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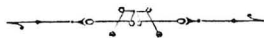
REPORT

—OF THE—

SILVER KING MINING CO.,

—TO—

JANUARY 13TH, 1880.



SAN FRANCISCO:

A. L. BANCROFT & COMPANY, PRINTERS,

721 Market Street.

1880.

SILVER KING MINING COMPANY.

LOCATION :

PIONEER DISTRICT, PINAL COUNTY,
ARIZONA TERRITORY.

PRINCIPAL OFFICE :

320 CALIFORNIA STREET, SAN FRANCISCO,
CALIFORNIA.

CAPITAL STOCK, - - \$10,000,000

DIVIDED INTO

100,000 SHARES OF \$100 EACH.

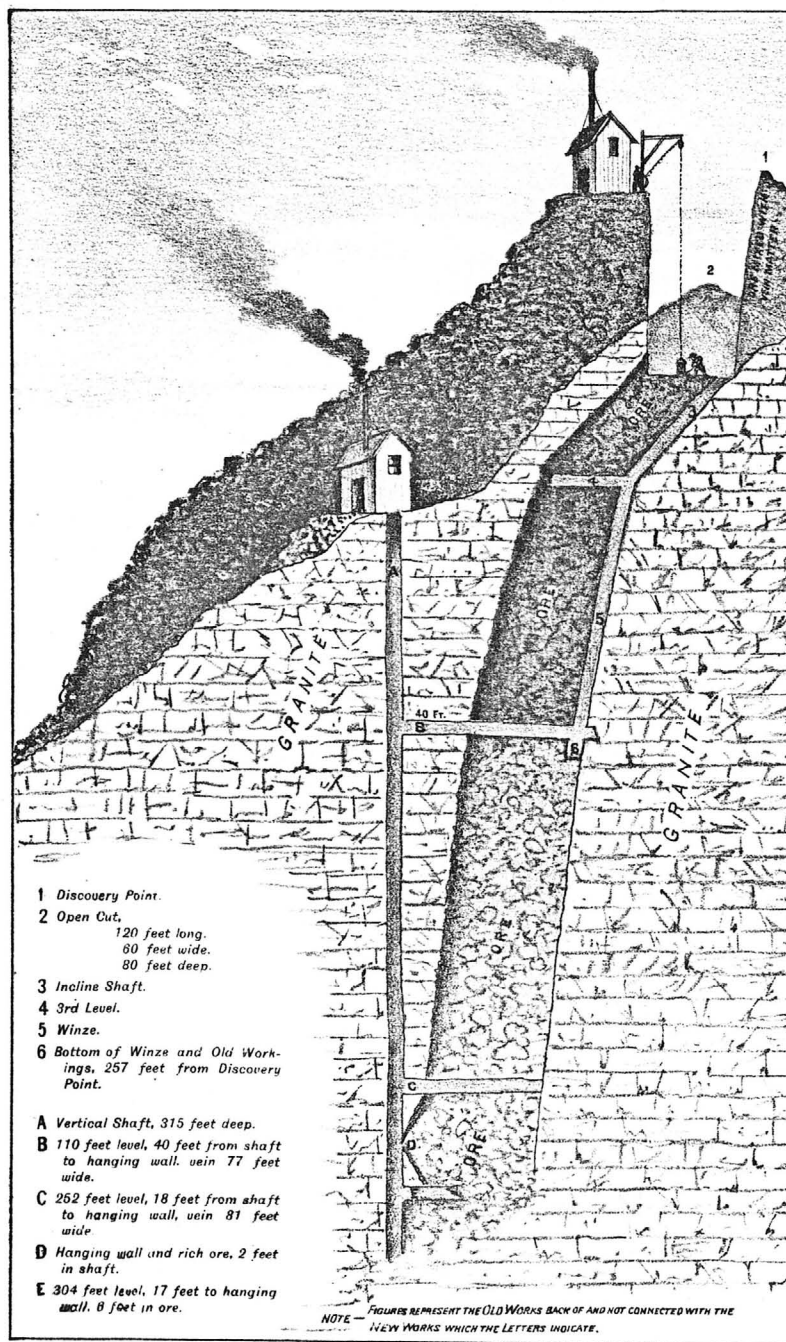
→*DIRECTORS.*←

JAMES M. BARNEY, B. A. BARNEY,
WILLIAM H. STANLEY, GEO. L. WOODS,
WM. H. BOOTHE.

→*OFFICERS.*←

GEO. L. WOODS,	-	-	-	-	PRESIDENT.
B. A. BARNEY,	-	-	-	-	VICE-PRESIDENT.
JAMES M. BARNEY,	-	-	-	-	TREASURER.
AARON MASON,	-	-	-	-	SUPERINTENDENT.
EDWIN B. BOOTHE,	-	-	-	-	SECRETARY.

JAMES M. BARNEY, General Manager.



CROSS SECTION OF VEIN.

❖❖REVIEW❖❖

In preparing for publication the copies of the official reports submitted at the annual meeting of the stockholders of the Silver King Mining Company, held in San Francisco, January 13, 1880, it is thought proper to preface them with a few of the prominent facts connected with the discovery and location of this mine and such other data of record as is of general interest to the stockholders.

Discovery and discoverers.	Charles G. Mason, Benjamin W. Reagan,
Location.	William H. Long and Isaac Copeland discovered the mine March 21, 1875; located it March 22, 1875, claiming fifteen hundred
Claim, 1,500 ft. E. & W.; 600 ft. N. & S.	(1500) feet in an easterly and westerly direction and six hundred (600) feet in a northerly and southerly direction, and had
Recorded.	this duly entered in the county records at Florence, all according to law.

Long & Copeland sell to Mason & Reagan.	Isaac Copeland sold his one quarter ($\frac{1}{4}$) interest to Charles G. Mason, and William H. Long sold his one quarter ($\frac{1}{4}$) interest to Benjamin W. Reagan, June 30, 1876.
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Mason sells to
Barney.

Charles G. Mason sold his one half ($\frac{1}{2}$) interest to James M. Barney, January 9, 1877.

Incorporation.

Capital.

Chief office.

First Director-
ate.

The Silver King Mining Company was incorporated under the laws of the State of California, May 5, 1877, with a capital stock of ten million (10,000,000) dollars, divided into one hundred thousand (100,000) shares of one hundred (100) dollars each, its principal office established in San Francisco, California, with James M. Barney, Benjamin A. Barney, Benjamin W. Reagan, George L. Woods and William H. Boothe, as trustees.

Barney & Reagan
deed to the
incorporation.

James M. Barney and Benjamin W. Reagan deeded their entire interests in the mine to the incorporation May 9, 1877.

The stock listed
on S. F. Stock
Board.

The Silver King Mining Company's stock was listed in the San Francisco Mining Stock and Exchange Board November 9, 1877.

Situation of mine
Distances to
Florence, Casa
Grande and
San Francisco.

The mine is situated in a little valley of the Pinal Mountains, and on their southwestern side, in Pinal county, Arizona Territory, about thirty-five (35) miles north-east from a point on the Gila river, at Florence, the county seat, which is some twenty (20) miles from the Southern Pacific Railroad at Casa Grande station, which is nine hundred and thirteen (913) miles from San Francisco.

How discovered.
Description of
its surround-
ings.

The discovery was made in an outcrop of the vein from the apex of a low conical hill that, like the valley, has been denuded by the elements of its super-strata of sedimentary rocks, of which a fine section, some two miles in length, is displayed in the precipice, which in places stands stripped a sheer thousand (1000) feet high, and is capped with basaltic lava. This precipitous mountain forms the boundary of the valley on its south. This valley is easily entered on the west by a good natural (now county) road of gradual ascent from the Gila river. On all other sides the approaches are most rugged, indescribably broken, and so rough that travel is not easy afoot; generally of this nature is the Pinal Mountain country on this side, eroded and disrupted into grand cañons, as it is.

Formation, de-
scription of
vein and con-
tents.

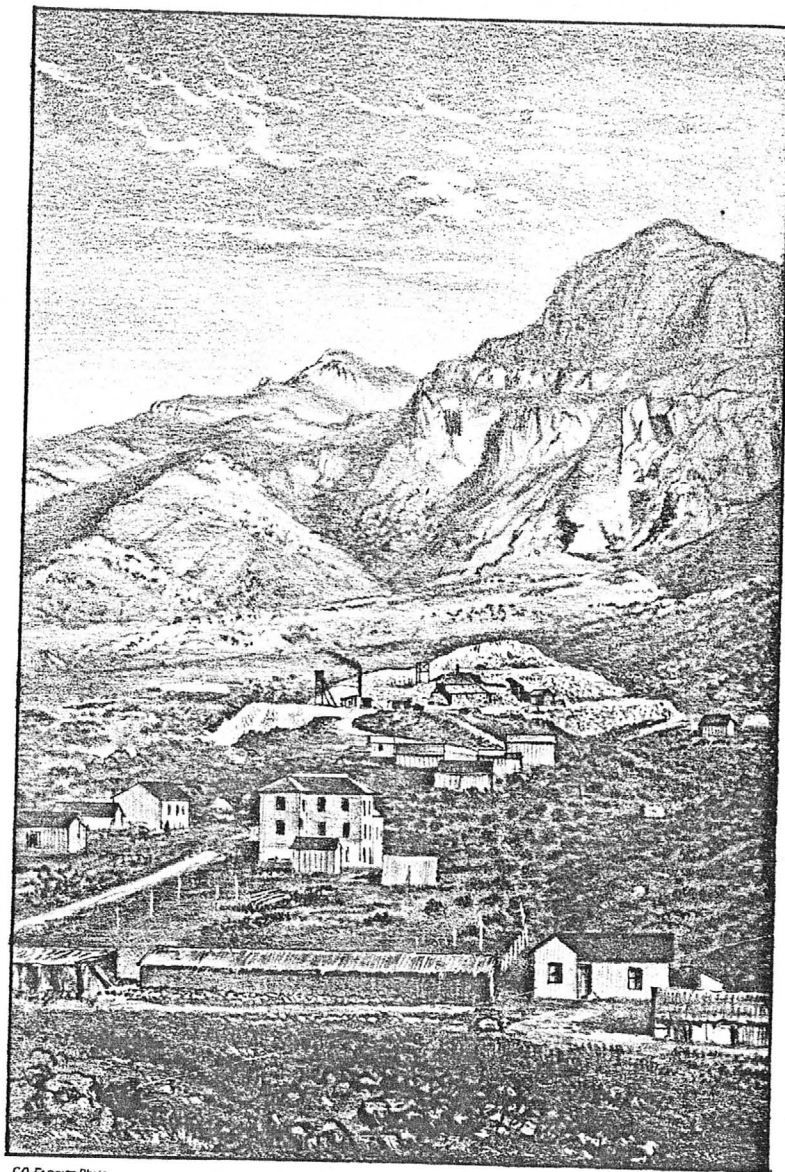
The country rock that incases the vein, is granite, of the azoic age. The matrix is quartz; lime and magnesia are found combined with the quartz in the gangue. It contains silver in all combinations, classified by the mineralogist, and in masses that call remark from the learned by their size and richness. Assays of quantities have given the contents as over twenty thousand dollars (\$20,000) per ton. At times it has salts of, and basic copper, as also sulphide and carbonate of lead; in it traces of zinc, arsenic and antimony have

Silver.

Copper.

Lead.

Y,



C.D. FARCIOT Photo.

SILVER KING MINE AND CITY.
LOOKING EAST.

A. L. BANCROFT & Co. Lith.

Gold. been discovered, recently and in the newer and deeper ground gold is obtained.

Record. This property has paid its way from the day of location, every expense of developing the mine; in the first place, from the point of discovery by incline shafts, tunnels, drifts and cross-cuts; and later, from a more north-westerly point of lower elevation, on the north side of the vein, by a vertical shaft (now 320 feet deep and in progress downward), and from this shaft by cross-cuts and drifts; all costs of extracting the ore, road-making, building a ten (10) stamp mill, with its appurtenances (at Pinal, on the county road, four miles westerly from the mine), which has been incessantly supplied; reduction, freight charges on supplies from and ores to market; steam hoisting works at mine, with store-houses and offices amply supplied at mine and mill. It has paid to its owners before and since its incorporation seven hundred and ten thousand dollars (\$710,000) in dividends. It has improved on exploration, so that to-day it has visible and tangible a reserve of many thousands of tons in excess of that in view six (6) months ago, and this without calling for one (1) dollar in assessments from its owners before incorporation or its stockholders since that time. These are facts as worthy of remark as they are rare in the mining world.

PRESIDENT'S REPORT.

OFFICE OF THE SILVER KING MINING CO.,
320 CALIFORNIA STREET,
SAN FRANCISCO, CAL., January 13, 1880.

The Directors herewith submit to the stockholders of the Silver King Mining Company, at their annual meeting, the reports of all its officers, which give a general *resumé* of the operations of the Company from May 5, 1877, to December 31, 1879, and an account of the Company's property and financial condition up to date.

From the reports of the General Manager, Superintendent and Secretary of the Company, it will be seen that its affairs are in good condition and full of promise for the future.

It is with great pleasure that we assure you that the Silver King Mine never presented as good a showing as it does now.

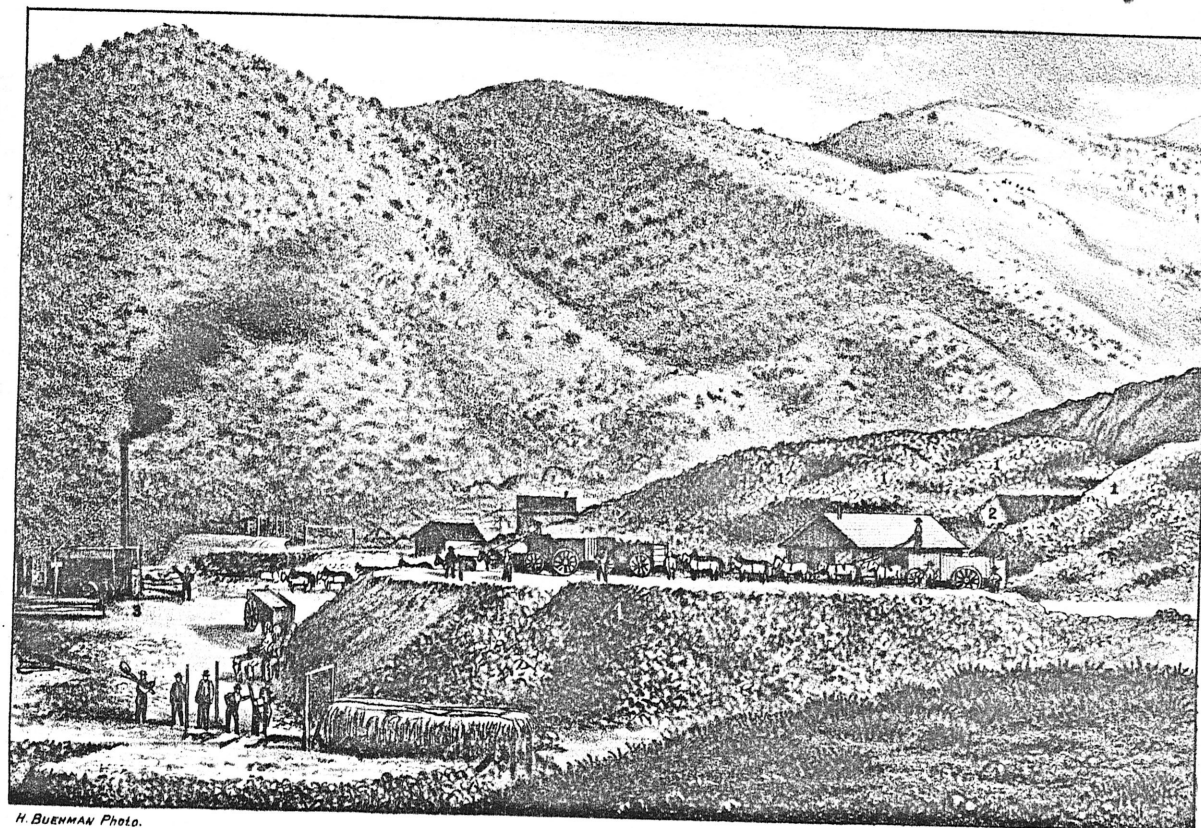
We feel justified in saying that the prospect of an immediate and continuous payment of dividends is assured. Dividends could be declared from and after February next, but in consequence of the large amount

of ore now exposed and ready for extraction, and the comparatively limited capacity of the present mill to work the ores, we deem it advisable to immediately add ten stamps to the mill and a requisite number of Frue concentrators, all of which can be completed and put in operation within sixty days from this date, and interfere but little with the working of the mill now in operation.

(Signed)

GEO. L. WOODS,

President.



GENERAL VIEW OF ORE DUMPS, SILVER KING MINE.
 1 ORE DUMPS. 2 OPEN CUT. 3 MOUTH OF VERTICAL SHAFT.

A. I. BANCROFT & Co. Lith.

GENERAL MANAGER'S REPORT.

SAN FRANCISCO, CAL.,

January 13th, 1880.

*Messrs. The Directors and Stockholders
of the Silver King Mining Co.,
320 California Street, San Francisco, Cal.*

GENTLEMEN: I submit this my report as General Manager of your Company for the time it has been my privilege to occupy that office.

This Company was incorporated May 5, 1877, and on May 9, 1877, I was appointed and at once given charge of its affairs.

The Secretary's report will show that the affairs of the Company are in a healthy financial condition, after paying for all improvements, dividends, etc.

This has been done from sales of ores, dressed and undressed. Those dressed were at first the product of a five (5) stamp mill and two (2) Frue concentrators, running on rich ore that was out on the dumps at the time of incorporation; and later, of a ten (10) stamp mill and four (4) Frue concentrators which ran on ore from the dump and out of the mine direct. It

is estimated that nineteen thousand two hundred (19,200) tons have been reduced up to December 31, 1879.

The expenses have been large, owing to the general state of the Territory and the remoteness of the property from a base of supplies—to say, San Francisco. From these causes the items of wages and freights on supplies to, and ore from, the mine have, by their importance, always demanded the closest attention.

After careful consideration it was decided more regularly to open the mine by a vertical shaft from a point in front of the lode to the west of, and less in elevation than that started from the discovery point of the mine. This shaft to tap the vein at about three hundred (300) feet deep, and to reduce the expense of extraction incurred through the old works, and serve, by connecting with those old works, as a means to ventilate the mine to any depth. This shaft to be heavily timbered, well lagged and closely sheathed with seasoned Puget Sound pine, and to be of two (2) compartments, each of four (4) feet by four (4) feet in the clear. This has been done in a most substantial and workmanlike manner, and will compare favorably with any like work on this coast. It is now three hundred and ten (310) feet deep, and the sinking continues. From this shaft at, say, one hundred (100) feet in depth, a cross-cut was run towards and through the vein, another at the depth of, say, two hundred and fifty feet (250), and a third (3d) was started at the depth of, say, three hundred (300) feet. The two cross-cuts through the vein served to substantiate the opinion of its igneous origin and the character of the fissure;

they exposed both foot and hanging walls at those depths. All three of the cross-cuts show ore corresponding to that in the old works of the foot-wall side of the vein. Assays of samples give an average value of sixty (60) dollars per ton. Very much of it contains several hundreds, and a fair proportion several thousands, of dollars per ton.

All the ore thus far sold has been obtained from the old works on the foot-wall side, where still remains a large quantity of average ore and much as rich as any taken out.

The Company now has a ten (10) stamp mill complete, one hoisting works on the old, another on the new site, store-houses supplied, assay offices, etc., with the road from the mine to the mill in good order, a large amount of pay-ore developed and in view in the mine, which seems inexhaustible, besides several thousands of tons of ore of low grade on the old dump.

Experience and examination show a sufficiency of water at Pinal, the location of the present mill, to supply at least twenty (20) stamps, and the ore exposed in the mine to supply them for a long time to come; therefore, I recommend that the means for reduction be doubled *at once*.

That the mine now has a large supply of ore ready for extraction, it can be taken out through the new shaft at much less expense than had to be incurred through the old works, the Southern Pacific Railroad is built to within fifty-five (55) miles of the mine and freight charges are accordingly reduced as well as a great saving made in time, to which many other important facts might be added, are proofs that the future



H. BIERMAN Photo.

SILVER KING MINE CROPPINGS AND DUMPS.

A. I. BANCROFT & Co. Lith.

of this company can be considered to be of the most positive and flattering nature. These, coupled with the enlarged mill, tend to satisfy a reasonable expectation of a resumption of dividends—so much desired by those interested—very shortly.

In closing this report, I have to thank the stockholders for many proofs of confidence shown to me, the President and Directors for continual kind acts, the Superintendent and Secretaries for their attention to requirements and co-operation with me for the good of all.

Gentlemen, I remain, yours very truly,

(Signed)

JAMES M. BARNEY.

SUPERINTENDENT'S REPORT.

SUPERINTENDENT'S OFFICE,
SILVER KING MINING Co.,
Pinal, Arizona, January 3d, 1880.

*Messrs. The President and Directors
of the Silver King Mining Co.,
320 California Street, San Francisco, Cal.*

GENTLEMEN: At your annual meeting I beg leave to report upon the improvements made on your property in Arizona during the past year:

On the first of January, 1879, the main vertical shaft was one hundred and ten (110) feet in depth, without timbers; now it is three hundred and four (304) feet, timbered in two (2) compartments in a good, substantial manner, and is in condition to run cages whenever their use is deemed advisable.

At the depth of two hundred and fifty-two (252) feet I started a cross-cut, running forty-one (41) degrees east of north, and struck the ledge nineteen (19) feet from the shaft, opening up a body of ore seventy-nine (79) feet in width, the average assay yielding sixty (60) dollars to the ton; much is very rich, running into the thousands.

The ledge is defined, having foot and hanging walls, and measuring eighty-one (81) feet in width. At present I am running along the hanging wall, in a southerly direction, in good ore.

At the depth of twenty-seven (27) feet below this level, the shaft cut through the edge of the ledge, showing good ore at that point, but, dipping to the north of east, it passed out of the shaft. Seeing this, I thought it advisable to run another level at the depth of fifty-two (52) feet, and am now fourteen (14) feet in a similar direction to the level above, and expect to strike the ledge soon.*

In June I erected steam hoisting works, which I find suitable for the present depth of shaft.

Water does not incommode the work in the shaft, as it only amounts to three (3) to four hundred (400) gallons per day. The present source of water supplying the hoisting works is what is known as the North King shaft.

The ore worked during the past year has been taken out from the original works, within a depth of about eighty (80) feet from the surface, and there still remains a large body to work upon.

On the old workings I placed a portable engine and hoisting works, expediting work and lowering the cost of extraction of ore.

The mill at Pinal has run on average ore; the water supply has been never-failing and abundant.

The wood contract was let last April for seven (7) dollars per cord, delivered at the mill, and for ore-hauling to mill at two and one half ($2\frac{1}{2}$) dollars

*The Superintendent reports, January 31st, 1880: "Cut the vein seventeen (17) feet from shaft, and am now ten (10) feet in good ore."

per ton. Both these contracts expire April first next.

The wages paid for work at the mill are from three and a half ($3\frac{1}{2}$) to five (5) dollars per day, and at the mine four (4) to four and a half ($4\frac{1}{2}$) dollars per day to miners, and three and a half ($3\frac{1}{2}$) dollars per day to common laborers.

Although the ore body at present opened would justify the erection of a forty (40) stamp mill, considering the uncertainty of the supply of water at the mine in quantity for that purpose, I would for the present only recommend that ten (10) additional stamps be added to the mill at Pinal, together with such machinery, pans, settlers, etc., as are necessary.

I would also recommend that during the year additional machinery be placed upon the mine, to enable its being worked to greater depth—the question of the permanency of the ore body and ledge being now beyond doubt—and that sinking in the shaft be continued for the coming year.

Respectfully,

(Signed)

AARON MASON,

Superintendent.

SECRETARY'S REPORT.

SAN FRANCISCO, December 31st, 1879.

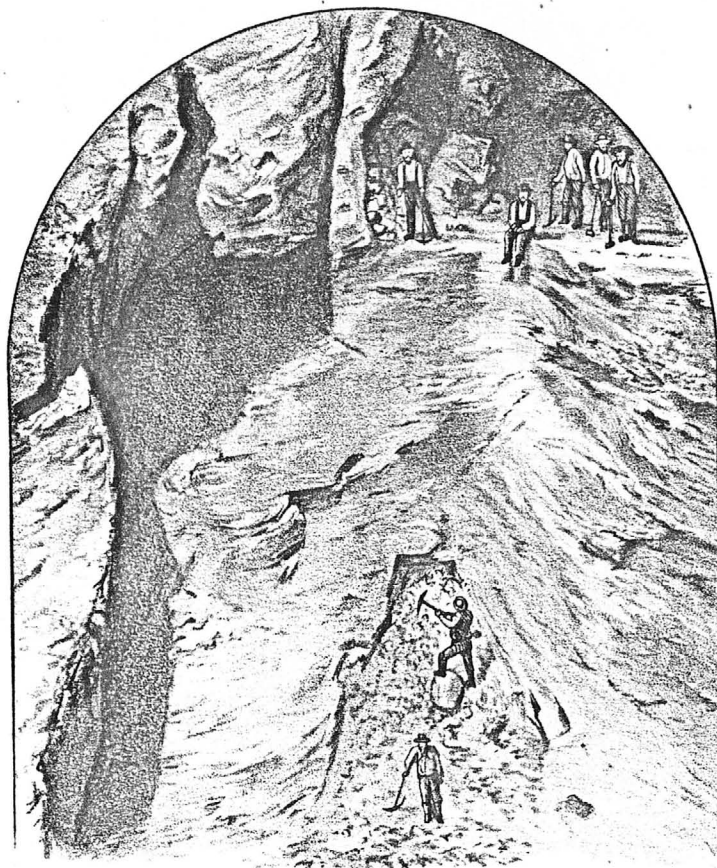
*To the President and Board of Directors of the
Silver King Mining Co.*

SIRS: In compliance with the by-laws of the Company, I have the honor to submit the following report as Secretary of the Company.

Yours truly,

(Signed)

EDWIN B. BOOTHE,
Secretary.



SILVER KING MINE, OPEN CUT.

H. BUEHMAN Photo.

A. I. BANCROFT & Co Lith

Y,

SECRETARY'S REPORT

From May 5th, 1877, to December 31st, 1879.

PRODUCT.

From Sales of Ore.....	\$819,141 58
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DISBURSEMENTS.

Supplies.....	\$47,179.27	
Wages at Mine.....	80,559.22	
Wages at Mill.....	57,357.92	
Freight:		
Per wagon on supplies,	\$14,931.46	
Per rail on supplies,	8,267.96	
Per wagon on concentrations,	30,863.77	
Per rail on concentrations,	13,453.81	67,517.00
Portage of Ore from Mine to Mill	44,101.87	
Wood.....	19,440.26	
Expenses of "76" Mill.....	27,944.35	
General Expenses.....	10,346.51	
Sampling and Assaying.....	2,182.74	
Lot and Offices at Pinal.....	2,000.00	
Taxes.....	2,902.44	
Insurance.....	610.00	
Rent of San Francisco Office, 32 months		
@ \$50 per month.....	1,600.00	
Salary of Secretary, 32 months @ \$50 per		
month.....	1,600.00	
Expenses of San Francisco Office, 32		
months.....	355.50	
Dividends Nos. 1 to 9, each \$50,000....	450,000.00	
Cash in Treasury ..	3,444.50	
	<u>\$819,141.58</u>	<u>\$819,141.58</u>



SILVER KING MINE, ORIGINAL WORKS.

H. BUEHMAN PHOTO.

A. L. BANCROFT & CO. LITH.

Y,

REPORT OF CHAS. H. SWAIN AND LEWIS WILLIAMS.

SAN FRANCISCO, December 25th, 1876.

Messrs. B. W. Reagan and James M. Barney.

GENTLEMEN: At your request we have made a careful examination of the property now owned by you, and known as the "Silver King Mine," and submit herewith a report upon it.

Its title is perfect beyond any doubt.

The location is 1500 feet in length, by 600 feet in width. When made, it was supposed by the locators that the vein had an east and west course, and it was so located, corner and side monuments planted, extensions on each side of it made by other locators, etc.

It now appears that the course of the vein is nearly north and south, with a dip to the west of about 42 degrees, this leaves the value of the ground belonging to the original location contained nearly in its narrow measurement.

The mine is situated in the centre of a basin, or is surrounded on three sides by high, rugged mountains, some of which show unmistakable signs of extinct volcanos, and the country, for many miles around, is more or less covered with basaltic rock.

The rock of the country is in part lime, granite, syenite, gneiss and porphyry, capped in many places with low-grade iron ore, under which capping nearly all of the best discoveries have since been made.

Small seams of quartz crop through this iron ore, varying in thickness from one fourth of an inch to one or two inches, and in nearly every instance carrying metal, either silver or argentiferous galena, with a general north and south course and dipping west.

The "Silver King Mine" location is made upon a spur or upraise in this basin, at an elevation of perhaps two hundred (200) feet from the bottom, upon the top of which the first discovery was made.

The original locators, being entirely unacquainted with silver mining, commenced their work by cutting the top of the hill off for about sixty (60) or seventy-five (75) feet, starting the cut from the west and northwest sides of the hill, and first striking the ore vein at a depth of some twenty (20) feet below its outcrop, and from which many thousands of dollars value of ore has been taken, and as they supposed all the ore at that level exhausted, much very rich ore, however, still remains.

Another cut was then started to get the vein at a lower point. This was commenced some distance down the hill, and at a point nearly perpendicular with the starting place of the upper cut was thirty-three (33) feet below it; before this cut reached the vein, work upon it was suspended, and it was afterwards, and is at this time, used as a dump for ores and for sorting, sacking and preparing for shipment the ores now being taken from the mine; large teams drive directly to it and shipments are made without extra handling.

From this level we take our departure for a survey of the underground workings of the mine.

A tunnel or drift was made running directly into the hill for a distance of one hundred and forty-eight (148) feet, the course of which is north 45 degrees east, thence in an irregular manner a further distance of some forty (40) feet.

Forty-seven (47) feet from the entrance to this tunnel, the ledge was first encountered and was crossed at an angle of about 40 degrees from the regular course of the tunnel.

At this point a drift has been run due north and upon the vein all the way for a distance of fifty-three (53) feet, at which place it was stopped, and another drift from the main tunnel (leaving it at eighty-five (85) feet from the entrance) was run, and it intersected the ore running due north, and at a distance of thirty-six (36) feet from the main tunnel, this drift was continued on for twenty-two (22) feet more, having from the tunnel a general direction north 60 degrees west.

A shaft was sunk from the level of open cut number one a distance of thirty-three (33) feet, and intersects the drift last spoken of in a north 68 degrees west direction, and fifty-eight (58) feet after it leaves the main tunnel. This shaft has been continued on down until it now has reached a total depth of one hundred and seven (107) feet from the level of the first outcrop or discovery, being fifty-four (54) feet below the tunnel level. Of work now being done from bottom of this shaft, we will presently speak.

Numerous other drifts have been run from the tunnel, but as they are useless, and do not change in any way the value of the property, we make no mention of them.

Forty-six (46) feet from the entrance to the tunnel, an incline has been sunk to a depth of forty-six (46) feet, running down on or near the foot-wall at an angle of about 45 degrees, through ore all the way, part of which is exceedingly rich.

At the bottom of this incline a chamber has been made of irregular form, and a drift running south 60 degrees west, has been run for a distance of some forty-seven (47) feet, nearly all the way through very rich ore. Another drift has also been made from this chamber, of large and irregular shape, and in a general northerly direction for thirty-two (32) feet, the west side of which is in good ore.

The only stoping ever done in the mine is now being done on the west side of this incline and near the bottom of it, and extremely rich ores are being constantly sent up from there for shipment. The ore taken from this level contains a great quantity of pure "native silver," mixed with "silver copper glauze," "antimonial silver," "ruby silver," and some streaks of "argentiferous galena." Many tons are daily taken out from here, and after selecting the ores, which will assay, upon an average, not less than one thousand (\$1000) dollars per ton, and putting a sort of second and third class ores upon the dumps for future use, balance is thrown over the regular dumping ground as worthless; of these we will again speak.

At about thirty-five (35) feet from the entrance to the tunnel, we find the feeders of quartz much concentrated, still, however, the barren or nearly barren rock is in excess; as we go down the incline, and follow the ore veins, they show stronger, and at its bottom are in excess of the country rock (syenite), showing a

very nearly perfect dip of 45 degrees; continuing down to the lowest workings in the mine, which, taking the dip of the vein, would make nearly one hundred and fifty (150) feet from the surface croppings, we find almost a solid body of exceedingly rich ore.

At the bottom of the shaft previously spoken of, a sump about ten (10) feet deep is excavated, and we are informed that only about five (5) barrels of water, each twenty-four (24) hours, has to be raised to keep the mine perfectly dry. From the bottom of this shaft a drift has been run south 22 degrees west, a distance of twenty-seven (27) feet, at which point it was turned and run due west. After passing through country rock, with a few feeders of quartz, for a distance of six (6) or seven (7) feet, the ore body was again struck, and had been crossed at exactly right angles to its course for a distance of fifty-four (54) feet, the ore being of the same character as that found in the level above. No hanging-wall has been reached at that distance, and the entire head of this cross-cut was in rich ore, some quartz not nearly as rich in metal was passed through in running the fifty-four (54) feet, the poorest of which would probably assay fifty (\$50) per ton, considerable many streaks would assay up in the hundreds, and selected ore in the thousands per ton.

Where the ore was first found on this lower level, some of the richest ore in the mine has been struck, the assays of which, as taken from the assayer's books, range all the way from five hundred (\$500) to twelve thousand (\$12,000) dollars per ton, with some selected ore showing as high as fifteen thousand five hundred (\$15,500) dollars per ton. The ore body here referred to is about one hundred and fifty (150) feet below the

outcrop or first discovery, and has been now followed continuously downward for that number of feet and has steadily improved.

Along the course of the vein on the upper or tunnel level, we find a drift of fifty-three (53) feet in ore or vein matter, and in the middle level, at bottom of incline, of about thirty-eight (38) feet. These two drifts being the only ones run upon the course of the vein, give the only data upon which to make any calculation as to how far north and south the ore-body extends; that it does extend both ways from present workings, we have not the slightest doubt. No reasonable doubt can exist as to the permanency of the ledge, and as to there being a very large body of rich ore it is beyond question.

We were informed by your Superintendent, Mr. Aaron Mason, that it was his intention to push forward the crosscut from the lower level, until the hanging-wall was found, with his best men, day and night; and when he did get it, to start two (2) drifts on the line of the vein, one north and one south, until he either found the end of the ore body or ran to the limits of the location. And at same time to start a drift along the foot-wall, where very rich ore was to be seen, and run that in like manner on the regular course of the vein, till the lines of location were reached.

Through all the workings of the mine to this date, nothing but solid rock has been encountered, and as no stoping has been done, not a foot of timber has been required, and none used, except to timber the deep shaft.

We have no doubt that it is a "true fissure vein,"

extending indefinitely north and south, with a western dip, and that as depth is reached it will become still more compact and free milling ore of high grade, and will take rank as one of the best silver-producing mines of the world. No estimate can be placed upon its value at present.

As regards future working of the mines, we take the liberty to suggest that you sink a shaft at least two hundred (200) feet due west from present workings. This, we think, very necessary, as the position of the mine to the surrounding country is such as to make it more than likely that a large body or spring of water may be struck at any moment.

With such a working shaft in perfect order, large amounts of ore can be raised, and when the mine is sufficiently opened to prove fully the quantity of ore is enough to keep a mill running, it will be full soon enough to think of incurring the expense of the erection of one.

By securing the right to the water running down "Queen" Cañon you will have all the mill privileges you require, and the ores can be very advantageously worked.

Our estimate of the value of ore of various grades in the mine, after liberal allowance for refuse rock in our measurements, is one million five hundred thousand (\$1,500,000) dollars, and we estimate further, that about the mine you have the no inconsiderable amount of more than one thousand (1,000) tons of ores that contain an average assay value of three hundred (300) dollars per ton, and considerable part of this is already mixed with barren rock, and is being, to a certain extent, covered up by it.

As *all* this rock will sooner or later be run through a mill, and should not be used any longer as your dump, but should be left as it now is, and new dumping ground selected for refuse rock now being hoisted. Attention to this will save you much expense.

In conclusion, allow us to congratulate you upon being the owners of such valuable property, and to venture the assertion: That the Silver King Mine, of Arizona Territory, will prove to be one of the richest silver mines of the Pacific Coast.

Y,

REPORT OF JOHN R. JAMES.

SAN FRANCISCO, June 15th, 1879.

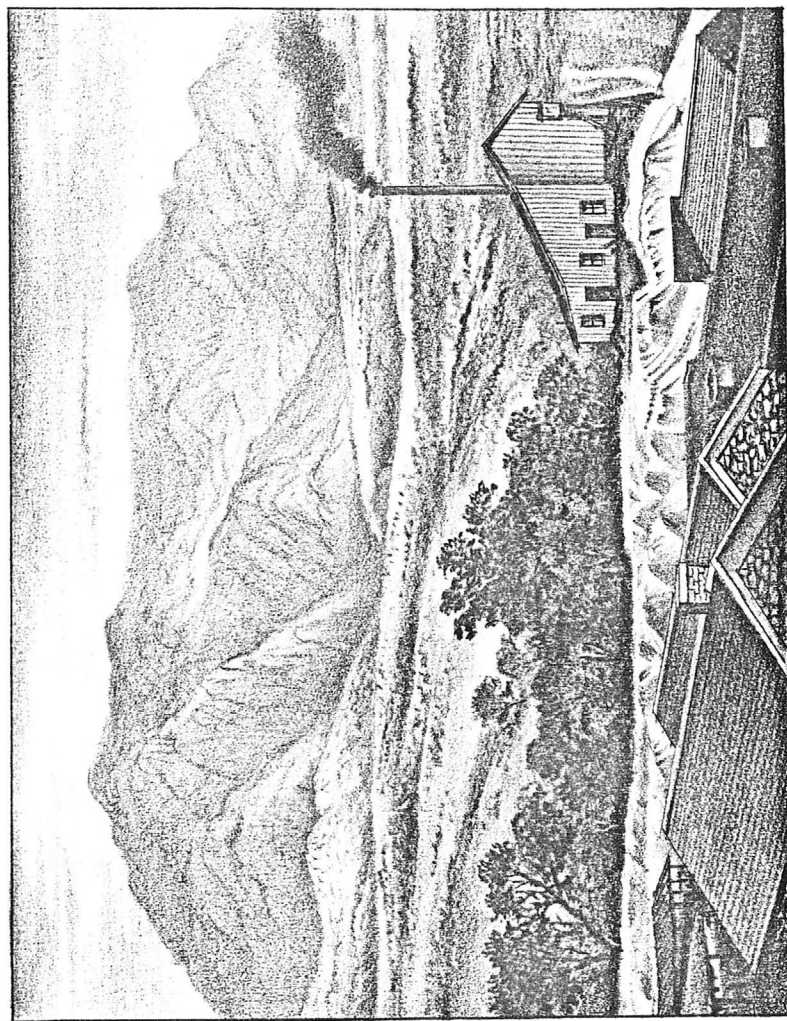
GENTLEMEN: Herewith permit me to transmit to you my report upon your property, of which I have made a thorough examination at the request of Col. James M. Barney.

This property I find is situated thirty-five miles north-east from Florence, in Pioneer District, Pinal County, Arizona, in a range of high and rugged mountains, known as the Pinal Mountains, extending for many miles through the Territory in a north-westerly and south-easterly direction.

The mine was located in March, 1875, but no work of note was done until July, 1876, when the work of development properly commenced, and has been continued up to the present time with the most gratifying results.

I find with your property a first-class ten-stamp mill, situate at Picket Post, about four miles from the mine, from which point the ores are hauled over a very good road by teams at an expense of \$2.50 per ton.

From the outcrop of the ledge a large space has been excavated in the ore which connects with the tunnel level, which is eighty feet below the sur-



A. L. BANCROFT & Co. Lith.

SILVER KING MILL, - PINAL-

H. BUENMAN Photo.

face. This level is one hundred and sixty-eight feet long. From this level a winze has been sunk thirty feet, connecting first and second levels. From the surface to this second level the ledge will average forty-eight feet in width, and from a working test taken every half hour from the battery I find it gives a result of \$45.62 per ton. The second level is one hundred and twenty-nine feet long.

Forty-four feet north of winze connecting first and second levels is a winze forty-four feet deep connecting second and third levels.

From the third level a winze has been sunk one hundred and fifteen feet, which will connect with the one hundred and ten foot level of the new working shaft which was started in February, 1879.

This shaft is now one hundred and fifty-seven feet deep, with work progressing, with day and night shifts, and, as I understand, it is the intention to continue to a depth of one thousand feet without delay, which action I would respectfully recommend. The work thus far done is perfect, being well timbered and divided into two compartments of four feet each, and which will afford ample facilities for hoisting sufficient ore to keep a 40-stamp mill constantly employed. They have also steam-hoisting machinery at this shaft of sufficient capacity to sink and thoroughly develop the mine.

The surrounding country is of lime and granite formation. The underlying base and body of the mountains in this district consist of a fine-grained and dense syenite, in which the walls of the vein are encased—the course of the lode being north-west and south-east. From the cropping to the third level,

the dip of the vein is to the south-west about forty-five degrees, and from the third level to the fourth level about eighty degrees.

The walls, foot and hanging, are regular and well defined, with clay gangue and soft porphyry. This vein, beyond all question or doubt, is a true fissure vein of vast extent and great mineral wealth.

From careful examination and calculation I find at the mine on the dumps and tailings of the mill, ore and tailings to the value of \$1,416,185; and it is safe to say that by proper management in extracting and reducing the ore there is at least \$600,000 to be disbursed in dividends.

I would not, however, recommend the Company paying any dividends for at least four months, for this reason:

From present indications it is expected a sufficient quantity of water will be encountered in sinking the new working shaft to enable them to run a 40-stamp mill at the mine, thereby saving a large amount of money in handling the ore.

To build a 40-stamp mill, sink the shaft and open the mine in proper shape, will cost no less than \$200,000; then you could pay a dividend of one dollar a month and carry a large surplus.

What work has been done on this mine is nothing more than prospecting to ascertain the course and extent of the ore channel; yet in doing this, I understand there have been nearly \$2,000,000 realized.

It has had no extrinsic aid; has erected necessary machinery, built expensive roads, etc., besides paying \$450,000 in dividends, and still leaving \$1,416,185 unextracted.

Among the special advantages of the mine are: The enormous rich ore in sight and measurable; the accessibility of the ore and ease of extracting it; and the possible and probable future vast extent of the unexplored ore body.

Hence, after thorough investigation I do not hesitate to pronounce the Silver King Mine one of unprecedented wealth (extent of developments considered), and to judge the future from the past and present, it is to be the great bonanza of the Pacific Coast.

Y,

REPORT OF FRANK G. WHITE.

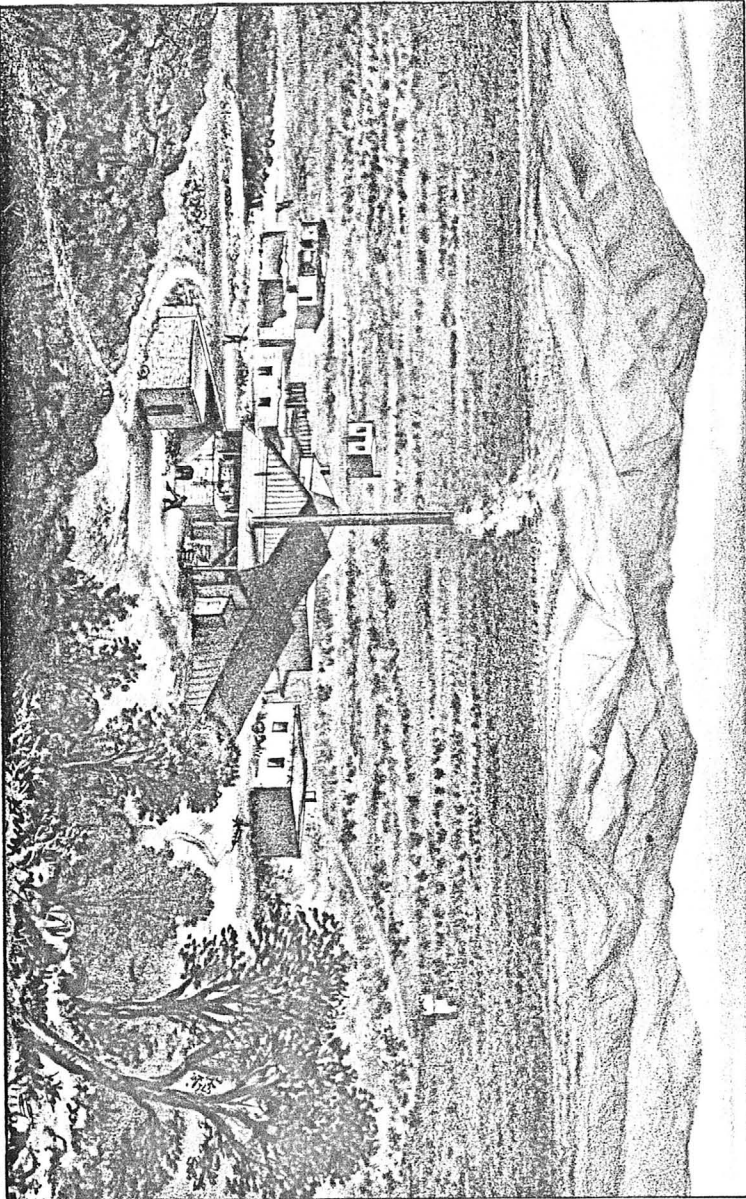
SEPTEMBER 3d, 1879.

Having visited the Silver King Mine of Arizona, at your request, I can, after a careful examination, report that the developments show a mine of large value.

The location was made east and west, or fifteen hundred (1,500) feet east and west by six hundred (600) feet north and south, the vein having a course north of west and south of east, not north and south, as we were given to understand before my visit to the mine; the work of sinking, driving and stoping having given unmistakable proof of the course of the true character of the vein.

The work and developments at the mine have exposed a very large body of ore, and the amount already shipped gives a proof of value but rarely found in a mine which has no more extensive openings than the Silver King.

The mining already done consists of an open cut above the tunnel or adit level, eighty-two (82) feet in length at the bottom or level of the tunnel, and one hundred and twenty (120) feet at the top. From this level an incline has been sunk thirty (30) feet to second level, and the back stoped out to tunnel level for



H. BUSHMAN Photo

GENERAL VIEW OF SILVER KING MILL, PICKET POST.

A. L. BANCROFT & Co. Lith.

Y,

some fifty (50) feet in length and twenty-five (25) feet in width, and a level driven westerly sixty (60) feet, from which the incline shaft has been continued to a depth of two hundred and fifty-seven (257) feet below tunnel level, but is now filled with water below the third level. At the third level a drift has been run on foot-wall some sixty (60) feet, from which point it was turned and driven into the ore body, or vein, a distance of sixty (60) feet. Below this point the water prevented examination, except through the perpendicular shaft—now being sunk at a point to the west of the former work—two hundred and forty-four (244) feet in depth, from the bottom of which a cross-cut tunnel is now being driven to cut or intersect the vein. At the depth of one hundred and fourteen (114) feet a cross-cut tunnel was driven to intersect the vein and extended to the foot-wall, showing the vein at that depth at least seventy (70) feet in width. From the above points samples were taken by me which have been assayed, which show an average result of fifty-five (55) ounces per ton in silver contained in free milling ore. There is exposed at surface some two hundred and fifty (250) feet in length of vein, showing an average width of about seventy (70) feet, carrying milling ore throughout its length and breadth. The above length only refers to that portion of the vein exposed. The new shaft is situated one hundred (100) feet further west, from which the vein is exposed in depth in all some three hundred and fifty (350) feet in length, and the width shown in cross-cut level from shaft is equal to width in open cut at surface, showing a body of ore of very large proportions—or say three hundred and fifty (350) feet in length, seventy (70)

Y,

feet in width, and opened on the incline two hundred and fifty-seven (257) feet in depth, and at the perpendicular shaft of a depth at least one hundred and fifty (150) feet below tunnel level, showing same width as at surface.

From this ore body has been mined and shipped:

Shipped as ore (estimated).....	1000 tons
Milled	18,000 "
At mine, selected from shipping ore.....	4000 "
" waste	5000 "

A total of.....28,000 tons

which has given in bullion over two million (\$2,000,000) dollars in value, of which the original locators received in net profits before sale to present holders \$260,000, and paid in dividends to present time \$450,000, showing the total profits realized on work to date, \$710,000.

The present situation, which is of more interest to stockholders, may be stated as follows:

To be a block of ground containing, in ore,

	in length	200 feet
"	width	60 "
"	depth	120 "

Showing in cubic feet.....1,440,000

Which, at 13 cubic feet to ton..... 110,768 tons

Less amount mined as above. 28,000 "

Leaving 82,768 "

Allow 15 per cent. waste ore..... 12,568 "

Giving in ore to mill 70,203 tons

which should give (estimate based upon result of assays and the present mill) a result of forty-five dollars (\$45) per ton, or the amount of \$3,203,135.

The question at once arises, why are not better results realized from present work, which may be answered by saying, the lack of facilities renders profitable work impracticable.

The Company has built a ten (10) stamp mill at Picket Post (now called Pinal), five (5) miles from the mine, where they simply crush and concentrate the ore, having no means of amalgamating, therefore lose a large percentage in the tailings, or from twelve (12) ounces to fifteen (15) ounces per ton of tailings. The ore is prepared by hand-labor for the stamps, the mill not being supplied by either rock-breaker or ore shutes. At the mine all the ore is handled in wheelbarrows and with shovels, using no cars for moving ore or shutes for loading cars or wagons, and all ore is hoisted by windlass, the only steam power employed being an engine at the perpendicular shaft; also, before building mill no ore was shipped of less value than one thousand dollars (\$1,000) per ton, to accomplish which a system of mining termed "cayoting" was resorted to, which left the average ore and utilized only the best, and which in time forced the treatment of a quantity of ore they are not now prepared to manipulate; also, entailing an excessive expense per ton on quantity milled. The course adopted, while paying large dividends, instead of developing and fully equipping the mine, has proved very unfortunate, and until the management shall conclude to change their policy and place the mine upon an economical and complete basis, the results are not likely to meet the expectations of stockholders.

In the above, the ore in lower part of the mine has not been estimated, or for that part of the ore body below a point ninety (90) feet deep in incline, leaving the balance of the two hundred and fifty-seven (257) feet, which is reported to be in good ore, outside of above figures. Neither has been taken into account — the ore at mine or tailings at mill.

In conclusion will say, the Silver King Mine, with judicious mangement, has as brilliant a future in store as it has of record in the past.

REPORT OF CHAS. H. SWAIN.

SAN FRANCISCO, January 16th, 1880.

To the Directors of the Silver King Mining Co.

GENTLEMEN: During the past week, and while in Pioneer District, Arizona Territory, I had the pleasure (through the courtesy of the Superintendent, Mr. Aaron Mason) of inspecting the property of your company.

I found much of interest at the mine, after a lapse of over three (3) years since my examination of it.

The course of the vein has changed somewhat, and in lowest cross-cut is about N. 45 degrees W., and the walls had straightened up to a dip of 60 degrees instead of 45 degrees to the west.

The recommendation I made for the sinking of a new shaft about two hundred (200) feet west of present workings, had been followed, and I found one had been sunk of good size, two (2) compartments, well timbered, and a credit to any superintendent as a piece of mining engineering.

This shaft, three hundred and thirteen (313) feet deep, has three (3) stations opened and two cross-cuts to the foot-wall, the middle one shows a vein of

Y,

about seventy-nine (79) feet of ore, much of it exceedingly rich in silver, and the whole distance giving a high average. The lower cross-cut had just cut the ledge the day I was there, and the ore here, fifty-two (52) feet below the middle cross-cut, appeared to be of the same character, and fully as rich as in the level above. The upper cross-cut shows eighty-five (85) feet from hanging to foot-wall; the ore is of the same grade as in the other parts of the mine.

Much ore still remains in the old workings above, and perhaps enough without taking any from these lower levels, to run the mill for the present year.

The outcome from the mine during the three (3) years subsequent to my report, has very fully verified all I estimated for its value then, and the large amount of ore now in sight in the mine, amounting to a number of millions of dollars in value, with its immense prospective value below the present workings, gives me the assurance to again repeat: That the "Silver King Mine" Arizona Territory, will prove to be one of the richest silver mines of the Pacific Coast, and with increased facilities for working the mine, and which I was informed are now contemplated, as well as a much larger milling capacity, there is no question of the future prosperity of your company, and it is with satisfaction that I can add my testimony to the value of the mine.

THE SILVER KING MINE

History of the Discovery and Location

THE SILVER KING - HISTORY OF THE DISCOVERY AND LOCATION.

I

The importance of the Silver King Mine in the history of mining in the United States and particularly in the territory of Arizona lends more than the usual interest in the details of the discovery and the location of the vein. The efforts to find the locality and to open up the mine date back into the period when the Southwest and Central parts of Arizona were still in the possession of the savages, and the history of the mine is closely connected with the development of the region and its settlement by the White Man. In fact the Silver King has been an important if not the leading factor in the reclamation of the Pinal region from the murderous Apaches. These hereditary marauding savages dominated the whole region and made it almost inaccessible to the hardy and daring prospectors who began to press outwards from the frontier settlements on the Gila River toward its sources in the mountains. The Pinal Mountains rising Eastward of the broad plains of the Gila and Salt Rivers stretch Northwestward from the Gila to the high ranges of the White Mountains and the plains of the Great Colorado. This range has many spurs and irregular outlying passes cut by canyons running down to the Gila Valley, which by reason of their extreme ruggedness and impassable nature afforded an excellent refuge and hiding place for the Apaches after marauding expeditions to the plains, or the destruction of helpless trains of immigrants. One of the trails most traveled by the Apaches led up the valley of the little creek now known as Queen Creek and over the nearly vertical face of the mountain, within a stone's throw, almost, of the point where the Silver King Mine was

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afterwards discovered. That the vicinity was a favorite resort and hiding place of the savages is shown also by the fact that there are caves in the face of the cliffs overlooking the trail, containing piles of ashes and fragments of Indian pottery.

In the year 1873, when General Stoneman, the accomplished cavalry officer, now governor of California, was commander of the military department of Arizona, it became necessary to adopt more vigorous measures than had been made for the repression of Apache raids. To this end General Stoneman moved with his command to the base of the mountains, near the Apache trail, and established a camp. He then constructed a road, or mule trail, diagonally up the face of the mountain, leading over into the higher tablelands and valleys of the Pinal Range. This pack trail, since known as Stonemans' Grade, is the main traveled route of the Globe and Pioneer districts.

One of the soldiers, named Sullivan, employed in cutting the trail, when returning from his work one evening, sat down to rest on a projecting rock, and began picking up loose fragments of the rock about him, among which were some small but heavy black, metallic looking lumps. These, instead of breaking up when pounded on the stones, became flattened out and were evidently metallic, somewhat resembling lead. This attracted his attention but he did not fully realize the importance of his find. He gathered a few of the lumps and went to camp without saying anything about his discovery. His term of service expired soon afterward, and, after being discharged, he made his way to the ranch of Charles G. Mason, on Salt River. Mr. Mason was one of the very few frontiersmen who braved the terrors of the Apaches and staked out a farm in the fertile bottom lands of the river.

Sullivan showed the nuggets, which he had found, to Mason, but did not describe exactly the spot where he had found them. Then one day Sullivan disappeared and was not heard of for some years. He was supposed to have been killed by the Apaches.

The desire to find the place where Sullivan had discovered the pure stuff, as the ranchers called the lumps of pure sulphide, led them to make several attempts to get there. Prospecting parties were formed at intervals for several years to prospect the Pinal Mountains, and these parties were often close upon the spot without knowing it. They even made a location not a mile and a half from the place and called it the Silver Queen. (Now the Magma Mine.) This was the first location made in this region, but no district was then defined by boundaries or organized by the appointment of a recorder. Later the party extended their searches over the mountains into what is now known as the Globe district. Later Mr. Mason and Mr. Regan, one of his neighbors, formed a party of five to go to the Globe Mine and fetch out a quantity of ore. On their way back they were attacked by the Apaches, and one of their number killed. The survivors reached the bottom of the grade, near the water and camping ground, and Copeland was sent to break off some of the croppings from projecting rocks at one side of the trail and fetch them into camp two miles below. He went to the place indicated and later came back to camp shouting, "I have struck it, its good enough for me." The excited and hopeful prospectors gathered around him, and as the pieces of ore were passed from hand to hand, they concluded that at last they had discovered the place where Sullivan had found the original "black stuff". But they were in no condition

to remain at that time to explore the locality. They hastened on to the settlement on the Gila, restocked their store of provisions, and hastened back to the discovery point. There sure enough, were unmistakeable signs of silver. The long sought treasure was found at last. Standing upon the high point of the mineral stained rock they made the Silver King location, fifteen hundred feet long and six hundred feet wide. The district was immediately laid out, or designated as twenty miles square. This location and the location of the district was properly made in accordance with the laws and was duly recorded.

The ownership of the mine was equally divided between the four locators. On June 30th 1876 Copeland sold his one quarter to Mason, and Long sold his quarter to Regan. In 1877 Mason sold his one half to James M. Barney and on the 5th day of May, 1877, the Silver King Mining Company was incorporated under the law of the State of California. Since that date the mine has been worked continuously.

One day, in 1881, an aged man came slowly into the settlement at Picket Post, and with great interest wandered about the Silver King. Evidently in need of help, he soon went to the main office of the mine, and announced himself as Sullivan, the original discoverer of the vein. He was immediately given work by the day. Telling his story later he said that he had left the rancho, crossed the desert and reached the Colorado River. Being penniless, he had worked at different ranches, always hoping to secure enough to go back and stake the claim. Year after year he had looked vaguely forward, keeping his secret, until at last he had heard that a discovery had been made by Mason and others. Although without any ownership or right in the location, he could not resist a desire to return and see an opening of the mine.

SITUATION, ACCESSIBILITY, CLIMATE.

The Silver King Mine is situated near the base of the southwestern slope of the Pinal Mountains range in Pinal County, Arizona Territory, at an elevation of 3700 feet above the sea. The location overlooks the country to the southward as far as the Mexican line, and westward, the vast plain of the Gila and Salt Rivers to Phoenix, and beyond. This plain, now comparatively treeless, sterile and desertlike, was once the seat of ancient civilization, as shown by the numerous ruins of buildings, and the profusion of fragments of pottery strewn the surface, but there is no evidence that the dwellers of the plain had ever discovered wealth that lay hidden in the King Mountain.

The road from the Mine leads for a few miles down the foothills and then over the nearly level plain for about 35 miles to Florence, on the Gila River, the county-seat of Pinal County. Beyond this town the road continues over the plain to Casa Grande station, on the Southern Pacific Railway of Arizona, 913 miles from San Francisco. The natural road, now also the county road, is excellent at all seasons, and the drive from the railway station can be easily made in eight or nine hours. The mine may be reached from San Francisco in 53 hours, or in $5\frac{1}{2}$ days from New York, and at all seasons without embarrassment by snows, which renders so many of the important mines of the country comparatively inaccessible in the winter season.

The mill of the company is at the town called Pinal, on Queen Creek, five miles from the mine. Pinal is at an elevation of 2400 feet above tide. It is connected with the Mine by a good road, and by telephone. At Pinal the offices of the Silver King and Florence Telephone Company give direct telephonic communication with the Western Union lines.

The climate of the region is salubrious, and is particularly delightful in winter, as severe frosts are unknown. The air is remarkably clear, the days are warm and the nights are cool and refreshing. In summer the great heat of the day is tempered by the dryness of the air, which promotes rapid evaporation from the skin, and keeps down the temperature of the body. There is no interference with mining or milling operations, or loss of time due to the climate.

A project for a railway leading northwards from the Southern Pacific Railway to the Silver King Mine, and beyond it, is now under consideration, and in all probability a road will be built in the near future. Such a road would not only make the mine accessible in a shorter time than is now required, but would reduce the cost of freight on machinery and supplies, and afford a cheaper outlet for the ores and bullion. The configuration of the country is especially favorable for railway construction, particularly as far as the foothills, for it is nearly all a continuous, level, gravelly plain, without streams or canyons, and requiring little or no grading.

GEOLOGY:

The geological structure of the Pinal region is somewhat complex, but is very interesting. The whole country appears to have been covered, in comparatively recent geological times, with volcanic rocks, partly in a sedimentary form, as volcanic sandstones and conglomerates, and partly, and lastly, in a molten or lava form. Considerable areas of these rocks have been swept away by denudation and erosion, leaving the older and foundation rocks exposed to view, particularly in the valleys and canyons, while remnants of the lavaflow cap the summits and in places remain as flat-topped mountains; as, for example, the mountain known as Tordilla, at Pinal, back of the mill.

The Pinal Range, above the Silver King Mine, is formed chiefly of Palaeozoic strata with heavy beds of quartzite at the base, overlaid by massive limestones dipping eastwardly. These strata show along the Stoneman Grade as it ascends the mountain, and can be seen in greater thickness, probably not less than 3000 feet, by ascending Queen Creek further to the southwest. Several miles further southwest, towards the Gila, the same series of limestones crop out in mountain masses, pitching at a higher angle eastward, and in some of the upper beds Spirifers have been found, which I refer to the Coal Measure series of the Carboniferous formation. In some places there is a large development of a coarse conglomerate of a red color.

Above the limestone at the King Mountain, as I denominate the highest summit above the Mine, the volcanic outflows which form the capping, consist largely of pitchstone porphyry carrying obsidian, geodes of quartz crystals, masses of chalcedony and of semi-opal.

Below the limestone and quartzite series, gneissic and hornblendic rocks of the Archaean age crop out and appear to be the foundation rocks on which the sediments rest unconformably. Still lower down the slope, the rocks become ^{syenitic} sionitic and are then replaced by a distinctly formed feldspar porphyry, with small white feldspar crystals, and an abundance of iron pyrites finely disseminated. The formation appears to have the position of a dike, cutting the other rocks, but it is extensive, and continuous to and beyond the Silver King Mine. It may be regarded as the enclosing rock of the Silver King, though in one place, some 200 feet above the mine, there is a strongly-defined outcrop of a dense, hard porphyry with hornblende crystals and brilliant glassy feldspar forming a sienitic porphyry.

At the mine, and in it, the porphyritic structure generally becomes obliterated and the rock has more the appearance of a granular quartzite with a large amount of earthy admixture, and obscure fragmentary crystals of silvery mica. Examined alone, it would pass as a quartz containing much clay and iron protoxide. In some places it is almost colorless, white and earthy, easily cut or crushed, but shows distinct grains of quartz as large as peas. The larger portion of the rock below the open cut has a dark, greenish color, and is known by the miners, as "dark porphyry." In some places it appears to be chloritic. This, with the light porphyry, is the ore bearing rock of the mine. It is penetrated, as will be shown in detail in the following pages, by veinlets or quartz and by ore.

After carefully studying the rock in place and its environments by the unaltered crystalline porphyry, I am led to the conclusion that the rock of the Mine is an altered porphyry, changed in its place contiguous to the solfataric outflow, the principal portion of the silica of the feldspar having been removed, going, perhaps, to form the veinstone of the ore. If, as seems probable, the rocks originally were charged with disseminated pyrites as seen at some distance from the mine, it is now largely removed, and the pyrites may have exerted an important function in the precipitation of the ore as we now find it concentrated in veinlets and bunches. The altered porphyry appears to contain more iron protoxide than the unchanged rock. The feldspar porphyry below the mine is succeeded by a fine-grained grey granite, in places sienitic, and this again lower down the slope, towards the plain, by an extensively developed fine-grained mica slate formation. This formation is very ancient, and is lithologically and to all

appearances the equivalent of the Taconic slates of Berkshire, Massachusetts and the Vermont extensions. It is extensively developed in Arizona, and being one of the primal series of formations and fundamental bed-rocks of the territory, in and upon which such a variety of later formations are grouped, it deserved the distinguishing name of Arizona slate, which I shall apply to it. It is extensively exposed to view along the sides of the Queen Creek Valley, west of the Town of Pinal, where it may be seen in a highly contorted, twisted condition, traversed by innumerable veins of white quartz, also contorted, and often doubled back and forth upon themselves. This slate extends to the southwest, flanking the granitic masses of the Pinal Range, and is there, much traversed and broken up by granitic intrusion. This rock finally disappears, westward, under the post-tertiary formations of the Gila plains.

The sequence of the formations thus briefly noticed is shown on the appended sketch-section representing the summit of King Peak westward to the Gila Plain. The central portion of the Arizonian slate is concealed from view by the horizontal sediments of Tordilla Mountain, opposite Pinal, but it crops out along the valley below it. About seven miles below Pinal the slate is penetrated by granite intrusions, and is gradually replaced by granite.

The lower portion of Tordilla Mountain is formed of regular layers of compact white sandstone. It is suitable for building stone, and is quarried for that purpose. The same formation is developed along the Gila, but is there, in some places tilted up at considerable angles.

THE VEIN FORMATION:

The observer, standing upon the highest point of the Silver King location, the initial point of the mine, and of pioneer district, looks

below to the westward into the large open pit, or excavation, the result of the first working of the mine from the surface downward. This pit measures approximately 115 feet long by 92 feet wide and 120 feet in depth. It marks very nearly the limits of the ore-bearing ground, so far as it is yet known or developed at the surface and near it. The portions removed consisted largely of rock, the porphyry, so called, penetrated and seamed with interlacing veinlets varied of quartz, reticulating and crossing in every direction. These veinlets varied from the thickness of a sheet of paper to one-quarter of an inch or an inch in thickness, and were generally accompanied by ore in a medial position having quartz on each side of it next to the rock. The same conditions may be seen in the lower levels at the present time. In addition to these veinlets there are masses and bunches of ore, and apparently (at least in the upper levels) a central mass of quartz, a large and compact body, towards which the system of veinlets converged, or from which they may be said to radiate. This mass of quartz, of irregular dimensions, still exists in the region opened by the lowest levels of the mine, but it has not yet been thoroughly explored. This quartz appears to hold some direct relation to the deposition of the ore; the heavier bodies of ore, so far, having been cut below, or on the foot-wall side of the quartz body. I may be regarded as holding the relation of the chief veinstone to the ore, and as presenting within itself and together with the branching veinlets, the character of a true fissure filling, although it has not the usual sheet-like or tabular form. It is, instead, a columnar or chimney-like mass, some eighty feet in diameter in places, but irregular and without longitudinal extension. In other words, this quartz-vein, instead of

forming a sheet-like mass, or filling between parallel walls, with a length much greater than its breadth, is approximately cylindrical or columnar in its form, filling a nearly vertical spirally-formed cavity, as if it has risen as smoke rises in a chimney, but circling about through the riven rocks until it reached the surface by many outlets.

Without here discussing the various theories which might be advanced to account for this peculiar impregnation of the rocks with rich ores of silver; whether the flow was from above downward, or the reverse, whether the quartz with the associated metals was extruded from the surrounding rock and found lodgment by replacement, or whether it was diffused by the penetration of fissures by solutions or gases, I prefer to adopt the explanation that there was an upward flow of heated water and steam which carried the metals into the fissures and left them there. The conditions as we find them are most clearly explained upon this hypothesis, and I believe are most vividly and truthfully represented to the mind by this conception of an upward flow of thermal water along a main central channel, like that of a deepseated spring or geyser, now an extinct argentiferous solfatara.

If we examine the structure of the veinlets in details we find them presenting the characteristics of fissure veins. They extend for a long distances through the rocks and with parallel walls. They have regular veinstone and vein structure. The quartz forms on the opposite walls of the fissures in regular sheets, with "Combs" of quartz crystals pointing inwards and holding the ore in bunches and sheets. Such inclusions of ore are still to be seen in the small veins at the summit of the croppings and in the levels below.

Some of the various forms under which the ores present themselves in the mine, and the sequence or order of deposition of the mine be

shown to best advantage by a few of the veins.

(Here follows drawing-Fig. 2., section of a Vein, showing the structure) (Underneath the drawing the following appears:)

1. Porphyry
2. Compact Quartz
3. White Crystalline quartz
4. Ore filling, consisting of sphalerite, galenite and native silver, with some silver, with some vugs or cavities containing crystals of light-colored blende. Some irregular fragments of altered porphyry are enclosed in the midst of the vein.

3a. White crystalline quartz.

2a. Compact quartz.

1a. Porphyry

Figure 2, of one-half the natural size of the specimen, shows a veinlet about four inches wide in the light-colored porphyry. We find first, next to the rock, a lining of each side of compact quartz, succeeded by white crystalline quartz and the ore, in the succession indicated.

Figure 3, Section of a Veinlet in dark porphyry, carrying about two inches of dark colored sphalerite (blende) confusedly crystallized. The paragenesis is as follows; and is chiefly remarkable for the brown-spar which is not often found as a member of the series:

(Here follows drawing-Fig. 2 - section of a small vein)

(Underneath the drawing the following appears):

1. Porphyry
2. Compact quartz
3. White quartz
4. Brown-spar or Iron-spar with disseminated pyrites.

5. Central filling of compact ore. Blende chiefly

4a. Brown-spar and pyrites.

3a. White quartz

1 Porphyry

Another fragment of a veinlet shows quartz more distinctly crystalline, with some copper pyrites between it and the porphyry, and a central ore filling of massive blende and galena mingled together.

The ore occurs in bunches in the rock with but little veinstone. A tendency to triangular form is observable, and in several places I have noted veins joining nearly together at right angles, somewhat as shown by the figure annexed.

(Here follows drawing-Fig.4.-Example of reticulation of small veins, branching from one side in the green ("Porphyry"))

This is an example of reticulation but not of crossing. The latter form is, however, common, and may frequently be found in the masses of ore as sent out from the stopes, or better, in the freshly broken faces of the stopes. But irregularity of branching is the rule rather than any geometrical or symmetrical arrangement. The various appearances presented justify literal illustration, and I would be glad to be able to add a few photographs of some blocks of the ore bearing porphyry as taken from the dump.

The Reticulation of the veins is seen to the best advantage at the surface and particularly at the summit. There is at that point a very interesting example within the space of two square feet, showing apparently two system of veins of different ages, one system with a true north and south strike, and the other system having an east and west strike. They intersect at right angles as shown on the appended sketch, from a drawing made upon the spot, and curiously at this initial point they form a true right angle.

(Here follows drawing - Fig. 5.-sketch showing the north and south and east and west systems of veinlets, forming a cross at the summit of Silver King Mine.)

Cross, the arms of which point north and south, east and west, marking in a very appropriate manner the center of the district. I have deemed it worthy of a diagram or plot, illustrating as it does the reticulation of the veins and the complete mineralization of the mass of the rock. The east and west fissuring appears to be the elder of the two, for the veinlets of that direction are cut through and faulted for a short distance by the north and south veinlets.

It will be inferred by the preceding description that the richest and most important accumulations of ore are not found in the main body of the quartz veinstone. Although the massive quartz does hold bunches of rich ore, it is not, as a rule, so rich and profitable to work as the rock adjoining it. The ore is more abundant in connection with the small branching veins in the outside rock, than in the mass of the quartz itself. It must, however, be stated that the quartz body has not yet been fully explored, being only cross-cut in the upper levels. It is my opinion, however, based upon what has already been shown, that contrary to the usual conditions in mines, the chief body of quartz veinstone does not carry the best part of the ore. It appears rather to have been the main channel of the mineralization; the main artery or feeder to the thousands of veinlets branching from it into the wall rock, following the clefts and penetrating the substance of the rock, depositing and diffusing native silver and the sulphides throughout the whole massive rock for an indeterminate distance on each side.

So far explorations have extended, no distinct boundary line or wall to the ore has been found. The silver solutions appear to have found a congenial resting place in the midst of the rock. We have, as the result,

a form of mineral impregnations which may be classed as "stockwork", this name having been given to masses of rock so mineralized by small veins ramifying through them that they require to be mined en masse, and give broad excavations known as "floors". These are precisely the conditions found in the Silver King. The whole of the impregnated rock is blasted out and sent to the surface with but little selection or sorting. The "porphyry" and the veinlets go together and are crushed together, it being impossible to separate all the ore from the rock by sorting.

This extensive and varied mineralization, connected as it appears to be, with a central solfataric mass of quartz, gives good evidence of being deep-seated. It is evidently not superficial but has the appearance of a lasting ore-channel of great depth. There is no evidence of any weakening of the mineralization at the lowest level reached; on the contrary the lowest level is the largest yet opened except the Open Pit at the surface. The veinlets cannot be traced far on the surface, and it is difficult to show that they extend more in one direction than in another. The formation seems to have a general dip to the westward, and this is the direction of the underlie of the ore-ground, as is shown in the chapter upon Development.

The solid white quartz of the upper levels has not yet been fully explored. It contains rich bunches of grey copper ore, generally in a very friable condition, almost in black powder, but rich in silver.

MINEROLOGY:

The mine is prolific of minerals and silver specimens of great beauty, highly valuable to minerologists and collectors. There is, as usual, a great contact between the surface ores and the ores from the lower levels. The surface ores are partially oxidized and decomposed, and are

more earthly and less metallic in appearance than the ores from below. The rock enclosing them is also changed to a rusty brown color. The surface ores were, however, brilliant in the coloring, generally presenting masses of malachite-green, and of azure blue, due to the carbonate of copper with small sheets and filaments of snow-white pure silver in beautiful contacts. Here, also, were the nuggets generally in irregular nodular forms, with smooth surfaces, and jet black in color. Pyrites was rarely found. But when the mine was opened below the open cut, the true mineralization of the mass was found to consist generally of sulphides, - the sulphides of silver, of lead, of zinc, and of copper, disseminated, together with native silver, in the quartz veinlets through the rock.

The following list comprises the principal mineral species which I have found occurring in the mine; - native silver stromeyerite, argentite, sphalerite, galenite, tetrahedrite, bornite, chalcopyrite, pyrite, quartz, calcite, siderite, barite. Near the surface, in the decomposed parts of the vein, where the ores are partially lixidized and desulphurized, we find in addition Horn Silver (cerargyrite) malachite, azurite, native copper, cyprite, besides oxides and carbonates of lead, and possibly embolite, the chlorobromide of silver; also the argentite, in pure black lumps. I add notices in detail of some of the most interesting of the species.

Native silver -- In the filamentous form, coarse and fine, very white, and striated as if made up of bundles of fine wire, and ranging in size from the size of a pin or knitting needle to masses half an inch through, but solid and much twisted and gnarled. It is also finely filiform in long wires, and in threads as fine as a hair or silk, filling

cavities or branching from the coarser wires. It occurs, also in sheetlike masses and plates, and in thin films forming a regular continuous plating upon the surface of quartz crystals, especially when they occur embedded in the argentite and stromeyerite. It is found similarly on the faces and cleavages of black zinc blende. Distinct crystals of the metal are extremely rare in the mine; and I have seen only one small specimen of a brilliant white crust of silver lining a cavity with a few octahedral crystals upon it. The filaments are often subdivided towards the extremity, and ramify like the tendrils of a vine, and they frequently bear aloft on their ends detached and beautiful crystals or calcite, the silver wires penetrating the crystals as if they were beads. So, also they are found penetrating crystals of quartz and implanted at the base of the crystals, or at the end where the crystals were attached, especially when there are double terminations to the quartz crystals.

This native silver is remarkably pure. It has been shown by repeated assays to be from .990 to .997 (thousandths) fine. It does not blacken in nitric acid, and does not show a trace of copper or of gold by the usual tests. Fully one-third of the value of the product of the mine is in the form of native silver.

Argentite: This species was the first found at the surface and it continued to be found in working the mine down to the third and fourth levels, where it gave an unusual degree of value to the ore. It was easily recognized by its malleability, sectility, and its high content in silver, some of the early assays gave as high as 70 percent. I find its color to be black, with a metallic lustre, especially when cut. It is perfectly sectile and cuts like lead. The specific gravity taken in distilled water at 60 degrees is 6,828. A careful assay for the silver content yielded me 82.80 percent of silver. No Copper.

Stromeyerite: I place provisionally under this name the most peculiar and interesting of the mineral compounds found in the mine. It occurs massive, in blocks from an inch through to pieces weighing four or five pounds, but is more abundant in the third and fourth levels than below. It is generally penetrated by, or incloses, quartz crystals, and has a remarkably well-defined conchoidal fracture with brilliant surfaces. The lustre is highly metallic, splendid. Color, dark bluish-black, between graphite and anthracite coal. Streak brown, or reddish-black. Hardness about 3. Very brittle, but packs under the hammer. Specific gravity, 6.22. Soluble in hot nitric acid. Reacts for silver and copper. Contains 51.47 percent of silver, and about 30 percent of copper. Fuses quietly before the blowpipe. The determination of the amount of silver is the result of the assay, by myself, of a carefully selected sample. A sample not wholly free of included quartz, specific gravity 5.662, assayed for me by Mr. Aaron Mason at the mill, yielded 47.84 per cent of silver and 29.86 percent of copper. No allowance in either case is made of cupellation loss.

Galenite: Occurs coarsely crystalline and fine granular, but in the last mentioned form it is confusedly mingled with blende, and perhaps tetrahedrite. The purer crystalline masses cleave with a very brilliant lustre and the surfaces are considerably curved, so much so as to look like surfaces of conchoidal fracture. This pure crystalline variety does not appear to be rich in silver although occurring in close association with the metal. For the purpose of testing this question I selected some of the cleanest and purest cleavage fragments, apparently free from any other mineral, and had ten grammes assayed by Mr. Aaron. This quantity yielded only five milligrammes of silver, at the rate of

14.58 oz. per ton. In the large way the galena ore, so called from the preponderance of galenite, has been found to run from a value of \$42 to \$870 per ton. Large quantities of such ore in the earlier history of the mine yielded in the vicinity of \$800, on value of silver, per ton, but no doubt this was owing to the large amount of native silver and sulphide of silver mechanically enclosed with it.

Tetrahedrite: Argentiferous gray copper. This species was more abundant in the upper levels than in the lower. It was found not only in the porphyry but in bunches in the midst of the large body of quartz above and in the third level. Assays of this species have yielded at the rate of \$1200 to \$1800 per ton, and even over 3000 ounces. In the year 1880 it was regarded as one of the most important ores of the mine. It now seems to be partly replaced in the lower levels by zinc blends.

Bornite: and Chalcopyrite occur but sparingly and in small crystalline grains. Iron pyrites is frequently seen as a druse upon the filaments of silver, or coating some of the massive ore of blende and galena, or associated with the iron spar of the veinstone. Chalcopyrite, in small nodular masses occurs also in association with the stromeyerite, being apparently imbedded in the midst of the mineral.

Sphalerite: (zinc blende). This is an abundant mineral in the ore, and presents itself in a variety of forms; sometimes in beautiful transparent oil-green crystals and again in black masses without any crystalline facets except by cleavage. The crystals are so brittle and easily cleaved that it is very rare to get one with a single perfect place. Some fragments before me appear to be compound dodecahedral crystals with re-entering angles, and hopper-shaped cavities. Films, or thin sheets of iron-sulphide-pyrite can be seen with a glass implanted along the lines of cleavage.

This mineral is abundant, especially upon the seventh level of the mine, and is closely associated with the silver. The amount of silver which the crystals hold either in combination or mechanically entangled is variable. Clean crystallized fragments, of the dark color, after powdering and sifting, yield by assay from \$170 to \$200 in value per ton in silver. The metal is probably in mechanical combination, and experiments ^{are} necessary to determine whether the clean, clear blende carries the silver in any other form. The lighter olive-green in variety has yielded by assay as low a value as from \$25 to \$42 per ton.

The ore as now concentrated and shipped contains nearly 18% of zinc, chiefly or wholly in the form of blende.

Calcite: This species is not abundant in the mine and does not appear to play any important part in the combination of minerals of the formation of the vein. It is chiefly interesting by its occurrence in small crystals, impaled, or strung like beads, on the threads of silver. These crystals are in the form commonly known as "hail-head spar," being obtuse rhombohedrons of the minus series, $-1/2R$, with the prismatic planes i, i, i , corresponding to Fig. 553, B., Dana's Mineralogy.

Quartz: This is the chief veinstone of the mine and is found massive and crystalline and milk-white, purple, amethystine and also clear. The crystals are frequently found disseminated in the midst of the stromeyerite and apparently without attachment to a base. It forms cones and rosettes in cavities and is sometimes in large crystals. One from the seventh level is six inches long and $3\frac{1}{2}$ inches in diameter and has imperfect terminations at each end. One end being carernous with many interrupted planes and smaller implanted crystals at the side. The purple or amethystine variety is met with imbedded in the dark green ore-bearing rock. The porphyry of the miners, and is by them con-

sidered as a good sign for rich bunches of silver ore. It is usually in the central portions of white quartz. Some masses of calcedonic quartz, mining cavities, have been found in the dark green rock.

(Here follows a figure showing quartz crystal for the seventh level.)

Barite: It is found massive in bunches and next to quartz it is the most abundant veinstone or gangue but is not as closely associated with the rich ore as the quartz. Much the larger portion is easily sorted out by hand and thus does not interfere with the concentration of the ore on the tables of the mill.

DEVELOPMENT:

The mine is now opened to a vertical depth of 830 feet below the initial point of the cross at the summit above the open cut. This includes the open cut and the sump 36 feet deep. The summit is about 80 feet above the level of the mouth of the main engine shaft. The shaft, exclusive of the open cut and the sump, is thus 714 feet deep. This shaft is vertical and is well and thoroughly timbered in the best manner from the top to the bottom. There are two compartments, each four feet in the clear, and fitted with guides and cages. It is in perfect order, as shown by the smoothness with which the cages run. There is not sufficient water to require a pump; what there is comes from the 114 foot level and does not exceed 2000 gallons a day. It is hoisted by a tank fitted to the cage. A large sump reservoir at the seventh level serves to hold it while accumulating.

There are seven main levels as follows:

NUMBER	DEPTH FROM THE SURFACE
I.	114.6
II.	256.
III.	354.9
IV.	408.
V.	570.
VI.	612.
VII.	714.

An intermediate level, between the second and the third is at a depth of 302.9 feet below the surface.

The direction and length of these levels is best shown upon the map. (Map is attached to book.) They are generally curved and consequently their full length is not shown upon the section.

Level I. Passes through 80 feet of quartz and it stands some 30 feet into the country rock, or ore bearing rock, beyond it. It has not been cross-cut, and cannot be considered to be full test of that level of the mine. At the time it was run the distribution and the position of the ore was not as well understood as they now are.

Level II. 256 feet passes through about 75 feet of quartz and shows very rich silver ore in detached bunches throughout its mass.

The next level below, the 302.9 feet, or intermediate level follows the lower side of the quartz for thirty feet, and has a cross-cut extending at right angles for fifty feet, all in the quartz. The underlying ore ground back of the quartz has not been explored.

Level III: 354.9 feet extends on both sides of the shaft, and has been driven around the quartz chimney so that the two levels started in opposite direction, are now connected. This level penetrated a large body of fine ore of high grade, rich in silver, underlying the quartz, upon which considerable stoping has since been done, but without reaching as yet, any definite limits of the ore. The shape and extent of the excavation upon the sill floor is shown upon the accompanying diagram. The size of the floor is approximately 63 x 53 feet or 2700 sq. ft.

Each floor in succession upwards to the 303 foot level is smaller in area than the one below it. There are seven such floors or stopes from the sill floor, on the third level, to the upper one just under

the 303 foot level. This opening upwards is one of the largest stopes of the mine, and represents an excavation in the aggregate of 97,921 cu. ft. which taking 10 cu. ft. to a ton will represent about 9792 tons. I found the specific gravity of a sample of dark porphyry with some ore in it to be about 3, which would require about 10.7 cu. ft. to weigh a ton. A considerable part of the rock ore taken out should be

(Here is a diagram - plan of floor on Level 3)

estimated from 11 to 12 cu. ft. to the ton. This stope has been one of the best in the mine. Large quantities of silver sulphides were turned out of these floors and were rich enough to be sorted out by hand and shipped direct without being passed through the mill. The assays of ores from this stope were very high and for the roasted ore were from \$250 to \$400 per ton for months in succession. For the present, the work on these floors is not being prosecuted. They remain as they were a year ago. It is believed that the stopes will be considerably extended on the sides so as to extract the large additional quantity ore from each of the floors.

(Here follows a diagram - plan on level IV)

Level IV is excavated in the form shown upon the diagram. The distances between the timbers are 7 feet by 6.2 feet. A portion of the space is filled by waste. Stoping has been extended up to the 356 and above to the 300 foot level, as shown upon the section and in the foregoing description. A body of quartz about eight feet thick, is cut in the extreme northwest corner.

The area of this sill-floor is 2557 square feet, and the cubic measurement of the stopes above it to the 111. level are 133,788 feet, representing an extraction of 13,378 tons, as nearly as it can be cal-

culated, by measuring each floor. A portion of the excavated space for (here follows a drawing - Fig. 10 - Plan of the floor on level V.) one and a half sets up is filled in with rock waste to aid in supporting the ground above. This work is now in progress. The waste is hoisted from the V and the VII instead of being sent to the surface. It is carefully piled between the timbers so that mining can be extended at will beyond the limits of the present excavations.

Level VII. This level is but partially opened, as shown in the diagram of the sill-floor attached. It looks remarkably well, showing an abundance of ore, on the north and northwest sides of the sill-floor. The porphyry is very dark colored on the western side and appears to contain chlorite. Amethystine quartz and galena ore are abundant. The distances between the timbers are the same as on the VII level, being 6 x 6 feet, by 8 in height.

The area of this excavation is approximately 3348 sq. ft. There are no stopes above; the ground is all standing up to the IV. The cubic measurement of the ore extracted is 28458 ft., and the tonnage may be placed at 2875 tons. The sketch represents the position of the two winzes, which connect this level with those above and below for the purpose of ventilation. One extends down to the VI and the other up to IV. The other levels are similarly connected. One or two of the winzes are shown upon the section. One is in the line of the shaft.

Level VI: - This consists of a mere drift, extended 82 ft. from the shaft on the northwest to connect with a winze from the VII level. It is also connected by winze with the V level above. No stoping have been done here, but the ground is ready to be opened out when required. The cubic measurement of the ground removed is as estimated by calculation of the dimensions of the drift at 3150 feet, equivalent to 315 tons. The directions of this drift is the same as that of the VII, directly

Level VII: - 714 feet. This is the lowest level in the mine and it is also the largest. It extended northwest from the shaft and is ore bearing from the shaft to the extreme face. The limits of the ore are not yet ascertained. The faces around the excavation of the sill floor are still in ore and are showing finely, especially at the bottom. The floor of the whole level is (here follows a drawing - Fig. 12 - Plan of the floor level VII) said by the miners who worked it to be very rich. It is the most brilliant of the mine and gives great promise for the extent and value of the ground below and above it. The distance between the posts is six feet center to center and the total area of the floor as now excavated is 5904 sq. ft. stoping has been carried upwards three floors higher or 32 ft. above the sill floor. The aggregate extraction from this level and the connected floors above including the winze to the VI, is 166,228 cu. feet or about 16,623 tons.

The aggregate extraction from the mine below the open cut or rather from the 304 foot level to the VII inclusive may be summed up as follows, the extraction from each level and the stopes above it being recapitulated from the foregoing description:

AGGREGATE OF EXTRACTION FROM THE LEVELS BELOW THE 300.

<u>Number</u>	<u>Levels</u>	<u>Cubic Feet</u>	<u>Tons</u>
<u>Number</u>	<u>No. of Feet Deep</u>		
III	354-303	97,921	9,792
IV	408-354	133,788	13,378
V	510	28,458	2,846
VI	612	3,150	315
	714	166,228	16,623
		<u>429,545</u>	<u>42,955</u>

In calculating the number of tons, 10 cubic feet have been allowed to the ton. The pure dark porphyry, without ore, is found by experiment to have the specific gravity of 2.68 or 12 cubic feet to the ton.

The sump 36 feet lower than the sill-floor of the VII is reported to be in ore, thus proving the continuous existence of ore from the surface to the lowest point yet opened in the mine.

The strength of the ore ground in the lowest level is very encouraging for the future of the mine below, and it indicates, also that the upper levels may be more extensively opened to advantage. So far, there is nothing to indicate any giving out of the ore in depth. The changes of grade of ore from level to level are as likely to be in favor of higher grades of ore as of lower grades.

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THE MAP AND SECTION:- The map of the underground work of the mine is drawn to a scale of 32 feet to the inch and represents the open Pit and the successive levels in their relative position with respect to the shaft as they would appear from a vertical form of the ore channel makes it difficult to represent it, and causes the longer axes of the successive levels to be oblique to any one vertical plane.

The lines of the sets of timbers vary in consequence, and are not always parallel, or one directly above the other. The drawing representing the upper levels, or to the III inclusive, was made in 1880, and the other levels have since been added. The form of the third level sill floor has been changed to conform to its present condition (Dec. 1882). The levels above it remain as they were in 1880.

The vertical section of the mine is upon the scale of 64 feet to the inch, or one half the scale of the map. The position of the several

levels and stopes with respect to each other made it necessary to adopt a certain line of section to which they could all be referred by perpendiculars, as no one plane of section could be adopted which would pass through the longer axis of each level or floor. The line selected passes through the center of the shaft and lengthwise of the VII level. This line corresponds very nearly to the direction of the long upper level. It is not indicated on the map. The distances of some of the levels from the shaft are necessarily fore-shortened, inasmuch as they are curved in some cases so as to run nearly at right angles with the plane of section. But the relative positions of the chief excavations are correctly shown. It will be seen that they show a gradual dip or pitch of the ore formation to the westward at an angle of 68 degrees to 70 degrees, the underlie being about 250 feet in 800.

PRODUCTION OF THE MINE:- The records, if any exist, of the earliest workings of the mine before its incorporation, are very imperfect. It is therefore difficult to ascertain with precision the aggregate production. Much ore is known to have been taken out and sold before the incorporation of the Silver King Company. It is believed that the value of the ores so sold is not less than \$1,000,000.

The production since the incorporation up to the end of 1881 (Jan. 1, 1882) was \$1,973,458.68 gross, in value. It was estimated by the General Manager that 19,200 tons had been reduced and concentrated up to the 31st of December 1879. The sale of ore for the same period amounted to \$819,141.58.

The exceptionally rich character of the Silver King ore is best shown by the records of the shipments and sales and by the assays of average samples. It varies of course in different parts of the mine.

Some of the levels yield richer ore than others, as for example the III and IV where an unusual amount of rich sulphide of silver was found. Before the construction of the railway from San Francisco to Arizona, at Fort Yuma, access to the mine and transportation to and from it were not only tedious but very expensive. The development of the mine was therefore not only retarded but it was impracticable to work ores of a grade that ordinarily would pay a handsome profit. During that period of isolation and inaccessibility the shipments were of necessity restricted to handsorted ore of high value, carefully selected and averaging \$1,000 per ton, being such ores as would bear the great cost of extraction and transportation. All these extraordinary expenses have been gradually reduced, and since the completion of the railway through the territory it has become practicable to ship ores of ordinary average grade with advantage. Each of the lower grade ore, which for a time was laid aside, has since been sorted over and concentrated.

It is now found most profitable to crush and concentrate the ore and to ship the concentrates for sale to reduction works. Considerable quantities have been sent to the Castle Dome Mining and Smelting Company, at Melrose, California, to the Selby works, and to the Omaha Smelting Works.

The Mill of the Company is at Pinal, five miles from the mine, and twenty stamps are kept constantly running. The amount crushed per day ranges from 50 to 57 tons. In the month of November last, 1532 tons were crushed, being an average of a little over 51 tons a day. The stamped ore, wet, flows to eight Frue Vanner concentrators which are made to "handle" the entire product. For the same month of November the total product of concentrates was 78,914 tons, being 5.2 per cent of the amount of ore stamped; the tailings, by difference amounting to

tons 1453.56, or 94.8 per cent. These tailings contained by assay, \$4.95 per ton in value of silver, and the concentrates, by assay, contained \$1094.15 in value per (here follows a drawing Fig. 13) (Outline View of the Mill at Pinal. Piles of tailings in front) tone in silver being a total value of \$86,377.01, which deducted from the gross valuation, by assay, of \$93,574.56 shows a loss of \$7,197.55 in value, or 7.69 per cent.

The battery samples for the period averaged \$61.08 in value.

There is unusual difficulty in the way of obtaining closely correct samples of the concentrates owing to the amount of native silver they contain. Samples taken from the same lot, and in the same way, will often give very difficult results. Great care has to be exercised to take every particle of the bottom layer of dust next to the rubber cloth upon which the powder is mixed.

These concentrates are dried and sacked for shipment in strong canvas sacks. The average content in lead as determined from many shipments is $21\frac{1}{2}$ per cent and of zinc 18 per cent. The chief value is in the native silver disseminated in the stamped mass in the form of irregularly shaped scale like fragments.

At the time of my first visit to the mine, in the spring of the year 1880, desiring to check the statements of the value of the ore bearing rock by assays entirely under my own control, I took four samples, as follows:

1. On 356 foot level. Along drift for 10 ft., corresponding to the part sent to the mill.

II. On 356 ft. level. Face of drift for 10 ft.

III. On 304 ft. level. Quartz and "horse flesh" copper ore with some "yello copper".

IV. On 256 ft. level (second). Large pieces of quartz with some grey copper and yellow copper.

I took these samples to Messrs. Huhm and Luckhardt of San Francisco for careful assay and received the following returns, as per the original certificate, a copy of which is subjoined.

RESULT OF ASSAYS.

San Francisco, May 15, 1880.

Sample No. 9876 - Marked "No. 1" Silver King. One parcel of ore. The whole was crushed and pulverized, and an average sample proved to contain - gold, none; silver 114.23 ounces, equals \$147.69 per ton (2000 lbs.)

Sample No. 9877 - Marked "No. 2" Silver King. Small sack of ore. The whole was crushed and pulverized, and an average sample proved to contain - gold, none; silver, 243.05 oz. equals \$314.24 per ton (2000 lbs.)

Sample No. 9878 - Marked "No. 3" Silver King. Small sack of ore. After being crushed and pulverized, and average sample proved to contain gold, none; silver 77.99 oz. equals \$102.13 per ton (2000 lbs.)

Sample No. 9879 - Marked "No. 4" Silver King. Small sack of ore. The whole was crushed and pulverized and an average sample proved to contain gold, none; silver 14.58 oz. equals \$18.85 per ton (2000 lbs.)

The seventh level yields beautiful masses of native silver, associated with stromerite and blende. Specimens have been sent forward since my last visit in December and are equal to any seen in the upper level. The ore of the excavation has been extended, and full details are given in the annual report of the Superintendent, dated January 1, 1883.

Since then some important additions have been made to the facilities for delivering and crushing ore to the mill, and to the plant for concentrating.

A large crushing mill has been erected at the mine, where ore is passed through a large sized Blake rock breaker, and is stored in bins with shoots and gates so that it is loaded direct into the wagons to be taken to the mill at Pinal.

The batteries have been changes so as to deliver from both sides, and four additional Frue tables will be set up. It is expected that with these improvements the daily product can be increased to 75 tons of concentrates.

The outline sketch of the Surface work at the mine represents the new building for the crusher, approximately, as when the sketch was made the foundations only had been laid.

William F. Blake.

Mill Rock, New Haven, Conn.

March 1883

(Then follows a map of the levels of Silver King Mine.)

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