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Item 9

AMERICAN ZINC CO.

Boyer Nevada copper Mine

WALTER G. SWART FILES

NEVADA

FOLDER 69

File under: W. H. Carpenter
Subject: Gold & Copper Mining

Denver, Colo., November 26, 1909.

69

Mr. Arthur Howe Carpenter,
Imperial Hotel,
New York City, N.Y.

My dear Mr. Carpenter:

Much obliged for your letters. I am doing what I can on the Penobscot and will notify you of the results as soon as possible. I have no doubt it will interest our people.

Don't forget that I want a chance at that copper property in Nevada. I am not going to let you sidetrack me on a gold mine but I want the copper mine as well. The fact that we are interested in the copper property cuts no figure at all with our attitude toward the gold property. We are in shape to buy as many properties as you could bring along to us provided they are big ones, good ones, and worth the money. It does not matter whether they are gold, copper, silver, lead, zinc or breakfast-food mines.

Give my very best regards to your father and to yourself. I shall hope to hear from you further and will keep you posted as to any developments at this end.

Yours very truly,

WGS-P

FRANKLIN R. CARPENTER & SONS
MINING AND METALLURGICAL ENGINEERS

FRANKLIN R. CARPENTER, Ph. D., F. G. S. A., ETC., ETC.
ARTHUR HOWE CARPENTER, METALLURGICAL ENGINEER
CRANSTON HOWE CARPENTER, E. MET., E. M.
MALCOM HOWE CARPENTER, MINING ENGINEER

F. R. Carpenter & Sons
Boyer Nevada

DENVER, COLORADO, Dec. 20, 1909.

69

W. G. Swart, Esqr.,
508 Commonwealth Bldg.,
Denver, Colorado.

Dear Mr. Swart:-

Enclosed find a clipping from the local paper at Lovelock, where ~~the~~ we get off to go to the Boyer-Nevada Copper property. The interesting thing about this is that Johnny Reid is back of this railroad with out humble selves. Now Reid's backers in his mining enterprise is the William Rockerfeller, who is J. D. R.'s brother. In turn the Rockerfellers own large interest in Southern Pacific. This cut off is bound to come for it will save some thirty forty miles in transcontinental time, while it will also pass through a bigger freight country than the present road bed from a mining poiny of view. This right of way will pass within a mile or two of the Boyer-Nevada Copper property. There is a large salt marsh near the property, which in view of the troubles of the Salt companies around Salt Lake will become valuable. We have filed upon this salt. The road will pass directly over it.

T rusting that this will of added interest,

I remain,

Very sincerely,

Arthur Howe Carpenter

Dic.A.H.C. - H.

P.S. Please do ~~not~~ consider any remarks of mine relative to Reid - other than complimentary. While entirely self-educated he is a good mining engineer and very clever.

My brother Mac met Johnson while hiking and Mac talked with him at Cat Ck.
Nov. 26-09

THE LO

An Independent Newspaper F

VOL. X. No. 32 LOVEL

SOUTHERN PACIFIC HAS AN EYE ON HAZEN - BATTLE MOUNTAIN CUT OFF

Looking for a way to shorten the Southern Pacific line through the state of Nevada was the purpose of a visit to Lovelock the latter part of last week of E. L. Johnson, of Salt Lake, the locating engineer of the company. The company has its eye on a 40 mile cut-off, for through train service, from Hazen to Battle Mountain. A franchise for a road from Battle Mountain to Hazen has been granted by the state of Nevada to John T. Reid and associates, and Locating Engineer Johnson, in company with Mr. Reid, went over the route covered by this franchise.

The Southern Pacific road in Humboldt county enters the county at the east center borders, and following the course of the Humboldt river, makes a big curve, near the center of the county at Winnemucca, and then takes a southwesterly course to its exit at the south central border. The proposed cut-off, as above stated, for through train service, would eliminate 40 miles of roadway. This road would pass through the extreme southeastern portion of the county, and would pass through a rich mineralized district, where many producing mines could be found with the transportation facilities.

The present road would by no means be abandoned, for the business done by the railroad company in this county has been greater than anywhere else in the state. Through the cut-off it would be possibld for the railroad company to cut considerable time from its transcontinental schedules, and equalize the present advantage of the Western Pacific, through its lower grades over the high Sierras.

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File Subject: Boyer-Nevada
Churchill Co. Nevada

DENVER, COLORADO

Boyer-Nevada Copper property

14 patented claims.
20 unpatented claims.
Buildings clear.
Price — $250,000
Down — $25,000.00
Agreed to extend it —
Balance ~~to be applied up~~ /
Secured by 5 year
mortgage bonds @ 5%
retirable at any time

— 11 —

File Under: E. A. Clark
Subject: Boyer Nevada

Denver, Colo., December 20, 1909.

69

Mr. E. A. Clark,

Boston, Mass.

Dear Mr. Clark:

I wrote you November 6th that I was on the track of what looked like a big possible porphyry copper property in Nevada. I have chased this constantly, but only today have I something really definite to report.

The property in question is called the Boyer-Nevada, and is located in Churchill Co., Nevada, 45 miles south of Lovelock.

There are 14 patented claims and 20 unpatented. The ore is an original chalcopyrite, in porphyry; and resembles closely the Pilares ore of the Moctezuma Copper Co. in Sonora, rather than the chalcocite ores of Ely, Bingham or Globe.

The surface ores are oxydized (carbonates) and go down one to two hundred feet. In cracks and fault planes near the surface the carbonates are rich and much ore has been shipped. The mass of the surface porphyry is lean however. Drill holes show cores of unaltered sulphide below that promise exceedingly well.

All development has been done on the richer surface carbonates. The unaltered zone is still unexplored save by two abortive drill holes. The area is sufficient to make it one of the very large mines if it is a mine at all. It is a prospecting scheme pure and simple, but with more than ordinary chances for success, if I am any judge, and worth investigating.

The property is held by Dr. Franklin R. Carpenter

Mr. E. A. Clark - - 2. Porphyry Copper.

formerly of Deadwood, and of pyritic smelting fame. I don't think much of the doctor as a business man, but he commands some respect as a geologist, and certainly ought to know the ear marks of a big porphyry copper. He does not grow wildly enthusiastic over this property, but says very quietly, yet positively, that he has spent ten years hunting this country and Mexico over, and in his opinion this is one of the big chances. He has spent the last five years in the employ of the Du Pont Powder Co. as their special scout looking for sulphur---native or as pyrite. He is still with them but working on metallurgical processes for them, and says they do not care to become copper mines. This mine comes to me because I was instrumental in getting his Blake contract(long since expired) under which he tried to treat the Calumet & Hecla and Nonesuch ores in Michigan.

The price of the property is given as $250,000. The owners, from whom Carpenter has it under bond and lease, want $25,000 January 15th. I told Dr. Carpenter they had no right to ask any cash down on such a prospect. They ought to be perfectly satisfied if a strong concern agrees to spend say $25,000 drilling or otherwise prospecting the ground, to postpone all payments. Dr. Carpenter has gone out there to see them and hopes to get this sort of a deal fixed up.

Any balance of the $250,000 unpaid is to be secured by 5 year mortgage bonds at 5% retirable at any time.

We can have until January 15th for preliminary examination. (A preliminary is all that could be made, as there are no underground workings to speak of.)

If we decide to prospect by drill or otherwise, we are supposed to pay $25,000 cash as I have already said, but Dr.

Mr. R. A. Clark - - 3. Porphyry Copper.

Carpenter thinks $10,000 will hold it, possibly $5,000. I think it can probably be had, with Young playing the cards, with no payment at all.

Carpenter says he wants to retain a 10% interest. He is hard up, as he usually is, and will do business. He makes $10,000 to $20,000 per year, but never has a dollar.

I have had a good deal of trouble getting him pinned down to anything. I finally got hold of him in Chicago tendays ago, and made him promise to give me the facts and first chance as soon as he reached Denver, but I had to camp in his office here to get them. I think we should arrange to look at this ground as soon as Dr. Carpenter returns to Denver. This is especially true, as I have also two very promising zinc properties offered near there, which could be examined by the same engineer.

If I go to Pioche shortly, as is now the plan, I shall not be able to go to Lovelock myself. I do not want to send Mr. Disbrow, as I have no positive knowledge of what he knows about copper. The man sent ought to have seen the Moctezuma country in Sonora, and be a pretty good man generally. I'd rather see George Kennedy go than anyone else, but I don't know where he is nor whether he would be available. Next to him, I would prefer McDaniel or Crossdale. You may know some other good man now free.

Kindly let me know about this as soon as possible.

Very truly,

WGS-F

File Under: E A Clark
Subject: Boyer-Nevada

Denver, Colo., December 21, 1909.

69

Mr. E. A. Clark,

Boston, Mass.

Dear Mr. Clark:

I have this morning some further information about the Boyer-Nevada Copper property about which I wrote you yesterday. It seems that E. L. Johnson of Salt Lake has just been to Lovelock with a view to putting in a 40 mile cutoff on the Southern Pacific from Hazen to Battle Mountain. The franchise for this cutoff has been granted by the state of Nevada. This cutoff means a shortening of the distance 40 miles. It would pass within two miles or so of the Boyer-Nevada Copper property. This franchise has been issued to John T. Reid, the mining engineer who has one of the zinc properties of which I wrote you. I am informed that William Rockefeller is one of the men who is backing Reid.

At the time the Lucin cutoff across Salt Lake was built, I saw estimates on the cost of this Hazen cutoff and statements were made that it was the next important piece of work the Southern Pacific would do.

Yours very truly,

WGS-P

CC Mr. Kimball
Mr. Holden.

BOYER-NEVADA COPPER MINE CHURCHILL COUNTY NEVADA

DATE January 1st, 1910 INFORMATION SUPPLIED FROM WORK SHEET DATED _____ PAGE NO. 115

The following statement regarding this property is given on January 1st, 1910, by Dr. Franklin R. Carpenter. His two sons are now en route to the mine. They will forward some candidates by wire immediately. As soon as the surface can be seen I will arrange to have the examination made.

The Company holds a bond and lease upon copper-bearing ground in Churchill County, Nevada. The property consists of the following parcels of ground:

16 claims, patented or patent applied for,	320	acres
24 claims, located and carefully surveyed,	480	"
11 claims, along the tunnel and tunnel site,	220	"
49 claims,	980	"

This ground is copper and gold bearing. There are water-rights mill-sites and 320 acres of salt ground showing a bed of pure salt fourteen feet thick so far as known. This is part of a large bed of salt covering many square miles.

This Company has spent much time and money in prospecting this ground and have bored three diamond drill holes and done much prospecting on the surface. After the further small payment of $4,000.00 the Company will receive deeds for the whole ground and may place stock for the deferred payments and to furnish the necessary capital to start development work. The deferred payments, amounting to $40,000.00 are payable as follows:

June 1st, 1910,	$20,000
January 1st, 1915,	$17,500.

The last payment, due in five years, will be secured by first mortgage upon the property and will bear interest at five per cent., payable annually, until the mortgage bonds are taken up.

These are among the most valuable deposits ever worked. The Utah Copper Company, The Ohio Company, The Boston Consolidated Company, whose property consists of an immense porphyry deposit in Bingham Canon, Utah, get a yield of about twenty pounds per ton of rock mined. Next to these come the Ely mines in Nevada, somewhat richer, but still very low grade. The Boyer-Nevada is a porphyry deposit in the prospective stage and may be as valuable as either of the above deposits. As a matter of fact, the surface showing is better than either of them. Our diamond drill work did not in any case get through the completely leached or decomposed zone, but enough was learned to show that the copper ore goes down. In addition to the secondary enrichment expected with depth, there are numerous veins of sulphide ore running from 4% to 35% copper. Besides, the whole deposit is gold bearing.

On the northeastern end of the property old workings disclose a large tonnage of rich carbonate ores. Some of this has been mined and stacked up ready for treatment. A sample of this pile gave 18% in copper.

On the Treasury Box claim, about the middle of the property a tunnel has been driven into the side of the hill which commences in sulphide ore and runs into it 280 feet all in ore.

BOYER-NEVADA COPPER MINE CHURCHILL COUNTY NEVADA.

DATE January 18th, 1910. INFORMATION SHEET FROM W. O. GUEST, DENVER. SHEET NO. [illegible]

The following statement regarding this property is given me January 14th, 1910, by Dr. Franklin R. Carpenter. His two sons are now en route to the mine. They will report snow condition by wire immediately. As soon as the surface can be seen I will arrange to have the examination made.

"The Company holds a bond and lease upon copper-bearing ground in Churchill County, Nevada. The property consists of the following parcels of ground;

16 claims,	patented or patent applied for,	320 acres
24 claims,	located and carefully surveyed,	480 "
11 claims,	along the tunnel and tunnel site,	220 "
49 claims,		980 "

This ground is copper and gold bearing. There are water-rights mill-sites and 320 acres of salt ground showing a bed of pure salt fourteen feet thick so far as known. This is part of a large bed of salt covering many square miles.

This Company has spent much time and money in prospecting this ground and have bored three diamond drill holes and done much prospecting on the surface. After the further small payment of $5,000.00 the Company will receive deeds for the whole ground and may place stock for the deferred payments and to furnish the necessary capital to start development work. The deferred payments, amounting to $237,500.00 are payable as follows:

June 1st, 1910,	$20,000
January 1st, 1915,	217,500.

The last payment, due in five years, will be secured by first mortgage upon the property and will bear interest at five per cent., payable annually, until the mortgage bonds are taken up.

These are among the mostvaluable deposits ever worked. The Utah Copper Company, The Ohio Company, The Boston Consolidated Company, whose property consists of an immense porphyry deposit in Bingham Canon, Utah, get a yield of about twenty pounds per ton of rock mined. Next to these come the Ely mines in Nevada, somewhat richer, but still very low grade. The Boyer-Nevada is a porphyry deposit in the prospective stage and may be as valuable as either of the above deposits. As a matter of fact, the surface showing is better than either of them. Our diamond drill work did not in any case get through the completely leached or decomposed zone, but enough was learned to show that the copper ore goes down. In addition to the secondary enrichment expected with depth, there are many cue veins of sulphide ore running from 7% to 35% copper. Besides, the whole deposit is gold bearing.

On the northeastern end of the property old workings disclose a large tonnage of rich carbonate ores. Some of this has been mined and stacked up ready for treatment. A sample of this pile gave 15% in copper.

On the Treasury Box claim, about the middle of the property a tunnel has been driven into the side of the hill which commences in sulphide ore and runs into it 250 feet all in ore.

The grade of this ore is such that, judging from a number of concentration tests made on small lots, it will yield 28 pounds of copper per ton and about sixty cents in gold. The diamond drill hole was sunk from the bottom of the tunnel. The average of all samples for eighty-five feet shows an assay of 1.86% copper and 0.020% in gold, the gold here beinga little lower than the average of the rest of the property. This ore body is traceable on the surface for over 1,000 feet and is thought to be 300 feet or more in width. The last 120 feet of the tunnel was sampled three separate times by me with the utmost care with the following results:

First sample,	1.70% copper
Second sample,	1.45%
Third sample,	1.47%

All of the tunnel and the core samples are much leached. It is thought that the entire porphyry intrusion in which these ore-bodies occur will prove to be copper-bearing. If much of it proves to be ore the amount that would be present would be almost beyond computation.
The ore-body on the Treasury Box above mentioned could be mined as an open quarry proposition.
In addition to this, there are numberous veins of copper ore everywhere, many of them large enough to work. They average about 15% copper and from $1.00 to $5.00 in gold.

A tunnel-site has been taken up in such a manner that it will cut the property nearly fifteen hundred feet deep. In front of the portal is a complex of veins of rich carbonate ores that will be cut at depth by the tunnel, while one large vein will be cut within five hundred feet. On the surface this vein is nearly one hundred feet wide and is traceable throughout several claims in length. It is thought that there is enough copper ore in this vein to make the property a great copper mine alone. A sample from the surface gave 22.10% copper.

The Boyer ranch, about eight miles distant from the mines is the present nearest Post Office. The salt marsh or bed, below the ranch is the lowest point in the inter-mountain region, being about 3200 feet above sea-level. The salt marsh is the remains of an old salt lake, similar to the Great Salt Lake in Utah. The shores of this old lake can be traced along the mountains on either side of the valley which is about fifteen miles wide. The basin is rock-bottomed and permanent water is found at eight feet depth, while at certain times of the year water stands 2 feet deep or more over the surface of the salt bed. Hence plenty of water exists for all milling purposes. In addition to this source of water, which is inexhaustible, and which is distant from the mines in an air line about three miles, the company owns a number of springs above the property which will furnish a large amount of water.

The valley in which the Boyer ranch and salt beds are is broad and level and a railroad could be built direct from Winnemucca down the valley to the mines, or traction engines could operate hauling all freight at little expense. The climate is very dry and with the exception of a short rainy season the roads would be practically open all the year round.

In addition to this a railroad has already been surveyed which will pass within five or six miles of the property from which a spur can be built to the mines down the valley with practically no grading work. The Southern Pacific is said to be contemplating the construction of this road as a "cut-off" from Battle Mountain to Hazen. It would save them about forty miles while some of the stock-holders of the Southern Pacific own large mining interests in this section that would be served by the road. A charter has already been obtained from the State legislature for this right of way.

There is a small, but complete, smelting plant upon the property that has never been blown in. It is quite certain that this could be operated at a profit under favorable conditions upon the surface ores.

PROPOSITION.

The Company is capitalized at $10,000,000. The stock has a par value of One Dollar per share. In order to meet the outlay of development work and to meet the next payments due upon the purchase price of the property and to furnish the necessary capital to get the Smelter ready for operation, a limited amount of the Treasury Stock is offered for sale. The control of the Company is held in a pool belonging to those who have made the preliminary payments and paid for the prospecting and patenting of the claims.

DIAMOND DRILL RECORD.

The record of the drill hole sunk from the bottom of the Treasury Box tunnel referred to above follows:

From	To.	Copper	Gold
0	2	4.74	0.02
2	5	1.36	0.02
5	8	2.27	0.02
8	12	2.57	0.02
12	15	2.27	0.02
15	24	2.98	0.02
24	27	0.25	0.02
27	32	1.06	0.02
32	37	0.40	0.02
37	40	0.10	0.02
40	45	0.45	0.02
45	49	0.66	0.02
49	55	2.73	0.02
55	58	0.25	0.02
58	64	0.30	0.02
64	73	0.25	0.02
73	78	0.35	0.02
78	80	0.40	0.02
80	82	6.15	0.045
82	83	4.44	0.045
83	85	4.04	0.02
Average*		1.52%	0.0204

*This average is figured by multiplying the assay of each sample by the number of feet represented by that sample and totalling the products and dividing by eighty-five feet, thus giving the actuall average assay of the entire core. The actual yield from concentration tests on the Boyer ore from the tunnel was about 27 pounds per ton of ore. We have based our estimates upon 25 lbs.

F. R. Carpenter, President.
THE BOYER-NEVADA COPPER COMPANY.

FRANKLIN R. CARPENTER & SONS
MINING AND METALLURGICAL ENGINEERS

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MALCOM HOWE CARPENTER, MINING ENGINEER

69

DENVER, COLORADO, May 16th, 1910.

W. G. Swart, Esqr.,

C/o F. I. Gunnell,

First National Bank, Lovelock, Nevada.

My dear Mr. Swart:-

I am in receipt of your letter from Butte advising me of your intended examination of the Boyer-Nevada. I do not know if you have copies of the maps or not. For fear that you have not copies of the reports I send you under separate cover copies of my father's first report and of his second report.

In addition to this I wish I could see you and talk the property over while on the ground. The thing that my father and I were betting on, more almost than anything else, was the almost certain value of the front range of hills running from Boyer's ranch almost 9 or ten miles south. Our gulch opens about ~~four~~ miles from the ranch and Cranston will show you where the tunnel site is located. I hope that you will be able to go with him up on top of this front range and on "Lookout" peak. Then go with him up to where he had me this spring, up where the Swift claims are. There you will get the best idea of the formation. I also send you the meagre report of Ransome of the U. S. G. S. for your guidance. It may be of some use, though I don't altogether agree with him. I do think that there is a line of weakness and crushing about 1000 feet wide running from where the smelter is clear through to where the Swift claims are. Cranston will show you where that is. The treasury-box lode lies right parallel with this line.

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DENVER, COLORADO

Going back to the front range. You will see many seams and lodes outcropping. I have been told (and have seen the samples) that sheets of native copper have been taken from many of them. I think that the entire eruptive in which they occur, that which shows the great rock decay, will prove to be underlaid with a great secondary enrichment. I, also, think that the flat under the cabins on the upper part of the property running down the valley should lie upon another secondary copper ore body.

Also while there Cranston must take you to see the "White Rock Canon" property. He was very much taken with it. He will show you also the veins and outcroppings discovered by himself and Mac this spring below what we call the Treasury Box, also, into the workings that he calls the "Belle Mare". These I have never seen. (Under which we have this under option two and it should form part of the deal.)

Remember that the entire ore-body exposed in the Treasury Box tunnel assays nearly forty cents in gold. (He must show you the outcrop on the hill above also.)

The annual report of the Utah Copper Company shows that they got a yield of 20.3693 lbs. or 1.0165 %. I know the Treasury Box ore-body will beat that gold and the property is only just begun to be prospected. I believe that other and larger bodies are there. If you should take up the proposition I think that as much of the adjacent country as possible to our tunnel line along the front range should be acquired.

It is only a prospect, Mr. Swart, but we believe that it is a promising one. Our option is so favorable that any money spent for prospecting. If the prospecting shows it favorable for a mine, then all money spent will be repaid. I trust that your news will be good. I am getting to be a pesimist very fast.

Very truly yours,
Franklin R. Carpenter & Sons

W. G. SWART,
MINING AND METALLURGICAL ENGINEER.
DENVER, COLORADO.

BOYER-NEVADA COPPER COMPANY.

Boyer, Nevada.

Mr. E. A. Clark,

Boston,

Dear Sir:-

During the last few days of May and first days of June, 1916, I visited the above property.

It lies on the South slope of the Silver Mountains, in Churchill County, Nevada, about 75 miles South and East of Lovelock, across the salt and alkali deserts and across three rugged ranges. No property can work in that section until a railroad is put through.

There are about 50 claims in all, located in a compact group and averaging about one separate and distinct occurrence and variety of eruptive rock to each claim. The whole property is a variegated patchwork of assorted porphyry masses, partly capped by a fairly regular system of rhyolite flows which from a distance look exactly like sedimentaries. The country is in some respects similar to that at Clifton, Arizona, and is almost as rugged, but is much more noticeably broken up into small segregated masses, and has no such extensive mineralization. There are a few small seams of a good grade chalcopyrite and bornite, but no general mineralization of the porphyry anywhere, nor any evidence that there has ever been enough copper in the whole range to make one good copper mine.

The primary sulphides show almost at the surface, so secondary enrichment need not be looked for. There are no extensive shatter zones, giving room for ore formation, nor is

there any chalcocite to be found. It is simply a lean primary chalcopyrite in a hard eruptive.

The chief showing lies in a body of what is probably andesite, about 1000 feet long, and near a contact with rhyolite. A long fissure cuts through this andesite from East to West, approximately parallel to the contact and some 100 to 200 feet distant therefrom. In this fissure is a breccia running from 3 to 5 feet wide, which shows perhaps 3% copper as chalcopyrite, chiefly in small specks in the andesite fragments themselves. The andesite walls show the same sort of mineralization, which gradually fades out as the fissure is left behind, until at 10 to 15 feet on either side there is practically no copper to be seen. Inasmuch as this fissure and its walls have been repeatedly sampled to go only 1.27% to 1.88% copper, I considered it hopeless to touch this lean country rock, and consequently I did no sampling.

Several crosscuts show parallel fissures at a distance of 30 to 60 feet, but they are small, tight, and but slightly mineralized. One or two cross fractures have been cut, but they are also small and tight and show nothing worth following.

On the South edge of this same andesite body, and perhaps 300 to 500 feet from the showing just described, is another fissure with a somewhat similar showing, but on which only a little surface work has been done. But the ground between these two——which would have to be ore to make this a big mine——is tight and hard, and has absolutely no surface showing of any sort——iron, copper or even printer's ink.

All the above work lies near the Western end of the

andesite body. At the Eastern end lies a group of old workings with a showing of carbonates, but the grade is very low, and the outlook anything but promising.

A number of years ago a Fraser & Chalmers smelting furnace was dragged in and set up. It is still there, having never been blown in. There is probably 100 tons of coke piled up, the hauling on which must have cost $40 per ton. The smelter is intelligently located on the top of one of the highest, steepest, most barren ridges in the vicinity, where everything, including the ore and water, must be hauled up two to three thousand feet by teams over the worst road in Nevada. It has however a fine view, plenty of room for slag dump, and the fumes could do no possible damage. Neither could the dividends.

I inspected the entire property, and could see no hope of its ever making a big mine.

The diamond drill holes on which the owners banked so heavily were all put down in the main fissure——none out in the country rock at all.

On returning to Lovelock I wired you that we could not do anything with this property, and this is to confirm in detail that tele ram.

Yours very truly,

W. G. Swart

Boyer - Nevada

MEMO.

AUG. 10th, 1911.

Mr. Swart:

Arthur Carpenter called this afternoon to say good by as he was leaving for Lovelock, Nevada. His address will be c/o First National Bank, Lovelock.

He also said that they had run another tunnel sixty feet lower than the old one, and when in 100 feet cut the ore which runs 5% copper. He claims that the ore body is 350 feet wide.

R. H. Munn.

I have estimated the unaltered Boyer ore yield at twenty-five pounds, although the unaltered rock from the breast of the tunnel and the winze is much higher. In fact, no assay from the unaltered zone has given so low a yield as twenty-five pounds per ton:

25 lbs. of copper at 13 cents per lb., $3.25; profit per ton	$1.50
25 lbs. of copper at 15 cents per lb., $3.75; profit per ton	2.00

It is purposed to build the mill in 1,000 ton units. It will cost $750,000 to build one unit and equip the mine, and the profits should be as follows:

ANNUAL PROFITS.

CASE I.—Copper 13 cents, 1,000 tons treated per day.	
1,000 tons at $1.50 per ton, $1,500 per day, 360 days	$ 540,000
CASE II.—Copper 13 cents, 2,000 tons treated per day.	
2,000 tons at $1.50 per ton, $3,000 per day, 360 days	1,080,000
CASE III.—Copper 15 cents, 1,000 tons treated per day.	
1,000 tons at $2.00 per ton, $2,000 per day, 360 days	720,000
CASE IV.—Copper 15 cents, 2,000 tons treated per day.	
2,000 tons at $2.00 per ton, $4,000 per day, 360 days	1,440,000

This would pay a fair interest upon a capitalization of $10,000,000. The Homestake gold mine, probably the largest in America, makes but eighty-three cents per ton of ore treated; the Alaska Treadwell eighty-eight and ninety-nine-hundredths cents.

OXIDIZED ORES.

I have not figured the quantity of oxidized surface ores upon the property, but it is very large. Many tons were delivered to the smeltery upon the north end of this property. I took an average sample of these ores at the plant which gave 15.00 per cent. copper. This ore was mined mainly from open cuts near the smelting works. While I was totally unable to estimate with any accuracy the quantity that might be expected, it will certainly reach many thousands of tons.

These ores are found in patches the full length of the property from north to south. Upon many of the claims they are developed by open cuts, pits, etc. There are, also, in other parts of the property, many small veins, varying from a few inches to three feet, which carry ore running from 12 to 30 per cent. copper.

An average of twelve assays from all these various openings furnished me by the former owners gave 12.68 per cent. copper. It is entirely likely that these ores may exist in sufficient quantity to more than pay the cost of the property, but as its future value must depend upon the ores in the unaltered zone, I have not included any of these oxidized ores in my estimates of profits.

WATER.

Ample water exists in the form of springs owned or controlled by this company for a 3,000 ton plant, while subterranean water will greatly increase this estimate.

These springs are of two varieties. First, those upon the mountain sides at the mine; second, those in the valley a few miles distant. This valley is rock bottomed. The great salt marsh, five miles distant, is the last remnant of a great inland lake, once covering a very large area. This salt marsh or bed consists of very pure white salt and covers about seventy-two square miles and represents about the present level of the subterranean water. Near the marsh permanent water is found at eight feet depth, while the level at which springs break out is a few feet above the level of the marsh. This water supply is similar in all respects to that of Douglas, Arizona, and is ample for all purposes. "The whole salt marsh itself is sometimes covered with water from one to two feet deep" (Boyer).

The salt deposit is known to be at least fourteen feet deep, and to cover, as said, seventy-two square miles and is inexhaustible. It is only mentioned incidentally, as it may be found advantageous to work this ore later by a chloridizing process, rather than smelting, and for the bearing that it has upon the railroad problem. There are, also, beds of gypsum, gold prospects and other copper deposits in the neighborhood.

TIMBER.

Table Mountain Range is well covered with timber for at least fifteen miles each way from the mines. Both timber and fuel can be had for years to come. By means of this timber and salt it may be found possible to work this deposit by leaching, thus obviating the necessity of a railroad.

RAILROAD.

The valley to Winnemucca being broad and level, and in a nearly rainless region, is well situated for traction engines, so that a railroad in any case may not be necessary. It is therefore thought best to let the railroad stand as a separate investment. It can be built for about $800,000, and should be a profitable investment, as it would reach the mining camps of Nickel, Boyer, Wonder, etc., and others already discovered, but not yet developed, as well as the salt fields already mentioned. There are, also, large bodies of ron ore near the line, which are said to be very pure and have the unusual property of carrying nickel, which (for many purposes) greatly improves the iron. These deposits are known to be very extensive.

OIL.

Much of the adjoining or next valley is staked for oil claims, there being every indication that oil will be found. This would be of great value to these mines.

IMPROVEMENTS.

During the early excitement there was built for these mines a thirty-six inch water jacketed smelting plant, complete with all details, to be used for the rich carbonate ores. This smelting plant is in a good state of repair today. Coke was hauled in and is now upon the ground, but the plant, most wisely, was never blown in. It could not have succeeded, owing to the great cost of coke and other supplies.

Respectfully submitted,

FRANKLIN R. CARPENTER.

Denver, Colorado, Dec. 5th, 1908.

List of claims considered in this report:

Nevada Queen, Mammoth and Colorado King, being patented lode mining claims.

The following are held by possessory title:

Tiger, Stella B, Buelah B, Detroit, Boston, Churchill, Junction, Bell Mare, Emma Nevada, Key, Treasury Box, Trail, Lulu B, Lock, Jesse B, Stray Dog, Hornet, Bee Hive, Wasp, Tunnel, Lucky Dog, Hill, Monte Christo, Colorado Boy.

Note, January 1st, 1909:

Analyses of several monthly statements of the Utah Copper Company show a yield of under 25 pounds per ton of ore, while on page 1314 of the Engineering and Mining Journal for June 27th, 1908, the following statement appears: "The concentrating plant (Utah Copper Company) is now treating 5,000 tons of ore per day, averaging 1.6 per cent. copper, from which 20 pounds of copper per ton is recovered." At page 50 of the Advanced Chapter from Mineral Resources of the United States for the Calendar Year 1907, which has just reached me, L. C. Graton makes the following statement concerning Utah copper ores: "The great disseminated chalcocite deposits have been estimated by very extensive sampling to contain an average of between 1.5 to 2 per cent. copper. The yield from concentrates smelted in 1907, representing over 700,000 tons of ore, was about 1.2 per cent. copper, 17 cents gold and 5 cents silver per ton." One and two-tenths per cent. copper (1.2%) is 24 pounds per ton. The gold and silver assays of the Boyer ores, not included in the above estimates, are quite as high.

The costs of the Utah Copper Company are sometimes, but not always, reported a little higher than I have given in the text of my report, but I let my Boyer estimates stand, because of more favorable conditions. For instance, the Utah Copper Company has an ore-freight charge, while the Boyer ores can be treated practically at the mines.

FRANKLIN R. CARPENTER.

THE BOYER-NEVADA COPPER COMPANY.

The Company holds a bond and lease upon copper-bearing ground in Churchill County, Nevada. The property consists of the following parcels of ground:

14 claims, patented or patent applied for,	about 280	acres.
24 claims, located and carefully surveyed,	" 480	"
11 claims, along the tunnel and tunnel site,	" 220	"
49 claims, ...	980	"

This ground is copper and gold-bearing. There are water-rights, mill-sites, and 320 acres of salt ground showing a bed of pure salt 14 feet thick so far as known. This is part of a large bed of salt covering many square miles.

TITLE, TERMS, TIME, ETC.

The Company has spent much time and money in prospecting this ground, and has bored three diamond drill holes and done much surface prospecting. After the further small payment of $5,000 the Company will receive deeds for the whole ground, and may place stock for the deferred payments and to furnish the necessary capital to start the development work. The deferred payments, amounting to $237,000 are payable as follows:

June 1, 1910,	$ 20,000
January 1, 1915,	217,000

The last payment, due in five years, will be secured by first mortgage upon the property, and will bear interest at five per cent., payable annually, until the mortgage bonds are taken up.

PORPHYRY DEPOSITS.

These are among the most valuable deposits ever worked. The Utah Copper Company, the Ohio Company, and The Boston Consolidated Company, whose properties consist of an immense porphyry deposit in Bingham Canon, Utah, get a yield of about 20 pounds per ton of rock mined. Next to these come the Ely mines in Nevada, somewhat richer, but still very low grade. These mines pay enormous dividends.

The Boyer-Nevada is a porphyry deposit in the prospective stage, and may be as valuable as either of the above deposits. As a matter of fact the surface showing is better than either of them. Our diamond drill work did not in any case get through the completely leached or decomposed zone, but enough was learned to show that the copper ore goes down. In addition to the secondary enrichment expected with depth, there are numerous veins of sulphide ore running from 7% to 35% copper, besides, the whole deposit is gold-bearing.

FORMER WORKINGS, ETC.

On the northeastern end of the property old workings disclose a large tonnage of rich carbonate ores. Some of this has been mined and stacked up ready for treatment. A sample of this pile gave 15% in copper.

On the Treasury Box claim, about the center of the property a tunnel has been driven into the side of the hill which commences in sulphide ore and runs into it 250 feet, all in ore. The grade of this ore is such that, judging from a number of concentration tests made on small lots, it will yield 25 pounds of copper per ton, and about 40¢ in gold. The diamond drill hole was sunk from the bottom of the tunnel. The average of all samples for 85 feet shows an assay of 1.52% copper, and .0204 in gold, the gold here being a little lower than the average of the rest of the property. This ore-body is traceable on the surface for over 1,000 feet, and is thought to be 300 feet or more in width. The last 120 feet of the tunnel was sampled three separate times by me with the utmost care, giving the following results:

First sample,	1.70% copper.
Second sample,	1.45% "
Third sample,	1.47% "

All of the tunnel and the core samples are much leached.

It is thought that the entire porphyry intrusion in which these ore-bodies occur will prove to be copper-bearing. If much of it proves to be ore, the amount that would be present would be almost beyond computation.

The ore-body on the Treasury Box claim, above mentioned, could be mined as an open quarry proposition.

In addition to this, there are numerous veins of copper ore every where, many of them large enough to work. They average about 15% copper, and from $1.00 to $5.00 in gold.

TUNNEL-SITE.

A tunnel-site has been taken up in such a manner that it will cut the porphyry under the property nearly 1500 feet deep. In front of the portal is a complex of veins of rich carbonate

ores that will be cut at depth by the tunnel, while one large vein will be cut within 500 feet. On the surface this vein is nearly 100 feet wide and is traceable throughout several claims in length. It is thought that there is enough copper ore in this vein to make the property a great copper mine alone. A sample from the extension of this vein near the surface gave 22.10% in copper.

WATER, TIMBER, RAILROADS, IMPROVEMENTS, ETC.

The Boyer ranch, about eight miles distant from the mines, is the present nearest post-office. The salt marsh, or bed, below the ranch is the lowest point in the inter-mountain region, being about 3200 feet above sea-level. The salt marsh is the remains of an old salt lake, similar to the Great Salt Lake in Utah. The shores of this old lake can be traced along the mountains on either side of the valley, which is about fifteen miles wide. The basin is rock-bottomed, and permanent water is found at eight feet depth, while at certain times of the year water stands a foot deep or more over the surface of the salt bed,- hence plenty of water exists for all milling purposes. In addition to this source of water, which is inexhaustible, and which is distant from the mines in an air line about three miles, the Company owns a number of springs above the property which will furnish a large amount of water.

The valley in which the Boyer ranch and salt beds are, is broad and level and a railroad could be built direct from Winnemucca down the valley to the mines, or traction engines could operate handling all freight. The climate is dry, and, with the exception of a short rainy season, the roads would be open all the year around.

In addition to this a railroad has already been surveyed which would pass within five or six miles of the property. The Southern Pacific is said to be contemplating the construction of this road as a "cut-off" from Battle Mountain to Hazen. It would save them about forty miles. Some of the stockholders of the Southern Pacific own large mining interests in this section that would be served by the road. A charter has already been obtained from the State Legislature for the right of way. A spur from this road to the mines could be built at low cost.

There is a small, but complete, smelting plant upon the property that has never been blown in. It is quite certain that, under favorable conditions, this could be operated at a profit upon the surface ores.

PROPOSITION.

The Company is capitalized at $10,000,000. The stock has a par value of one dollar per share.

In order to meet the cost of development work, the next payments due upon the purchase price of the property and furnish

the necessary capital to get the smelter ready for operation, a limited amount of the treasury stock is offered for sale, for particulars of which please address the Secretary, whose address is 508 Equitable Building, Denver, Colorado.

The control of the Company is held in a pool belonging to those who have made the preliminary payments and have paid for the prospecting and patenting of the claims.

DIAMOND DRILL RECORD.

The record of the drill hole, sunk from the bottom of the Treasury Box tunnel and referred to above, follows:

From	To	Copper.	Gold.
0	3	4.74	0.02
3	5	1.36	0.02
5	8	2.27	0.02
8	12	2.57	0.02
12	15	2.27	0.02
15	24	2.98	0.02
24	27	0.25	0.02
27	32	1.06	0.02
32	37	0.40	0.02
37	40	0.10	0.02
40	45	0.45	0.02
45	49	0.66	0.02
49	55	2.73	0.02
55	58	0.25	0.02
58	64	0.30	0.02
64	73	0.25	0.02
73	78	0.35	0.02
78	80	0.40	0.02
80	82	6.16	0.045
82	83	4.44	0.045
83	85	4.04	0.03
	Average-	1.52%	0.0204

This average is found by multiplying the assay of each sample by the number of feet represented by that sample, totaling the products and dividing by 85, the total number of feet, thus giving the actual average assay of the entire core.

Respectfully submitted,

THE BOYER-NEVADA COPPER COMPANY.

By _____ Pres.

Errata: On the first page, read $237,500 in place of $237,000, and $217,500 instead of $217,000.

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24 ~~15~~ claims, located and carefully surveyed,	~~300~~ "	480
11 claims, along the tunnel and tunnel site,	220 "	
~~40~~ claims,	~~800~~ "	
49	980	

This ground is copper and gold bearing. There are water-rights, mill-sites and 320 acres of salt ground showing a bed of pure salt fourteen feet thick so far as known. This is part of a large bed of salt covering many square miles.

TITLE, TERMS, TIME, ETC.

The company has spent much time and money in prospecting this ground and have bored three diamond drill holes and done much surface prospecting. After the further small payment of $5,000. the company will receive deeds for the whole ground and may place stock for the deferred payments and to furnish the necessary capital to start the development work. The deferred payments, amounting to $237,500. are payable as follows:

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The Beyer-Nevada is a porphyry deposit in the prospective stage and may be as valuable as either of the above deposits. As a matter of fact the surface showing is better than either of them. Our diamond drill work did not in any case get through the completely leached or decomposed zone, but enough was learned to show that the copper ore goes down. In addition to the secondary enrichment expected with depth, there are numerous veins of sulphide ore running from 7 % to 35 % copper, besides, the whole deposit is gold bearing.

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On the Treasury Box claim, about the middle of the property a tunnel has been driven into the side of the hill which commences in sulphide ore and runs into it 250 feet all in ore. The grade of this ore is such that, judging from a number of concentration tests made on small lots, it will yield 25 pounds of copper per ton and about sixty cents in gold. The diamond drill hole was sunk from the bottom of the tunnel. The average of all samples for eighty-five feet shows an assay of 1.51 % copper and .0204 in gold, the gold here being a little lower than the average of the rest of the property. This ore-body is traceable on the surface for over 1,000. feet and is thought to be 300 feet or more in width. The last 120 feet of the tunnel was sampled three separate times by me with the utmost care with the following results:

First sample,	1.70 % copper.
Second sample,	1.45
Third sample,	1.47

All of the tunnel and the core samples are much leached.

It is thought that the entire porphyry intrusion in which these ore-bodies occur will prove to be copper-bearing. If much of it proves to be ore the amount that would be present would be almost beyond computation.

The ore-body on the Treasury Box above mentioned could be mined as an open quarry proposition.

In addition to this, there are numerous veins of copper ore every where, many of them large enough to work. They average about 15 % copper and from $1.00 to $5.00 in gold.

TUNNEL-SITE.

A tunnel-site has been taken up in such a manner that it will cut the property nearly fifteen hundred feet deep. In front of the portal is a complex of veins of rich carbonate ores that will be cut at depth by the tunnel, while one large vein will be cut within five hundred feet. On the surface this vein is nearly one hundred feet wide and is traceable throughout several claims in length. It is thought that there is enough copper ore in this vein to make the property a great copper mine alone. A Sample from the surface gave 22.10 % in copper.

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The Boyer ranch, about eight miles distant from the mines is the present nearest Post Office. The salt marsh or bed, below the ranch is the lowest point in the inter-mountain region, being about 3200 feet above sea-level. The salt marsh is the remains of an old salt lake, similar to the Great Salt Lake in Utah. The shores of this old lake can be traced along the mountains on either side of the valley which is about fifteen miles wide. The basin is rock-bottomed and permanent water is found at eight feet depth, while at certain times of the year water stands a foot deep or more over the surface of of the salt bed. Hence plenty of water exists for all milling purposes. In addition to this source of water, which is inexhaustible, and which is distant from the mines in an air line about three miles, the company owns anumber of springs above the property which will furnish a large amount of water.

The valley in which the Boyer ranch and salt beds are is broad and level and a railroad could be built direct from Winnemucca down the valley to the mines, or traction engines could operate handling all freight at little expense. The climate is very dry , and with the exception of a short rainy season the roads would be practically open all the year around.

In addition to this a railroad has already been surveyed which will pass within five or six miles of the property from which a spur can be built to the mines down the valley with practically no grading work. The Southern Pacific is said to be contemplating the construction of this road as a"cut-off" from Battle Mountain to Hazen. It would save them about forty miles while some of the stock-holders of the Southern Pacific own largemmining interests in this section that would be served by the road. A charter has already been obtained from the State legislature for this right of way.

There is a small, but complete, smelting plant upon the property that has never been blown in. It is quite certain that this could be operated at a profit under favorable conditions upon the surface ores.

PROPOSITION.

The Company is capitalized at $10,000,000. The stock has a par value of One Dollar per share.

In order to meet the outlay of development work and to meet the next payments due upon the purchase price of the property and to furnish the necessary capital to get the smelter ready for operation, a limited amount of the Treasury Stock is offered for sale, (for particulars of which please address the Secretary, whose address is

508 Equitable Building,
Denver, Colorado.)

The control of the company is held in a pool belonging to those who have made the preliminary payments and paid for the prospecting and patenting of the claims.

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73	78	0.35	0.02
78	80	0.40	0.02
80	82	6.16	0.045
82	83	4.44	0.045
83	85	4.04	0.03
	Average *	1.54%	0.0204

* This average is figured by multiplying the assay of each sample by the number of feet represented by that sample and totalling the products and dividing by eighty-five feet, thus giving the actual average assay of the entire core. The actual yield from concentration tests on the Boyer ore from the tunnel was about 27 pounds per ton of ore. We have based our estimates upon twenty-five pounds.

Very truly,

J. R. Carpenter

President.

THE BOYER-NEVADA COPPER COMPANY.

Boyer Copper Deposits, Nevada

By Arthur Howe Carpenter

The Boyer property was located by Alva Boyer, a pioneer ranchman and prospector of Nevada. He has disposed of interests to others, but still retains the control. This deposit occurs near the contact of a flow of andesitic porphyry over an earlier mass of green andesite. The earlier mass is provisionally classified as 'melaphyre,' more in the sense of meaning black or dark porphyry, a use of the term proposed by Chamberlain and Salisbury. It is a dark greenish andesite with rather abundant white crystals of feldspar. Magnetite, augite, and olivine occur. The overlying eruptive was called an 'obscure trachyte' by Clarence King, whose Fortieth Parallel Survey passed over the property. Following the proposed scheme of classification, this might properly be called 'leucophyre.' It is not trachyte. It has a rough fracture, the ground-mass is even and uniform to the eye, and the only crystals certainly visible are clear tabular sanadine.

The contact lies flat, dipping about 20° to the northwest. The white porphyry is the base upon which the thick series of basalt flows make a long high table-land called Table mountain. These flows of basalt have the same dip as the contact, suggesting that the white andesite was intruded after the basalt flows, but the dip of these old lava beds is more probably due to faulting and folding. The mass of white porphyry outcrops for about four or five miles in an easterly direction, and the dark melaphyre outcrops below it for the same distance. There are a number of copper prospects along this contact and near it in addition to the Boyer group, which is near the west end, and some of these deposits near the eastern end might repay prospecting. Chalcopyrite and chalcocite intermingled occur, almost at the surface. However, on the Boyer, the deposits seem to be the strongest and most abundant. Near the eastern end of this white andesite belt the nickel and cobalt mines of Cottonwood canyon occur, which are described by F. L. Ransome on pp. 55 to 58 of Bulletin 414, U. S. Geological Survey. These mines attracted a great deal of attention thirty years ago by producing rich cobalt ores, which were shipped to Swansea. At the prices then paid, some of the ore brought over $1000 per ton. At either end these andesitic flows disappear against massive rhyolite hills and mountains, while several miles farther south a similar outcrop occurs with copper veins capped with pure hematite.

The main workings at present on the Boyer property are on Treasury Box hill, about 200 ft. below the contact and in the altered zone in the melaphyre. The copper was evidently deposited at the time of the eruption of the white andesite. The heat and steam accompanying this flow altered the upper two hundred feet of the underlying melaphyre, forming at the base of the altered zone a hard and impervious layer with a peculiar banded structure. This forms the foot-wall of the copper deposits, which lie in the 200 ft. of altered material above, and below the contact with the overlying andesite. In many places throughout the altered zone, small dikes of the white porphyry occur, shooting off from the main body. In places just above the contact, small iron-capped veins are seen coming up through the leucophyre. When followed these veins lead to massive chalcocite disseminated in a gangue of breccia, pieces of the pure black sulphides half as large as a man's hand having been occasionally found. Massive bornite, tenorite, and cuprite occur also, mixed with the two carbonates, melachite and azurite, making small rich deposits of ore. If followed, it is thought that these ore-shoots will lead to the larger deposits that may lie at the contact and in the altered zone below it. At one place, from a deposit occurring at the surface (almost exactly at the contact), several large wagon-trains were loaded with rich copper sulphides and oxides, in 1861, and taken to Sacramento overland. The old shallow pits are still to be seen, surrounded with the piles of refuse, where was cobbed out the richer ore. Samples of these piles assay 29% copper. These rich ores carry 5 oz. of silver and traces of gold. Every other occurrence of copper ore on the property, when carefully assayed, seems to carry about 20c. gold per ton for every per cent of copper present.

The main work on Treasury Box hill was done in a bed of copper-bearing andesite about 100 ft. or more in thickness. The ore is chalcopyrite disseminated through the melaphyre, and the lower 30 ft. of the bed averages from samples obtained, wherever it has been opened, nearly 5% in copper and $1 in gold and traces of silver. Owing to lack of funds, it has been impossible to continue the development work as far as the contact, which dips in the direction the prospecting adits have been driven, but when this development work is done, interesting results may be obtained.

About a mile of the contact is included within the limits of the property, and throughout this distance it is possible to find ore in the altered zone in the melaphyre below the contact. At three other places besides on Treasury Box hill the surface indications are promising, and, in fact, at few of the well known copper properties of the West are the outcrops of copper-bearing rock more extensive. Large masses of carbonate ore exist assaying about 1.5% copper, and in places it is much richer.

The ground explored by the adit is badly faulted, so that it has not been possible to develop a continuous bed of ore, but it is thought that a bed of copper ore once existed over 100 ft. thick, 200 ft. wide, and, measured along the line of the dip, 500 ft. or more in length. Owing to the many faults, however, there are only blocks of ore lying at different levels, and not all of them have been opened. The dimensions given are simply the limits of the present exploratory work, and there is not so much ore actually developed. It is only possible ore. But there is reason to believe that the lower 30 to 50 ft. of each of these broken blocks will average over 4% copper. There is also reason to hope that the beds will continue down along the plane of the contact in the altered zone. The richer beds may be wider than this, but this is a matter of speculation. Naturally it is not thought that all of the altered zone beneath the contact is as rich in copper as this bed. The whole of it, however, seems to be copper-bearing, but most of it will be too low grade for profitable mining. Other beds will likely be found as rich and extensive as the one opened on Treasury Box hill, and the ore-bearing zone should continue as far down as the contact between the two porphyries and the beds of valuable ore prove strong and permanent. This ore zone lies so that several thousand feet of it, perhaps, underneath the white porphyry and back from the outcrop, could be prospected with churn-drills, though many of the holes farther back would have to go quite deep.

The ores are primary, and there is little or no secondary enrichment, nor has there been much chance for it. Large areas of the copper-bearing rock have been leached barren near the surface. The ground-water line does not seem to lie very deep now, however, and springs come to the surface in the contact and near it, and in places above it. In his general description of these properties Mr. Ransome refers to the occurrence of pyrite, but, so far as known to me, after a residence of nearly a year at the property, no pyrite occurs, all the sulphide ore consisting of chalcopyrite. This carries almost the theoretical content of copper, several pure specimens having been carefully analyzed. The general trend of the belt described by Ransome is the same as that described here, but it is not actually over 200 ft. wide.

Chalcopyrite is hard to concentrate, as it slimes badly in crushing. Several concentration tests made with Wilfley tables, however, gave a recovery of 70 to 80% of concentrate assaying over 20% copper, which is high for such an ore. It is therefore apparent that no difficulties exist like those encountered at Yerington. The ore is an ideal one for oil flotation processes, and a test made with a laboratory machine gave the wonderful result of 92% recovery in concentrate assaying 30% copper.

The Sinaloa Mining District

By G. L. Sheldon

The Sinaloa mining district is due south of the Fuerte and north of the Mocorito district, in the State of Sinaloa, Mexico. The county seat, Sinaloa, on the river of the same name, is an old town with a population of about 2000. Bamoa, a station on the Southern Pacific railroad Mexican system, about 14 miles south, and across the river, is the nearest railroad point. The western half of the district extends to the Gulf coast and is an agricultural area. The eastern half is in the foothills and Coast range section, extending to the Chihuahua State line, north and south from San Jose de Gracia.

At Bacubirito, 20 miles east of Sinaloa, the river makes a large bend, 6 to 8 miles long, and at the narrow neck, only about 300 yd. wide, the river bed, it is claimed, carries a good deal of placer gold. About twelve years ago considerable gold was taken from it, including numerous nuggets of good size, one of 4½ lb. At the neck of a tunnel could be driven that would carry the water of the river during the low-water stage, and the bed below could be cleaned to bedrock. The tunnel would give a 70-ft. fall on the downstream side and generate a large amount of electric energy. A few years ago Messrs. Yard and Hughes

STREET BOOTHS, SAN JOSE DE GRACIA.

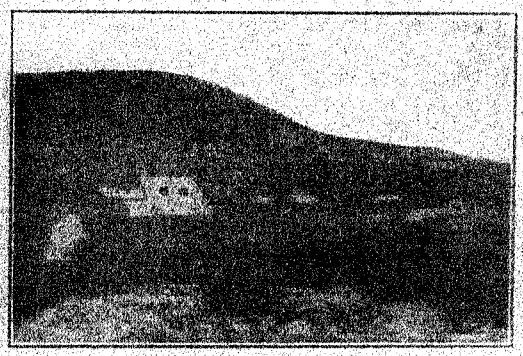
did some work on the placer benches above the river, near Bacubirito, putting in a small pumping plant. Five years ago some Philadelphia people put up a small mill on a gold property near the river, between Bacubirito and Sinaloa. The San Jose de Gracia section is the principal one in the district that has received attention, because of the high gold content of its veins; this has been recently described in the *Mining and Scientific Press*.

Twelve to fifteen miles west and north of San Jose is an old silver district where several mines in past years have produced and shipped considerable high-grade silver ore. Ten years ago the San Jose mine was worked by an American, and some shipments of good ore were made, but the owner lacked capital to properly develop it. It is in a mountainous country. North and east of this, at Alisos, on San Jose creek, near its head, are several prospects carrying gold and silver. Thirty miles east of San Jose, near San Vicente on the river, during the past two years, a new discovery has been made. The vein is 30 to 40 ft. wide and shows a gold content of $10 to $50, with some copper; the vein can be traced several miles, and shows mineralization. Many locations have been made upon it, but so far it is but little developed. About ten miles above San Vicente, on the river near Torrogueno, Don Zarapo Lopez owns the Torrogueno gold property. This is 2000 ft., above the river in the andesite—a good 9-ft. quartz vein. Two years ago some Americans did some work upon it, but quit for want of funds, it is said. South from Torrogueno, near the divide between the districts of Sinaloa and Badirahuato, is the La Colorada mine, worked thirty years ago to a considerable extent. This is a 10 to 15-ft. vein carrying silver. Two years ago a waterspout completely covered the old works with débris, as it is in a small gulch. West of this and south down the river, on the east side, is a large limestone area which has many known prospects, mostly silver, with not sufficient development to demonstrate their value. In the vicinity of Bacubirito the veins contain mostly gold.

Northwest of Sinaloa, 12 or 15 miles, is Ocoroni, on the river of the same name, known above the Yecorato river. Four miles above this place is a lead-silver district which, while known for many years, has only received attention since the advent of the Southern Pacific railroad. Many claims have been located and considerable

TORROGUENO VEIN, SINOLOA DISTRICT.

work done during the past year or two; for a distance of several miles there is a very good showing on a vein or veins, from 10 to 40 ft. wide, carrying 10 to 70% lead, good silver content, a little gold, and in some places zinc and copper. It was examined two years ago by an engineer who had several years' experience in the Coeur d'Alene in its early days, who thought the showing here was as good as that on the surface. It is only 20 miles by wagon-road from the station of Naranjos, on the Southern Pacific railroad, where it crosses the Ocoroni river. On account of its good transportation facilities and the urgent



SAN JOSE DE GRACIA MILL BEFORE ERECTION OF CYANIDE PLANT.

need of lead ores on the west coast for fluxing purposes, it is a promising lead district. Above it a few miles is an old silver-mining camp with ruins of old *haciendas*, where the ores were treated years ago. While the Sinaloa district is not as large as the Fuerte there is no doubt of its containing much good ore, and in time more than one producing mine will be opened.

The San Jose de Gracia is probably the best small gold district in the State. The lower agricultural country is fully equal to the valley of the Fuerte, and with its rich silt soil probably surpasses it. There is abundance of water in the Sinaloa and Ocoroni rivers for irrigation purposes.

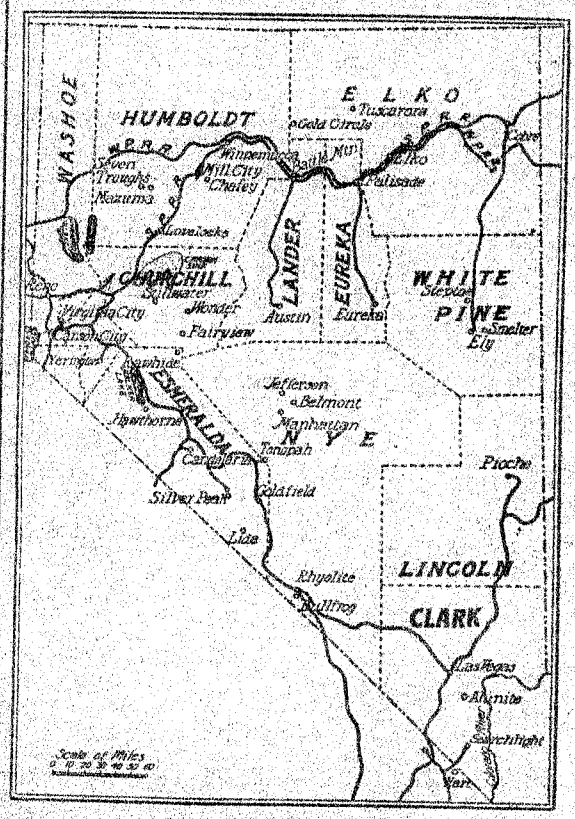
The world's production of zinc during 1910 was 883,419 short tons, and the consumption 882,573 short tons. In the United States the production was 269,184 short tons, and consumption 245,884 short tons.

There are over 1000 acres in the group of claims, and in Dixie valley, two or three miles from the property, mill-sites are held. Plenty of water can be had in this flat or valley, and it is probable that artesian water could be developed. In the centre of the flat a number of springs come to the surface. In the next valley to the east, flowing artesian wells thirty years old exist. That valley is said to be 500 ft. higher than Dixie valley, which is the lowest in Nevada, and, according to King, the point in front of the property is the lowest in the interior basin, so that water cannot get away. Everywhere in the centre of the flat water seems to stand permanently about 6 ft. below the surface. At the old borax plant, formerly operated there, they were not able to lower it below this point in a well, using a 4-in. triplex pump operated with a gasoline engine. The lower portion of this flat is occupied by the great Ossobb salt marsh, fully described by King. The whole valley is really a rock-bound lake, full of rock, silt, and clay of Quaternary times, and covered with the debris from the old lake floor. Water stands on the salt beds most of the year. The springs are fresh water. It is about 75 or 80 miles to either Battle Mountain or Winnemucca, both on the Southern Pacific railway. In going to either place there are no mountains or other barriers to cross. Winnemucca would probably make the better point for shipping and serving this section.

On Treasury Box hill about 500 ft. of work has been done, adits, drifts, raises, and winzes. Other parts of the group have received less attention. At one point about one-half mile north of the Treasury Box workings a shaft was put down into the melaphyre at the contact. They intended to drive from the bottom of this shaft back into the contact. This shaft cannot be explored now. It is supposed to be 170 ft. deep and passed through a bed of copper ore said to be 17 ft. thick, of oxides and carbonates. A sample taken from the ore piled on the dump assayed 15% copper with a little silver. The story among the local miners is that they actually drove toward the contact from the bottom of the shaft, but when they approached it, the ground got soft and, owing to the use of too few timbers, forty feet or more of the drift suddenly caved, becoming filled with decomposed rock, mud, and water. It is said that this water coming from the breast of the adit was greenish from copper salts, and that picks and shovels left standing in it became coated with metallic copper. An adit was then started farther down the hill to cut under the shaft and meet the contact lower. It was never finished, though about 800 ft. was driven. This could be cleaned out and driven through, but it was not laid out with any idea of future work and is on the wrong side of the hill, so that any ore developed would be inaccessible and costly to move. A shorter adit from the opposite side would cut the contact more quickly and develop more promising territory.

The property is a promising prospect. There is no large tonnage of ore blocked out at present. Probably 70,000 tons is all that can be counted as probable ore so far developed in the sulphide zone on Treasury Box hill, and much of this is low-grade concentrating ore. The adit through this zone averages 1.70% copper. This was driven at the time the porphyry copper mines were so fashionable, and this is a 'porphyry copper mine' in the sense that the gangue of the ore is an eruptive rock and the sulphides are disseminated through the rock. But it is chalcopyrite, not chalcocite, and while the grade compares well with the copper content of the ores at Ely and Bingham canyon, America at least, no one has so far attempted to exploit primary ore deposits of this character. At present it is remote from railroads. However, local conditions are favorable for cheap mining operations, once a railroad reaches the district. There is reason to expect that the Southern Pacific company will build a line or 'cut-off' from Battle Mountain to Hazen through this valley. This will shorten the distance across Nevada by the present route [illegible] miles, but necessitates the construction of a long tunnel, about six miles. There would be no other mountain ranges to cross and an almost level grade can be had. The estimated cost of this construction is much less than the cost of the Lucin 'cut-off' across Salt Lake, and the distance saved would be much greater.

The copper belt of the Piute range of mountains is about ten miles long and a number of other prospects occur farther south. On one group a vein or deposit outcrops about 100 ft. wide. An adit has been driven to cut this, but, so far, has only entered the foot-wall. The breast of the adit is in decomposed rock, badly stained with iron oxide. It will cut the vein about 200 ft. below its outcrop, and, I believe, will open a valuable deposit. There are a number of veins or zones extending the whole length of the ten miles, easily noticeable from a distance out on the flat, on cloudy days, as dark bands along the mountains. These are silicious irony outcrops, 50 to 100 ft. wide, and the zone in which they occur is 2000 or 3000 ft. wide. Whenever closely examined, copper sulphide, oxide, and carbonates are found, and it is likely that important deposits of copper will be discovered below. However, the ore of this region is chalcopyrite, and, until the secondary ores of Bingham, Ely, and the great Arizona 'porphyry' copper mines become scarcer, it is not likely that attention will be turned to these primary ores. But, sooner or later, the disseminated chalcopyrite ores that occur in large masses will attract attention, and it is from these deposits that future copper supplies of the world will be drawn. When that time comes, with the advent of a railroad, this region will become a copper producer of no mean importance.



MAP OF WESTERN NEVADA.

THE Straits Settlements Land Office returns show that during 1910 the area alienated for mining in Perak amounted to 10,464 acres. These figures show a considerable advance on those of the preceding year. There was some activity in mining in the Kinta district. In face, however, of the increased area alienated for mining in the year, the total area held under mining titles is said to have been reduced by about 3000 acres; the labor conditions have been enforced with some stringency, and there have been fairly numerous applications for the conversion of mining titles into agricultural.

Deterioration and Spontaneous Heating of Coal in Storage

By Horace C. Porter and F. K. Ovitz

*Not many years ago, coal was commonly regarded as an extremely unstable material, subject to very serious alteration and losses on exposure to the elements. The 1889 edition of Groves & Thorp's 'Chemical Technology of Fuels' says: "In some places coal is known to lose 50% of its heating value in six months." Other statements like this are to be found in recent literature, but probably the great majority of chemists and engineers today hold no such exaggerated ideas on the subject. There is, on the other hand, a well defined suspicion, in the minds of many, that sufficient loss of volatile matter and sufficient deterioration by oxidation does occur in coal to be of industrial importance; and for that reason the investigations described in this paper were undertaken, by the Bureau of Mines, to determine accurately the extent of the deterioration in different types of coal. First, a study was made in the laboratory of the loss of volatile matter from crushed coal during storage. The results of these experiments have been published in Technical Paper No. 2, Bureau of Mines, entitled 'The Escape of Gas from Coal,' and will therefore not be given here in detail. Suffice it to say that while several coals evolve methane in large volume, especially in the early period after mining, the coal suffered in one year a loss in calorific value from this cause of but 0.16% as a maximum. It seems, therefore, that the loss due to escape of volatile matter from coal has been greatly overestimated.

At the instance of the Navy Department, however, which is a purchaser of coal to the extent of two or three million dollars annually, and stores large lots in warm climates for long periods of time, more elaborate tests were undertaken to determine the total loss possible in high-grade coal by weathering. The extent of the saving to be accomplished by water submergence as compared to open-air storage was a point to be settled, and there had also arisen the question as to whether salt water possessed any peculiar advantage over fresh water for this purpose. Coal-storage problems have assumed importance during the past few years on account of the uncertainties of supply due to strikes and transportation difficulties. The naval coaling-stations, the Panama Railroad Co., the commercial coal-distributing companies of the Great Lakes, large coke and gas or power plants at a distance from the coalfields, and the railroads themselves, particularly those in the West, keep 50,000 to 500,000 tons in storage a large part of the time.

In brief outline, the tests by the Bureau were carried out as follows: Four kinds of coal were chosen: New River, on account of its large use by the Navy; Pocahontas, as a widely used steaming and coking coal in the Eastern section and as being also the principal fuel used in the Panama Canal work; Pittsburg coal, as a type of rich coking and gas coal; and Sheridan, Wyoming, sub-bituminous, or 'black lignite', a type much used in the West. Every test portion was sampled each time in duplicate. Moisture, ash, sulphur, and calorific value determinations were made on each sample, the last by means of the Mahler bomb calorimeter and a carefully calibrated Beckman thermometer. All the calorific values in the tables have been calculated to a comparable unit basis.

The results show in the case of the New River coal less than 1% loss of calorific value in one year by weathering in the open. There was found practically no loss in the submerged samples, and fresh water seemed to 'preserve the virtues' of the coal as well as salt water. There was almost no slacking of lump in the run-of-mine samples, and the crushed coal, in all cases, deteriorated more rapidly than run-of-mine. The Pocahontas run-of-mine, in a 120-ton pile on the Isthmus of Panama, lost during one year's outdoor weathering 0.4% in heating value, and suffered little or no physical deterioration of lumps. The Pittsburg gas coal, during six months outdoor exposure, suffered no loss whatever of calorific value, measurable by the calorimetric method used—not even in the upper surface layer of the bins.

The Wyoming coal lost as much as 5.3% in one of the bins during 2¾ years, and 3.5% even in the first three months. There was bad slacking and crumbling of the lumps on the surface of the piles, but where the surface was fully exposed to the weather this slacking did not penetrate more than 12 to 18 inches in the 2¾-year period.

No outdoor weathering tests have been made by the Bureau on coal of the Illinois type. Thorough tests, however, on this type have been reported by S. W. Parr, of the University of Illinois, and by A. Bement of Chicago, both of whom find from 1 to 3% calorific loss in a year by weathering. Mr. Bement reports a slacking of lumps (in tests on small supplies) of over 80% in one case and about 12% in another. It is probable that in this type, as in the Wyoming, the slacking in a large pile would not penetrate far from the surface.

Storage under water unquestionably preserves the heating value and the physical strength of coal. But it practically necessitates firing wet coal, and therefore means the evaporating in the furnace of an amount of moisture varying from 1 to 15%, according to the kind of coal. This factor is an important drawback to under-water storage with coals like the Illinois and Wyoming types, which mechanically retain 5 to 15% of water after draining, but in case of the high-grade Eastern coals, if firemen are permitted, as is ordinarily the case, to wet down their coal before firing, "so as to make," as they say, "a hotter fire," then the addition during storage of the 2 or 3% moisture which these coals retain would be of little consequence. Submergence storage is an absolute preventive of spontaneous combustion, and on that account alone its use may be justified with some coals, but merely for the sake of the saving to be secured by avoidance of weathering, there does not seem to be good ground for its use.

Losses in coal due to spontaneous heating are a much more serious matter. Oxidation, probably in the main an absorption of oxygen by the unsaturated chemical compounds in the coal substance, begins at ordinary temperature in any coal, attacking the surfaces of the particles, thus slowly developing heat. In a small mass of coal this slowly developed heat can readily dissipate itself by radiation, and no rise in temperature results. If radiation is restricted, as in a large pile densely packed, the temperature slowly rises. Now, the curve of oxidation rate, plotted against temperature, rises with great rapidity; and when the storage conditions are such as to allow a certain point (near 100°C.) to be passed, the rate of oxidation is great enough ordinarily so that the heat developed overbalances the heat radiated, and the temperature will rise to the ignition point if the air supply is adequate. The importance, therefore, can be seen of guarding against even moderate heating in the coal, either from internal spontaneous causes or by radiation from external sources. Increased loss of heating value and of volatile matter occurs at moderately increased temperatures, even though the ignition point is not reached.

The amount of surface exposed to oxidation in a given mass depends on the size of the particles and increases rapidly as the fineness approaches that of dust. Dust is therefore a dangerous thing in a coal pile, particularly if it is mixed with larger-sized coal which form air passages to the interior. Spontaneous combustion is brought about by slow oxidation in an air supply sufficient to support the oxidation but insufficient to carry away all the heat formed. There is a wide variation among coals in friability. In comparative rattler tests under certain standard conditions, Pocahontas, New River, and Cambria county, Pennsylvania, coals produced nearly twice as much dust (through ⅛-in. screen) as a sample from the Pittsburg bed. This is a large factor in spontaneous combustion. Mixed lump and fine, that is, run-of-mine, with a h

*Presented, by permission of the Director, Bureau of Mines, at a joint meeting of the New York sections, Amer. Chem. Soc., Amer. Electrochem. Soc., and the Soc. of Chem. Ind., New York, November 10, 1911.

PROSPECTUS OF

THE BOYER-NEVADA COPPER COMPANY

CHURCHILL COUNTY
NEVADA

The Boyer-Nevada Copper Company

OFFICERS

FRANKLIN R. CARPENTER . . President and General Manager
Equitable Building, Denver, Colorado

~~H. R. DOWLE~~ Wm. H. Smith, Wilmington, Delaware, Vice-President
~~Chicago, Illinois~~

~~EDWIN HAHL~~ . . . . . ~~Treasurer~~
~~206 La Salle Street, Chicago, Illinois~~

ARTHUR HOWE CARPENTER . . . . . Secretary & Treasurer.
Equitable Building, Denver, Colorado

DIRECTORS

FRANKLIN R. CARPENTER . . . . President, Denver, Colo.

Wm H. Smith ~~H. R. DOWLE~~ . . . . . Vice-President, ~~Chicago, Ill.~~ Wilmington, Delaware

~~H. WOLLENBERGER~~ . . . . . ~~Chicago, Ill.~~

Arthur Howe Carpenter, ——— Denver, Colorado.

~~BANKERS~~

~~WOLLENBERGER & CO.~~
~~206 La Salle Street, Chicago, Illinois~~

Offices of the Company
Equitable Building, Denver, Colorado

Mines located at
Boyer, Churchill County
Nevada

STATEMENT

The company holds this property upon very favorable terms, has made preliminary payments and is now doing development work. To meet this and other obligations it offers for sale a limited amount of Treasury Stock, for the particulars of which address

[redacted]

or

ARTHUR HOWE CARPENTER, Secretary,
Equitable Building, Denver, Colo.

REPORT ON THE BOYER-NEVADA COPPER COMPANY.

By FRANKLIN R. CARPENTER

THE BOYER-NEVADA COPPER MINES

LOCATION.

This group consists of twenty-seven claims and is located in Churchill County, Nevada, about forty-five miles southerly from Lovelock, a station upon the Southern Pacific Railroad, in Humboldt County, and about eighty miles from Winnemucca, a station eighty miles easterly from Lovelock, and also upon the Southern Pacific Railroad. The first locations were made in 1861 and some rich ore shipped by wagons to San Francisco. A railroad can be built at minimum cost through a broad level valley from Winnemucca to the mines. Incidentally it would open up a vast mineral region.

TITLE.

Three of the claims are patented and the rest are now held by possessory title, but will be surveyed for patent shortly.

GEOLOGY, ETC.

The country rock is an igneous intrusion, a "melaphyre." It lies between rhyolite upon one side and andesite upon the other and is about one and one-half miles wide. Whether the "porphyry" is one general intrusion I cannot say. It appears, however, to be of different ages, and the different layers to dip about forty-five degrees to the Northwest, though this is not asserted positively, but the ore-bearing deposit really consists of this mile and a half of igneous rock.

The ore is pure chalcopyrite, occurring in disseminated grains through the "porphyry," and is an original constituent of the rock itself, having crystallized at the cooling and solidifying of the magma. The ordinary rich copper ores show at the surface, but in the unleached or unaltered zone, no other copper mineral is discernible than chalcopyrite. The deposit is essentially a duplicate of the Utah Copper Company's mine at Bingham Canon, Utah. Like it the mine is not "upon a vein, lense or stockwerk, but upon the original magma whence have come all of our mineral values. The Utah has gone down to the backbone of nature for its ores, and the success of the company, which is not open to question, opens a new and vast field of possibilities in the mining world" (Stevens). Incidentally I may say that the selling price of the Utah shares gives the mine a value of $24,000,000.

If it were not for the success of the Utah Copper Company and other like low grade mines, which have come to the front recently, I should hesitate to indorse this proposition, and I indeed made a second study before doing so; but with the example of these companies, we have only to determine the extent and value of a new deposit, the pioneer work having already been done by them.

While copper indications are found upon every claim examined in the group, only one working reaches the unaltered zone, and this at one point only, to-wit: the winze at the end of the cross cut. This is the tunnel upon the Treasury Box claim. The tunnel runs into the deposit for 230 feet—starts in ore, ends in ore, and shows copper ore its full length. The first 120 feet shows ore of lower grade, running less than one per cent. copper. The next 110 feet is of better grade, but all save the deeper parts have been somewhat leached. The floor and farther parts of the tunnel are of a slightly higher average than the back, while repeated assays show that the winze sunk from near the breast of the tunnel is the richest part of the mine. The last few feet of this tunnel and the winze are also the only parts of the workings to reach the unaltered zone. It is greatly to be regretted that the workings are so few in number, but from surface indications it would seem that this particular ore-body can be traced for 900 feet and may be 300 feet or more in width, and, doubtless, is of great depth. It must not be understood that the above dimensions include all of the ore of the group, but merely indicate what the tunnel and surface indications show at this particular point. Other claims show much richer and more extensive surface secondary mineralization, but no work has been done to show the unaltered ore beneath. My own opinion is that this particular igneous intrusion is ore-bearing throughout the district, and that the entire porphyry from granite foot-wall upon one side to the limestone hanging-wall upon the other, is the "lode," but, of course, this term is not applicable in this case. With such a small part of the rock exposed or explored, one cannot even guess at the ultimate amount of ore to be found. It is safe to say that not one-hundredth part of the company's holdings has in any way been tested, even by surface pits. Again, in the case of the present "ore-body," no one knows the depths to which it will reach, nor have its limits in any direction been determined. Being, as said, a primary occurrence of ore, a part of the unaltered magma, it probably goes as deep as the intrusion itself. We can only compare it with Bingham Canon, Utah, where the deepest drill borings show no change in the ore contents. So that an ore-body 300 feet by 900 feet by 1,000 feet deep would yield more than 20,000,000 tons, but if much of the mass of porphyry is found to be mineralized the ore may be found to be beyond computation.

This property being a "prospect," or undeveloped property, it must not be inferred that this, or any large body of ore is actually "in sight," but in my opinion, large ore-bodies will be developed that will prove practically inexhaustible. This, however, is to be determined by prospecting before the erection of works. This prospecting is now being done.

There is reason to believe that a layer or section of the porphyry from 300 to 1,000 feet wide, dipping about forty degrees Northwest, running the whole length of the group of claims, will prove to be the best portion of the mass, but this I could not fully determine.

SAMPLING AND ASSAYS.

The following assays were obtained from samples of the last 120 feet of the tunnel, taken by me personally. They are lower than the results obtained by others.

	PER CENT. COPPER
Average sample from winze, end of tunnel, unaltered ore	3.48
First sample of 120 feet, including all rock, taken with great care, but somewhat leached	1.70
Second sample of 120 feet, somewhat leached	1.45
Third sample of 120 feet, somewhat leached	1.47

There are traces of gold and silver not included, nor are the rich carbonate ores at the surface included, which show an average value of 7 per cent. copper.

From all these tests and assays I have estimated that a production of twenty-five pounds net of copper will be secured from every ton of unaltered rock mined from the unaltered zone.

The ore being chalcopyrite, slimes badly in fine crushing, but this is the case equally at other mines of this class. Recently, however, an improved process for treating slimes of this class has been invented, by a well known mining engineer, the details of which I have been permitted to know, but this ore, tested by the old process, yielded in a crude preliminary test an indicated saving from the unaltered rock of about 91 per cent. But my estimates are made upon the results known to have been obtained by the Utah Copper Company, who return a net yield of twenty-seven pounds per ton of rock from ore said to assay 1.7 per cent. copper. Their costs are about as follows:

Mining	$ .30
Freight	.30
Milling	.75
Smelting	.15
Miscellaneous charges	.25
Total per ton of ore mined	$1.75

A poor upper "leached" or impoverished zone is characteristic of nearly all Nevada mines occurring in igneous rocks. This is true of the gold mines, even, notably at Goldfield, where rich ores did not occur at the surface, but in the unleached zone below. It is true, also, but in a different manner, at Ely and in other copper camps. The surface assays here at Boyer are as high as are to be expected in deposits of this class; while the only unaltered or unleached part so far opened shows ore running from 3½ to 5½ per cent. copper, but I have preferred to make my estimate upon a far lower general average, to-wit: