never produced a bucketful of water in the whole course of its development, which means the formation is open and deeply fissured, and that the desirable oxidized condition of the ore is likely to continue to considerable further depth. The ground is soft and easily worked; it does not swell, and is readily retained by light timbering, which greatly facilitates its development, and the property has the earmarks of becoming a bonanza if given the advantage of a decent equipment and an active campaign of development.

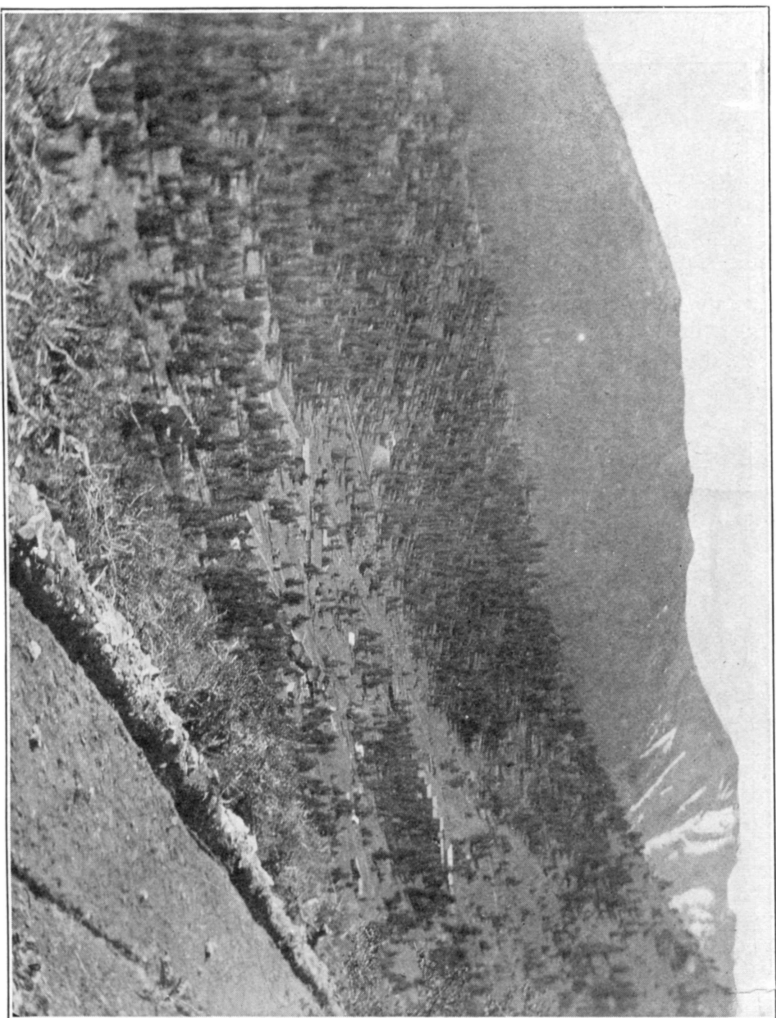
The surface evidences of this rich ore deposit were insignificant in comparison to its present development, and consisted of some float boulders of clean iron oxide ore with occasional pebbles of hard carbonate of lead. There are several other parallel veins on the extensive group of claims owned by this company that make far superior indications of ore at the surface to the body now being worked, and a further extensive development of the property is well warranted and justifies the anticipation of other valuable ore shoots.

The Gilmore Company employed about 35 men when in full operation, but the mine was shut down in October owing to the smelter situation and the unattractive prices of lead and silver.

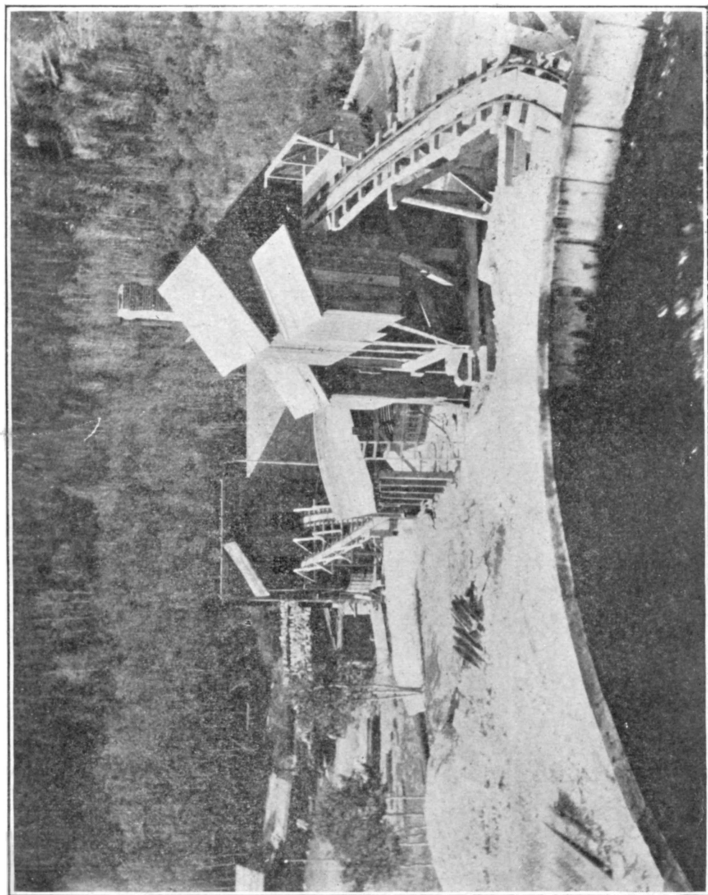
The traction engine haulage enterprise inaugurated by this company in 1906, after getting the road well bridged and otherwise improved at considerable cost, proved a failure, and its use was discontinued during the summer.

The engine, which is of the "Best" company's make, and of 110 H. P., was very successfully handled, and traveled 2,000 miles during the season, back and forth, between the mine and the railroad.

The chief weakness developed in the train was the constant breaking of the axles under the ore wagons. These wagons were all steel, with 4-inch steel axles, and had a capacity of 15 tons of ore each. There were 4 of them in the train and they were loaded with 10 tons each. The constant jar of the load seemed to crystallize the steel in the axles, and they would repeatedly break off at the shank and let down the load.



GILMORE CAMP.



GENERAL VIEW REDUCTION BUILDINGS, INCLUDING 50-TON MILL, MYERS'  
COVE CAMP, IDAHO.

There were no extra wagons, and the train became so badly crippled towards the close of the summer, and involved the loss of so much time to the crew and cost in repairs that this method of hauling had to be abandoned. Railroad transportation to the Gilmore mine should mean that fully half of its expensive ore haulage costs could be added to the profit side of the operation.

*Oriole Mine.*—Adjoining the Gilmore mine to the southeast the Oriole Mining Company is working a force of 10 men on development. This property is traversed by the same system of veins as the Gilmore group and has a number of fine surface indications which are being investigated in an intelligent manner, and it is not unlikely that similar important ore shoots will be found to those now disclosed on the Gilmore mine.

*Lemhi Union Mine.*—Five miles further southeast of these properties the Lemhi Union mine was quite actively developed during the past year, and shipped several carloads of high grade lead-silver ore very similar to that of the Gilmore, carrying still better silver values, together with several dollars per ton in gold and some copper. This mine was recently equipped with a 30-horsepower hoist and nearly all its shipments were made from sinking a shaft on the vein, which is 4 feet wide. This shaft is now down 120 feet, and the vein in this instance occurs at the contact of the limestone with a strong porphyry dike. It has every evidence of permanency and is likely to make a much larger production during the coming year, if metal values warrant. One of the carload shipments from this mine during the past season averaged 71 per cent lead and 48 ounces silver, \$5.00 gold and 4 per cent copper.

*The Bruce-Stone Copper Group.*—Well up towards the summit of the range, reaching to an elevation of over 9,500 feet, the above named property, embracing a large group of claims, carries some immense deposits of copper, gold and silver bearing iron ore, including a great pipe or chimney of solid magnetic oxide of iron that is 100 by 200 feet in surface area, and contains average values of 2 per cent copper, 2 ounces silver, \$1.00 in gold and 60 per cent iron. It is accompanied by an immense stock of eruptive diorite in a general formation of quartzite and

marbelized limestone. Branching dikes of diorite shoot out into the limestone beds and carry some rich impregnations along their borders of bornite copper mineral, containing high assay values in copper, gold and silver.

On the Tempest claim of this group a tunnel of considerable length has been run on a smaller body of brown limonite iron, containing rich brown jaspery copper oxide ore, and green carbonate. From this development a car-load shipment was made that yielded 10 per cent copper, \$8.00 in gold and 5 ounces silver per ton. This property is so situated as to afford a magnificent crosscut tunnel advantage, where a tunnel a thousand feet in length would gain a thousand feet of face depth under the principal ore croppings and affords a remarkable natural advantage for the extensive development of these great surface showings of mineral. The conditions exhibited at this property are almost identical with those at the surface of the White Knob mine at Mackay in Custer County, which has produced such important results in copper matte and bullion during the past two years.

*Spring Mountain Mines.*—Continuing southeast from this group to the head of Spring Mountain Gulch, 2 miles distant, considerable prospecting and development work was done during the past year on the Clark and Oakley mines, the Red Bird and several other properties, where handsome disclosures were made in both lead-silver and copper ores. These properties are all situated at a distance of from 70 to 85 miles from their most available point of railway transportation, involving an expensive wagon haul, which has greatly retarded their development. Their ore showings, however, are of such a nature as to attract the attention of smelter people, and a company has recently been formed, backed by St. Louis capital, to build a custom smelter of at least 100 tons daily capacity for this district.

*Nicolia District.*—Spring Mountain Gulch empties into the head of Birch Creek valley, a tributary of the Snake River basin. This is a broad, open valley, similar to the upper Lemhi, and it is bordered on the northeast, opposite the Gilmore Mountains, by a bold spur of the main Rocky Mountains range, where, at a distance of 15 miles across the valley from Spring Mountain, and at an ele-

vation of between 8,000 and 9,000 feet, the old Viola bonanza occurs. This property was extensively operated in the '80's and made a production of lead and silver conservatively estimated at \$5,000,000 in value. It carried a flat dipping ore body 1,100 feet long of irregular shape that varied from a foot to 70 feet thick enveloped in an immense body of soft brown iron; the lead ore consisted almost exclusively of sand carbonate. This great ore shoot was cut off by a fault and has never been recovered. The property, unfortunately, fell into indifferent hands and has remained idle for a number of years. It is situated near a defined contact of massive quartzite and shaly blue limestone. This contact can be traced along the mountain slope for miles and carries a number of other great iron blossoms associated with some lead at the surface, that warrant extensive development.

Five miles northwest of the Viola some well known and successful Utah operators, including Mr. J. D. Wood and Colonel Wall, are running a long crosscut tunnel to develop one of these deposits at considerable depth, and 8 miles southeast of the Viola, on the same contact, a company of prominent Coeur d'Alene operators are developing another important display of iron and lead mineral under option. This latter property embraces a large group of claims, on which 1,600 feet of tunnel work has been accomplished during the past year with a force of from 6 to 10 men. The main feature of this development is a crosscut tunnel 300 feet long, which taps a body of iron mineral at a depth of a hundred feet, and from that point a drift has been extended near the quartzite footwall for 600 feet, with several crosscuts out into the iron body, which has proven at one point to be fully 100 feet wide, of clean iron mineral, varying from a soft, spongy brown gossen to a hard, brick red and liver colored jaspery iron and vuggey drybone. Several streaks of clean sand carbonate of lead have been encountered, a character of ore identical with that produced by the Viola, and it is anticipated that some such extensive and important body of lead mineral will be found associated with this immense iron ore body with further work, as the property carries several handsome showings of lead at the surface. One of these, developed by a shaft 70 feet deep, is from



2 to 5 feet wide and averages 10 to 20 per cent lead with big kidneys of 60 per cent lead ore, together with good values in silver and gold. The main tunnel on this property is closely approaching a point under this best lead showing at a depth of 325 feet, and important results are anticipated in the near future.

*Railway Prospects.*—Lemhi County's rich resources of smelting ore have always been hampered and their development retarded by lack of railway transportation. Salmon City, the county seat of this county, is situated at the junction of the Salmon and Lemhi rivers and comprises an up to date and enterprising community with all the modern conveniences of a city of considerable size, except a railroad. Its citizens are feeling very much encouraged, however, at the prospect of railway connection with the outside world. A large corps of engineers have been steadily employed for over a year, and are reported to have spent fully a hundred thousand dollars surveying lines across the main range through the Lemhi and Junction passes, from Armstead near Dillon, on the Oregon Short Line, into the Lemhi valley. They are said to have found grades of from 1 to  $1\frac{1}{2}$  per cent over this great continental barrier, and have terminated their survey for the present at Salmon City, but it is understood that the work is to be carried on down the Salmon River canyon, which affords one of the most natural avenues for an east and west continental line that is left unoccupied in the northwest, and if constructed through this route, such a road would traverse one of the largest undeveloped areas in the United States that is rich in mineral and other natural resources. It would seem that the present move must be backed by one of the big railway companies to warrant such an expensive survey and investigation.

A branch survey line has been run from one of these routes into the Lemhi valley up to the Gilmore district at its head, which also traverses the Junction District, and its construction would be a great boon to those important sources of smelting ore, which would doubtless afford a heavy traffic, and they practically require railway transportation for their successful operation.

*The King Coal Mine.*—The Salmon and Lemhi rivers traverse an intermountain basin that has been the scene

of a land locked tertiary lake, and is now graded up with horizontal or flat dipping sandstone, shale, clay and marl deposits, capped with quaternary gravels and soil, and entirely surrounded and underlaid by altered crystalline metamorphosed formations, including granite. Near the base of these unaltered formations, 2 miles west of Salmon City, at the mouth of Jesse Creek canyon, an important deposit of lignite coal occurs, which, with its included bands of sandy bone, is 15 to 20 feet thick. It carries one seam, however, that is almost free from bone, for a width of fully 5 feet, that affords a splendid resource of domestic fuel. The property has been worked in a desultory fashion for several years, until the past summer, when it was purchased by Mr. H. C. King, an enterprising banker of Salmon, who has put it into the hands of a well known practical operator and undertaken its development on modern lines. In fact, the property has been producing profitable results for several months past and has proven a boon to the citizens of Salmon, where its product is mostly marketed, as the cost of cord wood fuel at that point has recently been raised to almost prohibitory prices. The clean lump coal from this property is sold at \$6.00 per ton, at which figure it finds a ready market and affords a handsome profit for mining, and the new development accomplished by the present management has greatly enhanced the value of the mine. While no analysis of the recent showing is available, the following result will indicate the character of the fuel. This analysis is a copy of a sample that was tested a couple of years ago and what width of seam it represents I am not advised. It ran as follows:

Moisture .....	16.12 per cent
Volatile Combustible Matter .....	38.03 per cent
Fixed Carbon .....	39.27 per cent
Ash .....	5.51 per cent
Sulphur .....	1.07 per cent
<hr/>	
100.00 per cent	

This mine has produced a thousand tons of coal during the past year. The main entry is 500 feet long, started and run on the vein all the way, and the development is being shaped up for operation on the long wall system.

The surface equipment consists of a tippie and bin with double beam Fairbanks wagon scales, screens for cleaning and classifying the coal into different sizes, and an adjustable sorting bench for picking out waste. The entry is equipped with 16 pound rails, set at 36-inch gauge, and standard coal mine cars with 16-inch wheels, and the operation is connected by telephone to Salmon City.

It is situated near the mouth of Jesse Creek canyon at an elevation of 500 feet above Salmon and 4,540 feet above sea level. The property embraces several hundred acres of smooth, patented ranch land, covering the best part of the Jesse Creek bench or plateau, and is probably largely underlaid with coal. The vein has a dip of 30 degrees towards the valley, but may flatten as it approaches it. A drill hole half way between the mine and town on the ranch, put down a few hundred feet, would have the double advantage of testing the continuity of the coal towards the valley and would possibly tap a good flow of artesian water, which would greatly enhance the value of the ranch land. It is possible that the artesian basin is already tapped by the erosion of the sedimentary formations north of Jesse Creek, or by a series of north and south check faults exhibited in the mine. However, this feature of testing the coal is well warranted by the double object aimed at. It is evident from the numerous other coal blossoms found around the borders of the Salmon basin at about the same elevation that the whole basin is underlaid with this coal measure. At no place, however, has the same thickness of clean coal been found, so far, as at the King property, and it is likely that over the central part of the basin the coal measure is represented by some thinner croppings of coal blossom in the nearly vertical bluffs that border the Salmon River for several miles north of Salmon City. These bluffs are made up of the same sedimentary formations and lie nearly horizontal, excepting some local disturbances, and the present dip of the coal vein and its inclosing beds of sandstone and shale, of about 30 degrees towards the valley, probably represents the gradual elevation of the Leesburg range during tertiary times.

The nature of this deposit and its accompanying fossils makes it manifest that it is due to an accumulation

of negative matter in the bed of a marshy lake of early tertiary date, and it is likely that the marginal areas of the lake and its protected coves and estuaries were more favored by the accumulation of vegetable matter than its central area, and this accounts for the thickest and cleanest accumulation of coal nearest the mountains.

The depth of these unaltered tertiary sediments should be governed by the elevation of the narrow outlet of the basin just below the old McNutt ranch, 11 miles north of Salmon City, where the solid underlying formations outcrop conspicuously at the river level. On the other hand, the central part of the basin may fill an orogenic sink, in which event the depth of the sedimentaries is problematical and the artesian chances enhanced.

South of the King coal mine, about 2 miles in the direction of Mud Lake, there are some conspicuous cones and flows of brown andesite lava that are probably of more recent date than the coal formations, and may have sent out intruding sills of molten rock into the sedimentary beds. If such an intrusion was injected under the coal seam and within moderate distance of it, say 50 feet or so, it would have the effect of dispelling the moisture and other volatile elements, and greatly enhancing its fuel value, probably to a semi-anthracite condition. On the other hand, if such a hot intrusion was injected too close to the coal seam, the result produced would be a bed of ashes or of worthless, dirty coke.

A miniature example of the genesis of these coal deposits is afforded a mile southeast of Salmon City at the Bismark and Edwards frog ranches where patches of sub-irrigated bottom land have resulted in marshy areas that support a dense growth of cattail rushes and other water plants whose undisturbed annual growth and decay is resulting in pronounced beds of peat, which, with sufficient time and subsequent sedimentation, would be transformed into lignite coal.

The climate of this region at the time the King coal beds were deposited was humid and probably not unlike that of southwestern Oregon and the country was densely timbered with giant cedars or redwoods as evidenced by the leaf fossils of these species so plentifully preserved in the adjacent shale beds and by the monster stumps and trunks

of the original trees up to 40 feet in circumference which may be observed at the petrified forest in Custer County 3 miles east of the Bayhorse bridge where they were preserved and silicified by a flow of lava mud and since exposed by erosion.

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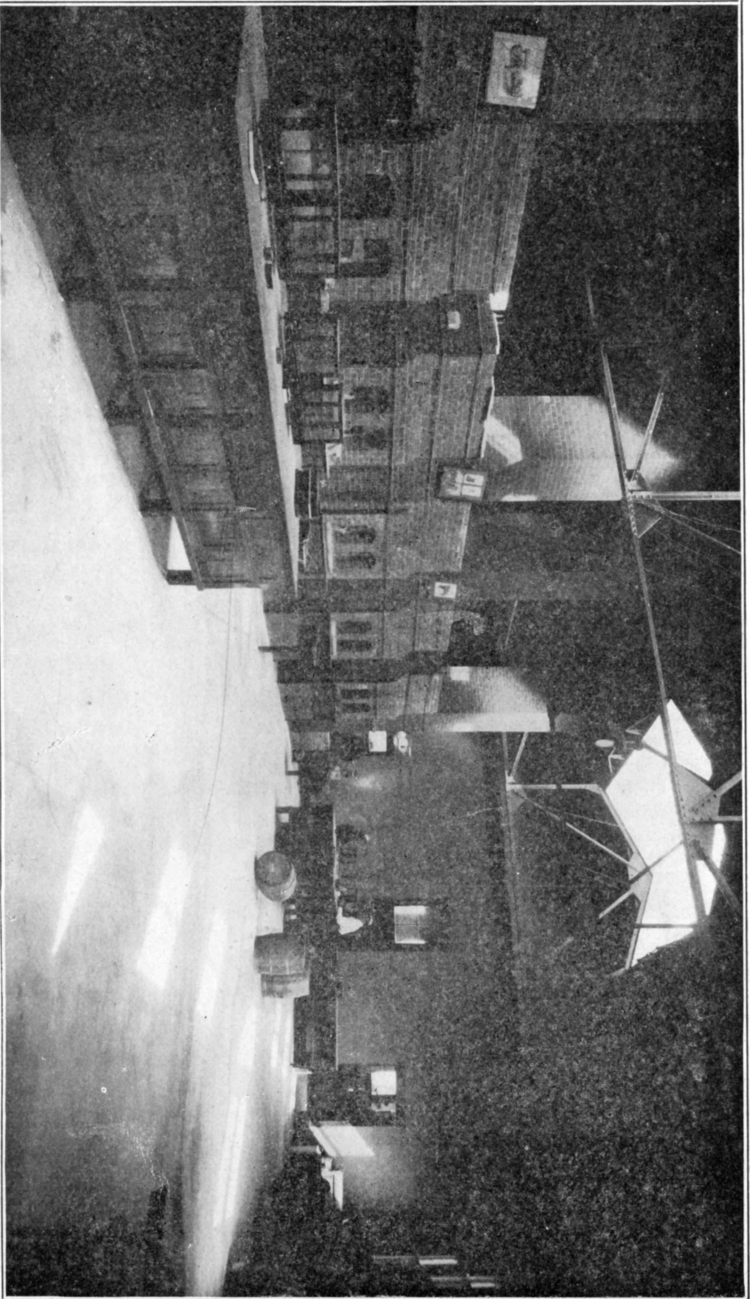
## LATAH COUNTY

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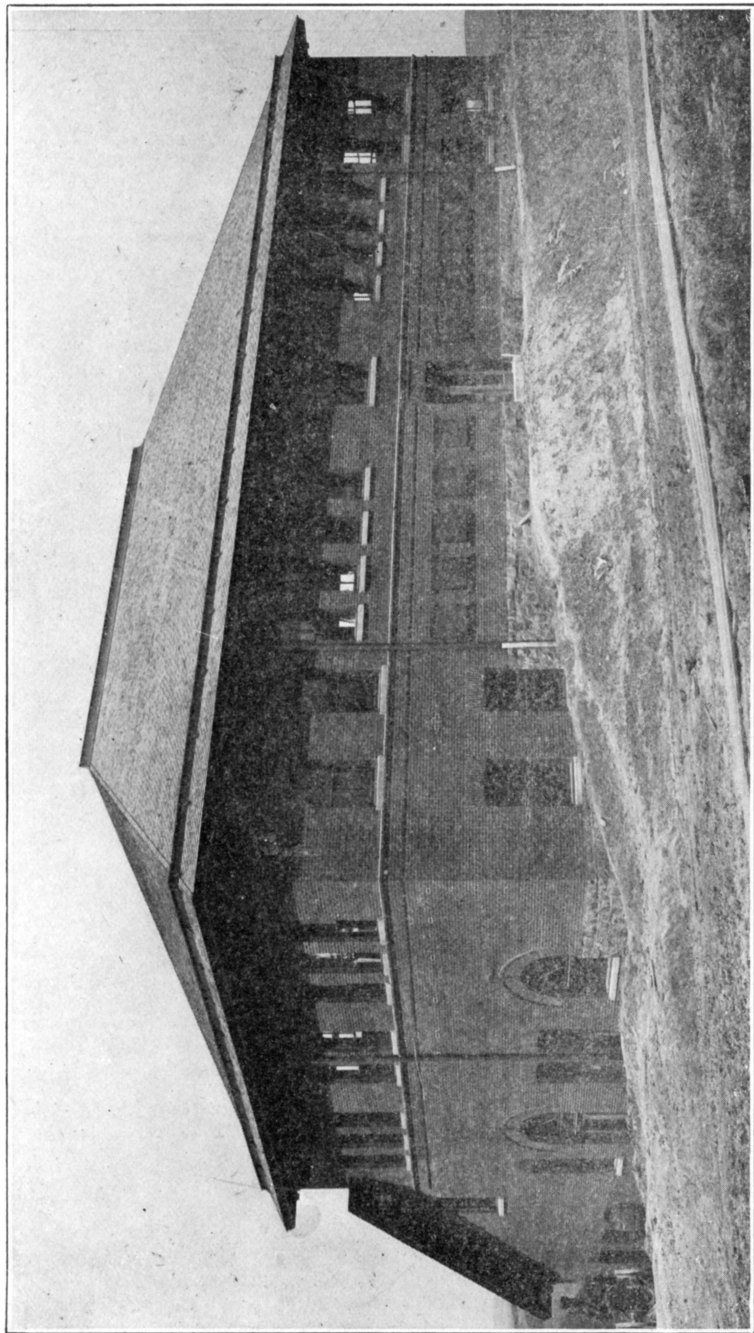
Latah County bears an important relation to the mineral industry of Idaho by reason of its annual production of a good crop of young mining engineers from the Department of Mining and Metallurgy of the University of Idaho, situated at Moscow, its county seat. This institution has turned out some bright young men who have already attained high rank in the practical mining affairs of the State, especially in the Coeur d'Alene District, where several of them are filling important and remunerative positions.

This institution is efficiently supervised by Mr. Byron E. Janes, under whose direction the new mining building and metallurgical laboratory has recently been equipped with a complete plant of practical testing machinery for testing all kinds of ores, where Idaho operators may send working samples and have treatment tests made for the best method adapted to their reduction, at a very nominal charge.

This mining school now embraces a magnificent collection of classified minerals, a splendid library of well selected technical literature, and the metallurgical laboratory, an interesting array of up to date mechanical equipment, including a small stamp mill with copper plates for amalgamation, and a small cyanide plant and tube mill to provide for sands and slime treatment. For



INTERIOR ASSAY LABORATORY, MINING DEPARTMENT, UNIVERSITY OF IDAHO AT MOSCOW.



NEW METALLURGICAL BUILDING, MINING DEPARTMENT, UNIVERSITY OF IDAHO.

concentration tests there are Hartz jigs and a variety of other modern separating devices, which will be added to as funds are available. The plant also embraces a complete assaying department and chemical laboratory for analytical work. Some additional equipment is still needed, but the institution is now in shape to produce important testing results and should prove of valuable assistance to the miners of the State in the practical determination of the best method of treating their ores, as well as providing instructive lessons in this important branch of the mining industry to the students.

Latah County contains some very interesting deposits of commercial mica, the development of which, however, has been somewhat retarded by conflicting interests in the ownership of some of the choicest deposits.

These deposits contain some remarkably perfect specimens of the varied crystal forms which usually accompany mica deposits, and a very interesting collection of these have been made by Mr. James' associate in the geological department of the school, Mr. De Lury. This work will be followed out with a view of exchanging for other desirable specimens from other collections. It is a move that should result in valuable additions to the present important collection of the institution, as the Latah crystals in their class are not excelled in perfection anywhere in the world.

This county carries a number of interesting deposits of placer gold and some copper and gold bearing ore, which have been developed to a limited extent at several points.

The placers of the Hoodoo District have made quite an important total yield since their discovery, and it is believed by some people that the district would afford good areas of dredging ground if properly tested.

The property of the Garfield Mining and Milling Company, situated in the Blackfoot Mining District of this county, has quite an extensive development of a good size fissure vein in walls of diorite and granite, containing good values in gold and silver bearing copper ore. This property is opened through a vertical, 2-compartment shaft, 300 feet deep, and has a total of 1,000 lineal feet of development, of which 250 feet were run during 1907.



It is equipped with a 20 H. P. hoist and 4-drill air compressor, and a pumping plant of 150 gallons capacity per minute on a 300-foot lift. It employed a force of 10 men during a part of 1907, under the management of Mr. Al Burns. The principal office of the company is located at Garfield, Washington, and Mr. William Dulin is president and Mr. A. P. Johnson secretary and treasurer.

The Mizpah, Copper King and Copper Butte mines, a short distance from the Hoodoo placers, are other copper properties on which considerable development work has been done. They carry a variety of copper ores and contain some high values in the red metal. Their enclosing formations consist of schist associated with intrusive dike rocks and are favorable for the occurrence of commercial bodies of copper ore.

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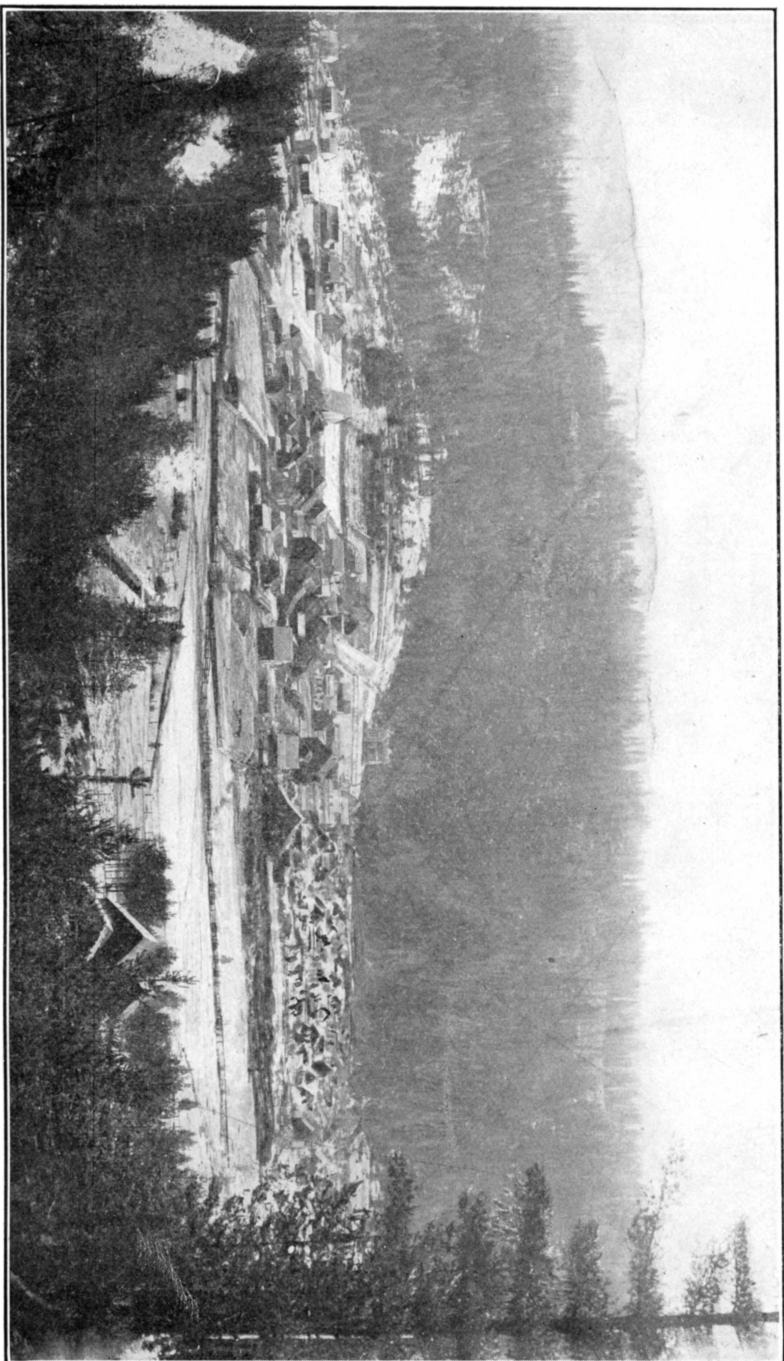
## NEZ PERCE COUNTY

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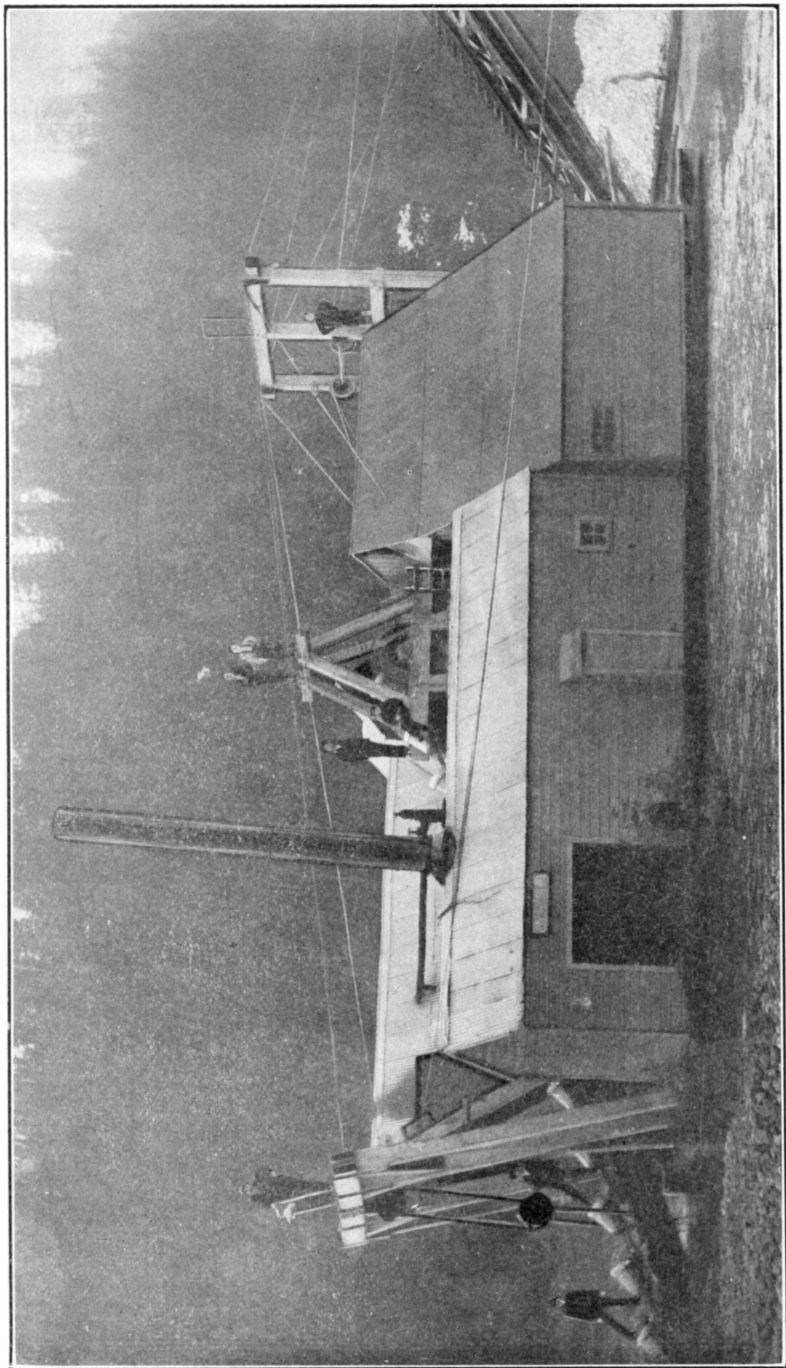
*Pierce City District.*—Pierce City District, the birthplace of the Idaho placer mining industry, whose beautiful situation and surroundings are illustrated in the accompanying half-tone cut, continues to be the principal source of precious metal production in Nez Perce County, and its extensive areas of good average-valued placer deposit to be the principal source of the gold produced.

Considerable development work has also been in progress during the year on its numerous gold bearing quartz veins that is destined to materialize in the added output of gold in the near future.

*Ruble Elevator.*—Pierce is again adding laurels to its history of originality by being the first camp in Idaho to try out a new invention applied to placer mining, known as the Ruble grizzly elevator,—a simple and most efficient device for stacking boulder tailings and operating



PIERCE CITY, THE BIRTHPLACE OF IDAHO PLACER MINING HISTORY.



CHAIN ELEVATOR DREDGE, IDAHO COMPANY, LTD., NEAR PIERCE CITY.

flat placer ground, invented and built by the Ruble Bros. of Golden, Oregon. This device is said to cut the cost in two in elevator work, as compared with the tubular type of elevator.

The first machine of this type to be installed in Idaho was put in in 1906, at the American placer mine, and gave excellent satisfaction. It has been operated steadily throughout the past season on this property under the management of Mr. James M. Porter, a well known mining engineer of Northern Idaho, and with such satisfactory results that a second machine has been ordered and material for it gotten on the ground ready to be put together for next spring's operation.

This device is simply an inclined grizzly floored sluice elevator with under current devices attached in one machine and is especially designed to work in flat placers and will handle rock several times as large as can be put through a tubular elevator with the same volume of water. It is such a pronounced improvement over other methods as to attract immediate attention and appreciation of hydraulic miners, and has been installed on several other North Idaho properties. One of these is the Gold Dollar mine, also the property of George Freedman, on Slate Creek, and of J. P. Harland, of Breakfast Creek, of the Pierce District, and the Elk Trail mine in the Elk City District, have already been equipped with these devices.

Mr. Porter advises the installation of a pair of these machines so that one can be moved ahead while the other is in operation, and in that way no time is lost. The accompanying cut shows the device in operation and the results.

Full descriptive literature on the practical application of this device can be had on application to the inventors.

Speaking of his experience during the past season, Mr. Porter says that his water supply averaged sufficiently to give him one pipe head of 110 feet with a 4-inch nozzle. The two streams shown playing in the picture were only in use during a short period of high water. With one pipe of that capacity handling heavy gravel and elevating the rocks to a height of 20 feet, which includes boulders occasionally that measure up to 32x18x16 inches, his operating costs amounted to about 7 cents per cubic yard

and he was able to put through 16 to 20 cubic yards of ground per hour that averages about 20 cents gold per cubic yard in value.

The force employed on this operation was 2 pipe men, 1 foreman and 2 laborers. One pipe man at night attends to all the work, the laborers working on the day shift only. The laborers moved the field giant when necessary, assisted in moving and resetting the elevator, cut and burned brush, and made themselves generally useful.

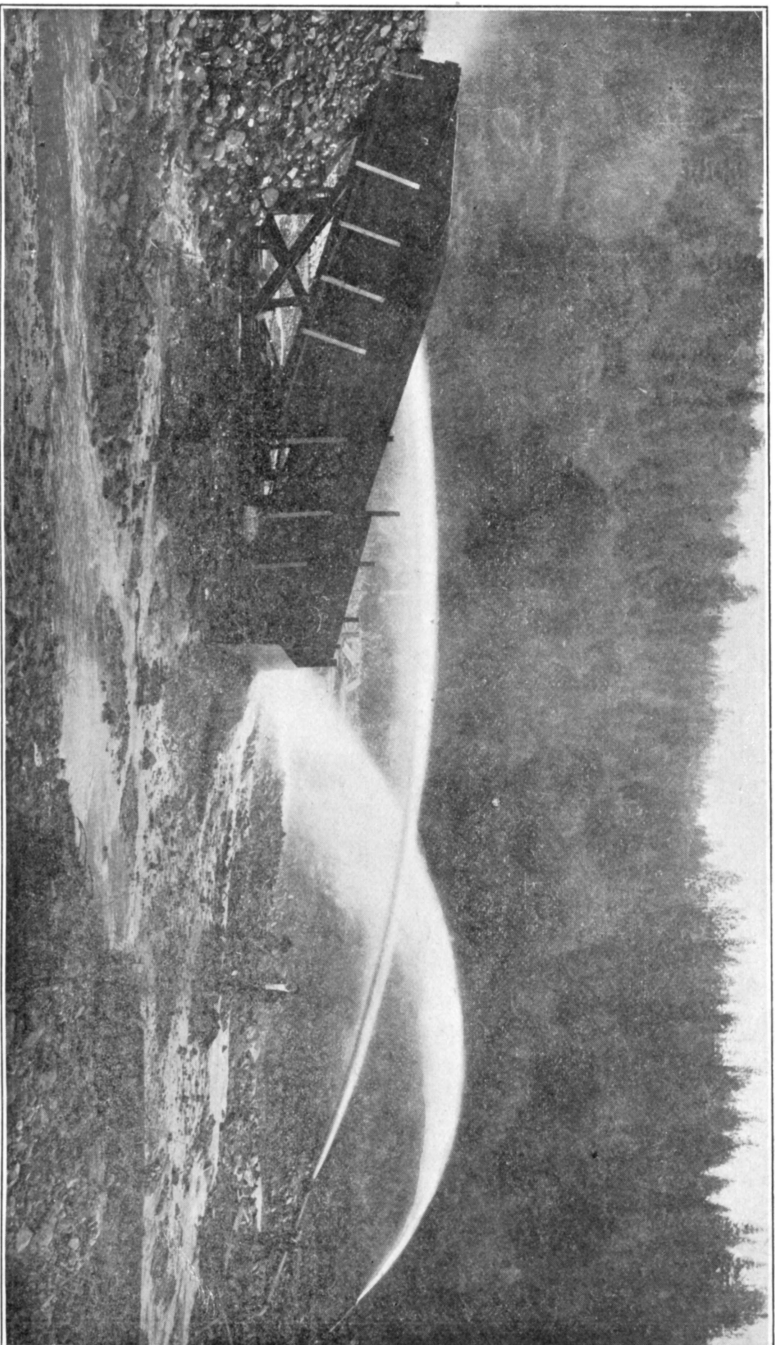
With 2 elevators he says one can be operated while the other can be moved and reset, thus keeping the water constantly employed and resulting in greater efficiency and lower cost.

*Idaho Dredge Company.*—The Idaho Company's dredge, which consists of a  $3\frac{1}{4}$ -foot bucket chain elevator machine, as shown in an accompanying plate, had a very successful season in 1907, and made a handsome yield of precious bullion, so much so that the company has decided to put in another and a larger dredge, as their ground is quite extensive, and has been recently added to by a new purchase. It contains good values and will afford steady diggings for two dredging plants for a term of years.

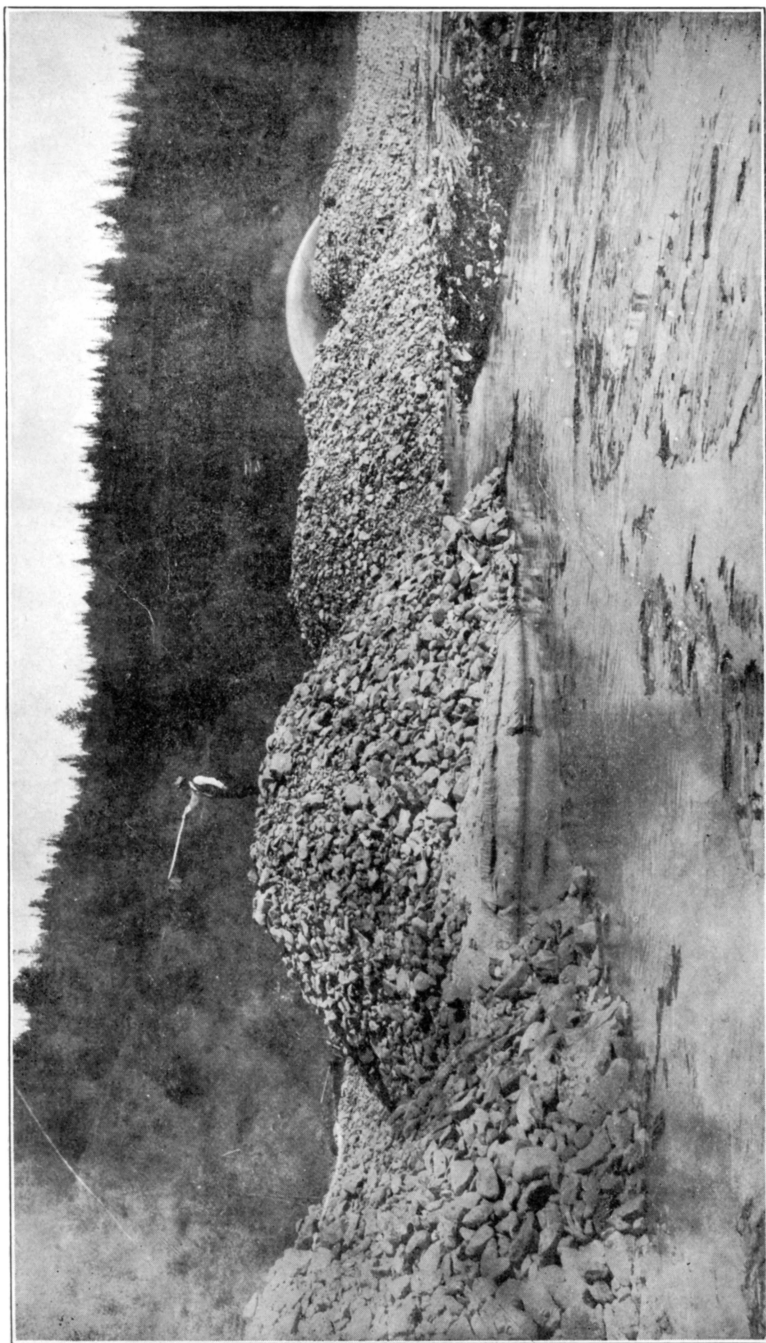
Among the most active quartz mining operations of the Pierce District during the past season the J. I. C. group on Silver Creek received considerable attention from its owners, who disclosed an ore shoot 200 feet long and from 5 to 12 feet wide in which the work reached a depth of 125 feet and the ore gave average values of \$12.00 to \$14.00 per ton in gold.

On the Dream Gulch property, which adjoins the J. I. C. on the northeast, a crosscut tunnel was run that intersected a 22-foot ore body at a depth of 125 feet that contained average values of \$6.50 per ton in gold, and in the same vicinity the Fitz Brothers have drifted 100 feet on ore running from 1 to 6 feet in width and which averages about \$8.00 per ton in gold. These ores are all very free milling, and it is believed can be treated on the ground by straight amalgamation mills and a high proportion of their values extracted.

In addition to the above mentioned properties the Wild Rose and several quartz mining ventures of this district



RUBEL ELEVATOR IN PRACTICAL OPERATION ON FLAT PLACER GROUND NEAR PIERCE CITY.



BOULDER PILES AFTER RUBEL ELEVATOR OPERATION, SHOWING ACCUMULATION OF MATERIAL AT EACH MOVE.

have been quite extensively developed and disclose large bodies of good milling ore with dividend paying streaks of very rich rock in some instances, and the district should soon commence to be heard from in the way of lode gold production, in addition to its important placer output.

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## OWYHEE COUNTY

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Owyhee County, during 1907, enjoyed a prosperous year of mining and milling operations and of new development, and produced precious bullion to the gross value of nearly \$900,000, and starts the new year with the prospect of embracing at least two new producers in its list at an early date.

The two old bonanzas still continue to maintain their remarkable reputation and add additional volume to the millions of dollars of real money they have contributed to the Nation's wealth in the past 15 years and with close management continue to make a decent margin of profit in spite of the enormous investment for plant and the recent rapidly advancing cost of everything that applies to winning ore in this district, in the shape of labor, freight, material, fuel, etc.

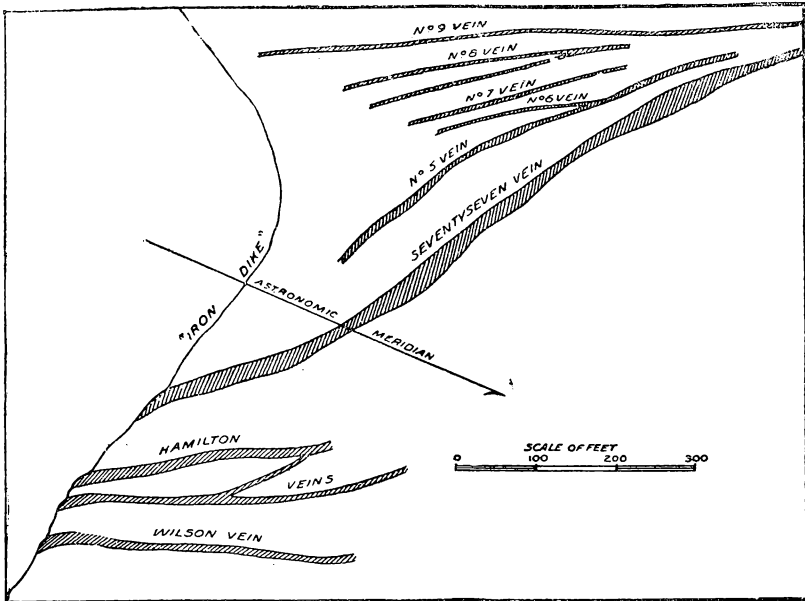
The labor famine during the middle part of the summer threatened seriously for a time to hamper the actual extraction of ore for milling requirements, and development work had to be largely suspended for lack of men to push it. With the changed conditions in the fall, however, men became plentiful and a normal crew at both of the big properties is now employed and the affairs of the companies in full swing.

*The Delamar Mine.*—The DeLamar management a little over a year ago finally succeeded in solving the knotty



problem of separating the pregnant cyanide solution from its slimed ore, and have operated their mill of 100 tons daily capacity steadily throughout the year with very satisfactory results, considering the fact that the recent development in the mine has brought to light strong silver values in the ore and silver in a varying mineral combination that had to be constantly watched and the chemical reaction of the solvent solutions adjusted to recover the maximum amount of values.

During the long period of rebuilding the mill to its present form and experimenting for better methods and



PLAN SHOWING TERMINATION OF FAMOUS BONANZA ORE BODIES OF THE DELAMAR MINE AT CLAY FAULT (IRON DIKE).  
 (From U. S. Geological Survey Report.)

a closer treatment of the ore available, the management pursued the wise policy of maintaining a good strong force on development work in the mine. This policy has been continued with the result that the famous old bonanza now on its ninth million of dollars of production, has a greater number of ore faces in sight at the present time and a bigger tonnage reserve than it ever has had at any one time during its interesting career. It is true that

the average values now being obtained are very much lower than formerly and that the tonnage now represented embraces large reserves of fill material which were left by the earlier operators of the property when the pan process was in vogue and milling charges were about \$16 per ton.

Mr. J. J. Bennett, the mine foreman, who has been with the mine a good deal of the time since its first discovery, has developed quite a scent for finding new ore bodies in the complicated network of veins for which the property is noted, and is able to sweeten up the fill material by a number of smaller new veins of good grade that have exhausted the whole alphabet in giving them names; this brings the working grade up to about \$12.00 or \$14.00 per ton, and a very fine saving of these values, amounting to over 90 per cent of the gold and from 70 per cent to 80 per cent of the silver, is made by straight cyanide work at the mill end of the operation, which treats 100 tons of ore a day, dry weight, a very handsome result when it is considered that fully one-fourth of the gross values are silver. The ore courses are still all confined to the northeast side of the iron dike fault, and the problem of its meaning not yet thoroughly solved, but the ore disclosures in the mine are of such tonnage, together with the fact that fuel costs are becoming prohibitive at that point, has induced the company to put in electric power from the Swan Falls plant to run their machinery with, and the installation is now under way, and when completed is likely to result in a considerable saving of operating costs and be much more satisfactory and reliable.

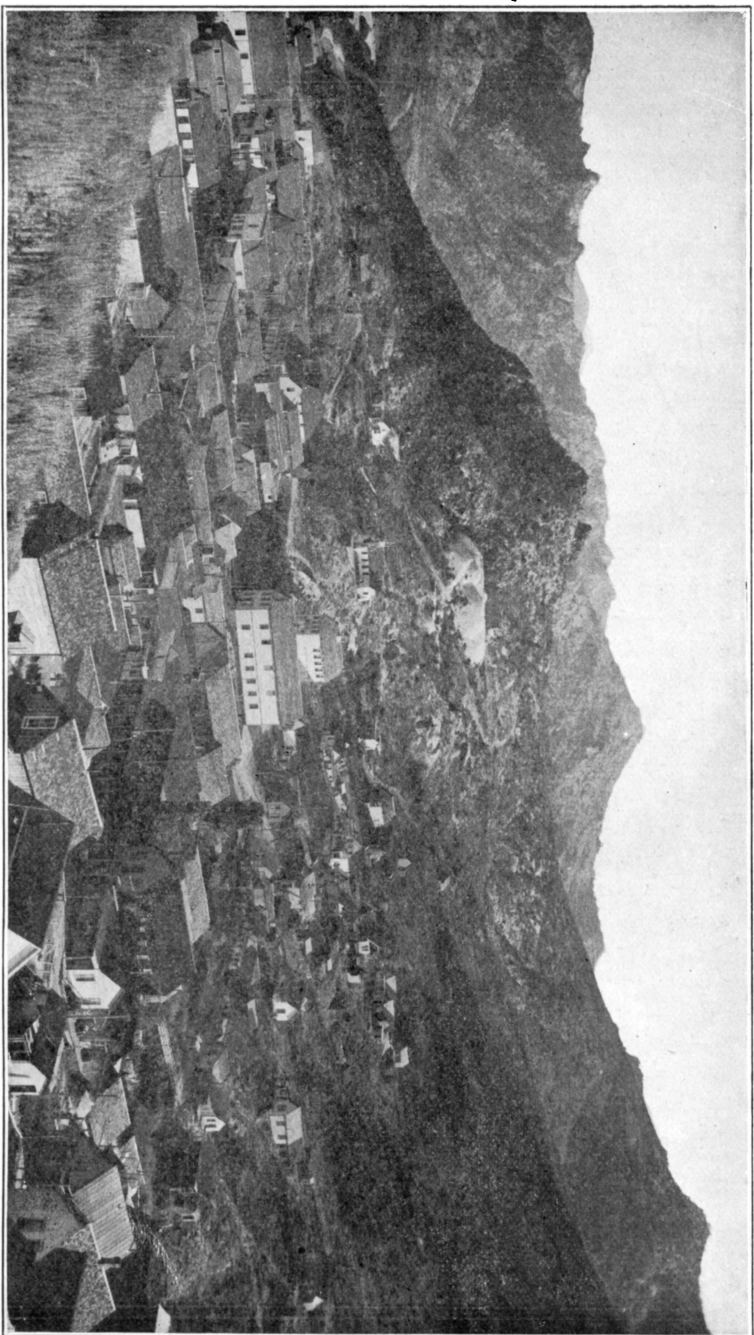
This mine is in a slow swelling formation of altered rhyolite, often reduced to clay, and is a difficult one to keep in shape. The long mill tunnel has been cleaned out and the connection through to the workings above reopened, which greatly improves the ventilation. Some extensive crosscutting work is in progress from the middle horizon of the mine in the direction of the new Sommercamp ore bodies, and it never has been better ventilated nor better conditioned nor had a most lasting future in prospect than at this date.

The company is employing a total force of 200 men and the management is to be congratulated on maintaining

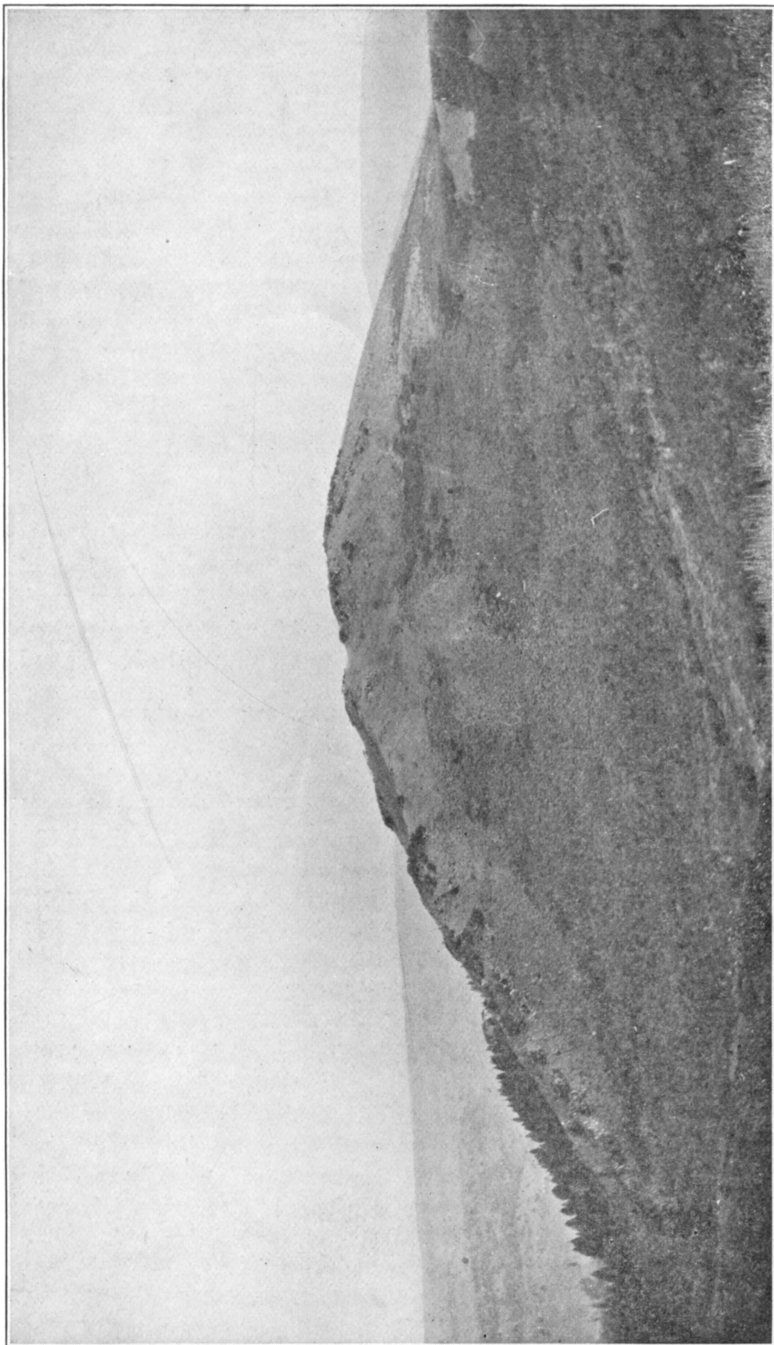
the life and operation of this splendid property with the definite prospect of a continued yield at a decent margin of profit for some time into the future, against some very adverse conditions both underground and on the surface.

*The Trade Dollar Mine.*—The Trade Dollar Mine was kept in steady operation throughout the year and is now carrying a full force of 225, all told. This is one of the most extensively developed and best conditioned mines in the State. It is equipped with a 20-stamp mill that treats about 40 tons of ore a day, of an average grade of something like \$35.00 per ton, of which about one-fourth is gold and three-fourths silver. The method of treatment is by straight concentration on frue vanners and Wilfley tables, which recover about three-fourths of the value in the form of high grade concentrates consisting principally of fine grained chalcopryite and argentite. The tailings are treated in pans and settlers without further grinding, but with the addition of a little steam heat and small doses of salt and blue stone a total recovery of 92 to 93 per cent of the values are made at a total milling cost of \$2.90. The mining costs are high, which is due to the fact that the pay streaks, while rich, are usually narrow and their extraction often involves a lot of tedious sorting work. The ore occurs as a hard chalcadonic white quartz in a nearly vertical fissure vein that traverses the granite formation of Florida Mountain, and two dome shaped caps of basalt and rhyolite and the main vein is constantly accompanied by a narrow dike of black basalt often reduced to a soft slippery clay gangue, which makes close timbering and filling necessary, and often involves the mining of a space from 5 to 10 feet wide to get a foot or so of high grade ore. In other places, of course, the pay is wider, but it is doubtful if the actual profitable ore exceeds a foot in width on the average. If it could be mined cleanly to this width, its value, of course, would be much higher than the mill feed now used, which itself is considerable.

Parallel with this main vein, at a short distance to the south, a small vein in tight hard granite walls of nearly clean white quartz with crustified lines of rich argentite along its frozen wall margins, has been mined through several levels in shoots ranging from 30 to 200 feet in



SILVER CITY, COUNTY SEAT OF OWYHEE COUNTY.



SOUTH MOUNTAIN SUMMIT NEAR SCENE OF RECENT COPPER, GOLD AND SILVER ORE DEVELOPMENT, OWYHEE COUNTY.

length, carrying from 6 to 8 inches of pay and involving the necessity of breaking  $2\frac{1}{2}$  or 3 feet of hard granite and accompanying barren white quartz to get the creamy borders.

The mine has a total of 132,000 lineal feet of development, of which 5,860 feet were run during the past year. This means an extensive amount of tramming and underground handling. The main opening is the Florida Mountain tunnel, connecting with the mill, 11,000 feet long, and still going. This connects with the extensive intermediate levels, nearly all of which are operated at some point through to within a short distance of the crest of the vein, 1,700 feet above, and it is a wonder that the mining costs are held down as low as they are under such conditions. The motive power all through is by electricity from the company's own plant from Swan Falls, without which it would be practically impossible to operate the mine at a profit. As it is, with close, capable management, a margin of about 20 per cent profit is obtained from the operation. The lowest level has not been as productive as some of the middle horizons of the mine, but some small shoots of the characteristic rich ore of the upper levels have been encountered in the Florida Mountain tunnel, which affords a new drainage level to sink from, and the management is hopeful of the remineralization of the fissure below that level, as long shoots of rich ore is being found at nearly the same horizon in the formation on a similar fissure at the Potosi mine near by. The men are well housed and every precaution is taken underground to insure their safety. Miners are paid \$3.25 a day; trammers, \$3.00; cagers, \$3.25; timbermen, \$3.75; motormen, \$3.50; surface laborers, \$3.00; hoisting engineers, \$3.75; electricians, \$4.00; blacksmiths, \$4.00; tool sharpeners, \$3.75; carpenters, \$4.00; millmen, \$3.50; all 8-hour shifts excepting carpenters, who work 9 hours. The company runs 3 boarding houses at convenient points to the main entries of the mine and charge \$1 per day for board.

Electric haulage is used in the main tunnel, and all other power requirements of the enterprise are supplied with electric motive power. Some wood and coal are essential for domestic and limited steam uses in the mill.

Coal costs \$20.00 per ton and wood \$12.00 to \$14.00 per cord of a very poor quality. Lumber costs \$32.00 per thousand, ordinary stull timber 22 cents to 24 cents per foot, and the cost of freight and supplies from the railway to mine is 60 cents per hundred pounds. Seventy-six thousand nine hundred and seventy-five pounds of Hercules powder was used during the year in the mining operation, of which one-third was 60 per cent and two-thirds 40 per cent nitroglycerine. Mr. James M. Guffey is president, Mr. A. W. Mellon is vice president, and Mr. Thos B. McKaig is secretary and treasurer of the company, all of Pittsburg, Pa.

The property is a combination of three mines, including the Trade Dollar, Black Jack and Florida Mountain mines and was taken over by the present manager, Mr. Frederic Irwin, in 1902, as a worked-out proposition, and has since, by a series of bold and venturesome moves in developing old areas of territories that have been passed up as exhausted and extending the big drainage tunnel been made to yield precious bullion to the gross value of something over \$2,500,000, and the property still maintains considerable vitality and the definite prospect of continued productiveness for some time into the future, unless increasing operating costs should continue and crowd the margin of profit too closely.

*The Banner Mine.*—Next to the old bonanzas, the property now attracting the most attention in the Silver City District is that of the Banner Mining & Milling Company, Limited, who have quite an extensive development on a pronounced fissure vein in rhyolite which traverses the company's property for 6,000 feet and parallels the Trade Dollar vein at a distance of about 2,000 feet to the west. This property is now being equipped with a milling plant of 30 tons daily capacity, which is rapidly nearing completion and is expected to be shortly put in commission on the extensive mineral reserves of the Banner mine by early spring. The fissure traversing the extensive group owned by this company is large and well defined, in places 15 to 20 feet between walls, and has been opened by a series of crosscut tunnels to a vertical depth of 400 feet and has a total of 3,700 feet of development, of which 1,544 feet were run during 1907, principally in the form

of drifts along the course of the vein, which traverses the rhyolite formations the same as the upper horizons of the Trade Dollar, and carries several excellent ore shoots containing some of the characteristic minerals of the Trade Dollar vein, conspicuous among which are some beautiful specimens of valencianite, a rare form of chisel pointed felspar crystals for which the Trade Dollar is noted, and has often been quoted in geological literature. This enterprise was promoted by local Silver City people, the leading spirit being its president, Mr. Peter Steele.

As the drifts are carried north on this interesting fissure, it is almost sure to meet the same changes in formation as did the Trade Dollar vein and penetrate the underlying basalt and granite. It is of such strength as to warrant the anticipation of its being continuous entirely through Florida Mountain, as was its famous neighbor, and it is not improbable that its extensive development to the north may reveal bonanza values, as rich ore bodies and placers have been worked on the northwest slope in the direction of its strike. The management expects to be able to deliver a grade of ore ranging from \$20.00 to \$30.00 per ton in value to the mill, and very profitable results are anticipated from the operation.

The mill is adapted for concentration and pan amalgamation like that of the Trade Dollar, and it is expected to make a close saving of the values. It is connected with the mine by a short horizontal and gravity tramway, which, together with its drainage tunnel development, will afford an economical means of ore extraction and transportation. This mill will also be run by electric power supplied by the Trade Dollar Company's plant. The Banner Company's property is situated on Long Gulch, about a mile west of Silver City, and is carrying a total crew at the present time of 80 men, a good many of whom, however, are employed on the mill and surface equipment work. The average crew for the past year has amounted to 24 men, and the extensive footage of underground work has been accomplished at a very reasonable cost, as the vein matter is soft and the walls well defined. The situation of the present lowest tunnel is still 600 feet vertically above the level of the mill and the topography affords a splendid deep tunnel site of no great length from that point.



*Potosi Mine.*—The Potosi mine, situated right within the limits of Silver City, is another very flattering new enterprise that has been undergoing steady development for over a year through a steep inclined shaft sunk on the vein, with 3 levels, the last one at a depth of 300 feet, which is now being opened, and sinking is to be resumed as soon as the drifts are out of the way. This mine was operated in the early days of the camp at a comparatively shallow depth, and produced some shipments of very rich ore. It acquired the unenviable reputation of containing very refractory mineral, but from recent practical milling tests made by the company it would appear that this was unwarranted, as a 50-ton lot was run through a local stamp mill during the past summer that yielded a very high result of extraction, which it is believed from the experience gained can be materially improved.

The drift from the shaft at the 200-foot level is 465 feet long and carries a total of 315 feet of ore shoots that vary from 6 inches to 3 feet in thickness, and carry average values of \$20 to \$50 per ton. The ore is a hard crystalline quartz in granite walls and carries its gold and silver values associated with copper carbonates, oxides and argentite, together with copper in sulphide form. The latter variety is likely to show a marked increase as development in the lower level progresses. This vein carries some small pay streaks of very rich mineral and is reputed to have yielded a 30-ton shipment in its early day operations that netted a thousand dollars a ton.

While not of large size, its high values and extensive distribution of ore along the levels, gives it a very flattering prospect of becoming a permanent and profitable producer. In fact, the ground now opened along the course of the vein carries as large a proportion of fertile ore of similar average grade for the length of its development as does the Trade Dollar near by, and it is not improbable that ore containing the bonanza values above referred to may be again encountered in the property with its further extensive operation.

Besides the Potosi vein, this group carries a small parallel vein known as the Knickerbocker, which has the reputation of turning out some very rich mineral from some shallow surface development.

The Star mine, with a record of bullion production aggregating \$1,000,000, adjoins the Potosi to the north and made its richest ore manifestations right up near the end line of this property, in which direction the development of the Potosi will be pushed by the management, where they have good reason to anticipate very important results.

The Potosi is equipped with a Hendry-Bolthof, 30 horse power electric hoist, carrying a 10 horse power overload reserve that is run by a Westinghouse motor, supplied with current from the Swan Falls plant, and gives excellent satisfaction. The company have material on the ground for a building for the installation of the small milling plant adjacent to the hoist, and are expecting to put in machinery and commence the treatment of their ores during the coming summer.

This mine is employing a force of 12 men and is under the local management of Mr. J. E. Masters. Its new bottom level represents the deepest developed ore horizon in this part of the Silver City District and may prove a valuable indicator and guide to further development at depth in neighboring properties.

*The Metallic Mining Co.*—Another interesting enterprise that was operated with a small force during 1907 in the suburbs of Silver City is that of the Metallic Mining Company, whose property embraces the old Miller & Walters ground. This company purchased one of Colonel Dewey's old tunnel enterprises from the Trade Dollar Company, situated near the head of an extensive old placer pit, a short distance northwest of town. This tunnel was driven in 1,100 feet. Its course has been deflected a few degrees to the north, and, when complete, will cut the vein traversing this property at a depth of 600 feet below the old workings, and 800 feet below the vein apex. This vein is from 3 to 6 feet wide and carries some very fine ore. Several mill runs have been made from it at intermittent periods in the past that have yielded from \$30 to \$60 per ton in 100 ton lots, and the company have good reason to anticipate the development of some valuable ore shoots when the present plan of work is more fully carried out. This property has been noted for the production of native gold specimen rock. Some of the finest specimens ever

found in the district have been derived from its former operations. An electric power plant and air compressor was being installed with which to push the work and rapid progress should be made with this equipment.

*The Perseverance Mine.*—In the Flint District, 5 miles west of the Trade Dollar, some extensive development work has been done on a series of strong fissure veins in the granite formations, of which the main vein of the Perseverance Mining Company is the most extensively developed. It has a crosscut tunnel 800 feet long that taps the main ore course of the group at a depth of 220 feet. This vein is also opened through a shaft a short distance further north, that is 453 feet deep. There is a total of about 5,000 feet of development work on the property, of which 150 feet was run during the past year. This work shows a series of strong parallel fissure veins. The principal vein being operated is 5 to 13 feet wide and is accompanied with an intrusive dike similar to that of the Trade Dollar main vein. The value of the ores of this property run principally in silver and average high, ranging from \$10 to \$30 per ton for milling ore and \$200 to \$400 per ton for shipping ore. The mineral is largely gray copper and antimonial silver minerals in massive white crystalline quartz. The pay is very distinct from the gangue and readily sorted, and it is possible with some of the recent concentration devices, the milling ore can be reduced to a high grade shipping product or treated successfully on the ground, as it is a simple mineral combination that may be made to yield readily to modern methods of treatment. This property embraces a large group of claims covering a series of half a dozen veins, all of which have been proven to contain rich ore. It is equipped with a mill which, however, needs some additional devices and adjustments for the more complete recovery of the ore values. There is a splendid drainage tunnel site on the group, where a crosscut adit 1,800 feet long would tap and drain all the veins of the series at a maximum depth of 500 feet, and with the fine reserve of mineral now in sight, is well warranted and would greatly facilitate the further economical development and extraction of the ore. With this tunnel run and some little additional equipment on the mill and an electric power attachment, there

is no reason why the property with good metallurgical advice should not become a dividend payer.

*The Iva Grace Mine.*—Near the Perseverance, the Iva Grace Mining & Milling Company carry a similar strong vein of the characteristic high grade silver bearing quartz of this district. It has made carload shipments averaging 300 ounces silver per ton and has a carload of mineral of that grade ready for shipment now, but will hold it in the hope of the price of the white metal shortly becoming more attractive.

*South Mountain Mines.*—In my last annual report, I gave an extended review of the South Mountain Company's mines, situated 20 miles southwest of Silver City. This property was operated under option during the greater part of the past year. It had a record of rich lead-silver production, an old smelter site and a considerable slag dump, together with an output of high grade silver-lead bullion amounting to something like \$350,000, made as far back in mining history as 1875, and carries a magnificent array of surface gossan ore deposits from which the lead-silver minerals had been extracted in the form of high grade carbonates from shallow surface workings by the early day operators, and it was anticipated that sulphide bodies of the same class of ore would be found under these gossan croppings.

Owing to the financial panic in October, this enterprise suspended operation. The result of the work put on the property in development, amounting to over \$20,000 in cost, was disappointing in respect to finding the anticipated lead-silver sulphide ore bodies. The surface gossens were also stained with copper carbonates, but that was thought to be only an incidental mineral. As far as the work has gone, however, the reverse has proven to be the case, and while the plan of tunnel development underway was not put through to the coveted point, where one of the big ore bodies was expected to be cut at considerable depth under the biggest gossan showing, there was some other work carried on at another point on the property by sinking on a smaller gossan cropping, which carried its highest values in lead, silver and gold at the surface, and a magnificent shoot of high grade silver-gold bearing copper ore developed.

The ore at this point proved to be a massive chalcopyrite, carrying considerable zinc blend, which, however, occurs in coarse crystals and could be readily concentrated out. The virtue of this copper mineral is the fact that it carries relatively very high precious values in silver and gold. The main ore streak disclosed is 5 feet wide, and a careful average sample across this width at the bottom of the prospect shaft 50 feet deep, yielded an average value of \$70 per ton in gold, silver and copper, while thick bands and masses of very much higher grade ore occurred. This rich copper sulphide ore also contains occasional kidneys of nearly clean steel galena, which, when assayed separately, runs 200 to 300 ounces silver, with considerable gold and high values in lead. This showing, made as it was, on a gossen outcrop that is repeated and far exceeded at several other points along the strike of the lode, certainly affords an attractive showing and indication of a very important tonnage of bonanza smelting mineral. With preliminary concentration, this ore could be matted on the ground and produce a shipping product that would run 40 or 50 per cent copper, and \$200 or \$300 per ton in gold and silver.

The mineral is almost identical in character with that so successfully treated at the Lost Packer mine in Custer County, by hot blast pyritic smelter, where matte worth 50 per cent copper, 10 ounces gold and 70 ounces silver, was made on a grade of ore carrying similar combined values. The Lost Packer ore runs much higher in gold than does the South Mountain ore, but the South Mountain ore runs enough higher in silver to balance up the difference in total precious values. The results so far accomplished by the development at this point are of a very flattering nature, and still afford the definite prospect of the development of an extensive resource of high grade smelting mineral, as this class of copper ore, under such favorable geological conditions as are manifested at this property, can safely be depended upon to go down and may prove to be associated with higher grade varieties of copper ore.

There is a prospect that the venture will be again taken up by the same company and equipped with an air plant and machine drills. Their operation during the past year was hampered by the scarcity of labor and the encounter-

ing of very hard rock in the main development tunnel they were running; but the information gained by the work accomplished makes the problem of proving the property much easier of solution, and its further development is almost sure to be rewarded by the disclosure of dividend paying ore bodies.

Adjoining the South Mountain property to the southeast, the American Standard mine was operated for a few months during 1907 with a force of 4 men, and shipped 14 tons of ore that averaged \$60.93 per ton. It contained 908 ounces silver, 13,645 pounds of lead, and a little gold, and yielded a gross result of \$867.91. This was from a lead carbonate streak in a big body of iron manganese gossien similar to several of the surface showings on the South Mountain property. The American Standard group also has several fine croppings of copper-stained mineral and should prove out some important copper sulphide ore bodies with further development at depth.

*/ Sunnyside Mine.*—The Sunnyside mine, situated a short distance north of DeLamar, was operated during the open part of the season with a force of 7 men. This property is equipped with a 5-stamp mill. It carries a good sized vein of gold ore containing splendid average values and produced several thousand dollars worth of bullion from plate amalgamation of free milling ore gouged from shallow surface development. The ore in this vein changes rapidly to a sulphide condition under the surface, and while maintaining its splendid values below the sulphide horizon, the gold is not as easily recovered by the simple milling plant now on the property as in the surface ore. It carries no very base minerals, however, and with additional equipment can doubtless be successfully treated on the ground, and is likely to become an important source of profit with further development at depth. This property is owned by Mr. F. A. Burgh, and has all the appearance of eventually proving a big winner.

There was considerable active prospecting development work on a number of new and old properties surrounding the Silver City District at Castle Creek and on the northeast slope of the Owyhee range, and in spite of its long and continuous record of high grade ore production, this famous old field seems destined to continue to be a very important source of precious bullion for years to come.

## SHOSHONE COUNTY

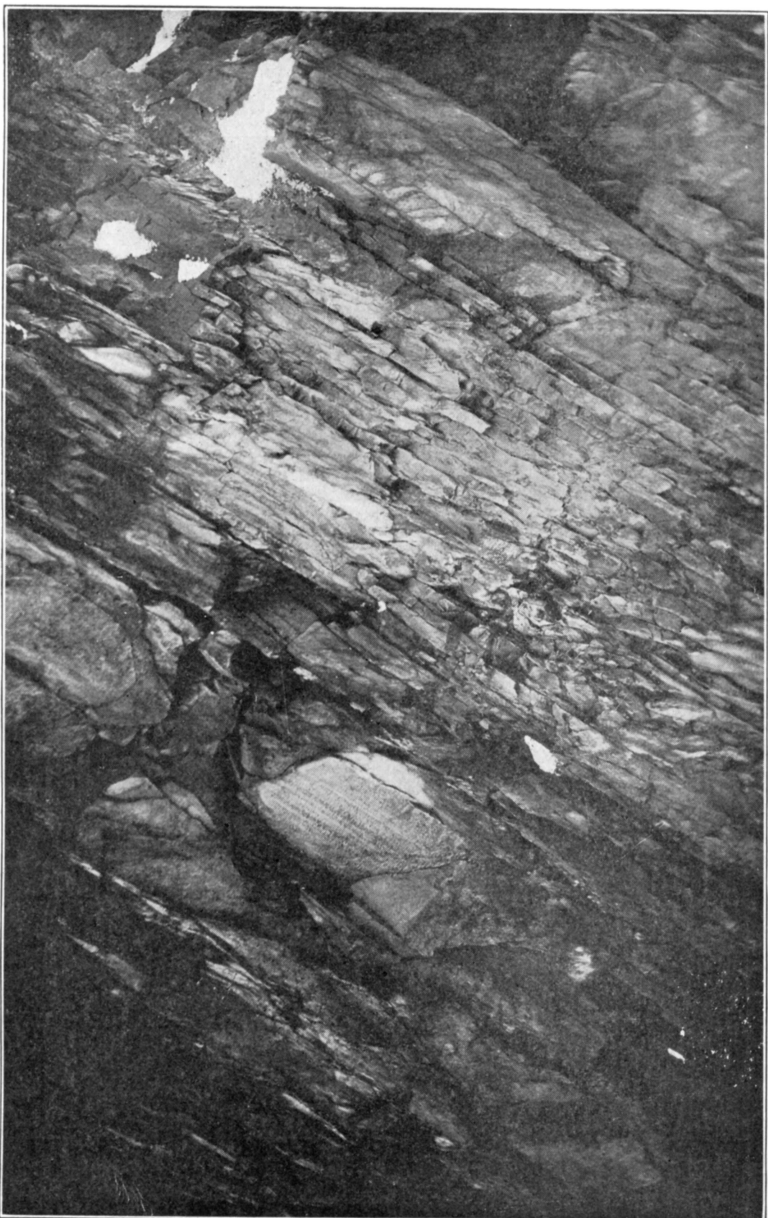
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The total mineral output of Shoshone County, in spite of the car, fuel and labor famine, and the unattractive prices for the metals during the last three months of the year, is only 11 per cent below that of 1906, and if the general panic had not struck the country until the close of the year, another record breaker in production and dividends would have been recorded. As it was, the Coeur d'Alene mines, owing to their size and the proportionately high values in silver and lead they carry, stood the collapse in metal prices a little better than did the eastern lead ore districts, and on a total output of \$19,014,403 in gross mineral value, paid net profits of \$5,600,000, which is a magnificent showing under the adverse circumstances with which the industry was afflicted during the year.

*The Federal Company.*—Of the Federal Company's mines, the Tiger-Poorman at Burke dropped out of the producing list early in the year for lack of developed ore, but a good crew has since been maintained prospecting at the new 2,200-foot level below Canyon Creek, for a continuance of the ore shoot worked above, and at the time of the writer's visit to the mine in December, it was showing encouraging symptoms of coming into the ore body, the position of which was then being closely approached by a drift on the course of the vein 200 feet vertically below the 2,000-foot level, where it had last been worked.

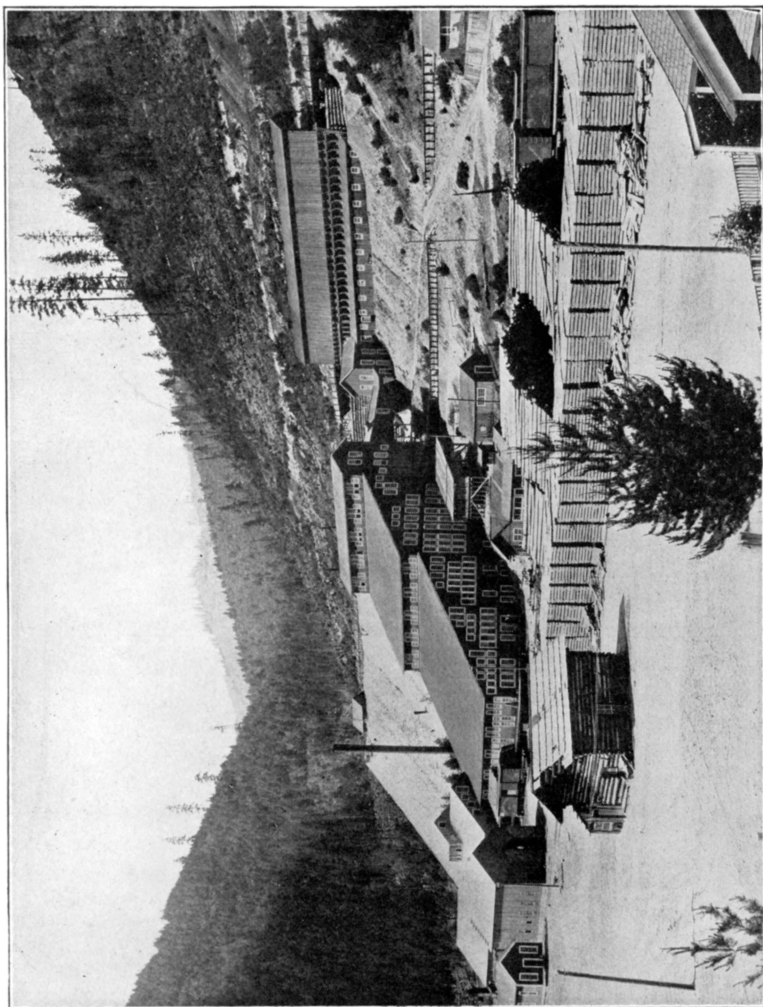
The vein at the present deepest level was found exceedingly well defined and was looking favorable to making ore. At the 2,000-foot level, the ore shoot was not as long as it had formerly been higher up, but it contained as much profit, for the ore was wider, cleaner and higher grade and it will not be surprising if the continuance of the present deep level through the position of the ore shoot mined above should yield another important lift of high grade mineral.

The action of the Federal Company in keeping this mine drained and maintaining a force on its further development at such great depth, which, as a matter of fact, is a critical point of interest to the community at large, is highly commendable and locally very much appreciated.



THIN BEDDED STEEP PITCHING BURKE QUARTZITE, THE MOST POPULAR FORMATION IN  
THE CORTÉZ D'ALAINES FOR LEAD ORE.



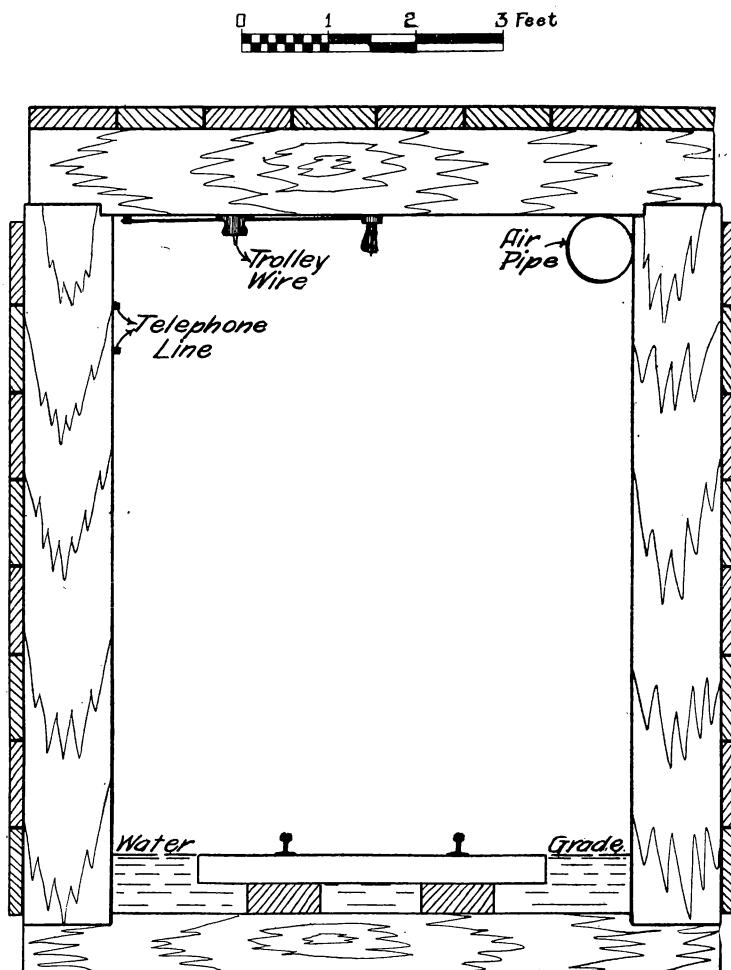


MORNING MILL AT MULLAN, 1000 TONS DAILY CAPACITY, AND DUMP OF NO. 6 TWO-MILE CROSS-CUT TUNNEL, SHOSHONE COUNTY.

The neighboring Hecla mine is showing such wonderful strength less than half the present depth of the Tiger-Poorman as to make the symptoms now being displayed of a further continuance of its ore bodies, very encouraging and it is sincerely to be hoped that the Federal Company will be rewarded by cutting the old ore shoot in a rich paying condition for their present efforts.

*Morning Mine.*—With the slump in lead, the famous Morning mine at Mullan was closed down early in the fall. This is a self-drained property opened at a depth of 2,000 feet by a crosscut tunnel two miles long, and in a splendid condition of development and in much better shape to let lie idle for a time than are the other mines of the company, where pumping is necessary and other conditions differ. The Morning was in splendid shape to shut down. It has one of the richest ore bodies at the No. 6 mill tunnel level, nearly 2,000 feet below the apex of the vein, that has ever been discovered, in its extensive development. During the year the property has been put in elegant shape and is quite a credit to Mr. C. K. Cartwright, the superintendent in charge, who has attended to the practical execution of its present splendid plan of new development and equipment between the No. 5 and No. 6 tunnels.

The No. 6 tunnel has been practically rebuilt and electrified throughout. The accompanying cross section gives an idea of the arrangement of its substantial equipment, which affords a little different plan form that ordinarily followed, especially in the laying of the track by giving the ties a longitudinal stringer. A block of ground 50 feet high is left undisturbed above the main level, and the 2-compartment raise connection with No. 5 is equipped with two separate cages, one used exclusively for hoisting men to the different intermediate levels, and the other for material. The ground is perfectly drained and the mine all through to No. 5 is in splendid shape and quite a contrast, as a place to work, compared to what it was above the No. 5 level, which was poorly drained and always sloppy and presented alternating hot, cold and drafty stopes approached by leg wearying climbs and very undesirable conditions under which to work. The present great block of ground between the two levels is in as fine a condition as any mine in the district at this time. The mine is in shape



CROSS SECTION OF  
NO SIX TUNNEL  
MORNING MINE—MULLAN IDAHO.  
FEDERAL MINING and SMELTING CO.

to commence its normal production of a thousand tons a day on a very short notice, and the big mill tunnel affords a new horizon to sink from, which can be readily turned to account without interfering with the extensive operation of the property above this level.

At the Morning mill considerable additional machinery was installed during the year, completing the retreatment plant at the fine end of the operation, which now includes Huntington mills, rolls, Callow screens and tanks for the purpose of regrinding and retreating the tailings which were formerly rejections, all the new machinery being run by electric power from the Washington Water Power Company. A new saw mill, machine shop and drill sharpening establishment have also been added, and the Shay engine haulage track abandoned since the electric haulage was established in the No. 6 tunnel, through which all the material for the extensive operation of the mine is now carried. The property is in shape to produce lead shipping mineral at a low cost.

*Federal Wardner Mines.*—At the Wardner mines of this company normal development and production has continued throughout the year. A new compressor has been installed at the mine and some additional regrinding machinery at the mill, including Huntingtons and slime tables. The great failings dump there has been leased to some Spokane parties, who are constructing a large plant for their retreatment, which it is expected will be completed about February. The local superintendent at the Wardner property of this company, Mr. D. W. Peoples, has been so successful in maintaining the output and finding new ore bodies in the hanging wall country as to induce the company to acquire by purchase and location about all the vacant ground that joined them in that direction, and a long tunnel, called the "96" tunnel, from Government Gulch, has been started and is well under way for the development of this territory at great depth.

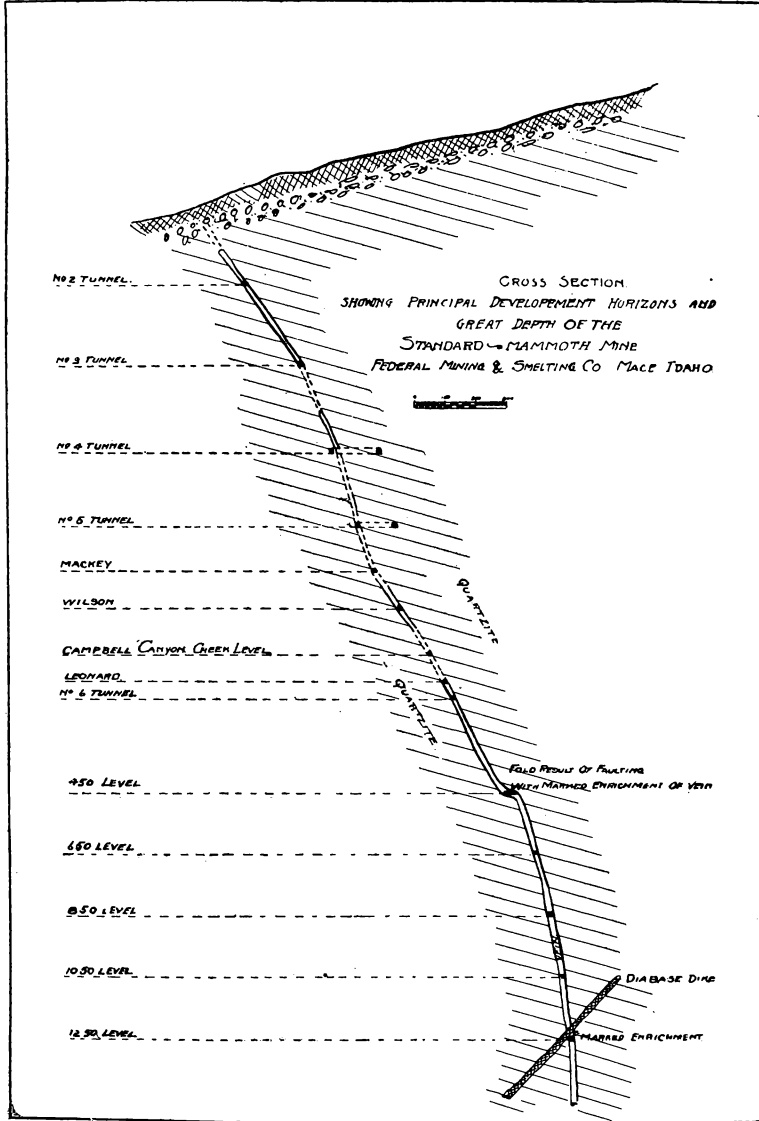
*Mace Mines.*—The Standard Mammoth mine at Mace, belonging to the Federal Company, continues to be the largest silver producer in the district and one of the largest in the United States. A splendid new compressor plant with a capacity of 4,000 cubic feet of air per minute has been put in successful operation at this property dur-

ing the year, and its effect on the drill bits was immediately felt throughout the mine and highly appreciated by the men who get the muck. The main shaft from the Campbell tunnel has been sunk to the 1,250-foot level, which is now being opened by drifting and showing some splendid ore bodies, one of the richest ore showings being encountered where a small black dike of igneous intrusive rock crosses the vein. An additional lift of 200 feet is well under way from the 1,250-foot level, where another station and drift will be opened within the next 90 days.

The accompanying cross section will give an idea of the great depth of this famous ore deposit below its apex, and numerous levels at which it has been mined. The ore shoot in the bottom horizons, now being stoped, has expanded to nearly 2,000 feet in length, and the property, besides being first in silver production, is second only to the Bunker Hill & Sullivan in the matter of its annual lead output, which, from its present showing, seems likely to be maintained for a long time to come.

This is one of the hardest mines in the camp to keep in shape. The vein is nearly vertical and the walls are sheeted into narrow slabs for 20 to 30 feet on each side of the ore, which makes them very heavy and impossible to hold without massive timbering and close filling with waste. The end pressure on the monster caps used, which are nothing short of young saw logs 20 to 24 inches in diameter along the main levels, is such as to frequently split them into slivers, and the sheeted quartzite wall will often buckle in between the sets. This motion, though irresistible, is very gradual, and is constantly taken care of, but involves a large crew of repair men all the time and a lot of additional expense. In spite of these adverse conditions, together with heavy pumping costs, the property is kept up in elegant shape and its product put on the surface at a very moderate increase in cost over that of some of the big gravity operated and self drained mines.

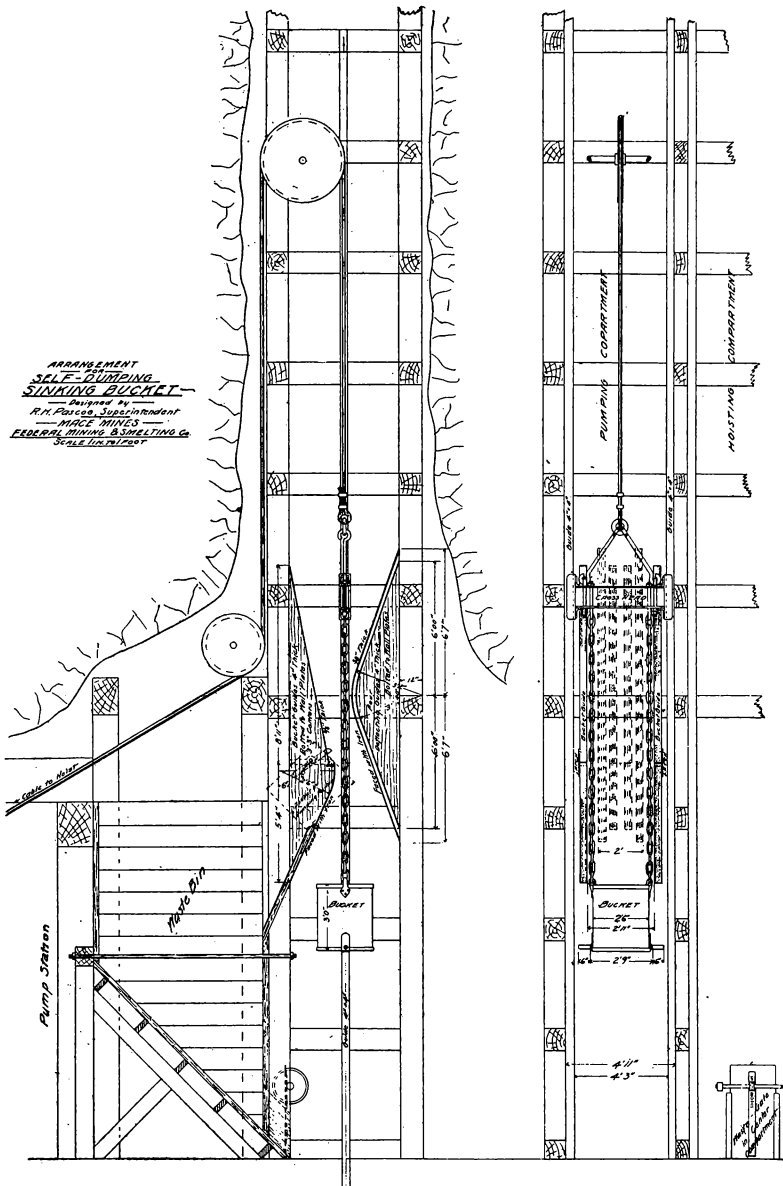
Captain Pasco, the local superintendent, as his name implies, was a born miner, and will leave the business, when he quits, considerably benefited by examples of the practical solution of difficult underground problems and the invention of original mining contrivances. His accomplishment a year ago in straightening several hundred feet



of the big 3-compartment shaft, through which the mine is operated from the Campbell level down that was a foot out of line and at the same time hoisting 1,000 tons of ore a day and since then maintaining it straight in a creeping country, is a notable feat, and his recently invented hoisting and self dumping and sinking bucket and crosshead attachment now being completed, is a life saving device. It does away with the danger of a loose crosshead so unreliable and susceptible to hinging up on the guides. This interesting invention will be appreciated from the accompanying sketches which show a bucket permanently attached to the crosshead with two chains, which can be made of any reasonable length sufficient to reach the bottom of the shaft for sinking a depth of several sets ahead of the timbering. They afford a steadier device to ride on and practically eliminate the danger of swinging or spinning of the bucket or of the loose crosshead hanging up, as formerly used, which was always a great source of danger.

The Standard shaft has been sunk from the 1,050-foot level to its present depth with this device, attached to an auxiliary hoist operated through the manway compartment and has proved a great economy in cost, through its self dumping attachment, eliminating the labor of one man, and made a total saving on 400 feet of work over the old device employed of \$4,100.

The crosshead shown in the accompanying plans is not the one intended to be used with the bucket, but the new illustration was not available. When completed, this invention, which is to be known as the Standard Automatic Dumping and Hoisting Bucket, with patents pending in the United States, Canada and all other important mining countries, will embrace a deep, heavy crosshead with automatic safety clutches attached, but in every other respect the illustration will show the workings and advantage of this new invention, the original merit of which is likely to bring it into general use, as it can be made applicable for any kind of shaft sinking, and especially for shallow shaft hoisting where it could be adapted and used in connection with an ore pocket as a smaller plan of skip hoisting, and with its self dumping features into a surface bin would afford a great economy in hoisting from a





moderate depth, like the numerous shafts in the south-eastern Missouri district, for instance.

The great mineral empire of the Federal Mining and Smelting Company, in the Coeur d'Alenes, with its army of 1,250 well drilled men, continues under the management of W. Clayton Miller, and in its diversified activities, calls for a high concentration of mental faculties, general knowledge and executive ability to keep its various departments of mining, milling, electrical and engineering operations working in unison and producing the desired profitable results. Mr. Miller has gathered around him a corps of practical departmental heads that form a very efficient staff of assistants, who each play an important part in the success of the great enterprise, and its remarkable production of mineral is likely to be maintained by building up with new properties where old ones fall down, for an indefinite period, if the present systematic management is maintained.

*Bunker Hill and Sullivan Mine.*—The Bunker Hill & Sullivan lead-silver bonanza continues supreme in the matter of output among the lead mines of the world, with one possible exception, that of the Broken Hill Proprietary Company of New South Wales. Its output of lead during 1906, amounting to a trifle over 40,000 tons, was something over 11 per cent of the total lead output of the United States and about 4 per cent of the total lead output of the whole world for that period, and it is likely that this great ratio will be increased by its 1907 record when the statistics are complete. When the fact is considered that this great yield is all handled through a single entry to the mine and stoped on one 8-hour shift in the 24, with a crew of 300 men, the quality and size of its ore bodies can be appreciated.

Mr. Easton, the manager, with his efficient underground assistants, has continued to maintain the magnificent resources of developed ore, in spite of this great yield, and towards the close of the year was getting evidence of new bodies of mineral in the presumably worked out Sullivan end of the property that promised to expand the reserves with further work in a manner that will discount some of his former phenomenal ore disclosures, and, in spite of the depression in values, the

property has continued to produce its normal yield and market the usual amount of high grade concentrates and crude ore, with no prospect of recession in sight.

The new tailings plant, built a year ago to work the millions of tons of coarse tailings accumulated during the history of the property, has been in operation throughout the past year, but not on the old tailing pile, as the quality of the current feed has proven to be such as to demand the almost entire service of the new plant for retreating the tailings of the current operation. Ground was broken during the year and the foundation completely excavated for the installation of a new mill of a thousand tons daily capacity, and the magnificent ore resources of the mine warrant its immediate construction, which will probably be undertaken during the coming year.

Some new and original improvements in the jig end of the milling operation at this property were introduced during the year by the mill superintendent, Mr. G. Caetani, that has materially increased the efficiency of the jigs, but at this plant, as well as at all the other big mills of the district, the lead-silver losses still afford room for original work.

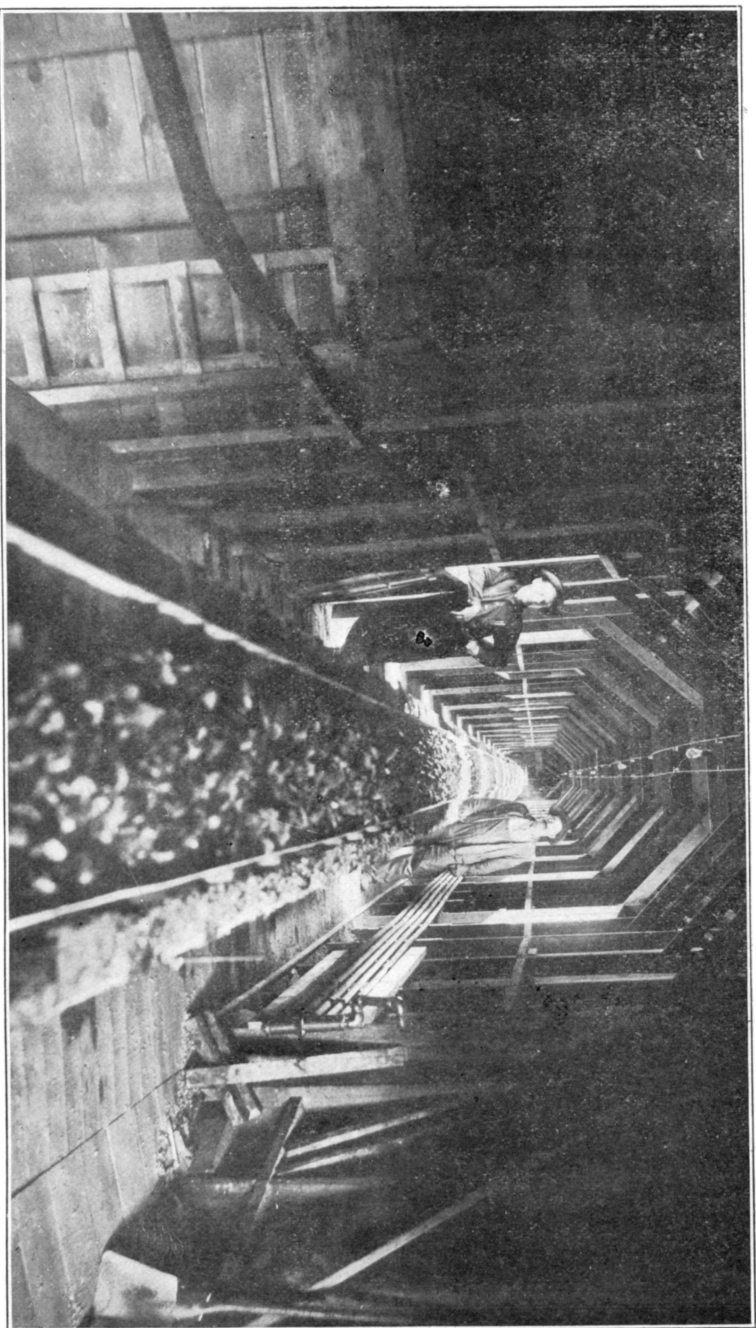
*The Hercules Mine.*—The Hercules mine closed the year with a record-breaking production. Its mill was almost continuously operated at a capacity of about 300 tons a day and made a splendid output of high grade concentrates, and the mine also afforded its usual large yield of clean shipping mineral. The main ore body of this property has shown a wonderful expansion in the lower intermediate levels between No. 2 and No. 3 tunnels. At the first intermediate level above No. 3, the stope floors have greatly expanded until a width of fully 50 feet of fine concentrating and crude ore spaces are being mined. West of the main shoot, at a depth of 1,200 feet below the apex of the vein, in the No. 3 tunnel level, a smaller shoot that varies from 2 to 6 feet in width by 300 feet in length, has been opened for stoping and is producing a good tonnage of the characteristic rich ore of the mine. Between these two ore bodies, the vein is well marked and filled with a kindly looking gangue for a distance of 200 feet, and it is not unlikely that these two ore shoots will have filled in this space and united as one continuous body 800 or 900 feet

long when the drift at the No. 4 tunnel, 700 feet deeper, has passed under the original ore channel, which it was closely approaching at the close of the year.

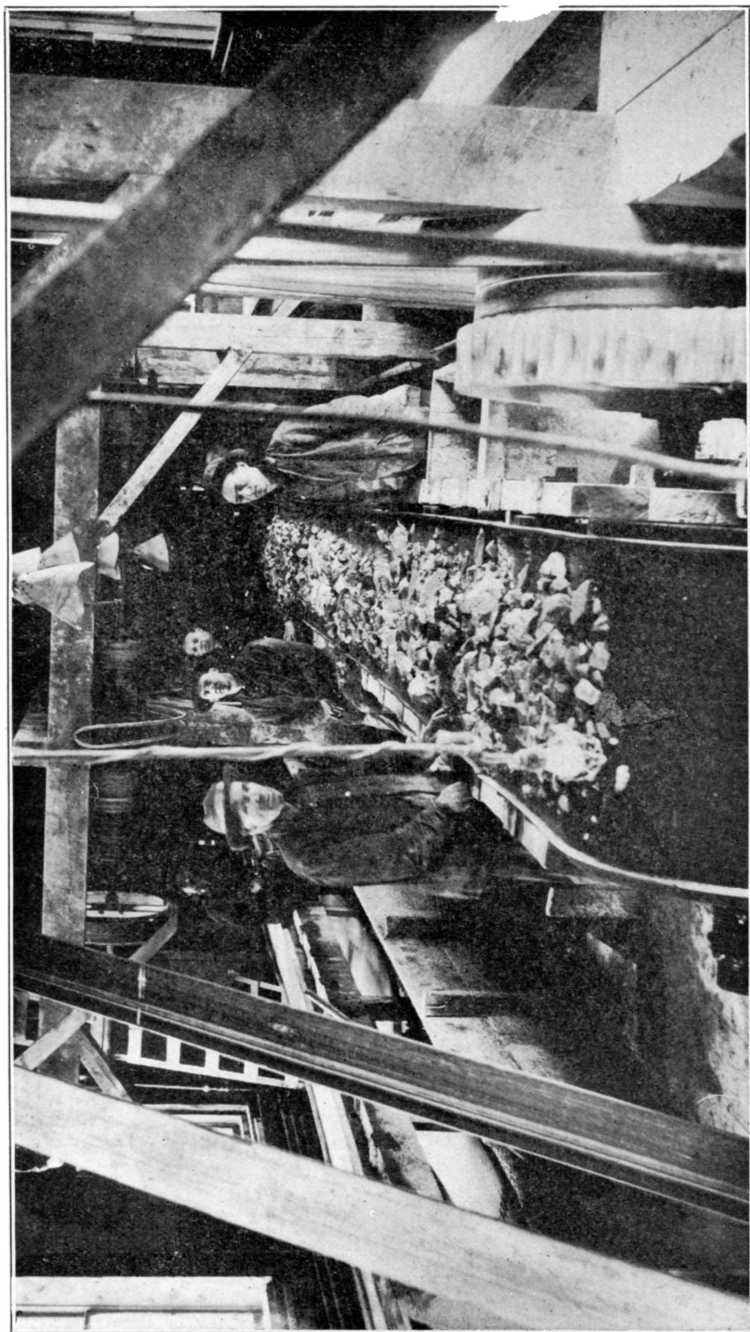
The No. 4 tunnel is over 4,000 feet in length and has been driven at the rate of 270 to 290 feet a month for the past 6 months, which is probably a district record of tunnel progress. It is 6x8 feet in the clear and equipped with electric haulage. Water Lynder drills were used in the work and a small belt elevator conveyor to load the muck into the cars, by which rapid progress was made, as it only involved raising the shovelful of muck on to the point of the belt about a foot high above the steel sheeted floor of the tunnel, which greatly facilitates the work. At the time of the writer's visit to this mine in the middle of December, the vein had been reached and drifting was in progress to the ore body. An enormous flow of water had been encountered, which had completely drained the No. 3 tunnel above where a big flow of water was formerly taken care of and used for developing power below the tunnel. The tapping of this big flow of water is a definite evidence that the ore channel was being closely approached and it is not improbable that it will represent the extreme length of the two ore shoots disclosed in No. 3 and a mineralized space between them, when fully undercut, in which event, if the same high silver and lead values are maintained, the Hercules can be made to run a close second to the Bunker Hill in the matter of profit production.

Its net profits for the past year, with a crew of 125 men working underground, are estimated at a million dollars, which makes it one of the most profitable mines in the world for the number of men employed.

*The Hecla Mine.*—This remarkably interesting property at Burke, although operated only to half of its ore producing capacity, closed another record breaking year of production and dividends. Its continuous record of 54 consecutive dividends, totaling \$1,520,000, of which \$520,000 was paid during 1907, and its limited family of stockholders, together with the magnificent expansion in width of its long ore shoot in the lowest level, puts this property in an independent position, and the management concluded to close the mine down, with the exception of a small force to continue department work, late in December, to await a better market for its product.



BELT CONVEYOR TO RAILWAY BIN, HECLA ORE SORTING PLANT, BURKE.



INDSIDE VIEW, ORE SORTING PLANT, HECLA MINE, BURKE.

The Hecla management have done some pioneer work in ore treatment by the introduction of slimed ore saving devices and by the establishment of an ore sorting plant at the mine, which is giving such pronounced satisfaction that the other big properties are following suit and the improvement is likely to be adopted at all the principal lead mines of the district.

*Ore Sorting Plant.*—The idea of this contrivance was brought by the manager of the Hecla Company, Mr. James F. McCarthy, from the slate picking anthracite breakers of his Pennsylvania home. The inside and outside features of this equipment are well illustrated in the accompanying plates. It consists of raising the ore in cars and cages (a method soon to be replaced by skip hoisting) to the top of a gallows frame station 52 1-2 feet above the collar of the shaft, where it is dumped over a 3-inch grizzly. The oversize from this grizzly is sorted by hand into three classes: No. 1, clean ore which is ready for shipment to the smelter; No. 2, clean waste which is returned to the stopes; No. 3, mixed ore and waste which passes on to a rock breaker. The under size from the third grizzly falls on a 1-inch grizzly. The oversize from the 1-inch grizzly passes through bins with an automatically regulated discharge to a 30-inch wide sorting belt, traveling 15 feet per minute. The ore is sprayed with water as it falls on the belt. From this belt is made the same separation as is made at the foot of the 3-inch grizzly, clean ore for shipment to the smelter, clean waste, and mixed ore and waste which passes to the rock breaker.

The under size from the 1-inch grizzly is carried on an 18-inch wide belt conveyor to a bin below the crusher, which receives this material as well as the material from the rock breaker. From this bin another 18-inch wide belt conveyor carries the ore 250 feet to a larger bin on the railway tracks. From this large bin the ore is hauled by O. R. & N. Co. to the mill, 3 miles distant down the canyon.

During November of this year, which is below the normal for the year, the plant produced from the oversize from the large grizzly 693 tons of waste and 190 tons of clean ore, at a cost of 37 cents per ton. The belt sorting produced 330 tons of waste at a cost of 60 cents per ton and 240 tons of crude ore, at a cost of 13 cents per ton.

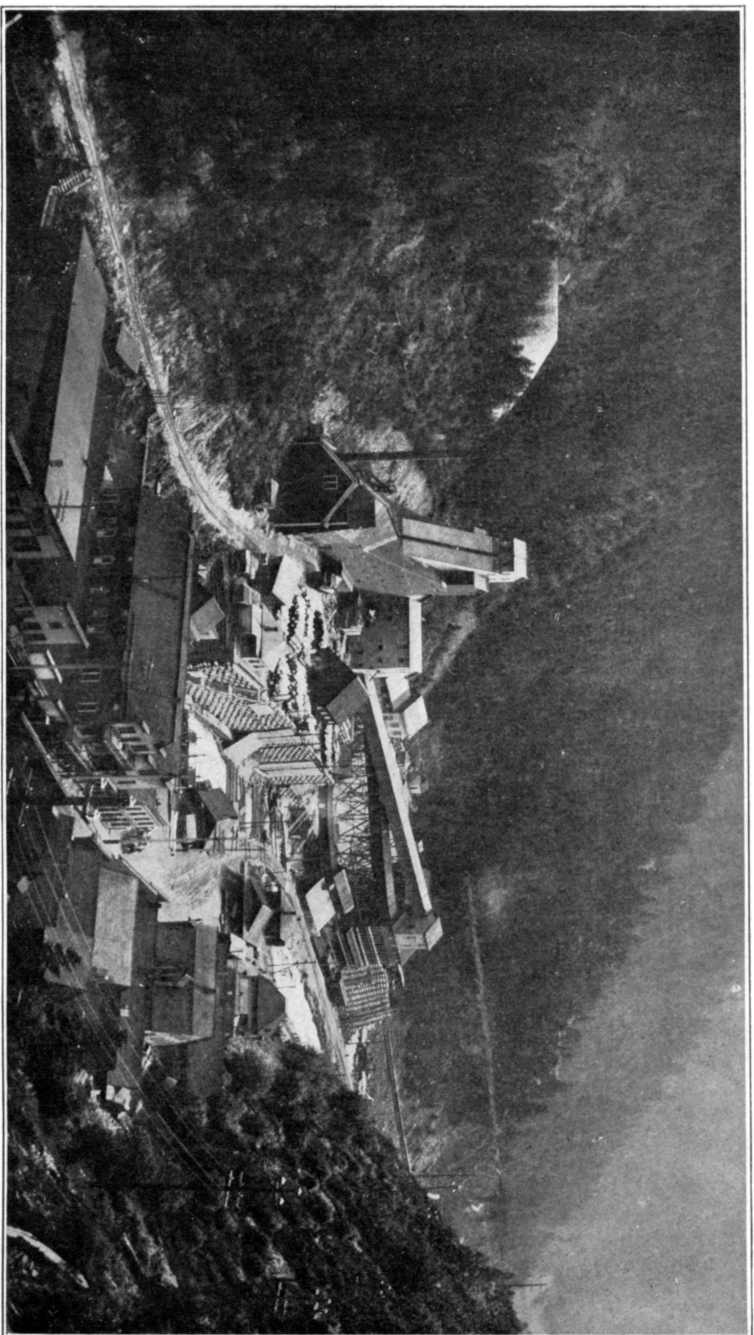
The plant was designed by J. M. Callow of the General Engineering Company of Salt Lake, Utah, and is the most complete plant of its kind installed in the camp up to this time. Two other plants of the same general character are under construction now.

The virtue of this contrivance is that it eliminates the cost of hauling dead waste to the mill and crushing it, together with its robbing and sliming effect on the better ore, and also reduces the sliming loss of unnecessarily crushing high grade crude mineral.

*New Electric Hoist.*—The magnificent expansion of the ore body in the lower level of the Hecla mine has warranted the management in its equipment for deep work, and a large modern electric hoist is now being installed, for which the massive concrete foundations are already established and the machinery now commencing to arrive. This electric hoist will consist of two reels with a center diameter of 5 feet, each equipped with 2,500 feet of 3-8x4-inch flat rope with a skip and cage weighing 3,500 pounds, and an ore load capacity of 6,000 pounds. The reels were built by the Wellman-Seaver-Morgan Company.

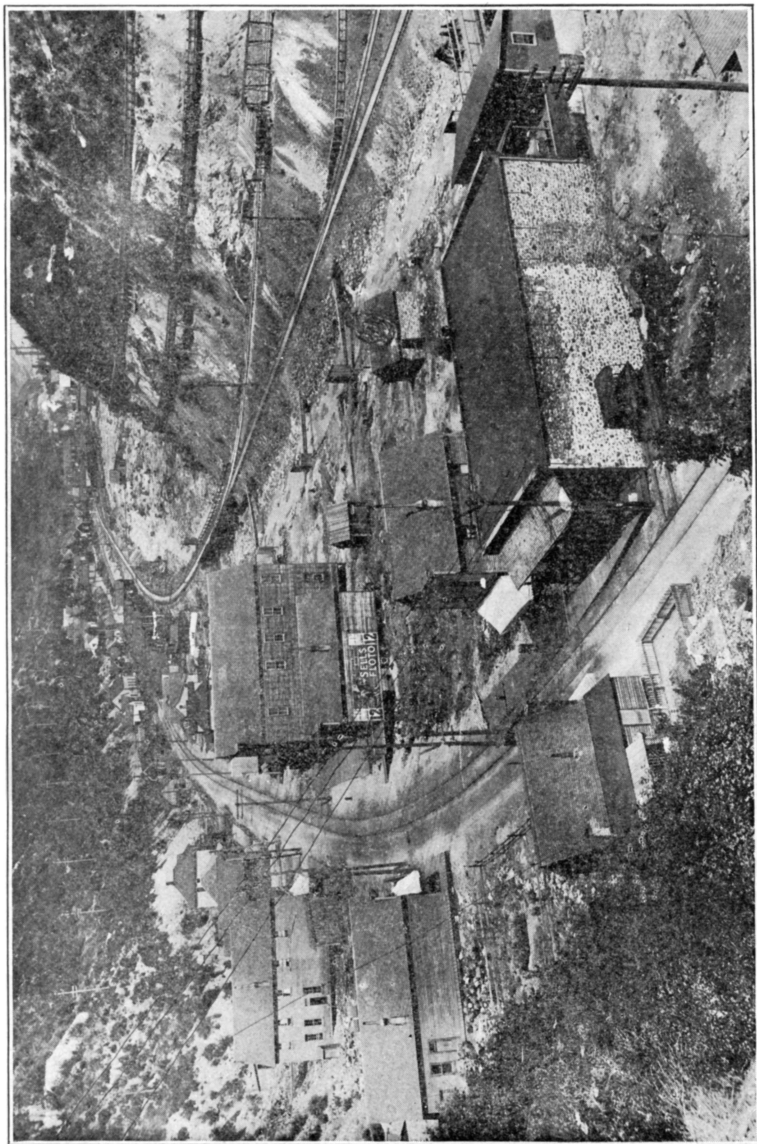
This hoist, when completed, will operate normally in balance and will make 27 lifts per hour from a depth of 2,400 feet. At times it will be required to hoist unbalanced, at which periods it is understood that the hoisting speed will be reduced to one-half of the normal speed. The normal cycle of operation will be most exacting at the 2,400-foot level, under which conditions each complete hoist will require 129 seconds, of which 10 seconds will be used for accelerating, 91 seconds operating at full motor speed, 8 seconds for retarding, and 20 seconds for loading and dumping skips.

The power available is from the line of the Washington Water Power Company and is 3 phase, 60 cycles, between 2080 and 2300 volts. For these conditions, the Westinghouse Electric & Manufacturing Company are furnishing a Westinghouse equalizer system, which consists of a fly wheel motor generator set, the function of which is to draw power from the line at a practically constant value, storing energy into a fly wheel, which energy will be available for driving the direct current generator of this set, the voltage of which is controlled by the operator and



HOUSING WORKS OF HECLA MINE, SHOWING ORE SORTING PLANT RECENTLY ADDED AND LOWER PART OF BURKE.





"THE CANYON" NEAR HECLA MILL, SHOWING TWO LINES OF STANDARD GAUGE RAILWAY ON FOUR PER CENT GRADE, TWO RAILWAY SPURS AND TWO FLUMES. A BUSY ARTERY OF THE COEUR D'ALENES.

the power of which will be used in a direct current motor directly connected to the hoisting reel shaft. The direct current motor on the hoist is constantly excited from the exciter, the armature of which will be mounted on the shaft of the fly wheel set.

The motor generator set will be self-contained, having a cast iron sub-base, 4 bearings and shaft, the driving element consisting of a 450 horse power motor, the generator being 360 K. W. capacity direct current with commutation poles to permit of handling its full load current at any voltage between 0 and 600 volts. Mounted on the shaft of this set will be a fly wheel weighing 29,000 pounds. Upon the end of the shaft will be mounted a centrifugal speed limiting device for overspeed protection. The hoist motor will be 375 horse power capacity at 600 volts D. C., operating normally at 60 revolutions per minute.

There is an automatic regulation of the speed of the induction motor and this limits the power drawn from the line circuit by bringing the fly wheel into action to supply the excess power over and above that supplied by the line. The reels for this hoist are on the ground. The electric end is due for shipment early in the year.

The above will be largely Greek to anybody but a technical man. It means, in plain English, that the Hecla management have purchased and are installing one of the most up-to-date and powerful electric hoisting machines that is manufactured in this country, and while it is put in at a high initial cost, it is a well tried device with big eastern mining enterprises and will unquestionably result in added efficiency and economy of operation.

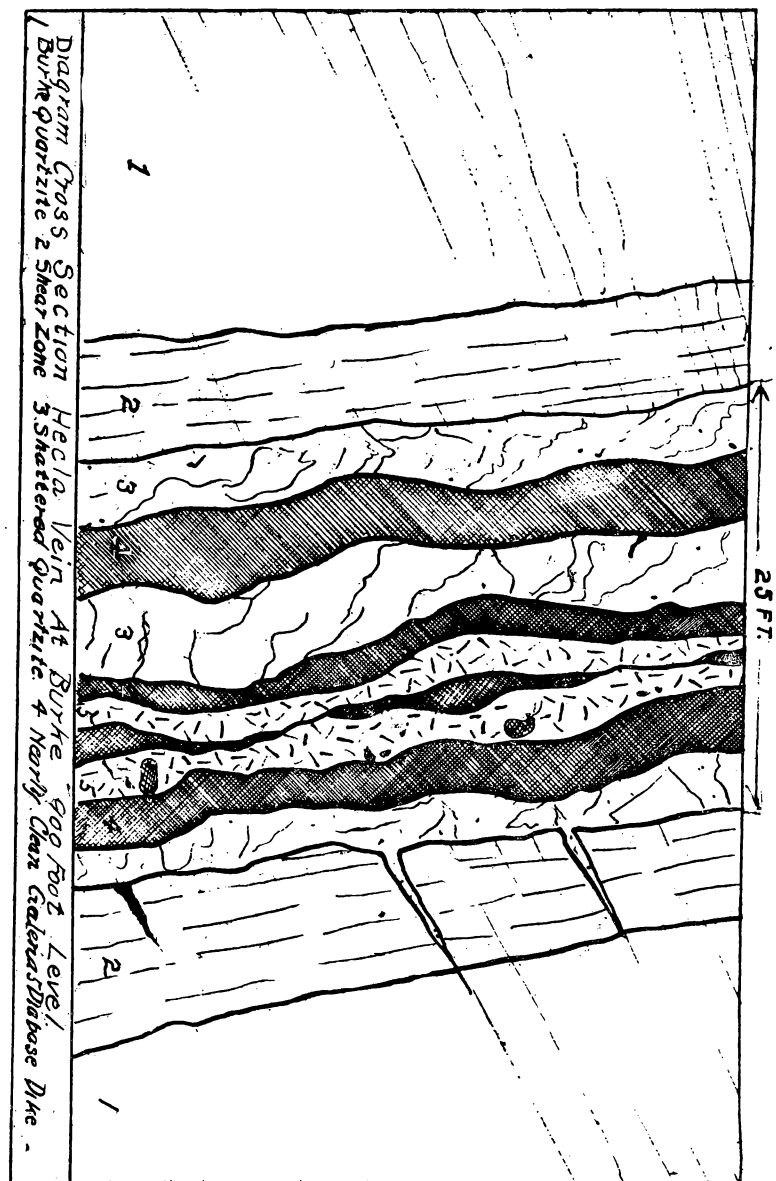
The Hecla mine, in some respects, is an individual type among the famous ore deposits of the Coeur d'Alenes. It carries an ore shoot a thousand feet in length in a nearly vertical fissure that strike a little south of east and north of west, and is accompanied with a wide, sheer zone of sheeted quartzite country rock, in which respect it closely resembles the Standard Mammoth and Morning veins, but unlike them, the main ore shoot in this instance is constantly accompanied by an included dike of fine grained, blue-black igneous rock that is often reduced to a clay, and again expands to a hard, fresh dike resembling diabase or basalt, which has not been properly classified.

This mine has had a very interesting career. The vein strikes into the bold slopes of Canyon Creek at Burke. Its upper adit levels were not very profitable. In fact, the commercial crests of the ore shoot were buried from 1 to 600 feet deep below the apex of the fissure. The property was started with a million share capital, and for several years of its early history its securities were bartered around at a few cents per share. In the lowest adit from the surface considerable good ore was found, but the mine did not make any notable production or profits until the first level from the vertical shaft was opened 300 feet below Canyon Creek. In the 600-foot level, from which almost all the ore of the past two years has been stoped, the ore body has shown a marked increase in width and productiveness. In the 900-foot level, above which the block of ore through to the 600-foot level is practically intact, the ore shoot is nearly a thousand feet in length and has expanded in the last 200 feet of its course to 25 feet in width.

In the 300 and 600-foot levels, the black dike accompanying the ore was generally on one side of the mineral, although occasionally good, strong streaks would make on both sides. At the 900-foot level, the dike is split in the center by an irregular ore course and carries a wide band of high grade galena mineral on both its walls, together with the unique occurrence of good sized patches and pebbles of clean galena imbedded in the hard, black dike rock itself. The face of the 900-foot level, during the writer's recent visit to the mine, was 5 sets wide, of which about 5 feet was dike rock and the balance alternating bands of nearly clean galena and shattered quartzite concentrating mineral.

While it is a fact that the reduction of the dike material to a clay in places and the slickensided faces it carries give evidence of the origin of the ore solution following an original dike filled fissure, due to subsequent movement, the occurrence of the clean mineral in the hard dike rock itself and on both its walls, is rather suggestive of its origin with this deep-seated intrusion, and, to say the least, this combination indicates a most promising prospect of permanency and staying qualities to great depth.

While ruminating over my necessarily generalized an-



nual review of the principal ore developments of this interesting field, it may not be out of place to digress a little into the realms of technical speculation as to the origin and probable permanency of these and other ore deposits, with the hope of at least inviting more intelligent discussion of an interesting problem, which in the Coeur d'Alenes has not received its fair share of consideration from technical men, considering the commercial position to which the district has attained in ore production.

The association of valuable ore deposits with igneous, intrusive rocks and post mineral faults, is one of the marked features of mining history, and unquestionably in most instances these disturbances form a connecting thread between the actual ore deposits and their origin or genesis, especially in Idaho.

The true genesis of ores is always an interesting problem to the miner. His possible vision into the processes of nature is so limited that the subject will continue to remain an intricate problem and open to conflicting ideas among the highest authorities, and it is only through experience and observed facts and mining results that any progress can be made in looking into the ground ahead of the miner's actual muscle, steel and dynamite.

The lead-silver deposits of the Coeur d'Alenes are noted for their occurrence in fault fissures, usually in a straight, thin-bedded quartzite country rock, in which respect they are in sharp contrast to the conspicuous association of limestone and igneous rocks, so characteristic of many other lead producing districts. In this district intrusive, igneous rocks are not of conspicuous development, but recent disclosures indicate that dikes and faults bear a very important relation to the origin of some of its noted ore bodies. At the Morning mine, a dike of massive black, basic igneous rock like diabase cuts obliquely across the vein in the vicinity of its richest ore development. This is also true of the famous Standard-Mammoth ore body, which has 2 cross courses of this kind. One recently encountered at the 1,250-foot level, below the Campbell tunnel, and nearly 3,000 feet below the highest apex of the ore body, was associated with a marked enrichment of the fissure for some distance on either side of its intersection without faulting the vein.

At the Hercules mine a strong dike of yellow rotten diorite terminates at the hanging wall near the center of the ore body, and continues on into the foot wall country rock at its western end, showing an apparent displacement of the dike of 150 feet. This interesting intrusion has been a constant accompaniment of the rich ore body through every stope from the surface down to the 1,200-foot level. It is hard to conceive how it can enrich the ore, as it is apparently of later date, and in some places injected into the rich mineral. Its constant association with the ore, however is an interesting fact, especially when it is considered in connection with a smaller rich ore shoot found in the Tamarack & Chesapeake mine a short distance further south, where a similar yellow dike occurs crossing the strike of the vein near its point of richest mineralization.

So far as I am aware, no dike rocks have thus far been encountered in the great Wardner lode, but an interesting occurrence of blind fault plains are noted in that famous ore channel in connection with large and irregular shaped bodies of rich mineral. These fault plains are nearly vertical and appear to terminate at the main foot wall below which no commercial ore bodies have been found. The hanging wall country of the Wardner lode is more or less shattered quartzite for several hundred feet in width, and overlapping ore bodies have been found as much as 300 feet away from the main foot wall fault plain on parallel false foot walls. These blind faults seem to carry up the ore bodies from the foot wall, or the parallel lines of fissuring that overlie the foot wall, for a considerable height on their course, when the ore makes away from them in the direction of the more open line of movement.

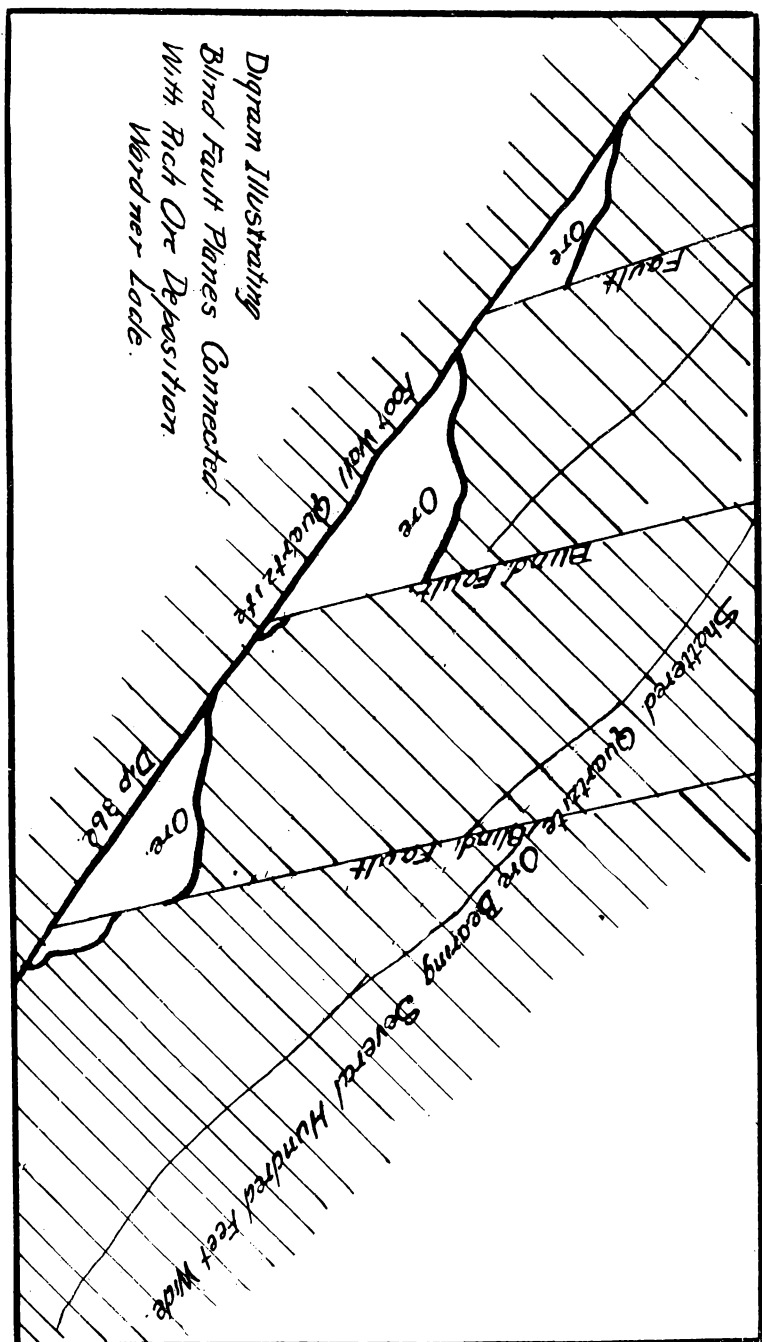
It is possible that the Wardner lode, as a whole, is a reversed fault in which the hanging wall country has moved upon the foot wall, which is more solid and unbroken, and that as development progresses down the plane of the main foot wall, that these vertical blind fault connections will be found.

A notable condition in connection with these blind faults is the apparent fact that they have resulted in secondary silicification, which has produced in effect a tight, hard amorphous or practically seamless mass of attendant ore bodies and formation, which permits the mining

of these bodies in big open chambers that are filled with waste but require very little timbering, as both the formation and ore occurring under these conditions are extremely hard and involve the use of lots of powder; while other ore bodies in the mine, where these vertical fault plains are not manifested, are generally associated with loose ground and need very close square set timbering and filling.

These vertical faults very closely resemble in appearance and action the tight vertical fault fissures with which the famous flat contact bonanza ore bodies of the Daly West mine at Park City was invariably connected, where they were supposed to be the source of ore bearing solutions that fed these limestone quartzite contact ore bodies, but were themselves of no commercial importance. It is further possible that the marked enrichment of the Bunker Hill & Sullivan mine at such great depth, 3,000 feet below its higher ore crests, is due to the approach of the primary trunks of these vertical fracture lines or to the approach of igneous, intrusive rock; and that the rich mineralization may continue, and make its highest manifestation of values as these connections are more closely attained.

It has been suggested by a recent writer on the subject that ore bodies may be derived from buried laccolites of igneous rock at no very great depth under the surface, and themselves relatively rich in the metals of which the fissure vents above them are local concentrations, and if that theory is tenable (and it is in a measure borne out by the igneous associations of the other big mines of the district) then the still further development in depth of this great property and its rich neighbors, should continue to produce remarkable surprises in the way of added ore resources, to the point of original displacement of the feeding fissures represented by the blind faults in the accompanying rough diagram, or to underlying, intrusive, igneous rocks of the same nature as seem to have influenced the mineral deposition in the other big Coeur d'Alene mines mentioned, for while no igneous rocks have so far been found in connection with the ore bodies of the Wardner lode, they have a conspicuous development on the St. Joe slope on its strike a few miles further southeast in the form of monster dikes of diorite connected with very





rich deposits of siderite (iron carbonate), the primary ore gangue, of the Wardner lode.

Pursuing this subject further, it will be of interest in this connection to call attention to the role played by igneous intrusions and post mineral faults in other Idaho mines of the first rank. The Minnie Moore mine at Bellevue, in the Wood River District, has produced silver-lead ore to the gross value of \$8,000,000. It was connected with cross courses or narrow dikes of basalt and in its lowest development a narrow basalt dike, often reduced to a clay, was an almost constant accompaniment of the ore. This great ore channel was cut off by a nearly vertical fault below the 1,000-foot level on its flat dip of 36 degrees, and it was argued by some high geological authority that commercial ore bodies would never be found on the opposite side of that fault. In the hands of a furniture manufacturer, however, who had a little more faith in nature, this theory has been exploded and a large resource of valuable concentrating ore has been developed on the other side of the fault, a thousand feet west on the strike of the vein, but again accompanied by the normal little basalt dike. This property is more fully discussed under Blaine County.

Another notable occurrence of rich lead-silver and gold bearing iron ore in connection with a basalt or diabase dike is that of the Croesus mine, near the Minnie Moore, which is illustrated by a diagram under the same county.

The famous Trade Dollar vein in Owyhee county is a vertical fissure vein that consists of a narrow dike of basalt with ribbony bands of white quartz on either wall of it a foot or two in average width. This property has been opened with a tunnel over 2 miles long at a maximum depth of 1,700 feet and has produced gold and silver bullion to the amount of \$12,000,000.

In the same vicinity the DeLamar mine is an interesting problem of apparent faulting in connection with bonanza ore bodies. A diagram under Owyhee County illustrates the situation at this property. The bonanza stopes and ore courses of the DeLamar terminated at a clay fault and show in several places a distinct drag along the fault plane to the northwest. The fault in this instance is called an iron dike. It was suspected by Mr. Waldemar Lindgren

to be a fault, as his analysis of the material showed it to contain the normal elements of the adjoining rhyolite formation reduced to a clay into which had been injected iron pyrites, and while this iron dike had not been cut through at the time of his examination it was subsequently passed through and his theory demonstrated. The iron dike fault on this property would seem to have cut the rich ore bodies of the mine at the maximum point of their highest values, but extensive development and search on the opposite side of the fault has failed to reveal their continuance, yet it is hard to conceive how the rich ore solutions could have originated in the soft fault dike to fertilize fissures running almost at right angles to its course and itself remain practically barren.

The Checkmate mine at Pearl, Idaho, has produced a half a million dollars worth of gold ore. It is developed by a shaft 600 feet deep with 5 extensive levels. Working out the long ore shoot of this mine, cross faults that formed a displacement of only half the width of the vein, in several instances, to as much as 10 feet, and very well defined, seemed to induce or occur at a line of enrichment in the ore channel where the values were double what they were a few feet from that point in each direction from their right angle course.

In the Whitman mine at Pearl, which now has a resource of \$20 gold ore undercut and exposed, amounting to a million dollars in gross value, a small black dike forms the footwall of the vein for 30 feet, then crosses the vein and forms a hanging wall for 20 feet, when it deflects off into the granite country rock and both the true walls of the vein are granite on either side of this intrusion. For the distance of its connection with the fissure, the ore body is twice its normal size and richness in gold.

The rich gold bearing quartz fissure of the Buster mine at Elk City, with over a million dollars worth of ore in sight, makes its richest development on either side of a cross fault.

At Shoup on the Salmon River, the Kentuck mine, with an output of a million dollars to its credit, was faulted by the intrusion of a dike of green stone at a depth of 500 feet, a horizontal displacement of about 30 feet on either side of which the richest ore developments of the mine were

made, where the stopes were called the "Golden Chambers" on account of the ore being much higher grade than normal and carrying numerous patches of rich specimen ore.

The Viola mine in Lemhi County contained a flat dipping deposit of lead mineral in shaly limestone 20 feet above a pronounced quartzite contact, from which \$5,000,000 worth of high grade lead carbonate ore was taken. This body of mineral terminated in a mass of soft brown iron oxide and was also cut off by a profound fault displacement a few feet below the point at which its lead values waned. Another immense body of iron gossen lies behind this fault a few hundred feet and may prove the source of the lead ore.

The old Monarch and Buffalo mines of Atlanta, now under one ownership, has a shipping record of \$5,000,000 worth of gold-silver ore, and a similar resource of well developed ore now in sight carries two big vertical quartz veins in granite divided by small black dike of igneous intrusive rock that dips through and away from the ore course at 600 feet deep.

It is easy to conceive how an original dike filled fissure may be reopened and form an ideal channel for the deposition of mineral value from ascending solutions, but it is hard to conceive how igneous cross courses and fault displacements, which manifestly appear to have occurred after the ore veins were formed and filled, could have had any influence on their enrichment without showing remnants of the enriching solutions along their own courses, but their connection with the points of highest enrichment in the veins mentioned is an interesting fact, to say the least, and may have some definite relation to the source of the ore.

#### OTHER EMBRYO BONANZAS OF THE COEUR D'ALENES.

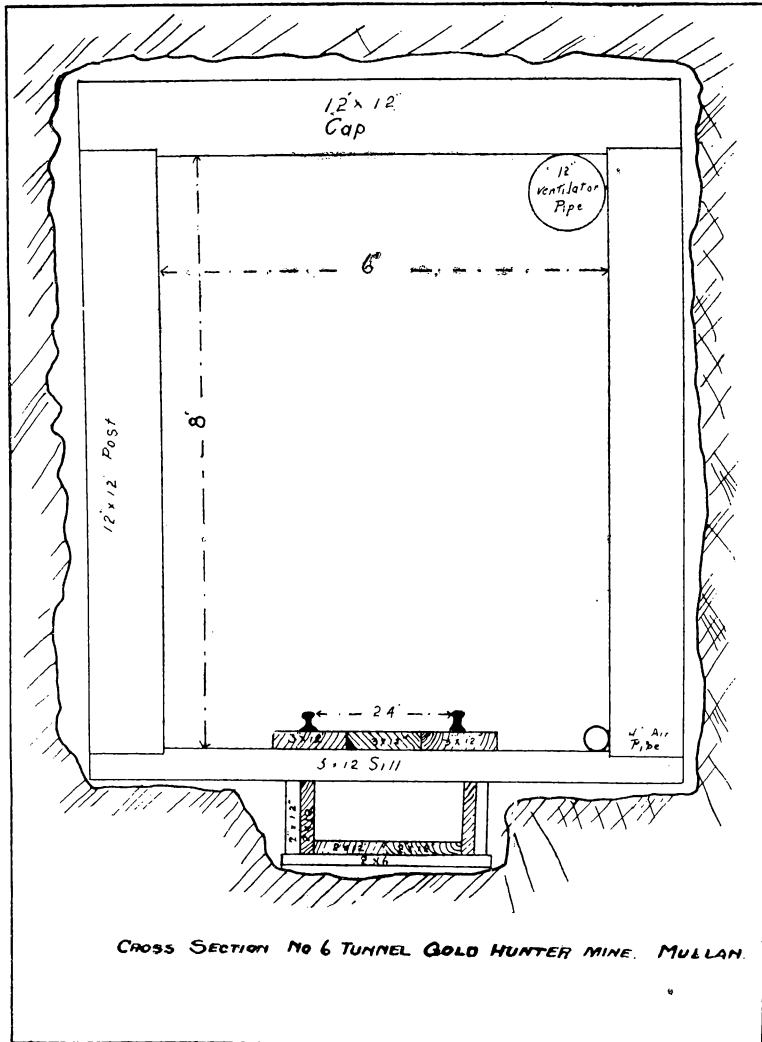
*The Stewart Mine.*—One of the most flattering new lead ore developments of the year was that of the Stewart mine, a short distance west of Wardner, which was gotten into shape for a large production when it encountered a series of difficulties due to the panic of the early fall, that temporarily tied up its operations. This property lies a few hundred feet out of line with the main foot wall of the Bunker Hill and Federal mines to the north, but it nevertheless carries in its surface manifes-

tations and in the shape, character and texture of its ore bodies, identical earmarks of some of the productive stopes of those famous mines, and while its area of territory is too limited to admit of its ever approaching them in production, its ore resources are nevertheless of such volume as to warrant the anticipation of a very interesting dividend paying period of activity and a person privileged to examine the various ore channels of the two big properties mentioned, cannot help feeling the manifest family relationship exhibited between them and the Stewart's ore deposits.

A readjustment of the affairs of this company was in progress at the close of the year, and its successful accomplishment will doubtless result in the active operation of the property and the addition of another important source of high grade lead-silver mineral to the steadily growing list of producers in the Coeur d'Alenes.

*The Gold Hunter Mine.*—A notable event was written into the history of the lead-bearing portion of the Mullan District by the completion last summer of the long mill tunnel of the Gold Hunter Company and a low cost record established by the management. This tunnel starts at a convenient elevation above the valley bottom and on a level with the back of the company's mill, and is run 4,381 feet to the Hunter ore bodies, which are tapped at a depth of 1,400 feet below their apex, and as predicted in my last report, these ore bodies were found in a superior condition of mineralization to that shown in the tunnels above. Six distinct ore courses have been cut that vary from 2 inches of high grade silver bearing gray copper ore, to a body of high grade lead ore 20 feet wide. This latter and another strong vein 16 feet wide, have already been drifted on 200 feet each and have disclosed some magnificent reserves of ore which, when more fully opened up and with connections made through to the works above, should afford a source of mineral that will keep the mill steadily employed for years to come. This big tunnel is 7x8 feet in the clear. The first 500 feet of its length is timbered, but the balance of the distance was mostly driven through very hard, tight, thin bedded quartzite at a total cost (with all its equipment in place and figuring in the power required to run the machines) of \$11.83 per foot, which is a result that has seldom been equalled and makes long tunnel work in hard

ground appear a less serious financial proposition than formerly. All the power and material for the permanent equipment of the work was furnished by the company and the labor was done by contract at an average cost of about \$7.50 per foot, at which figure the contractors furnished all labor and ammunition and made a decent margin of profit, besides establishing for themselves a reputation for rapid and economical work.



The Hunter mill was shut down at the close of the year on account of the unattractive prices of lead and the poor market for ore. This will permit of a more thorough development of the new ore bodies in the mill tunnel and of putting the property in shape for a large and profitable ore production when metal prices again adjust themselves to a satisfactory basis.

Among the other new lead ore developments of the Coeur d'Alenes during the past year, the Pittsburg Lead Company's mine on Nine Mile made a very handsome output of high grade mineral, and during the present suspension of shipments, is undergoing a plan of shaft development that is likely to put it in position to repeat its successful record of the past year when the metal markets are available.

*The Callahan Mine.*—Near Sunset Peak, the Callahan mine gratified its owner by making an output of something like 600 tons of 70 per cent lead ore, carrying fine values in silver in addition. This ore was all crude mineral, just as it was mined from the stopes, without any milling intervention, except the hands of the miners, and its high lead values probably constitute a record shipment in lead for such a quantity. The ore body in this mine has expanded at the present tunnel level to such an extent, as compared to its surface length, that if the same ratio is maintained in the new tunnel now being driven to tap it at several hundred feet further depth, the property ought to approach the Hercules class of profitable ore production, and its fortunate owners have followed the lead of that famous property and withheld their mine from stock company entanglements and handled its affairs in a very efficient manner.

*The Tamarack & Chesapeake Mine.*—The Tamarack & Chesapeake mine on Nine Mile Creek, north of Custer Peak, was operated throughout the year with a small force and shipped several cars of first class hand sorted ore, and has a developed ore resource in sight that should make considerable money for its owners when market conditions warrant its extraction.

*The Rex Mine.* On the same drainage, the Rex, or "16 to 1" mine, was taken over under lease and bond during the year by a company of enterprising operators, and an energetic campaign of development

gotten under way, which, according to well informed men, is likely to result in opening up some profitable reserves of good milling ore. This property was already equipped with a mill that has been overhauled and will doubtless enter the shipping list with a considerable output when the demand for lead ores again becomes normal.

*The Charles Dickens Mine.*—The Charles Dickens mine, west of Wallace, was another property that was equipped with a mill and developed to the producing stage during the year, and a number of cars of rich concentrates were sent to market as a result of its operation.

*Surprise Mine.*—At the Surprise mine at Pine Creek, a few miles south of Wardner, another interesting silver-lead deposit that developed a handsome shoot of high grade mineral, was tapped during the year by a crosscut tunnel 430 feet long, and a drift had been extended on the ore of 150 feet at the time of the writer's visit in the summer, and still showed rich ore in both faces. The crosscut was being extended in the mountain, where a second vein is expected to be cut. This ore body is opened at a depth of fully 500 feet below the vein apex and had been raised on 100 feet. The ore carries high grade galena associated with some zinc and copper sulphides, but the silver values, which are relatively high, run principally with the lead and make a very fine shipping product. The property was equipped with a concentrating mill of 250 tons a day capacity, and a 7-drill air compressor, all substantially housed and of the latest design. This handsome little plant was gotten into commission late in the summer and produced considerable shipping mineral, but its output was too late in the season to find a market, and the operation was suspended at the mill, but is being continued underground, and a more thorough development of the ore resources this winter will put the property in shape for successful and profitable operation in the future.

*The Nabob Mine.*—The Nabob mine on the tributary of Pine Creek, not far from the Surprise, was operated during the year with a small force of men and several carloads of high grade crude lead-silver ore were shipped. This deposit carries 2 parallel courses of lead ore not far apart, in which respect it resembles several of the more important

producers of the district, notably the Hecla, Tiger Poor-man, Morning and Hunter mines. These veins range from 2 to 4 feet wide and the mineral is quite continuous for fully 350 feet in length. The general run of the ore is good concentrating material, but smaller streaks up to 6 inches wide have been found that run 70 per cent lead. The ore carries about one-half ounces silver to the unit of lead, and occurs in a slate formation, but the dip of the veins across the slate beds is such that at a further depth of 400 feet below the bottom of the shaft, which is now down 365 feet, these ore courses will pass into a quartzite formation that is well exposed in a belt fully a mile wide underlying the slate, and the situation affords a magnificent chance for crosscut tunnel development, by which method the vein can be tapped at great depth in the quartzite formation, and if there is anything in the influence of quartzite on ore deposition as compared to slate, the future of the property lies at further depth. The veins are of such strength and so well mineralized as to fully warrant some deep tunnel work and the anticipation of important ore bodies.

*Imperial Mining Company and Cooney Mining Company.*—Rich lead ore disclosures were made during the year in the property of the Imperial Mining Company and the Cooney Mining Company, near Burke, and of such a nature and in such close association with neighboring bonanzas as to give definite promise of developing into ore bodies of considerable commercial importance with further work.

*Galena and Anchor Mines.*—Lying between the Hecla and Standard-Mammoth bonanzas, the Galena and the Anchor mines, both with splendid fissures and some record of production in early days, have recently been equipped and are undergoing an active campaign of development with a bright prospect of picking up a continuation of the ore bodies of their famous neighbors.

*Frisco-Morning Belt.*—A splendid stretch of promising lead bearing territory lying between the Morning Mine and the Frisco mine, and embracing the Star, Flynn and the Black Bear Fraction groups, was the scene of considerable interest and development during the year. A long crosscut tunnel is being driven on the Black Bear Fraction property that is rapidly approaching the fissured



zone that has produced so much profitable ore on the Helena-Frisco and Gem properties, and from the surface ore developments of this property, the owners are warranted in anticipating big results in ore development when the main fissured course is penetrated.

On the Star property a good force of men have been steadily employed for the past two years, and the two main fissures traversing the famous Morning group have been intersected at great depth, and drifting for ore bodies is now in progress, and is being rewarded by very encouraging results in the way of bodies of concentrating ore and occasional streaks of clean shipping galena.

This stretch of territory is held in high esteem by old timers who have helped to make the history of the famous old mines that bound it on either end, and it will not be surprising if, during the continuance of this work, bonanza ore deposits are disclosed within another year.

#### COPPER.

In spite of the fact that the Snow Storm bonanza was only operated at a minimum capacity during nine months of the year, it made a record production in copper ore with a shipment of 95,000 tons, of which 77,000 tons were clean shipping mineral and sent direct to the smelters, and 18,000 tons, low grade dump material and trimmings, were successfully treated in the acid leaching plant owned by the company on the ground. This great yield of mineral contained a gross metal contents of 6,984.24 pounds of copper, and 446,187 ounces of silver, from which regular monthly dividends were paid to the stockholders for 9 months at the rate of 3 cents per share, and a magnificent plan of improvement and new equipment added to the property at a total cost of a hundred thousand dollars, including a large boarding house situated between the No. 3 and No. 4 tunnels, with accommodations for 240 men. This is a modern miners' hotel, plastered throughout, electric lighted, steam heated and very substantially furnished. A similar, though smaller, building with accommodations for 50 men, was erected near the mill, also a commodious office building, and the mechanical plant was added to with a 20-drill compressor to be operated electrically, together with 5 electric motors in the leaching plant, which will do away with the present steam

equipment and result in a saving of 35 cents per ton of ore treated on this item alone. Considerable other additions and alterations were made to the mill, including 3 new precipitating tanks, which has greatly increased the percentage of extraction. Other improvements, consisting of an auxiliary steam driven 7-drill air compressor, a drill sharpening machine, saw mill, complete machine shops, 3 new hoists in the mine, and numerous other improvements to facilitate ore extraction.

The great block of territory between the No. 2 and No. 3 tunnels was extensively developed in the 5 intermediate levels, where half a dozen new stopes were started and the ground shaped up for a production of a thousand tons a day, if market conditions develop a demand for the ore in the future. The great ore shoot at this horizon is 700 feet long and has been mined as much as 40 feet wide of straight shipping ore. It shows several faces 10 to 25 feet wide that will average up to 10 per cent copper with about an ounce and a half to silver to each unit of copper.

In the lower intermediate levels, masses of clean, black sulphide have been encountered and occasional specimens of native leaf silver ore that call to mind the rich native silver bearing glance ore of the middle horizons of the Colusas at Butte, and point to a marked enrichment of the fissure when it is encountered at the level of the new No. 4 tunnel now being pushed into the vein and rapidly approaching it.

The property is in shape at this date, with the ore quite completely blocked out, to guarantee its past year's record of production for several years to come, without counting what may lie below the No. 3 tunnel level in the vein, where there is every reason to expect even better resources and higher grade ore than has been found in the mine above that level.

All of which puts the Snow Storm in the bonanza class of profitable ore producers, and the management is to be congratulated on transforming it from an insignificant prospect to one of the largest, best equipped and best conditioned ore resources in the district.

Among the other copper properties of the Snow Storm belt that made definite progress during the year and encountered handsome showings of the same identical character of copper ore as the Snow Storm carries were those

of the Lucky Calumet and Missoula Copper companies, where disseminated copper carbonate and bornite sulphide ore were disclosed in well defined fissure courses up to 30 feet in width, that with further extended development are likely to disclose similar surprises to the Snow Storm.

These properties are supplied with an electric driven air compressor of 8 drills capacity, with which rapid progress is now being made in their development.

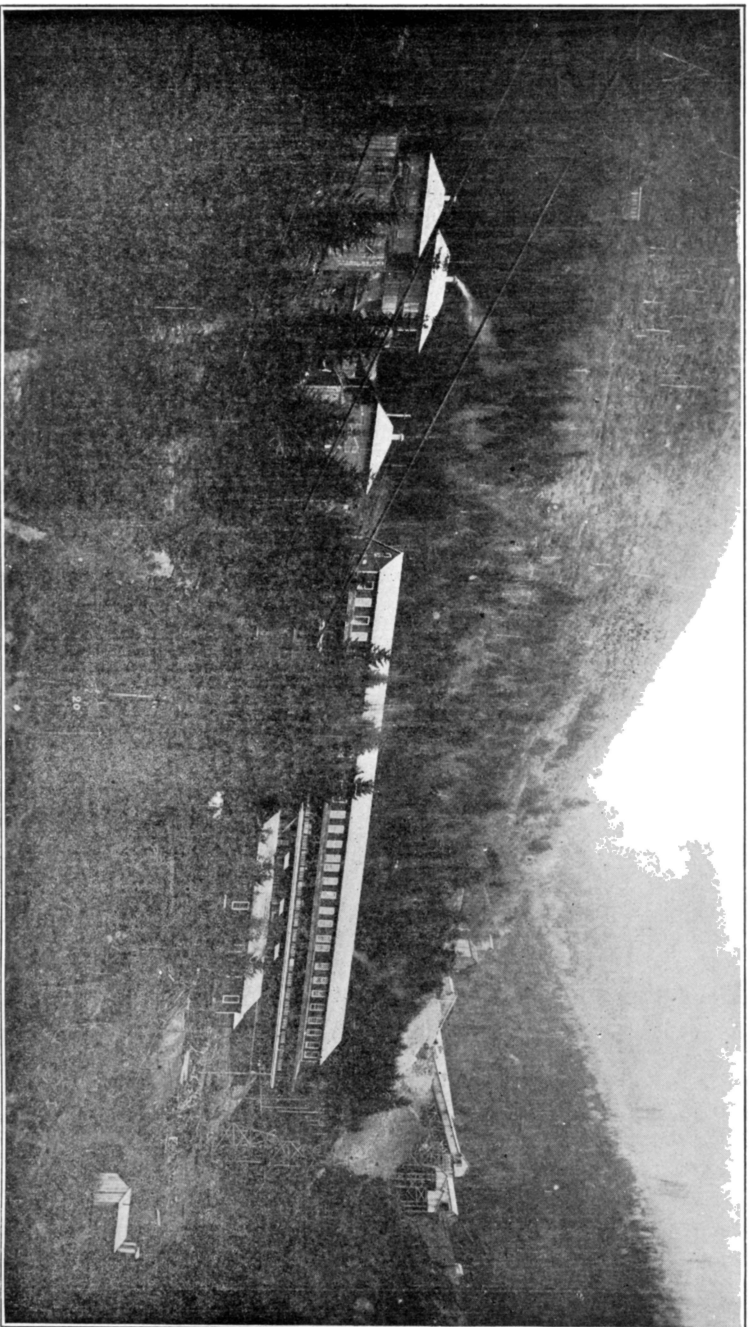
This is also true of the National mine, in the same vicinity, where an energetic campaign of development has been continued throughout the year, and the mine continues to yield the characteristic rich ore for which it was noted at the surface, and is likely to become a producer of importance at an early date.

Ore has been encountered in the National that carries a combination of both copper and lead with values of 7 to 20 per cent copper and 15 to 70 per cent lead, together with as much as 120 ounces in silver, and \$6.00 in gold.

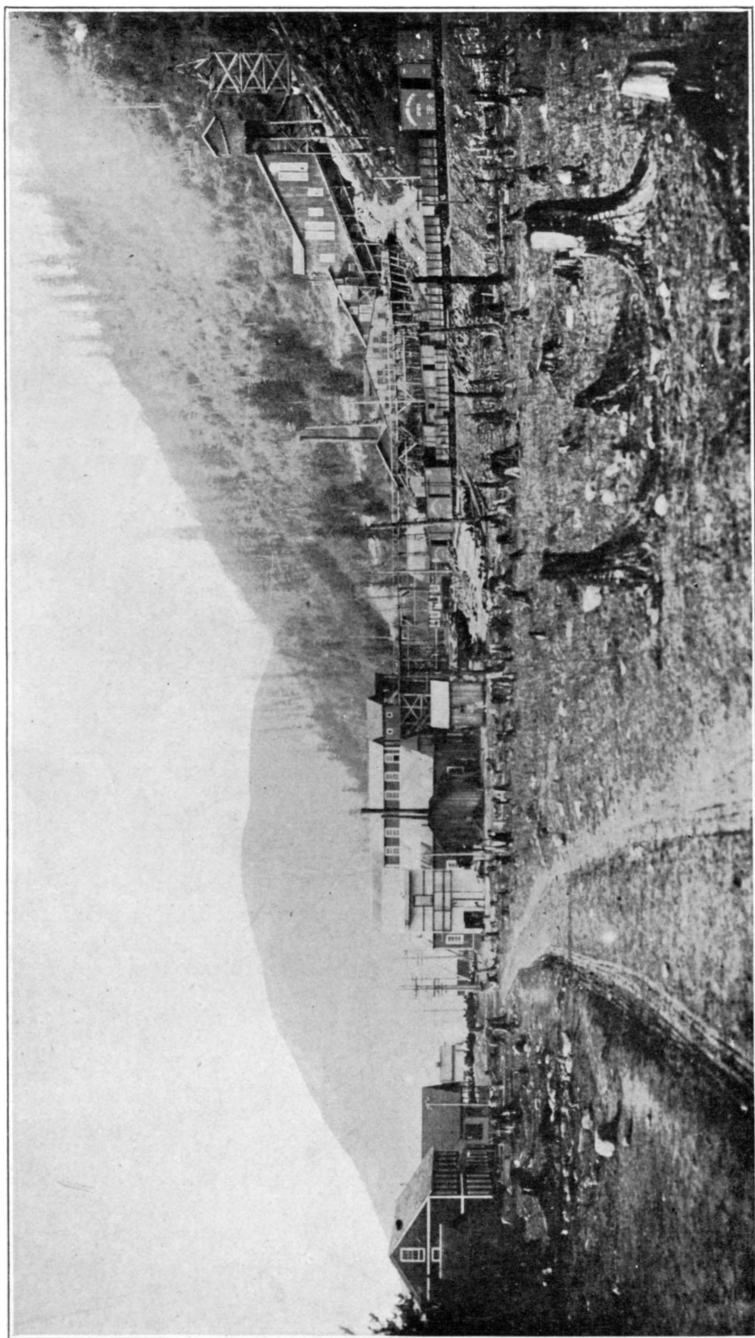
East of the Snow Storm, a number of other properties were actively worked throughout the year, and the characteristic copper carbonate and sulphide ore disclosed at several points, and it will not be surprising if this interesting belt of territory affords a number of dividend paying copper-silver mines as time advances, as it is decidedly unlikely that the Snow Storm ore body is alone in such a continuous and well mineralized belt.

On the opposite side of the South Fork Canyon, the Queen mine development was pushed into a handsome body of mineral which would have stood shipping at good profit if copper prices had been maintained throughout the year.

On the Park belt, the anticipated results expressed in my last annual report were not realized, especially in the Park mine, where a small crew was kept constantly at work in the lower tunnel of the property, endeavoring to locate the ore bodies that make such a magnificent manifestation of gossen mineral associated with rich copper ore at the surface, and in the upper tunnels. Along in December, however, a strong fissure was cut in one of the crosscuts from the main lower tunnel, on the Park, which contained considerable quartz and some copper mineral, and may prove to be the channel sought for and indi-



NEW MINERS' HOTEL, RECENTLY BUILT BY SNOW STORM COMPANY BETWEEN NO. 3 AND NO. 4 TUNNELS. ACCOMMODATES  
250 MEN WITH ALL MODERN CONVENIENCES.



SNOW STORM LEACHING PLANT AND TRAMWAY TERMINALS, LAKSON SIDING.

cated in the work above, when it has been drifted on more fully.

Conflicting opinions have been expressed in regard to the meaning of the immense surface gossens exhibited by the Park, Springfield, Champion and the balance of the great string of properties extending on this line to the east. Some experts argue that these immense gossens are a result of a complete oxidation of siderite or spathic iron, and may not necessarily be associated at depth with important bodies of copper sulphide mineral, as the rich pebbles their upper horizon contain would indicate. This, however, is purely a matter of opinion.

Siderite or spathic iron is the original gangue mineral on which all the famous lead ore bodies of the Coeur d'Alenes are built. It is the gossen croppings of the famous Minnie Moore with an \$8,000,000 production in the Wood River District of Idaho; it is the principal gangue of the Ramshorn and Sky Lark copper-silver mines of Bay Horse District in Custer County, Idaho; and its occurrence in the deeper levels on the Lost Packer mine at Loon Creek, Idaho, where the normal product of the vein averages 15 per cent copper and 3 ounces gold per ton, have recently shown a strong development of spathic iron that was marked by a notable increase in gold values; and with such notable examples of association with profitable ore bodies in both copper and lead, I see no reason why it may not be the surface manifestation of bonanza bodies of high grade copper sulphide mineral in the great fissures that traverse the west slope of the Coeur d'Alene-St. Joe divide, and I still have the utmost confidence in rich ore results with continued, intelligent development on that string of properties which carry the strongest surface manifestations of mineral of any portion of the Coeur d'Alenes.

*Monitor Mine.*—On this belt, to the east, where it crosses the State line, the Monitor mine was successfully operated during the year and made an output of 500 tons of high grade chalcopryite ore, containing an average value of 16 per cent copper and \$5 gold per ton, which was shipped crude, without milling; and several other similar sources of ore are likely to be revealed along this belt with continued work.

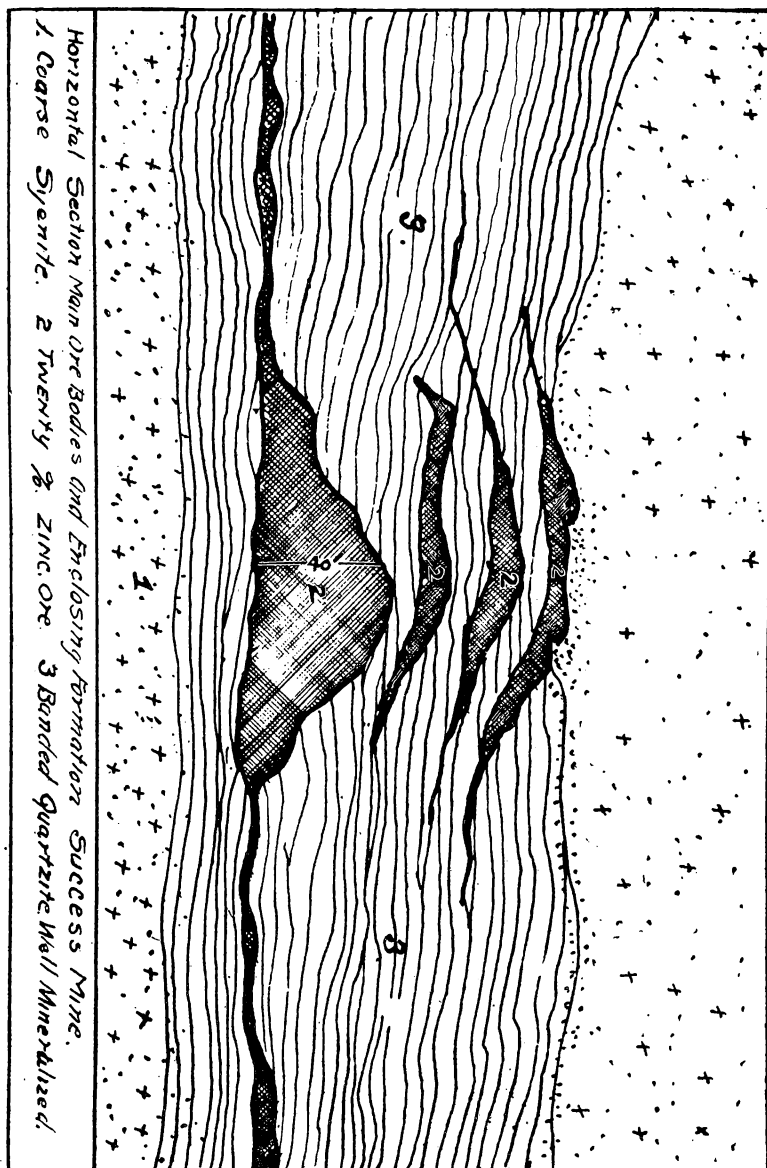
## ZINC.

The Coeur d'Alenes close the year 1907 with a very respectable output of zinc and totals more pounds than does its copper output, and was nearly all derived from two mines, the Success and the Frisco.

*The Success Mine.*—The Success mine, formerly known as the Granite, is an old property that was worked in the early days of the camp for lead exclusively. It is situated about 4 miles north of Wallace on Nine Mile Creek, and under the present management and ownership has been developed into a zinc bonanza, and now discloses what is probably one of the largest bodies of high grade zinc ore in the United States.

The present great ore body is developed by a tunnel of moderate length from the mill level near the creek that taps the shoot at something like 400 feet deep under the old workings, from which the mine is reputed to have yielded lead-silver ore that afforded a net profit variously estimated at from \$200,000 to \$600,000. After being worked from the surface down to this old level the ore bodies became very zincy. The present lower tunnel, however, was run by the old company but just missed the magnificent body of ore now disclosed, although a large amount of diamond drill work was done to find it. The unusual rake of the ore channel in the plane of the vein to the west seems to have been the cause of missing it, but if it had been found it is doubtful if the operation of the property would have continued any longer at that day, for the reason that a market for western zinc ore had not then developed.

Since being taken over by the present company, of which Mr. H. F. Samuels of Wallace is president and manager, and purchased the property for a song, a remarkable development of high grade zinc ore has been made, which also carries good associated values in lead and silver, and the ore bodies have proven to be continuous between the new mill tunnel and the old Granite tunnel above, through a vertical height of 400 feet, and with a flat rake of the ore body to the west of about 45 degrees dip in the plane of the vein. This remarkable ore body now disclosed in the mine is opened at the mill tunnel level and in 4 intermediate levels. It is shaped in horizontal sections something like an ear, as shown by the accompanying diagram, being





about 125 feet long by 40 feet wide in its widest dimension. It then tapers down to a few feet in width and has been drifted on continuously for several hundred feet to the east from where it was discovered at the mill tunnel level. Along this drift some swells as much as 2 feet wide of nearly clean steel galena ore are exhibited in the roof of the drift, and further exploration along this end of the shoot is likely to afford additional successes in the finding of big ore reserves.

The full area of the big part of the ore body has been cut out at the mill tunnel, but its associated ore bodies in the hanging wall have not yet been prospected at this level. Those in the intermediate levels, however, above the adit, are well developed and have been quite extensively stoped. They are 3 in number that range from 5 to 15 feet in width of the same high grade zinc-lead mineral, and make a total width for the heart of the ore deposition so far developed, of 60 feet of massive zinc sulphide ore at the widest part of their manifestation, tapering down to a foot or so in width at their ends, beyond which they warrant further testing.

The ground to the west of this magnificent mineral channel has not been explored at all, and it is possible it may reveal additional ore bodies along the main strike of the vein. This great reserve of mineral averages better than 20 per cent zinc as mined, together with from 2 to 8 per cent lead, and a sprinkling of iron pyrites. The ore occurs in a belt of quartzite, which is probably a highly silicified slate that is 300 to 500 feet wide and bordered on either hand by a wide belt of syenite or quartzless granite.

The contact of these two formations presents an interesting condition of metamorphic action contrary to the usual rule of a contact between an eruptive and a sedimentary formation, which often shows a clearly marked and open parting. The heat of the intrusive rock seems to have welded it into the sedimentary so that the one formation is blended into the other without any defined parting. The ore deposit is unquestionably older than the granite intrusive for the reason that tongues of granite are found injected into the ore body and the subsequent effects of this intrusive rock seems to have been a complete

silicification of the sedimentaries and their contained ore bodies, which have welded the ore and formation into a tight, hard, seamless mass that requires little timbering but lots of powder in the mining operation.

The vein is nearly vertical and the method employed of extracting the ore is underhand stoping in benches to a big rock chute extending from the intermediate levels down to the mill tunnel, and by back stoping on ore, from heavy drift sets which are provided with massive chute timbers that will stand bulldozing in case the coarse ore hangs up. The chutes are placed at close intervals into two parallel drifts through the wide part of the main ore body, and only sufficient ore is drawn to keep the men up to the back with a manway provided at each end of the stope. In this manner the ore body may be mined through without timbering to the first intermediate level, and subsequently drawn off as required, and this condition of the deposit afford the chance for very economical mining.

The property is equipped with a complete concentrating mill that has lately been enlarged and now has a capacity of 200 tons a day. It embraces a Blake crusher with 4 sets of rolls, 16 4-compartment jigs, 3 sets of Callow screens and 9 Callow tanks for sizing the pulp. There are 16 Wilfley tables and the ore averages, as it comes from the mine, runs 20 to 25 per cent zinc, and 2 to 8 per cent lead as it is broken down in the stopes without sorting. The mill produces 50 tons of zinc concentrates a day with this kind of feed, that is a remarkably clean product, considering the original mixture, the lead separation being almost complete, while the zinc concentrates run 45 per cent zinc with a little iron pyrites.

The property is in a comparatively new stage of development as a zinc mine. The whole zone of quartzite in which the ore occurs is more or less mineralized, and it is not unlikely that other bonanza shoots of the same class of ore will be found as the exploration of the property progresses, especially to the west, and by further crosscutting and raising on the extension of the vein to the east the ore resources of the mine may rapidly be doubled. The ore reserves completely blocked out at the present time will aggregate fully 150,000 tons of 20 per cent mineral, and there is no reason why these big ore bodies should not go down in the dip of the vein to a very considerable depth.

The property paid a \$60,000 dividend during the past season's operation, and would doubtless have doubled that amount if the price of spelter had been maintained throughout the year. It was shut down late in December, but is in magnificent shape for a large output whenever market conditions warrant, and will doubtless become one of the steady dividend payers of the district. Its development and equipment with the successful solution of the problem of separating the minerals to such a clean marketable product, are a worthy tribute to the energy and ability of Mr. Samuels and his associates, as they have established the reputation of the district as a profitable source of zinc ore that will encourage the development of its other zinc bearing areas.

*The Frisco Mine.*—The Frisco mine, after lying idle for several years, was unwatered during 1906 for the purpose of exploring the vein at further depth, and its mill was re-adjusted with considerable additional equipment for the purpose of separating the heavy zinc values contained in the ore body at its bottom level. The mill was successfully operated for a short period and made an output of mineral characteristic of the old days, which included nearly 200,000 ounces of silver, 6,758,658 pounds of lead, and 2,992,874 pounds of zinc. This ore, however, was largely derived from some old bottoms and stope remnants left by the former operation. A new lift of 200 feet was sunk below the 1,400-foot level, but drifting at this horizon proved to be unsatisfactory to the management in the matter of ore disclosures, and the property was shut down early in the season, its pumps taken out and it was allowed to again fill with water, to the great disappointment of the local community.

The Frisco has formerly been the mining school of a number of mine foremen and superintendents who have since and are now successfully filling positions of trust and displaying marked ability in following and finding new ore bodies in the other big producers of the camp. These men were invariably enthusiastic advocates of the probable permanency and success of the Frisco vein at further depth, and believed it was not given a sufficient chance to prove its merits, or the necessary amount of crosscutting development work and drifting that its reputation war-

ranted, for it is a well known fact that this noted ore course was repeatedly subject to fault movements and had afforded some complex problems in its former period of development that had several times been successfully solved, and it seemed a matter of regret with the whole community, especially the successful ore getters of the camp, that after unwatering the old mine it had not been given a more thorough exploration at depth, as a good many well informed men have abounding faith in its future and in its prospects of deeply rooted ore bodies.

*Pine Creek District.*—Some handsome developed resources of a similar mixture of zinc ore, as is found in the Success and Frisco, associated with good lead values, exist in the Pine Creek district, a few miles south of Wardner, where a series of strong parallel fissures having the same general course as those at Wardner, have been developed to considerable extent, and large reserves of zinc-lead ore disclosed at several points. In some of these properties the lead is in excess of the zinc values; in others, the reverse is the case, but nearly all the properties in that section carry a strong mixture of zinc mineral, which, with proper milling facilities, can doubtless be made to yield an important output of clean zinc concentrates.

Among the properties of this part of the Coeur d'Alenes which have been developed to considerable extent, are the Surprise, previously described, the Douglas, Highland Chief, Nevada-Stewart, the Nabob, the Sydney, the Trapper, the Jim Blaine and several others. The bulk of the formation in this section is Pritchard slate, but wide belts of clean quartzite, presumably of the Burke variety, occur in close association with some of the ore courses, and it seems only a matter of the successful adaptation of milling machinery for the proper separation of the ores of these properties when this part of the Coeur d'Alenes will make a big yield of zinc, as well as lead, and afford a number of very profitable mining enterprises.

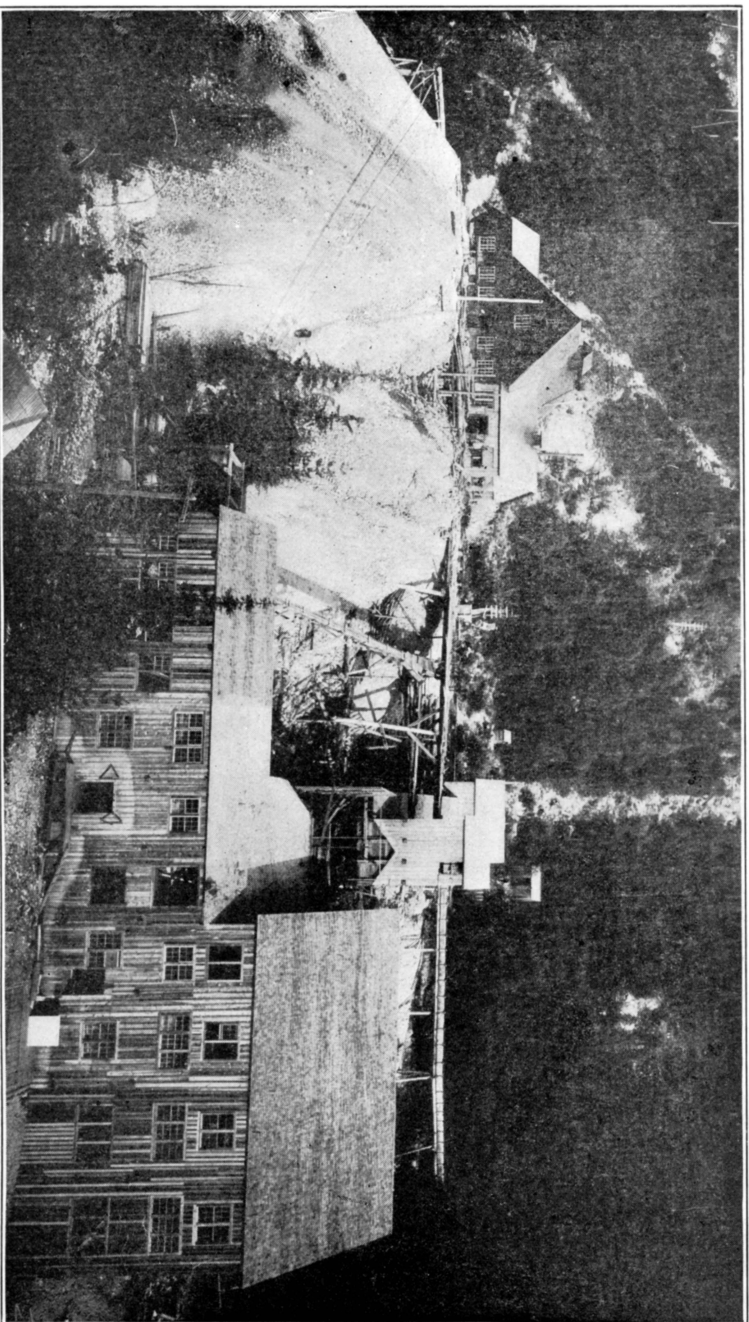
In this connection the new zinc-lead plant being installed at the Idaho Consolidated mine in Blaine County, a description of which is given under that head, is worth studying and keeping track of, as it may mean the solution of a metallurgical problem that will have an important bearing on this part of the Coeur d'Alenes.

*The Stanley Mine.*—The Stanley mine, situated in the wonderfully mineralized area surrounding Burke, gave the district its initial shipment of clean antimony ore last year and still continues to attract public attention. Its development has been very considerably extended recently, and while the market has been unattractive for antimony ore, there are some handsome ricks of mineral of this class piled up at the mouth of the lower tunnel awaiting better prices.

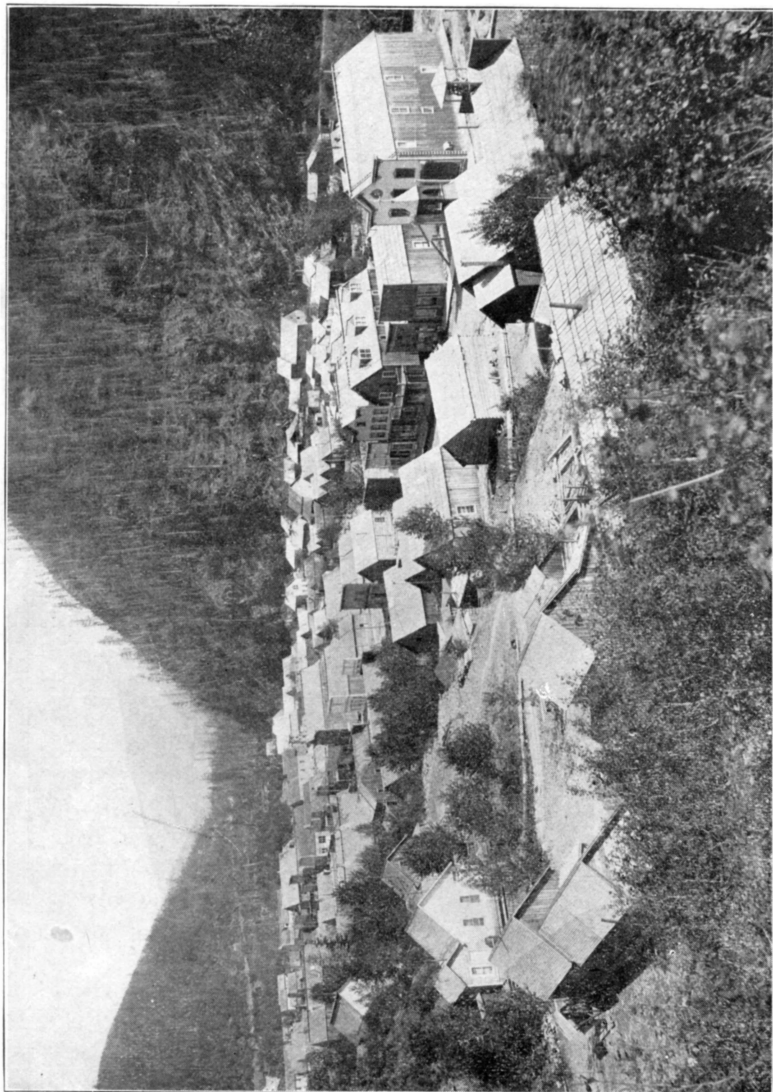
The property is developed by 2 tunnels 150 feet apart, the bottom one being about 300 feet vertically below the croppings of the vein over the present development. The uncertain condition of the size and length of the ore body displayed a year ago have been in a marked degree solved, and the main ore shoot has been picked up in the lower tunnel and connected by a raise in a magnificent body of mineral through to the upper tunnel. It had also been drifted on 100 feet in the bottom tunnel, and the drift was all in ore the greater portion of its length at the time of the writer's visit during December.

The ore seems to make in flats and steeps. The raise from the lower tunnel for the first 50 feet is at an angle of about 50 degrees and the vein rather small. From that point up, however, it flattens off to a pitch of about 35 degrees and for the balance of the raise connecting through to the upper tunnel, a distance of 130 feet, the whole size of the raise is in a magnificent body of ore that ranges from 5 to 20 feet wide as exhibited by crosscuts, and when freshly broken, before it is powder blown, sparkles like a jewelry shop with masses and fluted crystals of stibnite or clean antimony sulphide in a shattered yellowish white quartz.

This magnificent body of quartz is said to average \$20 per ton in gold, and while the writer has never sampled the property and can not vouch for this statement of such big gold values, I am free to state that it looks it, and as a further indication of the truth of the statement of its values, it is no trouble to pick up specimens of the ore on the dump and find coarse particles of visible native gold in them. There seems to be hardly any other mineral in the vein but quartz and antimony with its associated values of precious metal, in which respect it is in sharp contrast



SUCCESS MILL AND LOWER TUNNEL, FOUR MILES NORTH OF WALLACE, MOUNTAIN, RECENTLY ENLARGED.  
THE MOST SUCCESSFUL SEPARATOR OF COMPLEX ORES IN IDAHO.



MURRAY. THE SCENE OF THE ORIGINAL GOLD DISCOVERIES IN THE COEUR D'ALENES.  
NEAR TERMINUS OF NEW IDAHO NORTHERN RAILWAY.

with the neighboring bonanzas of lead-silver ore so close by, and affords an interesting problem of mineralization.

The foot wall of the vein is very distinctly and clearly marked and strikes north and south and has been picked up by a short crosscut tunnel a thousand feet further south of the present development down Gorge Gulch, just above the upper end of Burke, where a handsome streak of the same class of antimony bearing quartz is revealed, and it looks as if a drift on the vein from this lower point would be apt to disclose a succession of handsome ore bodies of the same nature as that disclosed in the main works.

The company are negotiating for the erection of a mill to treat the quartz for its free milling gold values. Some practical milling tests have been made on the ore and it is said to yield a high proportion of its contained gold values to simple plate amalgamation. The confirmation of these statements should mean that the Stanley will make a dividend paying gold mine at no distant date.

*North Side Mines and Railway.*—The event of greatest importance to the extensive mineral region lying on the water shed on the North Fork of the Coeur d'Alene River and constituting nearly half of the mineralized area of the Coeur d'Alene country, was the incorporation, financing and starting the construction of a railway to tap this interesting district.

This new branch is to be known as the Idaho Northern Railway and is to be 33 miles long. It starts near Kingston, on the O. R. & N. Co.'s Coeur d'Alene line, and follows the north fork of the Coeur d'Alene River to the mouth of Pritchard Creek, then up Pritchard Creek to the heart of the North Side District at Murray and extends to Raven, a short distance above Murray. This enterprise was successfully promoted and financed in the east by Hon. B. F. O'Neill of Wallace, and E. P. Spaulding of the Monarch Mining Company, at Murray, whose enterprise and success in the matter are worthy of all praise from the residents of the North Side, for the completion of this important branch will relieve them from the embarrassing and costly disadvantage of wagon transportation over a high mountain divide to present railway connections under which they have always labored.



This enterprise was fully established and construction contracts let and the work in progress with a large force of men when the financial panic struck the country early in the fall, and while the bonds had been sold and the capital all provided for to push the thing through at a rapid rate, the local directors, in consideration of the money stringency in the east, wisely decided not to crowd the financial end, under the circumstances. They, however, are carrying a small force on the work at this time and keeping the enterprise alive, and as financial affairs become easier, this force will doubtless be gradually increased and the construction work pushed through to a finish.

The route follows an easy water grade all the way to its terminus, and presents no serious construction difficulties. In fact, it is believed that the road can be built and equipped with rails at a cost of \$20,000 per mile.

What is locally known as the North Side section of the Coeur d'Alene field embraces the drainage of Pritchard, Eagle and Beaver Creeks and their numerous tributaries, covering an extensive area of richly mineralized territory that contains dozens of handsome lead-silver prospects and includes several fairly well developed mines, among which the Bear Top made quite an important output during the past year and shipped a number of cars of high grade concentrates which had to be hauled by wagon over the divide between the North and Side Forks at great expense.

With the Bear Top, Monarch, Black Horse and other developed resources of high grade lead-silver ore in the center of the North Side belt, and the young Callahan bonanza, which will be more nearly tributary to this new branch than its present shipping point at the south end of the district, and the Wait mine on the north end, the latter considered by competent judges to have the greatest showing of high grade lead-silver ore at the surface and in its numerous shallow openings of any mine ever found in the Coeur d'Alenes, together with the dozens of other new development enterprises in progress in this class of ore, the new branch, when completed, is definitely assured of an important traffic resource of this class, that will doubtless rapidly increase into an important tonnage as time and development advance.

Added to this class of ore, the North Side District carries an interesting array of gold bearing quartz veins that have been skimmed of their shallow surface oxidized ore, but still retain handsome showing of high grade gold bearing ore of a more refractory nature, which, however, with proper dressing and preparation for market, should provide another important source of mineral traffic. These, with the extensive placer resources of the country, and the new and apparently commercial resources of tungsten ore, together with the magnificent lumbering interests that will be tributary, this new branch should pay big returns for its operation from its inception, and as time advances, may become one of the most profitable feeders of railway traffic in the northwest.

*Government Geological Survey.*—The tardiness of the United States Geological survey in giving the public a full report of the geology and ore deposits of the Coeur d'Alenes is regrettable, and our representatives at Washington ought to be able to advance the district's interest in this respect by friendly intervention. The Coeur d'Alene mining district, since 1884, has enriched the commerce of the world with lead, silver, gold and copper values amounting to the grand total of something like \$175,000,000, and the sum of its attention from this important Government department has been a preliminary paper by Frederick Leslie Ransom, which, however, is of such a valuable and interesting nature that the complete report promised is looked forward to with a marked degree of interest, and should be hurried up.

Before Leadville had made anything like such a record of output it was accorded a monograph by Professor F. S. Emmons that has since become a classic in mining literature, and has proved of wonderful advantage to the further successful development of that important district, and has been added to from year to year, and it is to be regretted that the Coeur d'Alenes has not received further attention, for while we are not afraid of the report when it is completed becoming an obituary, even if it does not arrive for 15 or 20 years more, it nevertheless might prove a very profitable and interesting guide to the general advancement of the district at large.

One of the principal features brought out by the pre-

liminary paper of Dr. Ransom in his classification of the formations of this field, was to localize and identify the most valuable mines and ore deposits with a horizon of formation named Burke quartzite, and local operators of new enterprises often carry the point of tying their deposits to this formation to the extreme. The disposition to take this view is, to my notion, unwarranted, as I believe that the occurrence of ore in the slates and other horizons are likely to prove of equal importance where the same pronounced conditions of fissuring have attended its deposition.

As an illustration that "Burke" quartzite is not essential for the development of dividend paying ore deposits in this district, I would call attention to the fact that the two newest dividend payers, one of which has practically been given to the district by a storekeeper, Mr. W. D. Greenough, and the other by a former obscure attorney, Mr. H. F. Samuals, are neither of them in the Burke quartzite. I refer to the Snow Storm mine above Mullan in "Revett" quartzite, and the Success mine on the Nine Mile Creek, the latter, while its enclosing formations in their present condition contain more silica probably than does the Burke quartzite, when the ore body was originally formed, it was formed in a belt of Wallace or Pritchard slate, the banded markings of which representing original deposal lines and cleavage planes are still pronouncedly manifest in spite of the fact that the rock has been changed by a secondary silicification to its present form since the ore was deposited. Hence it appears manifest that the man with a good prospect in a condition of pronounced fissuring in the slate formations or other horizons, has no reason to feel discouraged or try to borrow a name for his formation to match his ore because it is locally popular.

The success of the two new bonanzas mentioned are the result of the energy, business tact and faith in nature of their sponsors above referred to, and the intuitive knowledge of the underground foreman associated with them. They were launched against the judgment of some very practical and technical men of previous experience in the district, and the handsome position and value as mining propositions they have attained substantially illustrates the speculative phase of mining investments and the im-

portant part often played by the new man at the business. Mr. Samuels can justly claim credit for the disclosing of two very important deposits, which include the Senator Stewart, as well as the Success, during the brief period of his residence in the district, and the handsome new hostlery which bears his name, now nearly completed in Wallace, will give the metropolis of the Coeur d'Alenes one of the best and most up-to-date hotels in the northwest and stand as a fitting monument to a successful mining career, which seems to be only well started, and the district is fortunate to have such citizens who are willing to back their faith in its future in such a substantial manner.

Wallace is rapidly assuming metropolitan airs, and a number of other very handsome business blocks were erected during the past year by resident investors, and mostly from mining profits, which is a substantial evidence of the district's future, as no one is better able to judge of its future than the men in close touch with its daily development.

*Mining Conditions.*—Mining conditions in the Coeur d'Alenes and business of all kinds was extremely prosperous during the first eight months of the year, due to the full operation of the big mines and the numerous new enterprises undergoing development. The scarcity of labor with the big producers was accentuated by the piratical small operators, who bid \$4 per day for underground work, and in that manner "Shanghaied" a good many of their best men, making it difficult for a while to hold a sufficient crew together with which to keep the mills going. The high price of the metals made it possible to mine a good deal lower grade ore in several properties than is normally extracted, but the rapid increase in cost of material, which has amounted to nearly 100 per cent on mining timbers, with a large increase in the cost of fuel for steam purposes within the past 4 years, together with a lot of new and inexperienced labor, materially governed the limit of grade that could be extracted.

The Washington Water Power Company of Spokane supplies between 4,000 and 5,000 electric horse power to the Coeur d'Alene mines at the reasonable rate of \$50 per horse power year, which has proven a big advantage to the district, whose sources of coal fuel supply are rather remote with high prices and subject to famine periods of

scarcity and the demand for electric power seems to be growing faster than it can be supplied.

The higher wages paid in this and other States was having its effect on the men and attracted many of them to other fields during the early part of the year, and an incipient demand for an increase in pay all round was talked of during the middle of the summer, but with the recession of values and the approach of the panic in the early fall, the labor situation became much easier, and by the close of the year fully half of the smaller operations had shut down, which was also true of several of the big mines, and of the larger mines, the Hercules, Standard-Mammoth, Last Chance and Bunker Hill & Sullivan were the only ones in full operation at the close of the year.

A good rate of wages is paid in the Coeur d'Alenes and averages over \$3.60 per day for all kinds of underground work. Three dollars and fifty cents is the minimum wage paid underground throughout the district, except for unskilled labor in the Wardner mines, where \$3 is paid, and an 8-hour day underground is the law in this State. These wages will probably be maintained unless the metal prices go very much lower than they are at the present time, which is unlikely. Board costs a dollar a day.

The mines are generally well kept up and well ventilated. There are no wet mines in the district, although the ground is generally damp enough to keep down dust, and cases of lead poisoning are seldom heard of. They are subject, of course, to all the normal hazards of big mining operations anywhere, but will compare favorably with the conditions of the best mines of the same capacity in other western States.

The elevations of the principal towns of the district are comparatively low, about 3,000 feet above the sea level. The country is richly timbered and has a mild climate, in which respect it affords a sharp contrast to the high elevations and desert aspect of many other big western camps, and, altogether, affords a desirable, healthy country in which to live.

The output of the district during 1907 was a trifle over 11 per cent less than last year, and figured on the gross metal contents of the minerals shipped, will aggregate \$19,084,435.09, and represents 85 per cent of the total output of the State.

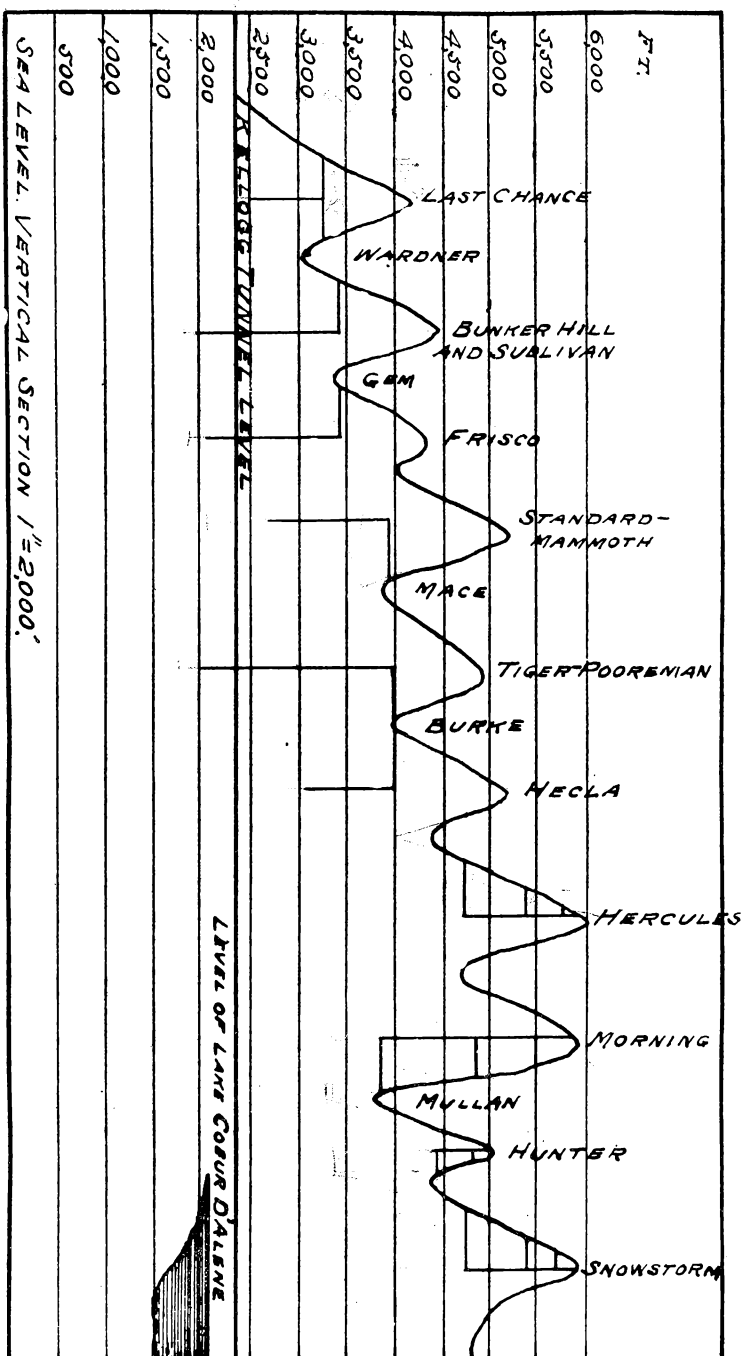


DIAGRAM REPRESENTING THE HIGHEST CRESTS AND DEEPEST POINTS OF DEVELOPMENT OF THE PRINCIPAL ORE DEPOSITS OF THE COEUR D'ALENES, 1906.

## TWIN FALLS COUNTY

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Twin Falls County, which was created by the last session of the Legislature from the western portion of Cassia County, made a shipment of gold amounting to a trifle over \$2,000 last year. Its source, if derived within the present boundaries of the county, was probably from the operation of the Snake River fine gold diggings. Aside from this source of precious values, the possible metallic resources of the new county are limited to the mountain slopes south of the big irrigation enterprises, where some excellent smelting ore float has been discovered that may ultimately lead to the development of minable deposits.

I have never examined the western extension of the Goose Creek lignite fields, but have no doubt that considerable portions of them are in the present area of the new county, and with intelligent prospect work may reveal a source of good lignite that would be useful for domestic purposes.

The agricultural resources of this new division of territory are probably unexcelled in area and ultimate real estate possibilities and values by those of any other county in the State, as they embrace nearly half a million acres of fine land, half of which is now under water, and the subjection of the balance well under way. These include the parent enterprise of the Twin Falls Land & Water Company and the Salmon River project.

The Twin Falls tract has seen a wonderful transformation from sage brush to productive farms in the brief period of 3 years, and with the new adjoining Salmon River tract should, within a few years, make Twin Falls the most productive agricultural county in the State. Its yield of last season of over 600,000 bushels of grain and 100,000 tons of hay, so shortly after its original desert condition, is simply an earnest of what the near future holds in store in the way of productive possibility.

This enterprise, together with the north side Twin Falls enterprises are extremely fortunate in falling into such progressive and strong financial hands as they have, and it seems likely that the territory will soon be extensively developed with electric railway transportation with a

southern extension to Ely, Nevada, which will give the tract a cash market for its products that will probably equal Butte, Montana, in population and requirements within a very few years; such a line of transportation would also develop some fine mineral territory between the two points, besides giving another transcontinental railway connection.

The whole west is growing so rapidly in other lines, as well as in agricultural enterprises, that there is hardly any likelihood of lack of market which will doubtless develop and rapidly meet the productive resources of the tract if diversified farming is followed. The topographical and geological features of these extensive tracts of rich agricultural land are of an interesting and valuable nature and insure its successful development and rapidly increasing value.

The Twin Falls north and south side tracts, and the adjacent Salmon River tract, are supplied lengthwise, from east to west, by a natural drainage sluice in the form of a profound box canyon, from 100 to 1,000 feet deep, the walls of which are built of a succession of lava flows, affording broad bordering plateaus, soil covered to a depth of from 1 to 20 feet, whose surface aspect presents a succession of low undulating swells, with a general north and south axis, and separated by shallow lateral arroyas and draws, which afford the most perfect natural drainage possible. This condition of topography insures the whole tract against sub-irrigated or soured land, and presents ideal conditions for obtaining the maximum results in distributing water.

The soil of this region is of a nature peculiar to the tertiary lava fields of this and adjacent States. It is not a residual soil due to the gradual decay of the underlying basalt, which, in this instance, is of very recent origin and much younger than the brown Columbia River lava further west, but is probably of local plutonic origin. Under irrigation it has proven to be of remarkable fertility, and probably originated as volcanic dust from the numerous crater cones that dot the surrounding Snake River plains, and has subsequently been modified in its distribution by wind and water action.

Between the soil and actual bed rock the land carries a



layer of white travertine of lime tuffa, locally called hard pan, which generally rests immediately on the lava bed-rock surface. This hard pan, however, when saturated with the water of irrigation, readily softens and becomes permeable to delicate plant roots. Its simple composition of nearly pure lime carbonate eliminates the probability of alkaline effervescence. Its origin is doubtless due to precipitation from the numerous hot springs that followed the most recent lava flows under the soil. A similar process is in progress today, and the same kind of travertine being deposited from warm springs of lime water now flowing to the surface at a point on a smaller plateau 4 miles west of American Falls.

The soil of this tract is of a gray brown color, and of very fine grain, so much so that about 80 per cent of it will pass through a 200 mesh sieve. In spite of its fineness, however, it has a loose sandy nature all through and does not bake. Its analysis gives a remarkable array of elements rich in the basic salts of vegetation, and so closely follows the complex composition of the underlying lava in the variety of its component elements as to practically establish its kinship.

This soil gives astonishing results in the production of alfalfa, whose well known virtue of fixing nitrogen from the air affords a natural means of fertilizing and a guarantee against impoverishment by proper rotation of crops.

These extensive tracts of land under canal lines are not, of course, all clean, and in some areas considerable patches of surface rock occur. These are not such a serious detriment, however, as to ruin the value of the land, for it has been proven that in most instances these rocks are simply surface flows of float basalt and are generally underlaid with a good depth of rich soil, and while these rock patches doubtless form an objectionable feature, the fact still remains, that when they are cleaned off, valuable and productive areas of deep soil are available, and not a bare waste of bedrock.

The origin of these patches of surface rock is an interesting problem. Some authorities have argued that the soil of the whole tract is of wind blown origin from the adjacent mountain slopes. This seems to me to be unlikely, and while the wind could have displaced the soil from its origi-

nal source to its present position, it is inconceivable how it could have conveyed slabs of lava, weighing up to 200 pounds, over such a broad area of comparatively flat surface and deposited them on 4 or 5 feet of soft soil along the crest and western slope of the north and south swells, for which the tract is noted. Nor does there seem to be any other source for them in the position they occupy, on the top of the soil, than that of ice and water transportation. It is not improbable that the bulk of the soil of this tract originated as volcanic dust, and during the time it was accumulating, or shortly after, the whole area was covered with one of the Snake River Valley lake periods, and that the rocks were moved to their present position, frozen into ice flows which anchored on the westerly lee shores from the prevailing westerly winds, which probably were the same then as now, and were thawed out and dropped there on the already soil-covered lake bottom, as it is a notable fact that these deposits occur principally at the crest and westerly slope of the swells.

This action can be observed along the Snake River, east of Heyburn. Every spring where the shore ice freezes into the talus lava rocks break away in the spring in large cakes, with connected slabs of lava, to float on down the stream and anchor on the low borders of mud banks where they thaw out with the advance of the season and mix with the silt and sand of these low island accumulations in the bed of the stream.

The astonishing results of irrigation on this tract have to be seen to be appreciated. The further development of its natural power sites, and equipment with electric lines, warrants the anticipation of a remarkable growth in population and real estate values.

## WASHINGTON COUNTY

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### SEVEN DEVILS DISTRICT.

Washington County contains a variety of mineral resources. Its most interesting deposits so far developed are of the copper bearing variety and situated in the Seven Devils District. This interesting district is noted for high grade copper ores carrying good associated values in gold and silver. It has been afflicted by title litigation ever since its discovery, but I believe this is now pretty well cleared up. Its second drawback has been its remoteness, but this disadvantage will be greatly ameliorated by the completion of the Northwestern Railway to Homestead. This work is so far advanced that locomotives are likely to whistle into Homestead inside of a year, which will put them within 3 or 4 miles, air line, distant from the best developed portion of the Seven Devils district and will greatly facilitate the marketing of its ores.

*The Peacock Mine.*—The most important mining operation of the past year in this field was that of the Peacock mine, which was handled under lease and bond by Mr. George W. Boggs, who mined and shipped 500 tons of 16 per cent copper ore containing in addition several dollars per ton in gold and silver, and while doing so greatly increased the already large ore reserves of the mine.

The Peacock carries an immense surface gossien of iron and sandy garnet gangue with a rich dissemination of copper carbonate and bornite ore. The bornite occurs in segregated masses that sometimes contain as much as a carload of 30 to 40 per cent copper ore, and the whole mass of gossien outcroppings with creamy bunches gophered out is said to average 6 per cent copper through the ore shoot.

The formation is gray dyorite and the ore body is probably a replacement of a disconnected body of limestone, for narrow belts of limestone associated with rich copper ore and an excessive development of garnet and other metamorphosis minerals occur in repeated outcroppings on the strike of this property to the southwest for several miles.

The Peacock is situated at an elevation of 6,730 feet above sea level, and the canyon slope towards the Snake

River falls away from this point at about half pitch, affording magnificent chances for deep crosscut tunnel development. The property makes such a handsome showing at the surface, and at the present shallow development, of comparatively rich average values in copper, as to indicate that its development in depth may afford a bonanza resource of copper mineral that can be shipped crude as mined, when the railway is finished, and a connection made with aerial tram, as it could be reached by a line of that kind to advantage.

*Lockwood Mine.*—The Lockwood mine, south of the Peacock, was also operated under lease and bond, and 2 carloads of 45 per cent copper ore were mined and shipped during the year, which yielded a very handsome margin of profit over cost of shipment.

*Blue Jacket Mine.*—At the Blue Jacket mine in this district, near Landore, a small crew were worked during a portion of the year, and an old shaft re-equipped and pumped out for the purpose of expert examination, with a view of purchasing from the present owners, by some prominent Chicago capitalists. This property has been developed by a vertical shaft 360 feet deep. The shaft, however, is tapped by a crosscutting tunnel at a depth of 200 feet and there are 4 short drifts. This work, together with another short tunnel on the adjoining claim of the same group, has produced ore to the gross value of \$300,000, and practically all of the ore sent from this property has averaged over 20 per cent copper and up to 45 per cent copper by the carload lot. This production was made when copper averaged less than 15 cents per pound.

The ore occurs as contact segregations between a big zone of garnet rock with its associated metamorphic minerals of epidote specularite and molybdenite, with gray diorite, and on the opposite side of the garnet zone with an accompanying vertical belt of white limestone the ore was in rich segregations of nearly clean bornite, with a little carbonate alteration near the surface.

The surface manifestations of copper on this property are insignificant. The garnet rock and accompanying limestone belt is from 100 to 200 feet wide and bordered on both sides with an extensive area of gray diorite. Wherever the gray brown garnet rock cropping is broken into,

its shrinkage and general structure planes show rich bands of high grade copper mineral with hardly anything to indicate their occurrence at the surface but a pitted condition of the gangue. With such an output of rich ore from such a limited development and where the geological conditions are so strong and favorable for a continuance of the ore at further depth, there is hardly any question but what the extended development of this property will reveal valuable bodies of high grade copper mineral, and it is probable that the property can be developed into a very profitable mine.

The Blue Jacket and the Peacock have been responsible for the principal output of the Seven Devils District, together with the Decorah and Arkansas mines, which are of similar type. There are a string of other properties, however, of the same nature, associated with limestone zones and garnet rock, in the district, on which more or less development work has been done and rich ore disclosed, and with the advantage of nearer railway transportation several valuable producers of copper, gold and silver ore are likely to be opened up.

In the vicinity of Cuprum, a little further southwest of Landore, quite a lot of development work has been done in the past. This portion of the region carries some wide zones of mineralized porphyry and diorite, impregnated with a variety of high grade copper minerals and native copper, and it is believed can be made to furnish an immense tonnage of concentrating ore. In addition to these deposits this portion of the Seven Devils District carries some pronounced fissure veins with sugary friable quartz gangue containing some fine values in gold and silver that can probably be concentrated to a high grade shipping product, or possibly treated on the ground by amalgamation and cyanide.

In this part of the district the National Copper Mines Company carried a small force of men on their property, who accomplished 275 lineal feet of work during the year and the mine has a total of 1,200 feet of development, principally in the form of crosscuts and drifts.

The Falk group of claims, owned by Messrs. Rude and Hitchcock, was also operated during the year by its owners, who ran 150 feet of drift on a big quartz fissure 44

feet wide. The property has a total of 1,000 feet of work, and the owners are contemplating the erection of a mill to treat the extensive ore resources they have developed.

Near the Snake River, below Cuprum, along the steep slopes of the canyon, there are a number of copper bearing deposits showing disseminated copper minerals through zones of old porphyry formation, together with some definite veins of high grade chalcopryite ore, and the encouraging prospect of railway transportation soon to be established for this belt resulted in a considerable amount of prospect development work in this locality with some very interesting results at several points during the past year.

#### HEATH DISTRICT.

This district is situated on the west slope of Cuddy Mountain near the head of Brownlee Creek, and 7 or 8 miles from the new railroad extension down Snake River, and was the scene of a little mining activity during the past year. It carries some rich copper ores and also some rich silver-lead ores. The copper minerals generally occur near a contact of quartz-monzanite, with overlying bodies of quartzite, slate and limestone, the latter associated with a variety of porphyry intrusions.

*I. X. L. Mines.*—The I. X. L. group at Heath, owned by Mr. A. L. Donart and associates, has an area of fine to coarse monzanite nearly 2,000 feet square, carrying a surface dissemination of copper carbonate minerals which change at a very shallow depth to yellow copper sulphide ore and present the possibility of developing into an immense deposit of concentrating material that would run 1 1-2 to 2 per cent copper and pay to handle on a big scale.

This copper bearing formation varies from rather fine grained, brown spotted porphyry rock to a coarse crystalline structure resembling granite.

The coarser rock contains yellow copper sulphide ore, wherever it has been dug into on this property for a depth of 10 feet, and along the shrinkage and fracture planes some rich bands of mineral occur, especially where the schist joints of movement are shown. The sulphides are also disseminated in the hard coarse grain of the rock and when the mineral is separated by hand concentration, the resulting concentrates carry 15 to 20 per cent copper and \$7 to \$9 dollars in gold per ton.

This deposit is geologically related to the famous copper bearing monzanite deposits of Bingham, Utah, and Ely, Nevada, and probably shows a better surface manifestation of copper minerals than does the Bingham deposits, but whether the mineral will be as uniformly disseminated through the rock at depth as the Bingham deposits were found to be, is a matter of speculation. This deposit could be very cheaply tested with crosscut tunnel work and is worthy of investigation.

*Railroad Mine.*—In addition to these decimated copper-gold bearing formations there are several others of more concentrated form. The Railroad mine, near the border of the monzanite area, carries rich segregations of carbonate ore at the surface and peacock copper with iron pyrites and an occasional sprinkling of white bismuth sulphide, very rich in silver, where it has been cut at a depth of 80 feet with a short crosscut tunnel. This deposit is over 100 feet wide, through which great width it averages 3 1-2 per cent copper, together with about \$2 in gold and silver per ton, and several carloads of select ore from chamber segregations have been produced from the mine that sampled 20 to 40 per cent copper.

There are a number of other handsome prospects in this locality containing similar high values in smaller veins and deposits, and all of the ores of the copper properties of the district carry proportionally high values in gold.

Adjoining the copper belt in the vicinity of Ruthburg and Grade Creek, 2 miles west of Heath, there exists what is known as the Black Belt, so named from a series of immense croppings of manganese gossens and black stained porphyry associated with narrow belts of pink limestone and old porphyry formations with accompanying bodies of schist and slate.

*Belmont Mine.*—One of the principal mines of this locality is known as the Belmont, and was operated during the year by the Belmont Mining Company, who undertook to cut the vein at a vertical depth of 400 feet with a crosscut tunnel 600 feet long. The tunnel was run 550 feet during the year, but fell a little short of its objective point, when the finances of the company ran short and the enterprise has since been hung up, an unfortunate and disappointing circumstance to the whole district, as the

property contains a lot of merit. It has previously been developed through some shallow tunnels and was equipped with a dry silver mill at one time, with which 50,000 or 60,000 ounces of silver were taken out from the treatment of the ore.

The ore of this property consisted of narrow bands of rich horn silver and lead carbonate ore at the surface. This, however, rapidly changed at the comparatively shallow depth to rich, silver bearing, lead sulphide ore, which could not be treated by the milling method employed, and the mine remained idle for a number of years with a splendid showing of mineral in its upper shallow tunnel, containing values from 40 to 200 ounces of silver per ton. The lead values are likely to be maintained and increased at the new level when the vein is cut, and probably form the basis for an important and profitable mining operation.

*Hercules Mine.*—At the Hercules mine, about a mile further north from the Belmont, a handsome dump of concentrating lead ore, containing several hundred tons, is piled up at the mouth of a caved tunnel, and is said to represent a dike, or vein, of ore 20 feet thick at a point 300 feet in from the portal of the tunnel, and in this big vein some stringers of mineral were found matted together with wire silver. The ore on the dump is a hard, fine grained, porphyry rock, threaded with a fine net work of antimonial lead sulphide ore, rich in silver. The rock is gray when first broken but rapidly turns black on exposure, due to its contained managanese minerals. The best ore croppings of the deposit are rusty, light brown carbonates of lead and manganese and afford some samples rich in silver values, together with fair values in lead. This is also true of the Green Horn vein, a parallel body in the same zone, where hundred ounce silver values a foot wide are obtainable in the croppings of the deposit.

This portion of the Heath District contains some attractive prospects, and with proper development several of them are likely to be transformed into good producing mines that will pay handsome profits for their operation.

*Weiser District.*—The Anderson group of claims 7 miles northwest of Weiser embraces a large body of lava breccia cemented together with quartz and silicious sinter and



was worked to some extent during the year. This deposit contains some high values in gold; it is highly thought of by some mining people who have examined it and consider it has chances of becoming a profitable deposit of gold milling ore.

On the opposite side of the Weiser River, at Crane Creek canyon, a company of local people has recently been formed to operate a large deposit of low grade, gold bearing rock found at that point. The writer has not seen either of these last mentioned properties, but has seen some of the ore, and is able to say that it is not unlikely to prove a favorable matrix for paying values in gold.

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## GEOLOGICAL DIAGRAM OF IDAHO

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The accompanying geological diagram of the State is submitted with a view of giving a general idea of the distribution of its principal formations. To make a reasonably complete map of this kind would cost a great deal of time, labor and expense, for which there is no provision made in the finances of this department; but a geological map is so often called for I have attempted to give an idea of the subject in the accompanying diagram.

The drainage of the State is entirely through the tributaries of the Columbia River (except a small corner in Bear Lake County), and its topography, with the exception of the Snake River valley, is generally rugged, without any definite range system, but presents a deeply eroded broad plateau with a general slope from east to west, and extreme elevations ranging from 12,000 to 13,000 feet in the higher peaks of the Sawtooth mountains to 800 feet above sea level at Lewiston.

The extensive area of granite, gneiss and schist rep-



resented occupying the central part of the State from the north border of the Snake River valley and reaching nearly to the north end of the panhandle is one of the largest in the United States and embraces some island-like deposits of extrusive, acidic and basic lavas with occasional isolated patches of metamorphic sedimentary formations.

These granite formations range in age from Archean to Cretaceous, and according to recent classification of government geologists, a large part of them are of eruptive origin and show regional shadings into quartz monzonite and diorite.

The next largest area of formations in the State to the granite is that of the tertiary lavas. West of the eastern border line of Ada County, the basalt areas of the State belong to the Columbia lava period of early tertiary date, and are generally of a brown surface aspect. East of that line, the extensive flows of lava, embracing the greater portion of the Snake River plains, are of massive dull black color and of very recent tertiary age, reaching down to the quarternary. They are generally, however, soil covered, and east of the eastern border of Lincoln County are of comparatively shallow development. They are underlaid by an extensive development of rhyolite lavas which outcrop on the borders of the valley in extensive accumulations with accompanying tuffs, that have a total thickness of 600 to 800 feet, as exposed by faulting at some points.

The extensive development of thin bedded quartzites, slates and greywacks of Shoshone, Bonner and the upper half of Lemhi Counties are the lead bearing series of the Coeur d'Alenes. They are of pre-Cambrian age and have a stratigraphic depth of fully 10,000 feet.

Lemhi, Custer and Blaine Counties and a part of Fremont County exhibit an extensive development of middle carboniferous limestones, quartzites and shales with characteristic fossils and numerous deposits of gold, silver, lead and copper minerals. Another area of carboniferous formations, including limestone beds with characteristic fossils but often changed to marble by an excessive mixture of intrusive and extrusive igneous rocks of various kinds, occurs through the western half of Washington County, embracing the Seven Devils mountains and extends up into the Salmon River canyon in Idaho County.

The southeastern corner of the State, covering Bear Lake, Bannock, the greater part of Oneida, part of Cassia, Twin Falls and Bingham Counties are occupied by alternating horizons of triassic, jurassic and upper carboniferous rocks, together with limited areas of tertiary sediments and extensive flows of basalt, with an island of granite forming a high mountain summit a short distance south of the county seat of Cassia County.

Covering the northern and western borders of Fremont and a portion of the northeast corner of Bingham County, an important development of cretaceous coal bearing formations occur. This series is generally badly shattered and disturbed with lava eruptions and extensive block faulting, but at a point a short distance due east of the county seat of Fremont County, some very important deposits of high grade semi-bituminous coal have been discovered and partly developed. This is probably the only area of cretaceous formations in the whole State, the balance of the State being largely occupied by crystalline rocks and some limited areas of tertiary sediments which contain lignite deposits at several points. None of the latter, however, with the exception of a new operation in Lemhi County, have proved of commercial importance so far.

The extensive tertiary lake bed deposits of sandstone, shale and conglomerate shown covering a large portion of Canyon, Ada and Owyhee Counties, probably extend further east, but in their eastern extension are covered by recent lava flows.

In the vicinity of Payette, a short distance north of the county seat of Canyon County, and on the opposite side of the river in Oregon, some important manifestations of natural gas and oil are in evidence and a number of water wells have been sunk that have encountered strong gushes of gas. One of these, at a depth of 230 feet, has been affording a little gas plant of 12 jets and a large cooking range, with a steady flow of high grade natural gas for the past 7 years. This section carries some interesting manifestations of hydro-carbons that may prove of commercial importance with extensive development.

All the older formations of the State are extensively intruded by igneous rocks of numerous varieties which have

apparently played an important role in mineralization, and they are invariably found in connection with the ore bearing districts.

The extensive placer deposits of the State, which have yielded an output of precious bullion aggregating \$200,000,000 in value since their discovery in 1860, are largely confined to the granite area or its borders and outlying islands, which is also largely true of the gold and silver milling ore deposits. The most important copper ore deposits of the State are found in the carboniferous series, and in connection with the lead bearing series of the Coeur d'Alenes.

The State is exceptionally well watered and affords dozens of magnificent power sites. Its northern half, divided by the irregular south border of Washington, Boise, Custer and Lemhi Counties, is well, and in places densely, timbered. The southern half of the State below that line is largely devoid of timber, and is generally arid, but with the volume of water afforded by the Snake River and its tributaries affords some magnificent stretches of irrigable lands, which are being rapidly developed. The western border of the State, north of Washington County, is in the humid belt, and in Nez Perce, Idaho, Latah and Kootenai Counties, carries some handsome areas of rich Columbia lava soil that produces fine crops without irrigation and presents an interesting argument in favor of the government's forest reserve policy and the influence of vegetation on moisture.

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## STATISTICS

The accompanying statistics of output are based on the gross metal contents of mineral shipped and average New York quotations on the metals for the year, a method warranted by the fact that local smelting experience in Idaho with small plants does not show anything like the heavy discount losses in smelting figured off by the big trust smelters, who handle the bulk of the State's output, and the belief that about 96 to 98 per cent of the actual metal con-

tents of the ore figured on the usual fire assay basis is recovered and finds its way into commerce.

As this report is all written within 30 days after the close of the year some of the figures referred to in the front of the work will vary a little from the final results, as corrections have to be added to the final pages from tardy sources of information after some of the work is already in the printer's hands. The statistics are not presumed to be accurate as many of the smaller shipments, especially of gold, lose their identity by being sent to outside government assay offices and mints, and the big shippers of smelting ore get very slow settlements and generally give the results of 11 months' output with an estimate for December. The latter, however, is reasonably close to the facts as their shipping values are very uniform.

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## IDAHO COUNTY

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After the last chapter of the report was printed some interesting information of ore development was received from the Big Creek District, 30 miles north of Thunder Mountain District, in Idaho County, too late for extended review.

Big Creek District and its tributaries has a variety of formations and ore deposits entirely different from those of Thunder Mountain District, embracing gold, silver, lead, copper, antimony, nickle and cobalt ores and one very interesting deposit of cinnabar or quick silver ore. Many of its baser ores will require smelting and practically involve railway transportation to insure their profitable operation. This district is likely to enjoy the advantages of nearby railway transportation by the construction of a transcontinental line down the main Salmon River canyon, a short distance further north, in the near future; in fact, I am reliably informed that an important section of this new line in Idaho is likely to be under construction within six months. The completion of such a line would materially stimulate the development of Big Creek and other remote central Idaho districts that could furnish a big tonnage of mineral traffic.

## ADA COUNTY.

Gold, fine oz., 368.37 .....	\$ 7,572 92
Silver, fine oz., 227 .....	158 48
	<hr/>
	\$ 7,731 40

## BLAINE COUNTY.

Gold, fine oz., 2,319.18 .....	\$ 47,937 45
Silver, fine oz., 180.354 .....	117,807 23
Lead, lbs., 2,444.496 .....	130,047 18
Copper, lbs., 44,269 .....	9,145 98
Zinc, lbs., 120,715 .....	7,013 54
	<hr/>
	\$ 311,951 38

## BINGHAM COUNTY.

Gold, fine oz., 258.12 .....	\$ 5,335 34
Silver, fine oz., 21.60 .....	14 10
	<hr/>
	\$ 5,349 44

## BOISE COUNTY.

Gold, fine oz., 13,644.96 .....	\$ 282,444 74
Silver, fine oz., 15,322.92 .....	9,989 34
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	\$ 292,434 08

## BONNER COUNTY.

Gold, fine oz., 50 .....	\$ 1,033 50
Silver, fine oz., 18,800 .....	12,280 20
	<hr/>
	\$ 13,313 70

## CANYON COUNTY.

Gold, fine oz., 71.28 .....	\$ 1,472 48
Silver, fine oz., 7.56 .....	4 94
	<hr/>
	\$ 1,477 42

## CUSTER COUNTY.

Gold, fine oz., 10,203.24 .....	\$ 210,899 97
Silver, fine oz., 106.496 .....	69,563 18
Copper, lbs., 3,169,692 .....	654,858 36
Lead, lbs., 265,197 .....	14,108 48
	<hr/>
	\$ 949,429 99

## ELMORE COUNTY.

Gold, fine oz., 4,513.44 .....	\$ 93,292 80
Silver, fine oz., 4,811.40 .....	3,143 02
	<hr/>
	\$ 96,435 82

## FREMONT COUNTY.

Gold, fine oz., 76.41 .....	\$ 1,585 46
Silver, fine oz., 2,312 .....	1,510 44
Lead, lbs., 9,398 .....	500 00
Copper, lbs., 200,000 .....	41,320 00
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	\$ 44,915 90

## IDAHO COUNTY.

Gold, fine oz., 4,965.24 .....	\$ 102,631 51
Silver, fine oz., 637.75 .....	423 18
	<hr/>
	\$ 103,054 69

## KOOTENAI COUNTY.

Gold, fine oz., 550 .....	11,368 50
Silver, fine oz., 75 .....	48 99

## LEMMI COUNTY.

Gold, fine oz., 4,384.44 .....	90,626 40
Silver, fine oz., 41,528 .....	27,126 08
Lead, lbs., 1,742,988 .....	92,726 96
Copper, lbs., 62,220 .....	12,718 20

## LINCOLN COUNTY.

Gold, fine oz., 116.64 .....	2,410 95
Silver, fine oz., 62.56 .....	40 18

## NEZ PERCE COUNTY.

Gold, fine oz., 3,558.52 .....	73,554 60
Silver, fine oz., 1,041.48 .....	681 60

## OWYHEE COUNTY.

Gold, fine oz., 17,549.21 .....	362,742 17
Silver, fine oz., 799,873 .....	522,477 04
Lead, lbs., 13,645 .....	725 91

## ONEIDA COUNTY.

Gold, fine oz., 81 .....	1,674 27
Silver, fine oz., 6.48 .....	4 23

## SHOSHONE COUNTY.

Gold, fine oz., 3,435 .....	71,001 45
Silver, fine oz., 7,317,962 .....	4,780,092 77
Lead, lbs., 229,929,196 .....	12,232,233 22
Copper, lbs., 7,134,724 .....	1,474,033 98
Zinc, lbs., 9,071,836 .....	527,073 67

## TWIN FALLS COUNTY.

Gold, fine oz., 98.28 .....	2,031 45
Silver, fine oz., 3.24 .....	2 12

## WASHINGTON COUNTY.

Gold, fine oz., 132.08 .....	3,763 59
Silver, fine oz., 1,815.04 .....	1,185 63
Copper, lbs., 237,000 .....	48,964 20

## TOTALS FOR THE STATE OF IDAHO.

Lead, lbs., 234,404,920 .....	\$12,470,341 74
Silver, fine oz., 8,491,356.13 .....	5,546,553 82
Copper, lbs., 10,847,905 .....	2,241,177 17
Gold, fine oz., 66,426.29 .....	1,373,031 40
Zinc, lbs., 9,192,551 .....	534,087 21
Total value .....	\$22,165,191 34
Output of 1906 .....	\$24,138,317 03
Decrease .....	\$ 1,973,125 69



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