

FORT YUMA,
AT THE JUNCTION OF THE GILA & COLORADO RIVERS
1854.

Sonora --- and the Value of its Silber Mines.

REPORT

OF THE

Sonora Exploring and Mining Co.,

MADE TO

THE STOCKHOLDERS.

DECEMBER, 1856.

CINCINNATI:
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TO THE READER.

The work entitled "Ward's Mexico," from which copious extracts are made in the following pages, is a rare work and can be seen at the office of the Agent of this Company, Edgar Conkling, corner of Third and Walnut streets Cincinnati. Maps and other information may also be seen at the office of the Railroad Record, 167 Walnut street, Cincinnati.

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SONORA.

COL. CHARLES D. POSTON, COMMANDANT AND MANAGING
AGENT.

CHRISTIAN EHRENBURG, TOPOGRAPHICAL ENGINEER AND
SURVEYOR.

FREDERICK BRUNCHOW, GEOLOGIST, MINERALOGIST AND
MINING ENGINEER.

REPORT.

The Sonora Exploring and Mining Company, was organized in Cincinnati on March 24, 1856, by a few gentlemen who were familiar with the mineral resources of that portion of Sonora, which came into our possession by the Gadsden Treaty. The object of the company was to send an armed party of sufficient strength to protect itself against the Indian tribes, to explore this territory and recover and hold possession of old Spanish mines, abandoned in consequence of the Apache War and Mexican Revolution, and the consequent withdrawal of the Presidios or garrisons then stationed there. No country in the world is richer than Mexico, in the value and immensity of its mineral products, and Sonora is conceded to be the richest of its provinces. The Sonoritans complained that Santa Anna had sold to our government the most valuable portions of that province. And if government records can be relied on, the opinion of the Sonoritans is correct.

The splendid results which followed in such rapid and brilliant succession, the settlement of California, the ease with which that state could be approached from the Pacific, and the easy and cheap mining of the placers have completely dazzled the public gaze, and withdrawn attention from the Gadsden Purchase, where we may soon expect to see results, as brilliant and wonderful, as they will be unexpected and startling. To the early attainment of these results, there have been two serious obstacles. 1st. The mineral bearing portion of Sonora, is distant some 350 miles from the Pacific at San Diego, though readily accessible from the Gulf of California. 2nd. Small parties were

not safe in consequence of the presence of hostile Indians, and want of protection from troops.

The first of those obstacles is finding its own removal in the enterprise of our people. Vessels regularly find their way, and merchandise can be safely shipped to the Colorado river and to Fort Yuma built by Major Heintzelman in 1851. This point has already become a trading port of considerable importance, and bears the name of Colorado City. This is destined to be at no very distant day a place of great importance. It is from this source that the inhabitants of the great central valley of the West, and the Mormons must seek their supplies of merchandise. The mines are distant from this point about 200 miles. The intervening country furnishes natural roads unsurpassed by any of artificial construction. And the grade from the mining districts to the river being descending, there would be no serious obstacle to the transportation of silver or silver ore by wagons to Fort Yuma. But recent explorations have placed it beyond a doubt that the product of the mines will reach navigable waters on the Gila river, a tributary of the Colorado, at a much less distance.

The second objection that of lack of protection has been already obviated by the establishment of military posts in the territory. Major Steen, with four companies of dragoons is stationed at Tucson. This may be regarded as favorable for several reasons. The mere presence of United States troops is in itself a guarantee of protection. And that those troops should be under the command of an officer of the experience, tact, and ability of Major Steen, must be conceded to be a fortunate circumstance for this territory and for those, who shall be tempted to settle within its limits.

These obstacles removed, the salubrity of the climate, the fertility of the ranchos and the richness of the mines of this region will secure for it a rapid settlement by enterprising and hardy men, and those parties that are first on the ground will reap the advantages of a first choice and first occupation.

In addition to private sources of information possessed by

members of the company, who have visited in person the mines of this district, and examined the shafts, buildings and grounds of these abandoned treasuries, the company would present the following concurrent testimony of parties, whose opportunities for information were of the best character.

[Notes from Ward's Mexico in 1827, showing the value of Silver Mines, etc.]

H. G. Ward, the author of this work, was His Britannic Majesty's Charge D'Affairs in that country during the years 1825, 1826, and part of 1827. He never possessed a single mining share; this information he sought at the instance of his government, and it is derived from personal visits to the various mines, and inspection of the mining records. The statistics are derived from the records of the government fifths, which naturally can never exceed the amount of silver raised. See *Vol. II, p. 3.*

Mr. Ward sums up the coinage of the mint of Mexico, up to the year 1825, as follows:

Coinage from 1796 to 1810, inclusive,	\$342,114,285
“ “ 1811 to 1825, “	111,551,082
Total,	\$453,665,367

This was but the coinage at the mint, and does not, therefore, include the whole produce* of the precious metals. It is enough, however, to show the immense products of Mexican Mines. In the following extracts, we have aimed to give a fair example of the value of these mines. The reader should bear in mind, in all cases, that these are the results of the working of the deep mines in Central Mexico, while Ward, Humboldt and Wilson all concur in the opinion that the surface mines of Northern Mexico are much richer, and being more easily worked, are in the same ratio more valuable.

“The average annual produce of Soubreterete, near 24° North Latitude, during this period, is stated (though not upon the authority of registered returns, to have been \$300,000, or about \$200,000 less than the ordinary produce from the time of the great Bonanza, of the Fagoaga family, (when eleven millions of dollars were raised in eight months, from the Mine of El Pavellon alone), up to 1810.”—*Vol. II, p. 20.*

* Humboldt estimated the whole production of the mines in 1803 at \$1,767,952,069

The Fagoaga family mined in eight months \$11,000,000 from the mine of El Pavellon alone.

The riches of the Southern or Central mining districts of Mexico consist in the immense mass of ores, and not in their richness, as but $2\frac{1}{2}$ oz. are obtained from the hundred weight. See *Vol, II, p. 86.*

“It is in the immense mass of ores which they are capable of producing, and not by any means in the abundance of silver contained in them, that the riches of the Southern, or Central mining districts of Mexico, consist. Before the Revolution, it was calculated that the three millions of marcs of silver, to which the average annual produce of the country amounted, were extracted from ten millions of quintals (hundred weights) of ore; so that the proportion of silver did not exceed two and a half ounces to the hundred weight.”—*Vol. II. p. 86.*

“That the great mineral treasures of Mexico commence exactly at the point where Humboldt rightly states the labors of the Spaniards to have terminated (about Lat. 24°), is a fact now universally admitted by the native miners, although hitherto but little known in Europe.”—*Vol. II, p. 127.*

The historian next proceeds to give details. *Same page.*

“The States of Durango, Sonora, Chihuahua, and Sinaloa contain an infinity of mines hitherto but little known, but holding out, wherever they have been tried, a promise of riches superior to any thing that Mexico has yet produced.”

“These districts (list in Table IV) are distinguished, not less by the superior quality of their ores, than by the circumstance of their beginning to be productive within a very little distance from the surface (usually from ten to fifteen yards); whereas the Veta Madre of Guanajuato yields little or nothing until the depth of eighty yards is attained.”

“The metals seem to increase in richness as you approach the North; inso-much that in the Real, or District of Jesus Maria, in that great branch of the Sierra Madre, which separates the States of Durango and Chihuahua, from those of Sonora and Sinaloa, to the North and West—the ores of the mine of Santa Juliana (which does not exceed seventy yards in depth) appear, by a certified Report from the Diputacion de Mineria, now before me, to average seven and eight marcs of silver per carga, of 300 lbs., which is the average produce of ten cargas of good ore in Guanajuato; while ores of the best quality yield as much as from four to ten marcs per arroba, of 25 lbs., or forty marcs per carga.

“At Batopilas (in the State of Chihuahua), where the matrix is, in general, quartz, the pure malleable silver intermixed with it often exceeds in proportion one-half; and masses of this description, of the weight of eleven arrobas, (270 lbs.) have been raised. One of five arrobas in weight (125 lbs.,) was in

existence at Chihuahua during my visit to the North, and I was even solicited to purchase it for the British Museum."

A marc is \$8.50.

By the following extract from Vol. II, page 129, we learn that Zambrano paid as his tax to the government, of one-fifth proceeds, the enormous sum of \$11,000,000. And the Marquis of Bustamente paid the government \$300,000 for his title of Marquis.

"From Batopilas and Guarisamey, I have been unable to obtain returns as exact as those from Santa Eulalia; a great part of the wealth derived from the first, by the Marquis of Bustamente, having been sent out of the country unregistered, during the Revolution, by the ports of Mazatlan and Guaymas. But it is upon record, at Durango, that Zambrano, who was the proprietor of all the principal mines of Guarisamey and San Dimas, paid, as the king's fifth, upon the silver raised from the mines, between the period of their discovery, (in 1783) and 1807, when he died, eleven millions of dollars. These immense riches were derived principally from five great mines, La Candelaria (at San Dimas) San Juan Nepomuceno, Cinco Senores, La Abra, and Tapia; of one of which (La Candelaria) I possess the regular returns for five years, which prove the annual profits never to have been less than \$124,000, while in some years they amounted to \$223,082. The ores of the mines, during the whole of this period, appear to have produced from five to six marks per carga (of 300 lbs.) and often to have yielded twenty, and even thirty marcs. Indeed, nothing of a quality inferior to the first could have covered the expense of extraction; as, when the Candelaria had attained its greatest depth, (300 Varas), the water was still brought up from the bottom of the mine in leathern buckets upon men's shoulders. The Ley de Oro (or proportions of gold) in the ores of Guarisamey is very great, amounting sometimes to 2,100 grains to the marc. But, notwithstanding all these advantages, the mines are now going fast to ruin, the works having been suspended during the Revolution, and the possibility of re-opening them, at present, to any extent, being impeded by a lawsuit between the heirs and executors of the former proprietor.

"Without entering into similar details respecting each of the other districts mentioned in the Table of the Northern Mines (No. IV.), it will be sufficient to state that, with some few exceptions, they all possess, in a greater or less degree, the same advantages: richness of ores, and veins productive almost at the surface; that few have been worked to any extent; and, consequently, that the risk of making the necessary experiments there is trifling, in comparison with the immense outlay required by the old mines of the Southern districts, which have, in general, attained an enormous depth. The money which has been invested in the Valenciana, or in Rayas, or in the Biscaina vein, would be sufficient to make a trial of half the mining districts of the North at once; for no expensive works need be commenced there, until the character of the veins, which it might be in contemplation to work, was sufficiently ascertained. The undertaking would, indeed, require an adventurous spirit, and a determi-

nation to submit to every privation, at first, in order to ensure success; but if these qualities were combined with a sufficient knowledge of the country, and some personal influence, I am inclined to think that, with a very small capital, success would be undoubted.

"In the present state of discouragement with regard to all Transatlantic speculations, it is not probable that any experiment of this kind will be attempted upon a large scale for some time; but I am convinced that, when once it is fairly made, an enormous addition to the mineral wealth of Mexico will be the result. To what extent this may ultimately be carried, it would be useless now to inquire; for, without the assistance of foreign capitalists, years will probably elapse before the gradual spread of population facilitates discoveries in those rich districts, where the want of inhabitants now presents a serious obstacle to commercial enterprise.

"Population, however, in Mexico has always followed the course and progress of the mines; and that, too, with astonishing rapidity. The Mexican miners are proverbially inconstant in their tastes, and roam from one district to another, whenever there is a new discovery, or Bonanza, to attract them.

"Of this, Catorce, 24° Latitude, furnished a memorable instance in the year 1773. It is impossible to conceive a more bleak and desolate spot than that upon which these famous mines are situated—the very summit of a mountain ridge, inaccessible, even at the present day, to any thing but mules, without provisions or water, or resources of any kind; yet, in three years after the discovery, it had a population of five thousand souls, and the town now contains, sixteen thousand inhabitants. The fame of its riches brought crowds of settlers from Guanajuato, Zacatecas, and Sombrerete; and, notwithstanding all the local disadvantages which I have enumerated, these settlers have remained. But the mines of Catorce possessed all the properties which characterize those of the North; they all began to be productive almost at the surface, and all yielded ores of a quality unknown in the neighboring districts of Zacatecas and Guanajuato.

"The metalliferous dust of the famous mine of 'Zavala,' which produced four millions of dollars in two years, was eagerly bought up, at the mouth of the mines, by Rescatadores (proprietors of Amalgamation works), who came from Pinos, and even from Guanajuato (distances of fifty and eighty leagues) for the purpose, at the price of one dollar for the pound of ore (three hundred dollars per carga).

"The owner of the mines of Santa Ana and San Geronimo, (Capt. Zuniga), after living upon their produce during his whole life, bequeathed, by his will (of which I have an authentic copy), four millions of dollars, the greatest proportion of which was left to pious institutions. The mine of La Luz, which was denounced in 1804, and is still in full work, has given to its present proprietor, the Licenciado Gordo, the estate of Mal Passo, near Zacatecas, for which he paid \$700,000, and a million of dollars capital: the best ores, during this time, have sold, according to the Registers of the mine, at \$340 and \$380 per carga, of 300 lbs.

"The ores of a particular level of the mine of La Purisama, which belongs

to the family of the Obregons (*el ojo del cielo*), sold for \$600, \$400, and \$380 per carga: at which price they were bought as late as 1817.—*Vol. II, p. 129.*

“A similar enterprise will shortly be attempted in England, by an English gentleman (Colonel Bourne), who has been long a resident in Mexico, in conjunction with Mr. Escalante, the representative of the State of Sonora in the Senate.

“They have taken up contracts for the mines of Arizpe (about 30° north latitude), in a situation possessing great local advantages, a fertile country, the vicinity of two large rivers, and a communication by water with the Pacific. The mines themselves were formerly celebrated for their riches, and the capital required to bring them again into activity is very small.

“The specimens which I have seen of the ores extracted from them, almost induce one to adopt the theory, that the proportion of silver contained in the ores increases as you advance towards the North; a theory which is very generally believed at present, in Mexico, and which is certainly confirmed by the superiority of all the Northern ores to those of the richest districts in the South.

“The idea probably originated in the discovery of the famous *Bolas de Plata* (Balls of Silver) of Arizona, in the beginning of the last century, which was, and probably still is, believed in Europe to be one of those fables, with which mining countries always abound.

“But the attention of the present government of Mexico having been drawn to the subject, a search was made in the Vice-regal Archives, by order of the President, for the correspondence, which was known to have taken place respecting it in the year 1736.

“This correspondence I have seen, and I have in my possession a certified copy of a Decree of Philip the Fifth, dated Aranjuez, 28th May, 1741, the object of which was to terminate a prosecution, instituted by the Royal Fiscal, against the discoverers of Arizona, for having defrauded the Treasury of the duties payable upon the masses of pure silver found there.

“The decree states the weight of the balls, sheets, and other pieces of silver discovered (*bolas, planchas, y otras, piezas de plata*) to have amounted to 165 arrobas, 8 lbs., in all (4033 lbs.); and mentions particularly one mass of pure silver, which weighed 108 arrobas (2700 lbs.); and another of eleven arrobas, upon which duties had been actually paid by a Don Domingo Asmendi, and which, as a great natural curiosity (*como cosa especial*), the king states ought to have been sent to Madrid.

“The decree ends by declaring the district of Arizona to be Royal property, as a “*Criadero de Plata*,” (a place in which, by some natural process, silver was created;) an idea to which the flexibility of the metal, when first extracted, seemed, in those times, to give some color of probability; and by directing it to be worked upon the Royal account. This put a stop to the enterprises of individuals: the district was deserted; an attempt to send a sort of colony there failed; and, in a few years, the very name of Arizona was forgotten.

“I am far from supposing that the whole of the facts recorded in this decree can be taken as correct, although the authenticity of the decree itself is unquestionable. But what one can not adopt without confirmation, ought not to

be rejected without inquiry; and I see enough, at least, in these Records of Arizona, to warrant the supposition (confirmed as it is by the facts and appearances which I have mentioned in the preceding pages), that the hitherto unexplored regions in the North of Mexico contain mineral treasures which, as discoveries proceed, are likely to make the future produce of the country infinitely exceed the amount that has been hitherto drawn from the (comparatively) poorer districts of the South.

"In how far these discoveries must be influenced by the progress of population, and in what degree the discoveries themselves may be expected to influence that progress, remains as a subject of inquiry for the fourth and last section of this book; in which I shall endeavor to point out the connection between the mines, and the agriculture and commerce of Mexico, as the best mode of illustrating the effect likely to be produced by their prosperity upon a population, the general interests of which they so effectually promote."—*Vol. II, p. 136.*

Here he speaks of the mines of Arizpe, about 30 degs. North Lat., and states again the increase of silver in the ores, as you advance North; they are superior to those of the richest districts in the South. And of the Arizona, where the famous "balls of silver" were discovered. One mass of pure silver was found here, weighing 2,700 pounds.

Mr. Ward also suggests that the English capital invested in the deep mines of Central Mexico might have been much more profitably used in developing the northern regions, where the silver ore is nearer the surface.

"I do not mean to say that the great mines, taken up by our Companies, are exhausted; on the contrary, I believe that they will still amply repay the adventurers for the stake invested in them; but I have certainly little doubt that, in many instances, the same capital might have been laid out elsewhere, with a much more immediate prospect of advantage.

"Besides, however good the mines, the price which has been paid for their former celebrity in the shape of "Alimentos," (a yearly allowance to their owners), has proved a very serious addition to the first outlay of the adventurers.

"Those paid by the Real del Monte Company to Count Regla, amount to to 20,000. The Anglo-Mexican Company, for the mine of Valenciana alone, pays yearly \$24,000. On the preparations for draining the first, (the great Biscaina Vein), nearly two millions of dollars had been expended when I left Mexico; and at Guanajuato, the Valenciana mine had cost, on the 1st of September, 1826, \$672,264. Farther advances will be required in both cases, before the drainage can be completed; and certainly there ought not, in reason or justice, to have been any surcharge, in the shape of Alimen-

tos, where so large an investment of capital was necessary for the preliminary works."— *Vol. II, p. 81.*

You here see that the Real del Monte Company pays Count Regla, the owner of the mines, yearly \$20,000; the Anglo-Mexican Company, for the mines of Valenciana alone, pays yearly \$24,000. These mines are held, not in fee simple, but for terms not exceeding thirty years. On the first mines near \$2,000,000 had been spent in preparations for draining the mines, and in the second, over \$600,000. These were expected to pay.

Subsequent travelers state that the mine of Real del Monte did not prove a profitable speculation to this Company, owing to the vast depth of the mine, and the shortness of the lease which they held.

The immense landed estates of the Mexican nobility were mainly derived from the proceeds of these mines, as is shown in the following extract :

"An examination into the sources of the wealth of the principal families of the Mexican nobility will confirm what I have stated with regard to the towns, by leading us nearly to the same result. The family of Regla, which now possesses landed property to an immense extent in various parts of the country, purchased the whole of it with the proceeds of the mines of Real del Monte. The Fagoagas owe their present importance to the great Bonanza of the Pavellon at Sombrerete. The estates of the family of Vibanco proceeded from the mines of Bolanos. The houses of Valenciana, Ruhl, Perez, Galvez, and Otero, are all indebted for their possessions to the mines of Valenciana and Villalpando, at Guanajuato. The family of Sardenata (Los Marqueses de Rayas) takes its rise from the mine of that name. Cata and Mellado gave to their first proprietor (Don Francisco Matias de Busto) the Marquisate of San Clemente, with immense wealth, a part of which has been transmitted to his descendants. The Canada of Laborde, at Talpukahua, with the mines of Quebradilla and San Acasio, at Zacatecas, all contributed towards the three fortunes of Laborde. The family of the Obregones owes its beautiful estates (near Leon) to the mines of La Purisima, and Concepcion, at Catorce; as does the family of Gordo, the estate of Malpasso to the mine of La Luz. The son of Zambrano (the discoverer of Guarisamey), wasted as his rightful property has been, is still in possession of four of the largest estates in Durango; and Batopilas gave to the Marquis of Bustamente both the means of purchasing his title, for which he paid by a loan of 300,000 dollars, (60,000*l.*) to the Royal Treasury, during the Revolution, and the affluence which he is now enjoying in the Peninsula."— *Vol. II, p. 151.*

"Fortunately, there is no reason whatever to apprehend the approach of that scarcity of mineral productions with which many seem to think that New

Spain is menaced. Hitherto, at least, every step that has been taken in exploring the country has led to fresh indications of wealth, which, in the North, appears to be really inexhaustible.

"Mining in Mexico has hitherto been confined to a comparatively narrow circle; the immense mass of silver which the country has yielded since the Conquest (Humboldt calculates it at 1,767,952,000 dollars, in 1803), has proceeded from a few central spots, in which the capital and activity of the first speculators found ample employment; yet, if we examine those spots, we shall find that three centuries of constant productiveness have not been sufficient to exhaust the principal mines originally worked in each, while by far the largest proportion of the great Veins remains unexplored."—*Vol. II, p. 155.*

Here, again, the wealth of the mines in the North is said to be inexhaustible. Although the mines of Central Mexico have been worked for centuries, still the largest proportion of the great veins remains unexplored.

There is more reason to fear a falling off in the value of silver as a circulating medium, than a falling off in the amount of production, when these new mines are opened, and worked by American enterprise and skill.

After describing a mine in which a German Company had opened works, Mr. Ward says:

"The mine of Santa Rita cost them nothing, and they were induced to select it from finding that it would begin almost immediately to pay its own expenses."—*Vol. II, p. 334.*

The Sonora Exploring and Mining Company have already commenced working, and must soon pay expenes, as their mines are much more valuable than this.

"The great German Mine of Arevalo stands upon another little hill, nearly opposite the town.

"It enjoyed no sort of celebrity until the beginning of this century, when it fell into the hands of the present proprietor, Don Antonio Revilla, who, after working it for some time in an obscure way, was fortunate enough, in 1803, to fall in with a Bonanza, or mass of rich ore, which enabled him to carry on his operations upon a larger scale. In 1811, from one part of the level, called 'El Divino Pastor,' he obtained, in seven weeks, a clear profit of \$200,000."—*Vol. II, p. 345.*

Here is a specimen of a rich mine. This mine suffered during the Revolution, and had to be abandoned. A German Company have leased this mine for thirty years, paid down \$100,000, took the stock at a valuation; have the entire management, and half the proprietorship. Ward remarks, "Upon these terms the Ger-

mans obtained possession of the mine, and there can be no doubt that it will prove a most lucrative speculation."

"The Biscaina vein had been worked, almost uninterruptedly, from the middle of the sixteenth to the beginning of the eighteenth century, when the two principal mines (El Xacal and La Biscaina), which, in 1726, had produced 542,700 marcs of silver (4,341,600 dollars,) were abandoned by their proprietors in consequence of the difficulty of keeping down the water with the very imperfect machinery employed in those early days. The mines were then only one hundred and twenty varas in depth, and the known richness of the ores in the lower levels induced an enterprising individual, Don Jose Alexandro Bustamente, to denounce them anew, and to attempt the drainage by the Adit of Moran, a part only of which he lived to complete. On his death-bed he bequeathed his hopes and his works, to Don Pedro Tereros, a small capitalist, who had supplied him with funds to continue his operations, and who, sharing in all Bustamente's anticipations of success, immediately removed to Real del Monte, and devoted his whole remaining fortune to the prosecution of the enterprise. From the smallness of the capital invested, the work advanced but slowly, and was not completed until the year 1762; but in the twelve succeeding years Tereros drew from his mines a clear profit of 6,000,000 of dollars, or about 1,200,000*l.* sterling. He obtained the title of Count by the munificence of his donations to the Court of Madrid; and never was title more dearly bought; for he presented Charles III. with two ships of the line (one of 112 guns), constructed at the Havana, of the most costly materials, entirely at his own expense and accommodated him besides with a loan of one million of dollars, no part of which has yet been repaid. He likewise built the two great Haciendas of San Antonio and Regla, which can not, together, have cost less than 1,200,000 dollars (240,000*l.*); and he purchased landed property to such an extent, that even in the present depressed state of the agricultural interests of Mexico, the revenue of the present Count exceeds one hundred thousand dollars; and ought, in more favorable times, to amount to nearly two (40,000*l.*") *Vol. II, p. 362.*

These rich mines may be considered inexhaustible.

In Mexico, gold mines generally diminish in value as they increase in depth. A mine in the district of El Oro in 1805 (it is on record) a single carga of ore (300 pounds) was sold at the mouth of the shaft for \$11,000. A few cargass like this would repay all expenses.—*Vol. II, p. 393.*

"On the morning of the 13th of November, we visited the mine of Villalpando, situated in the mountains to the east of Guanajuato, about four leagues from the town, upon a separate vein, totally unconnected with the Veta Madre. A number of small mines are united in the 'Negotiation' of Villalpando, but the depth of the deepest levels does not exceed two hundred varas: the ores are rich in gold, and in appearance resemble those of the Rancho del Oro; picked stones have been found to contain as much as two ounces of silver

to one pound of ore; and the Ley de Oro, or proportion of gold found combined with this silver, sometimes amounts to five hundred and fifty grains in the marc; the value of which at the Mint is raised, in these cases, from eight and a half to thirty and thirty-five dollars. The principal proprietors of the mine are the Conde Valenciana, the Countess Ruhl, and the Conde de Perez Galvez. The Anglo-Mexican Company, to which it belongs, was in possession of eight *Barras*, or one-third of the mine; but the whole outlay was to be repaid out of the first produce, and a fund of reserve of 150,000 dollars for future contingencies, to be set aside, before any division of profits could take place. The drainage was conducted by four malacates (three English and one Mexican), and had been effected, in three months, to within twenty yards of the bottom of the shaft, at an expense of 84,000 dollars. The buildings connected with the mine had been all brought into a state of complete repair, and as the weekly produce already amounted to three hundred cargas of ore, the prospects of the adventurers were thought to be highly favorable. The mine was worked principally by *Buscones* (Searchers), whom the hope of a rich prize, (from the value of the gold in some of the ores), attracted in great numbers. Each man received in payment one-half of the ores which he had raised; and at the weekly sales it was curious to observe the eagerness with which all strove to attract the attention of the buyers, by putting their best stones in the most advantageous light; and sprinkling them with water, in order to show the metallic particles. The sale is conducted by the 'Administrador,' or principal Overseer of the mine; and as he moves from heap to heap, the 'Rescatadores' make their offer in a whisper, and the name of the highest bidder, with the price paid, is inserted on the list. The ores are immediately taken possession of by the *Cargadores* (Porters), by whom each *Rescatador* is accompanied; and sent down to the Hacienda in the town, where the *Buscones* receive their money on the following day."—*Vol. II, p. 428.*

Mr. Ward visited the Villalpando mine. An Anglo-Mexican Company have the lease of one-third. They had got in draining the old mine, within twenty yards of the bottom of the shaft, at an expense of \$84,000. Their prospects "were thought to be highly favorable."

Mr. Ward visited the mine of Sirena, in which the Anglo-Mexican Company holds ten *Barras* in perpetuity, and had acquired four more for twelve years, by an additional advance of \$100,000. A *Barr* is one twenty-fourth.—*Vol. II, p. 430.*

The Valenciana mine, near Guanajuato, was slightly worked towards the end of the sixteenth century, and neglected as unpromising until 1760, when Mr. Obregon, a young Spaniard, resolved to explore the vein upon a point believed to be "emborrascada," or destitute of mineral riches. He had small fortune, but after working for many years, wielding with his own hands

the tools of the miner, he suddenly struck enormous masses of rich ore. The profits amounted, in several successive years, to one and a half million of dollars. A share in the Valenciana, which, in 1824, would not have sold for \$20,000, was thought by the natives to be worth \$100,000 at the time of my visit in Nov. 15, 1826.—*Vol. II. p. 439.*

The ores of the mine of Santa Anita, near Guanajuato, sold in 1740 for their weight in silver, in consequence of the large proportion of gold in them. A shaft was sunk by the father of the present proprietor, at an expense of \$700,000, and produced a net profit of \$11,000,000 clear of all expenses.—*Vol. II, p. 448.*

The Rayas mine, near the same place, appears by the books of the proprietors, to have paid to the Provincial Treasury, as the king's fifths, the sum of \$17,363,000. A large tract of virgin ground was still to be laid open.—*Vol. II, p. 455.*

"Several of these adventurers were pointed out to me, who came to Catorce at first with a board of images upon their heads, but now rank amongst the most respectable *merchants* of the place. Throughout Mexico, indeed I believe in every part of Spanish America, they are ignorant of the distinction made in Europe between the wholesale and the retail trade. There is nothing at all inconsistent with their ideas of propriety in keeping a shop; a 'tienda' is, on the contrary, attached to every Hacienda, and the proprietor regards the profit on the sale of the goods, with which it is his business to keep it supplied, as a part of his yearly income. This was always done, too, in remote parts of the country in great mining 'negotiations;' and thus the wages of the miners being naturally exchanged at the shop for the supplies of which they might be in want, a small capital was sufficient to keep up the circulating medium required, the whole of the weekly issues returning almost immediately into the hands of the proprietors. In some instances, where dollars were scarce, checks upon the shops were given for the amount due to each laborer, and thus a sort of paper circulation created, which was seldom objected to where the credit of the adventurers was tolerably well established." —*Vol. II. p. 511.*

A "tienda," or shop for the sale of goods, is attached to every Hacienda. In this way the wages of the miners are exchanged for goods. A "bar" of silver contains 136 marcs, or \$1,156.

The mine of Arana, near Durango, is celebrated for containing cavities, commonly called "Clavos," filled with a rich metal-

liferous dust, composed almost entirely of gold and silver. Zambrano "denounced" this mine. Mr. Glennie, from whom Mr. Ward borrowed these details, states that he himself saw in the books of the custom-house of Durango, *eleven* millions of dollars registered as the sum paid by Zambrano, as the king's fifths, and the fact was likewise corroborated to him by the Governor, who examined the register himself, in order to ascertain it.

"On the Western declivity of the Sierra Madre, and in nearly the same parallel of latitude as the Parral, are the famous mines of Batopilas. To enter into a minute description of this extraordinary district would exceed the limits of this work. I shall, therefore, only subjoin a few remarks upon its situation and produce. Its distance from Parral is about eighty leagues, nearly due West, and it is situated in a very deep ravine, similar to that of Guarisamey. The climate is warm, yet healthy. The metallic lodes, visible by their elevated crests, are almost innumerable, and by far the greater number of them have never yet been examined. The principal mines are El Carmen, San Antonio, Pastrana, Arbitrios, Dolores, Candelaria, and Buen Suceso, with many others, which it is not necessary to enumerate. The Carmen is the mine that produced the enormous wealth of the Marquis of Bustamente, and from which a mass of solid silver was extracted, weighing seventeen arrobas, or 425 lbs. The ores of Pastrana were so rich, that the lode was worked by bars, with a point at one end and a chisel at the other, for cutting out the silver. The owner of Pastrana used to bring the ores from the mine with flags flying, and the mules adorned with cloths of all colors. The same man received a reproof from the Bishop of Durango, when he visited Batopilas, for placing bars of silver from the door of his house to the sala, for the Bishop to walk upon."—*Vol. II, p. 577.*

"Buen Suceso was discovered by an Indian, who swam across the river after a great flood. On arriving at the other side, he found the crest of an immense lode laid bare by the force of the water. The greater part of this crest was pure and massive silver, and sparkling in the sun. The whole town of Batopilas went to witness this extraordinary sight as soon as the river became fordable. The Indian extracted great wealth from his mine, but on arriving at the depth of three varas, the abundance of the water obliged him to abandon it, and no attempt has been since made to resume the working.

"In this district the silver is generally found pure, and unaccompanied by any extraneous substance. The reduction of the ores is consequently easy and simple. When the silver is not found in solid masses, which require to be cut with the chisel, it is generally finely sprinkled through the lode, and often seems to nail together the particles of stone, through which it is disseminated. The lodes are of considerable width, but the masses of silver are only met with at intervals.

"In the mine of El Carmen, the Marquis of Bustamente, after the first bonanza, drove thirty varas in depth without meeting with any thing to repay

his labors; but being fully persuaded that all lodes have their alternate points of good and bad, he continued until, at the depth of forty varas, he met with the second bonanza. There is very little water in the mines of Batopilas, excepting those situated near the banks of the river, and these the river itself might be made to drain. The population of the town was, at one time, very considerable, but it has decreased of late, whole families having gone to the new discoveries of Morelos and Jesus Maria; the first of which lies in the vicinity of Batopilas, and appears to possess all the characteristics by which the lodes of that district are distinguished. It was discovered in the spring of 1826, by two brothers (Indians) by name Arauco, to one of whom a little maize for tortillas had been refused upon credit the night before. In two months they extracted from their mine \$270,000; yet in December, 1826, they were still living in a wretched hovel close to the source of their wealth, bare-headed and bare-legged, with upwards of 40,000*l.* sterling in silver locked up in their hut. I possess two large specimens of the ores; they are almost pure silver, and there is consequently no difficulty in reducing them by fire, however rude or defective the process. But never was the utter worthlessness of the metal, as such, so clearly demonstrated, as it has been in the case of the Araucos, whose only pleasure consists in contemplating their boards, and in occasionally throwing away a portion of their richest ores to be scrambled for by their former companions, the workmen."

"To the North of El Parral, and about five leagues to the South-east of the city of Chihuahua, is the ancient mining district of Santa Eulalia. It has been long abandoned, and the mines are in a ruinous state. The ores were generally found in loose earth, filling immense caverns (*salones*), of which some are stated to be sufficiently large to contain the cathedral of Mexico. The correctness of this assertion may require confirmation; but there can be little doubt of their magnitude, since the last bonanza extracted from one of them continued for nine years, and one real being laid aside for each marc of silver produced, a fund was formed, out of which the cathedral of Chihuahua was built, and a fund of reserve formed, of 100,000 dollars. The ores of Santa Eulalia are generally mixed with a considerable quantity of Galena, which renders them fit for smelting."—*Vol. II, p. 581.*

In the district of Jesus Maria, upwards of 200 metallic veins were registered in one year, within a circle of three leagues in diameter.—*Vol. II, p. 582.*

Vol. II, p. 590, speaks of Sonora, which he says "can hardly fail in the course of a few years to acquire great and permanent importance."

"To the north of Cinaloa, Sonora commences, and embraces the whole space from the shores of the Gulf of California to the confines of Durango and Chihuahua, upon the Table-land, (between twenty-seven and thirty-four of North latitude), comprehending in this vast extent of country almost every possible modification of climate, the heat being varied in proportion as the platforms

are more or less raised above the level of the sea. A much less degree of elevation is, however, required in these Northern latitudes to produce that temperate climate which is found to be most conducive to the fertility of the soil, and the comforts of the inhabitants; and a rise of a few hundred feet is sufficient to give to Arispe, and the districts in its vicinity, the temperature which the towns within the Tropics only enjoy at a height of from four to seven thousand feet."—*Vol. II, p. 568.*

The above extract will convey some idea of the delightful climate of Sonora.

"The whole of this country is rich in every variety of agricultural produce, for besides wheat, maize, and barley, the sugar-cane grows in the valleys, with figs, pomegranates, peaches, grapes, and numberless other fruits; horned cattle, mules, and horses abound throughout the province, and may be purchased in any number, at about one-fifth of the price usually paid for them in other parts of the Republic; and to these advantages are added a most delightful climate, and the facility of a communication by water with the port of Guaymas, from which the towns of Babiacora and Oposura are only distant between seventy and eighty leagues.

"Such a combination of favorable circumstances induced General Victoria (himself a native of the North), Don Pedro Escalante (the representative of the State of Sonora in the Senate), and several other Mexicans connected with the Northern Provinces, to entertain the idea of bringing into activity, by the formation of a Company, some of the mining districts near Oposura and Arispe, formerly celebrated for their wealth, but abandoned during the great Apache war, in the latter half of the last century; when the Indian tribes upon the frontier, irritated by the hostilities of the Spanish presidial troops, made so general an attack upon the Northern Provinces, that all the isolated establishments were broken up, and even the towns themselves preserved with difficulty."—*Vol. II, p. 598.*

The above extract shows the fertility of the country of Sonora and cause of the Apache war.

As you approach the Western coast, the harshness of the North wind disappears, and is replaced by a soft and balmy feel in the air, unknown even in summer in the capital (Mexico), where the evenings and mornings are generally chilly.—*Vol. II, p. 642.*

"The depth of the mines is small, their riches acknowledged, and the causes by which their working was interrupted, known. The advances necessary in order to bring them into activity, are small."—*Vol. II, p. 599.*

Statements of mineral riches *not* exaggerated.—*Vol. II, p. 600.*

"I am aware that many of the statements contained in this, and the preceding books, respecting the mineral riches of the North of New Spain, will be thought exaggerated. They are not so: they will be confirmed by every future report; and, in a few years, the public, familiarised with facts, which are only questioned because they are new, will wonder at its present incredulity, and regret the loss of advantages which may not always be within its reach.

"I am willing to hope, however, that my present undertaking may have the effect of directing the attention of many of my countrymen to a field, the importance of which has been hitherto but little suspected. Many of the facts detailed in the preceding pages are known in Mexico only by persons immediately connected with the part of the country to which they relate, but by them they are unanimously confirmed.

"It may be asked, how a territory, possessing such vast natural resources, can have been reduced to the state of comparative poverty in which it now lies? The cause is simple. The precious metals do not in themselves constitute wealth, and as long all communication between Sonora and the rest of the world was prohibited, except through the medium of the capital (Mexico) and the port of Vera Cruz, they could not even be employed as a means of obtaining the produce of European industry, which they now command. The inhabitants, forbidden to avail themselves of the harbors upon their own shores, without quicksilver (so essential in mining processes), and without a mint, (the nearest was that of the capital, 600 leagues from Arizpe), thought little of the mineral treasures by which they were surrounded, and devoted their whole attention to the cultivation of those upon which their subsistence and comforts depended.

"Their Haciendas, their flocks and herds, horses and mules, constituted their only care; and no portion of Mexico is richer than Sonora in these; but even at the present day, in many of the larger towns, money is unknown; and sales are effected by barter; the produce of the Interior, (as silver bars, gold dust, hides, or flour), being exchanged for the imports of Guaymas, and Mazatlan at Petic, or Rosario, Alamos, and Cosala. There is no mint, as yet, nearer than Durango or Guadalajara, and until an establishment of this nature be formed, the circulating medium will, of course, continue very small; but the exports of the precious metals in bars and grains to Calcutta and Canton are very considerable; the intercourse with India and China being already more frequent than that with any of the Southern Provinces of the Republic."

The owner of the rich mine of Nuestra Sonora de Guadaloupe, near Jalisco, in 1825 refused one million of dollars for the privilege of working this mine for *three* years.—*Vol. II, p. 607.*

The mines of Churunibabi, Pinal, Huacal, Aguage, and many others, are situated to the north and north-east of Nacosari, at no great distance from San Juan del Rio, built upon a stream which falls into the Yaqui. These minerals are equally rich with those already described. Pinal contains a greater proportion of gold than silver. It is recorded in the archives of Arispe, that the former owner, a lady, by name Maria Quijada, lent, at one time, 700 marcs of gold for the use of the government.

"Churunibabi is a very old mine, worked in the same way as San Pedro; as, indeed, are all the mines in this part of the country. The direction of the vein is east and west, the breadth two varas. The last persons who undertook to work this mine were three men by the names of Escalante, Vasquez, and Coulla. They cleared away the rubbish at one end until they found a pillar, left to support some of the old workings, from which they took ores that produced \$70,000, and yielded seventy marcs of silver per carga, of 300 lbs. Not immediately finding the principal vein, they divided the money, and discontinued their works. The mine is laid open from the surface 400 yards in height. Tradition says that the first discoverers found the vein of virgin silver half a vara in breadth, that it was abandoned in the Apache war, with the vein as described above two varas, and ores of seventy marcs per carga. The richness of these ores appears almost incredible, but when we consider the great quantities of bars of silver that Sonora has produced, without the aid of quicksilver, the metals must have been very rich and abundant.

"Ten leagues to the west and south-west of Nacosari, and six to the north of San Juan, are the mines of Tobarachi and San Pedro Vigilia, with ores of from six to eight marcs per carga.

"To the west of Arispe, 30½ Latitude, are the mines of Santa Teresa, of gold and silver, completely virgin, and the Cerro, or mountain of San Pedro, which contains innumerable mines and veins untouched.

"In all the districts above described, the roads are only passable for horses and mules, the country being very mountainous, but not of very great elevation. None of these mines are more than six or seven leagues from rapid streams of water, sufficiently considerable to work almost any machinery.

"The mines of La Agame, near Horcasitas, are famous for the abundance and richness of their gold ores. Those of Lampazos and Palos Blancos, five leagues to the south-west of Tepache, are likewise excellent veins and rich ores.

"I have here mentioned the most considerable mining districts, but in Sonora almost every mountain and hill contains silver and gold. Even in the plains, beds of native gold have been found in grains, varying in size from one to sixty ounces, as in Cieneguilla, San Francisco, San Antonio de la Huerta, Mulatos, Boucachi, and various others. Silver has been found in immense balls in Arizona.

"Besides the towns already named, those of most note in the northern part of the State are Dolores, Cucurpe, Tuape, and Opodepe on the river Dolores; Banamita, Cinaguessci, and Sonora, on the river Sonora; Bacuóchi and Parispe, to the north of Arispe; there are likewise some good settlements on the Ascension river, and in the Pimeria Alta.

"The valleys through which the rivers Sonora and Dolores flow, are much more fertile and abundant than the valley of Oposura, particularly in grain; they are also considerably larger.

"Of the Indian tribes to the North of Arispe and Fronteras, little is known, except by the natives of the country. No dependence can be placed on the accounts given by the Spaniards, who were cruel colonizers, and have always provoked that barbarity of which they so much complain. I have seen much

of Indians, and am acquainted with most of the tribes that inhabit the west country that stretches from Florida, by Texas and Cohahuila, to the Pacific. I have invariably found them kind and harmless, when well treated. The Apaches of the North are an extremely independent and high-minded people. They have very light complexions, and will not live in towns, or in a domesticated state, but subsist entirely by hunting. They are very brave, good horsemen, handle the lance remarkably well, and are good marksmen with the bow and arrow. The Governor of the State, Don Simon Elias, told me, that if an Apache leaves his hut for one minute, on his return he examines his bow, turns over every arrow, and looks at the point and feather, so that he is always prepared for enemies or game. The continued wars carried on against them by the Spaniards for many years, and conducted by cruel and rapacious officers, gave them the greatest abhorrence of their conquerors, but they entertain no antipathy towards the Creoles born in the State; and frequently when the Spaniards were obliged to sue for a suspension of hostilities, they sent two brothers, called Geronimo and Leonardo Escalante, to treat. These men exercised so great an influence over the Indians by their mode of treating them, that they always succeeded.

"In the part of Sonora last described, the climate is charming, the thermometer ranges betwixt 50 and 84; the atmosphere is always dry and clear. The inhabitants require no fires in the houses in winter, nor are they oppressed with the summer heat. In the mountains, the evenings and mornings are sometimes chilly.—*Vol. I, Appendix, p. 579.*

"At length the pieces of native gold and silver, and the gold dust which the Indians brought down to trade and barter with their new neighbors, induced the Spanish government to push their conquests farther, and the country was occupied as far as the Rio Colorado. The name given to the district by the first settlers was Senora, which has been corrupted to Sonora."—*Vol. I, Appendix, p. 584.*

The glowing accounts given by Ward of Mexico as it was in 1827, are confirmed by a more modern author. Wilson, in his "Mexico and its Religion, with Incidents of travel in that country during parts of the years 1851, 1852, 1853 and 1854," not only confirms but enlarges upon the assertions of Ward, and proves by irreproachable testimony that Sonora is in reality "*a region of country which combines the rare attractions of the richest silver mines in the world, lying in the midst of the finest agricultural districts, and where the climate is as attractive as its mineral riches.*" With these remarks we shall introduce the reader to the following:

Extracts from Wilson's Mexico and its Religion.

Chihuahua and Sonora are the States or Departments to be affected by our

Pacific Railroad. Sonora is the most valuable of the two, not only on account of its inexhaustible supply of silver, but also on account of its delightful climate and agricultural resources. It is like the land of the blessed in Oriental story. California does not surpass it in fertility or in climate.— With industry and thrift, it could sustain a population equal to that of all Mexico. The table-lands and the valleys are so near together that the products of all climates flourish almost side by side. Food for man and beast was so easily procured that the descendants of the early settlers sunk into effeminacy long before the breaking out of the great Apache war of the last century. Drought, however, makes the formation of artificial lakes and reservoirs necessary to the full development of its agricultural wealth.

But it is the remarkable abundance of silver which distinguishes it above all other countries except Chihuahua. I have described, in a former chapter, the long and laborious processes by which silver is produced from the ore in the southern mines, and also the great depths from which it is raised. In Sonora silver is most commonly extracted from the ore by the simple process of fusion. But in the district of Batopilos it is, or rather, was found pure. If we should adopt the theory that veins of ore extend through the entire length of Mexico, then I should say that they "crop out" in Sonora, or rather, that the silver *lodes* which are here above the surface dip toward the city of Mexico, and also northward toward California. The mountain chain which traverses California under the name of the *Sierra Nevada*, appears to be only a continuation or reappearance of the mountain chain here called *Sierra Madre*, (Mother Range,) which forms the boundary between the departments of Sonora and Chihuahua.

On the western declivity of this mountain range, the most remarkable illustration of this fact of cropping out, is found at Batopilos, already mentioned. This town is in a deep ravine. The climate is, like that of the California gulches, intensely hot, but remarkable healthy. Here the *lodes* of silver ore are almost innumerable, with crests elevated above the ground. The mine of *El Carmen*, in the times of the vice-kings, produced so immensely that its proprietor was ennobled, with the title of Marquis of Bustamente. This was the beginning of the family of Bustamente. A piece of pure silver was found here weighing *four hundred and twenty-five pounds*. I should like to continue in detail to enumerate the rich surface mines in the southern portions of these two States, but, lest I should weary my reader, I must omit them and refer those who wish to learn more, to the translations from the last official reports of the *Mineria*, entitled Chihuahua and Sonora, which are embodied in the appendix.

"The 'Good Success Mine' (*Bueno Sucesso*,) was discovered by an Indian, who swam across the river after a great flood. On arriving at the other side he found the crest of an immense *lode* laid bare by the force of the water. The greater part of this was pure massive silver, sparkling in the rays of the sun. The whole town of Batopilos went to gaze at the extraordinary sight as soon as the river was fordable. This Indian extracted great wealth from

his mine, but, on coming to the depth of three Spanish yards, (*varas*), the abundance of water obliged him to abandon it, and no attempts have since been made to resume the working. When the silver is not found in solid masses, which requires to be cut with the chisel, it is generally finely sprinkled through the *lode*, and often serves to nail together the particles of stone through which it is disseminated." "The ores of the *Pastiano* mine, near the *Carmen*, were so rich that the *lode* was worked by bars, with a point at one end and a chisel at the other, for cutting out the silver. The owner of the *Pastiano* used to bring the ores from the mine with flags flying, and the mules adorned with cloths of all colors. The same man received a reproof from the Bishop of Durango when he visited *Batopilos*, for placing bars of silver from the door of his house to the great hall (*sala*) for the bishop to walk upon."

The next mine of interest in our progress northward, is the *Morelos*, which was discovered in 1826 by two brothers named Aranco. These two Indian *peons* were so poor that, the night before their great discovery, the keeper of the store had refused to credit one of them for a little corn for his *tortillas*. They extracted from their claim \$270,000; yet, in December, 1826, they were still living in a wretched hovel, close to the source of their wealth, bare-headed and bare-legged, with upward of \$200,000 in silver locked up in their hut. But never was the utter worthlessness of the metal, as such, so clearly demonstrated as in the case of the Arancos, whose only pleasure consisted in contemplating their hoards, and occasionally throwing away a portion of the richest ore to be scrambled for by their former companions, the workmen.

Near the *Morelos* is the *Jesus Maria*. Though on the western or Sonora slope of the mountain, it is only eight leagues from Chihuahua. This, like *Morelos*, is a modern discovery, and of course was not included in the number of those Sonora mines which produced such an intense excitement about a hundred years ago in Mexico, and even in Spain. Here, *within the circuit of three leagues, two hundred metallic lodes were registered in one year*. The story of the mine of *El Refugio*, discovered by a fellow of the name of Pacheco, gave occasion for anecdotes like those of the Arancos which we have just recited. A dealer had an old cloak which took the fancy of Pacheco, and to purchase this thing he gave ore from which the dealer realized \$8,000. Three twenty-fourths (three *barras*) of the product of this mine netted, between the years 1811 and 1814, \$337,000. On the Sonora side of the mountain is *Santa Eulalia*. The ores of this *real* [district] are found in loose earth, filling immense caverns, or what are called "rotten ores," in California, and are easily separated by smelting. One shilling a mark (\$8) was laid aside from the silver which one of these caverns produced, which shilling contribution constituted the fund out of which the magnificent Cathedral of Chihuahua was built.

Proceeding northward we come to a spot the most famous in the world for its product of silver, the mine of *Arazuma*. For near a century the accounts of the wealth of this mine were considered fabulous, but their literal truth is

confirmed by the testimony of the English ambassador.* After examining the old records which I have quoted, I have no doubt that the facts surpassed the astonishing report; for, in Mexico, the propensity has ever been to conceal rather than over-estimate the quantity of silver, on account of the king's fifth; yet it is the king's fifth, *actually paid*, on which all the estimates of the production of Sonora silver mines are based. Arazuma (which, in the report of the Minería that I have translated for this volume, appears to be set down as Arizpe,) was, a hundred years ago, the world's wonder, and so continued until the breaking out of the great Apache war, a few years afterward. Men seemed to run mad at the sight of such immense masses of virgin silver, and for a time it seemed as if silver was about to lose its value. In the midst of the excitement, a royal ordinance appeared, declaring Arazuma a "creation of silver," (*creador de plata*;) and appropriating it to the king's use. This put a stop to private enterprise; and, after the Indian war set in, Arazuma became almost a forgotten locality, and in a generation or two afterward, the accounts of its mineral riches began to be discredited.

We have the following record in evidence of the masses of silver extracted at Arazuma. Don Domingo Asmendi *paid duties on a piece of virgin silver which weighed 275 pounds*: The king's attorney (*fiscal*) brought suit for the duties on *several other pieces, which together weighed 4033 pounds*. Also for the recovery, as a curiosity, and therefore the property of the king, of *a certain piece of silver of the weight of 2700 pounds*. This is probably the largest piece of silver ever found in the world, and yet it was discovered only a few miles distant from the contemplated track of our Pacific Railroad.

I might continue enumerating the instances of mineral wealth brought to light in these two States, Sonora and Chihuahua, if I supposed it would be interesting to my readers; but as they have heard enough of silver, I may add that rich deposits of gold were found at Mulatto, in 1806, and a still greater discovery of gold was made a few years ago. In this latter discovery the poor diggers suffered so much from thirst that a dollar was readily paid for a single bucket of water, and at length, by reason of the drought, this rich *placer* had to be abandoned.

Such is Sonora, a region of country which combines the rare attractions of the richest silver mines in the world, lying in the midst of the finest agricultural districts, and where the climate is as attractive as its mineral riches. But its richest mineral district is near its northern frontier, and is almost inaccessible, and can never be advantageously worked without an abundant supply of mineral coal for smelting; nor can any of its mines or estates be successfully worked without greater security for life and property than at present exists. The capitalists of Mexico will not invest their means in developing the resources of Sonora, and in consequence, the finest country in the world is fast receding to a state of nature. I found in the Palace at Mexico a copy of the last report of the Governor of Sonora upon the state of his Department, in which he mentions, among many other causes of its deca-

* Ward.

dence during the last few years, the extensive emigration of its laboring population to California.

Extravagant as are these statements of the mineral riches of Sonora, they probably do not come up to the reality, as the largest of them are founded on the sums reported for taxation at the distant city of Mexico, when it was notorious, as already stated, that a large portion of the silver was fraudulently concealed in order to avoid the taxes. Such concealment could be successfully carried on in a region so distant and inaccessible as Sonora was in the time of Philip V., for it was in the reign of that idiot king, before the liberal mining-ordinances of Carlos III., that the Sonora mining-fever broke out.

A hundred years have passed since the once formidable Apaches swept over northern Sonora like a deluge, blotting out forever the hopes which the Spanish court had conceived of retrieving the fallen finances of their empire from this *El Dorado*. But Providence had ordered it otherwise. The Spaniards had done enough to demonstrate its inexhaustible wealth, and then they were driven away from this "creation of silver," and the whole deposit held for a hundred years in reserve for the uses of another race, who were destined to overrun the continent.

The territory of the State of Sonora lacks nothing but security [from incursions of Indians,] in order that the hand of man may be profusely recompensed for his labor. Virgin soils, where the agricultural fruits of all climates not only flourish, but many of these improve in quality; navigable rivers, which contribute in part to the easy transportation of the products to the ports of the Pacific for exportation and consumption; mines and *placers* of precious metals, in many of which there is no necessity of capital to explore and collect them—are not these stimulants enough to attract there a population thrifty and civilized? In order to ascertain the mineral riches which the nation may lose in a short time, we call attention to the mineral statistics which follow, although they are imperfect and diminutive.

"As already we have said, the whole of Sonora is mineral; but as among us we only give this name to those places in which there have been discovered and worked a conjunction of veins, it results that the places in this state to which for this cause has been given the name of mineral are thirty-four. Some of the mines are *amparadas* [viz., worked sufficient to confer a legal title to the occupant], and are imperfectly in a state of operation. The names of all of these two classes, which are sixteen in all, are Hermosillo, San Javier, Subiate, Vayoreca, Alamas, Babicanara, Batuco, La Alameda, Rio Chico, El Aguaja, Aigame, El Luaque, Saguaripa, La Trinidad, San Antonio, and El Zoni.

"The remaining eighteen are found abandoned, some for the want of water, and others for the want of laborers or capital, and by the fear which the barbarous Indians inspire. The names of these last minerals are San Juan de Sonora, that of the Sierra at the north-west of Guaymas, Arizuma, Bacauchi, Antunes, San Jose de Gracia, El Gavilan, San Ildefonso de la Cieneguilla, San Francisco el Calou, Santa Rosa, San Antonio de la Huenta, Vadoseco Sobia, Mulatos, Basura, Alamo-Muerto, and San Perfecto.

"In the same state have been discovered twenty-one *placers*; of these, one

is of virgin silver, in grains and plates (*planchas*), and twenty of pure gold, in grains and dust; but as nearly all these are situated in the mineral districts (*minerales*) already mentioned, the names of those which are not given, are the following: Agua Caliente, Quitovac, Las Palomas, La Canaca, and Totahiqui. With the exception of three, to which gold-hunters from time to time resort to relieve their necessities, all the others remain abandoned.

"There was only one mineral district actually in work at the close of the last century and the beginning of the present: those now actually in process of being worked are fourteen, and their names are La Grande, La Quintera, El Subiate, Bulbaucda Europita, Vayoreca, La Cotera, Santo Domingo, Noercheran, La Sibertao, Minas-Nuevas, El Tajo, Minas Prietas, and another near La Grande.

"From the mineral districts (*minerales*) abandoned, there ought to be inferred an increased number of mines, which are in the same condition, but we do not know their names, and we have only notices of the twenty following: Pimas, La Tarasca, Ubalama, Ojito de San Roman, Yaquis, La Guerita, Noguila, Las Animas, Afuerenos, Piedras-verdes Navares, La Calera, Caugrejos, Guillarmena, San Atilano, San Teodoro, and El Gavilau. In those in Pinas, and in one of those of the *mineral* of San Jose de Gracia, have been found considerable amounts of pure silver deposited in their veins, and mineral taken from San Teodora has produced one half silver. In extracting the silver from the ore in this place, we ought to mention that the greater part of these mines are susceptible of great *bonanzas*, from not having been worked extensively, as their proprietors abandoned them when the metals failed to appear upon the surface, and when the exploration was a little more costly.

"There are eleven haciendas in the State of Sonora for purifying the metals which the mines and *placers* produce, without taking into the account many little establishments, with from two to five horse-mills, with one bad furnace for the fusion of metals. Three of these are situated in Alamas, five in Aduana, one in Promontorio, another in Tatagiosa, and the last in Minas Nuevas (New Mines.) There are many abandoned mines, as the rubbish and ruins indicate, which we have noticed, in all the abandoned mineral districts.

"Attention having been much called to the ley and weight of the grains of pure gold found on the surface in Quitovac, Cienequilla, and San Francisco, as well as those masses of virgin silver found in Arizuma, which wonderful riches stimulated the colonial government to despoil the proprietors of it, and afterward the King of Spain, in declaring that it pertained to his royal patrimony.

"All those places in Sonora which are actually abandoned, as well as all the lands of that State, are susceptible of producing great riches. The reasons on which these assertions are founded are those which M. Saint Clair Dupont mentions in speaking of the probable variation there will be in value of gold and silver in time, by reason of the great extractions hereafter of these metals, particularly in California [this was before the annexation of California] and Sonora, where, as in the Ural Mountains, and the Altai Mountains of Central Asia, gold is extremely abundant, and because in the *placers* mentioned ex-

plorers have recognized gold in dust, which they have not washed for want of water in some, and from the difficulty that exists in others in order to work them, such as those of Arizuma and La Papagueria.

“ Various are the causes on account of which the riches which lie buried through all parts of the immense territory of the State of Sonora have not been explored. Some of these reasons have already been referred to, but, for greater clearness, we take this opportunity to recapitulate them all. The first, which are much noted, are the following :

“ 1st. The absolute want of personal security.

“ 2d. The scarcity of population, and of the means of subsistence for the few hands that they were able to have devoted to working mines in the immediate vicinity of hostile Indians.

“ 3rd. The irregularity and the want of experience and capital in those who have undertaken the exploration and the extraction of metals, which has occasioned the abandonment of this class of speculations whenever they presented any difficulties, or commenced to be more costly by failing to produce metals upon the surface of the earth. Some certain speculations which have been been directed with regard to the rules which regulate mineral industry, and have been prosecuted with capital, have well compensated the labors and efforts of the proprietors.

“ Gold and silver, as above said, are not the only mineral productions of Sonora. In the part of Muchachos situated in the Sierra Madre, between Tucson and Tubac, and in Mogollon, a place situated in the mountains of Apuchuria, in those of Papagueria, and near the Colorado are found great masses of virgin iron, and abundant veins of the same metal. Cinnabar was discovered in 1802 in the hill of Santa Teresa, situated in the *mineral* of Rio Chico; and in the hills which are at the north of the Colorado, it has been found in the past age. Copper is also found in Antunes, Tonuco, Bacauchi, Pozo de Crisante, Sierra de Guadalupe, Sierra de la Papagueria, and particularly in the Couanea, from whence have been extracted great quantities of this metal, with a great ley of gold. Metals of lead (*metales plomosos*) abound in Agua Caliente, Alamo-Muerto, La Papagueria, Arispe, and La Cieneguilla. From these two last points have been taken considerable quantities of them, for supplying all other mines of the State [to aid in fusion], and for munitions of war. Copperas, or sulphate of iron, is abundant in San Javier, San Antonio de la Huerta, and Agua Caliente. In the first of these placers a vein runs from south to north, from pieces of which, dissolved in water, there results a tint which, by evaporation, forms into grains, and produces the same effect as the tint of China. In Cucurpe is *amianto*, or incombustible crystal, which the ancients so much valued. Marbles of various classes and colors, as well as alabasters and jaspers, are found in Opasura, Hermosillo, Ures, La Campana, and other points; but we do not know as yet the place from which the Aztecs obtained the beautiful reddish marble which they used in the construction of their divinity of Chapultepec, which is preserved in the National Museum, and which, according to all conjectures and probabilities, proceeded from the quarries of marble of that State. There are quarries of the stone of chrispa,

and even the magnet in Alamas, Hermosillo, in Sierras of the frontier, and in the causada of Barbitas, ten leagues distant from Hermosillo, near the route of La Cieneguilla. Muriate and carbonate of soda, saltpetre, or nitrate of potassa, are found in the margin of the rivers which empty into the Gulf of Cortez [of California], and particularly in the mouths of the Colorado." *Wilson's Mexico*, page 383.

The testimony and opinions of these standard authors, Ward and Wilson, are confirmed by the following extracts from the journals of the day :

DISCOVERY OF SILVER IN SONORA, MEXICO.—El Vox de Sonora, published at Ures, in its issue of July 13, says :

"The fabled riches of the Arizona are familiar to all. Those mountains of silver which, according to the traditions of our grandfathers, were explored in the eighteenth century with so much success, have been re-produced in the pueblo of Banamichi, where the work of mining is now extensively carried on.

The mine known as the "Oro of Don Jacinto Padilla," contains the two precious metals which serve for the purpose of commerce. It presents a vein which is called by miners *sin respaldo*, (without a back,) for the purpose of denoting the abundance of the metals; and, by the last accounts we have, we learn that there has been put into one lot of three *cargas*, two flasks of quicksilver, without all the silver being taken up. It is calculated there is a thousand dollars of silver in a bulk of three *cargas* of the first class of metal and of the second and third class, it is said that, in the former, there is about twenty *marcos* (a marco is eight ounces,) and in the latter from twelve to fourteen, besides the gold, which is separated. It is calculated that there are forty dollars of gold in each *bulto* of three *cargas* of the first class of metal, and from twenty-five to thirty dollars in the others. The mine is very convenient and easy to work, especially as it is situated in the immediate vicinity of the *pueblo*. The mountain in which this mine is situated is celebrated in tradition, and presents many appearances which promise the greatest hopes; but unfortunately, the spirit of enterprise in Sonora is dead, on account of the lack of security from the barbarous Indians. We believe, however, that we will stimulate it by the news which we have given. We ourselves believed it was fabulous when it was first circulated.

The following is an extract from the Los Angeles Star. The information was derived from Lieut. Washburn, who has been for three years at the head of a United States Surveying party in this region :

The route of Mr. Washburn's party lay along the banks of the Gila, up which they traveled. There they found the vegetation generally scarce, although the soil seemed very rich, and the river afforded every facility for irrigation. There was an abundance of mezquit and cotton wood timber along the river bottoms, which were very extensive. Having proceeded about

200 miles up the Gila, they arrived at the Maracopa and Pimo villages. These Indians live chiefly by agriculture. They raise corn, wheat and barley; melons and squashes; raise cotton and make cloth, and have horses. They are peaceable, industrious, and well behaved, and give every indication of being a happy people. They treated the party with the utmost kindness and hospitality.

Leaving the Gila about nine miles above the Pimo villages, the aspect of the country becomes changed, hills are more frequent, the country being well adapted for grazing purposes. From the Gila to Tucson the distance is eighty miles. This is an open country with plenty of water at this season of the year. Grass is found in many places; the soil fertile in appearance; but there is no facility for irrigation. The Valley of Tucson is quite extensive, being 20 or 25 miles broad from mountain to mountain, and about 30 miles long. It is watered by a creek which at places sinks and appears again further down; after running a course of about ten miles, the water sinks about a mile below the town. The soil is generally of a fertile description, although the alkali is found in places; it produces an excellent grass, four or five feet high; and where cultivated, yields two crops of wheat or barley, and one of corn. Figs, peaches, grapes, quinces, &c., are found here, but for want of attention they do not reach perfection.

The town of Tucson contains 500 or 600 inhabitants, mostly Sonorians. They are in continual dread of the Apaches, and will hardly dare to venture a mile out of town. Several Americans had come there; traders, miners, mechanics and adventurers, in expectation of U. S. troops being sent there. But they were generally dissatisfied with the country, and some were leaving, having given up hopes of the arrival of troops. There was considerable talk among the inhabitants, of the mineral wealth of the country, but no one dares to prospect. A grist mill has been erected on the creek about a mile from town, which is doing a good business. The houses are built of adobes. About thirty miles from the town, in the mountains, there is said to be an abundance of pine timber, with water at hand, and numerous eligible locations for saw mills. But whatever advantages this country may possess, will remain undeveloped until troops are sent there to keep the Indians in check, and afford protection to prospecting parties. A large amount of money was paid for this territory, and it seems only reasonable that protection should be afforded our citizens who go there for the purpose of legitimate trade. Let that once be afforded, and in a very short time it will be ascertained what the Gadsden purchase does contain.

The Mission San Xavier is nine miles south-west of Tucson. A number of rancheros reside here, who are possessed of some stock, and raise the usual grains—corn, wheat and barley. This is a continuation of Tucson Valley, and is capable of producing abundant crops. When under the direction of the Jesuits it produced annually an average of 10,000 fanegas of wheat, (25,000 bushels.) The stream sinks here, but soon rises again, affording facilities for irrigation. The Mission buildings are in good order, and much larger than such structures usually are. They cost the Spanish government

\$33,300 $37\frac{1}{2}$, all of which was refunded by the Indians. They are of the usual form. The original paintings, engravings and carvings are in good condition.

A ride of thirty-one miles over a deserted country brings us to the Sopori Ranch, (Douglass') which for grazing purposes, cannot be excelled anywhere. It is said the title to this ranch is spurious. Although not cultivated, this country is all arable, with occasional valleys capable of producing luxuriant crops. On the border of this ranch the four men were killed, of whom we formerly gave an account.

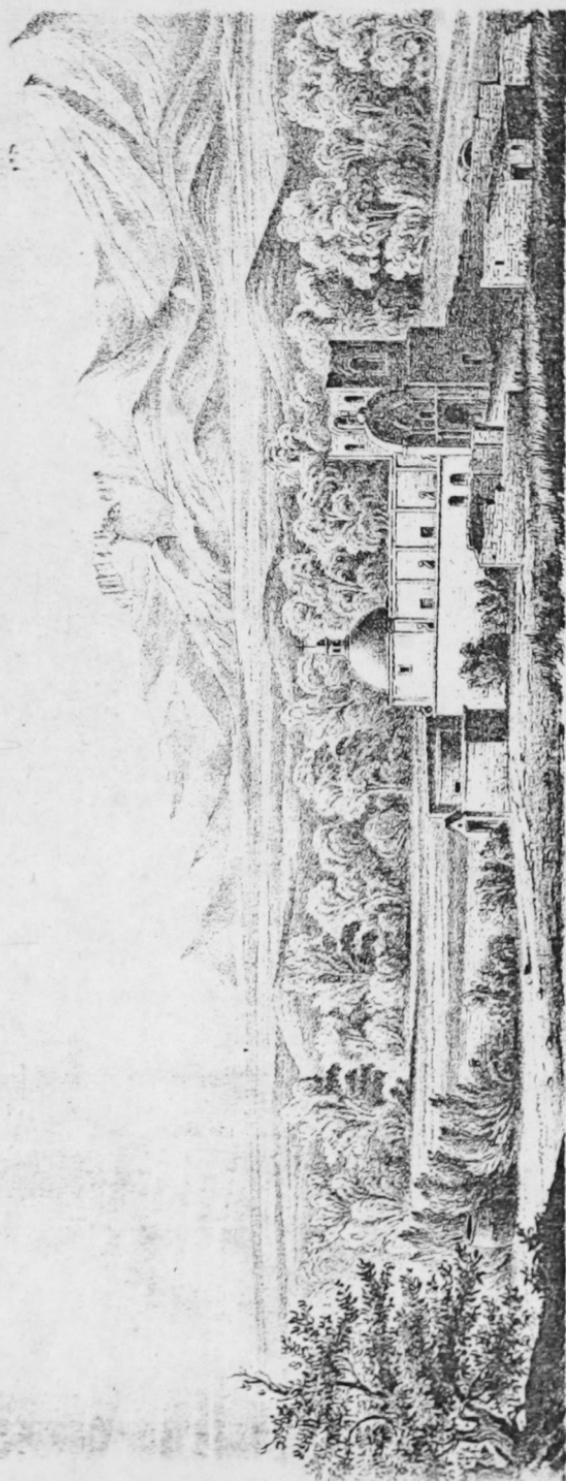
Fifteen miles further on, is the Arivaca Ranch, deserted,—title said to be good. There can be no better stock ranch than this.

Leaving Arivaca, we cross the line of the Gadsden purchase at some fifteen or twenty miles, from which the Bossena Ranch is about fifteen miles. This ranch is deserted, the old adobe walls standing. The country presents a more broken and hilly appearance here than at the former ranch, but none the less valuable for stock or agricultural purposes. Near this ranch large pieces of silver have been found on the surface of the ground, one of which was valued at \$500 or \$700.

The next extract we shall present, is taken from a paper on the geological observations on the Pluto-Volcanic slope of the Sierra Madre along the Azimuth boundary line through North-western Sonora, made under the direction, and communicated with the permission, of the United States Commissioner, Major W. B. Emory, by Arthur Schott, Washington, D. C., and read before the American Scientific Association at its meeting in Albany, in 1856 :

In the physiography of the country, the Sierra del Ajo, forming the north-eastern corner of the Cienaga di Sonoyta, seems to be a remarkable monument, establishing the real boundary between the coast and the interior. It is also in the north-western portion of the same where rich argentiferous and auriferous copper ore abounds, containing, as it is said, sufficient gold and silver to defray the expenses of mining and assaying. These ores were discovered some years ago, and are worked now by a California mining association, called the "Arizona Company." This same company, besides exploring the stretch from here direct to the Gila river, first opened also, with considerable expense and labor, a road through the mountain passes, and provided by means of artificial tanks, for the preservation of rain water, which annually falls upon these regions.

After this, it is scarcely worth while to refer you to an article in the "American Mining Chronicle," New York, Nov. 15th, 1856, on Mining as an investment, in which the writer, in instituting a comparison between it and other investments, says :



Mission of Tumaccacari

RUINS OF THE MISSION OF TUMACCACARI,
destroyed by Apache Indians.

"It appears from these records that on the total amount of capital invested in British mines, taking good, bad, and indifferent, all together, an average annual dividend of $12\frac{1}{2}$ per cent. is regularly paid; the original paid in capital invested in the 350 mines enumerated amounting, all told, to but \$17,795,080. Comparing this state of things with that which exists in other favorite investments in that country, we find that the \$2,000,000,000 invested in railroads, returns only an annual average of about 2 per cent. in dividends; and that the \$165,000,000 devoted to other enterprises, such as canals, bridges, water works, gas, docks, land, and other companies, can only show an average of $4\frac{3}{4}$ per cent. It is shown, moreover, on making an average of ninety-four of the English mines, that after paying back the original capital three times over, they are making current dividends to the amount of $35\frac{3}{4}$ per cent. on the original outlay. Pick out an equal number of the very best of all other enterprises put together, and they can not show any thing like the same results. But let us go on to the figures:

"107 copper mines are enumerated; 26 of which are dividend paying; 74 selling ores, but non-dividend paying; and 7 not selling any ores. The money expended in developing these mines has been

Dividend Mines.....	\$1,086,235
Non-dividend.....	4,026,235
Mines not selling ores.....	277,990
	<hr/>
Total expenditures.....	\$5,390,460

The total amount of dividends received up to this time from the 26 paying mines is \$11,472,390, being 1056 per cent. on the capital invested in them, or 213 per cent. on all the capital invested in the whole 107 mines. The annual dividends now being regularly paid by the 26 amount to \$1,456,410, being 134 per cent. for each of them, or 27 per cent. on all the capital invested in all the mines, good and bad alike."

Relying upon these proofs of the riches of this region and upon the personal knowledge and observation of members of the company, a party of explorers were sent out, fully armed and equipped and ready for any emergency, whether the hunting a deer or a deadly fight with the marauding Indians, under the guidance of a gentleman who had already spent considerable time in the territory and associated with gentlemen of eminent scientific knowledge and skill, with instructions to proceed to the Purchase and discover and occupy the richest of these old silver mines, in all instances giving preference to silver over gold and to fix the permanent location and buildings of the company as near the navigable waters of the Colorado as should be consistent with the possession of the best and most profitable

mines. The following extracts from the journal of the party will illustrate how well and faithfully these instructions have been carried out.

[*Extracts from report of CHARLES D. POSTON, of the journey of the Exploring party from El Paso to Tubac.*]

After waiting several days Dr. Stake started with me from Fort Thorn for the purpose of visiting the Apaches, under his charge on the Mimbres, and at the Copper mines. We were anxious to visit the Copper mines and to get the Doctor's favorable introduction to the Indians under his charge, but the principal object of the visit was, to find some Indians who had brought the Doctor two large pieces of pure silver taken from a mine in the Chirichihui (Chillacowa) Mountains and to get them to show us the mine. The Indians were unfortunately absent gathering acorns and we had to postpone the expedition until the Doctor comes over to Tucson sometime this Fall. The history of this mine is similar to thousands—the Spaniards working it were all killed and the Indians are yet living who killed them, and can show the mine.

You may well imagine that after a rapid ride of sixty miles, without stopping we were delighted to come in view of the green fringed Mimbres. Our camp had been moved here some days previously and we found it surrounded by a great many Indians the principal men of the nation, as our men had told them their "White Father" would come out. They treated the Doctor with the utmost respect and affection and he seems to have great control over them—they even call upon him to settle their private difficulties. He has induced them to cultivate 200 acres in corn on the Mimbres, and the present crop promises well.

After resting a day and drinking of and bathing in the delicious waters of the Mimbres we prepared for our visit to the Copper mines. The camp was ordered on to Ojo de Vaca and taking Mr. Brunckow and a few men with the Doctor and a large Indian escort we set out for the celebrated Copper mines. Mr. Brunckow thinks the copper ore here will yield an average

of about 50 per cent and is entirely inexhaustible. He followed the vein about eight miles northward and found no indications of its going under. He also found a vein of silver to the East running parallel with the copper and perhaps mixed with it. There is also lead and iron in abundance, probably enough iron to build a Railroad from the Rio Grande to the Colorado. The gold washings here are well known and in the rainy season are worked in a primitive way with considerable success. It was the rule under the management of McKnight here to allow the hands Saturdays for the purpose. The stores were always open on Sunday and of course the money was all taken in.

The old triangular Fort built here by the Spaniards has been repaired and is now in a pretty good state of preservation, so that we had good quarters and a safe court-yard for our animals. In the evening before our departure, the Doctor killed a fine fat deer, and the Indians lent a willing hand to build a blazing fire and here in this old deserted Fort we had a "big eat" and feasted where the brave old Spaniards feasted a hundred years ago.

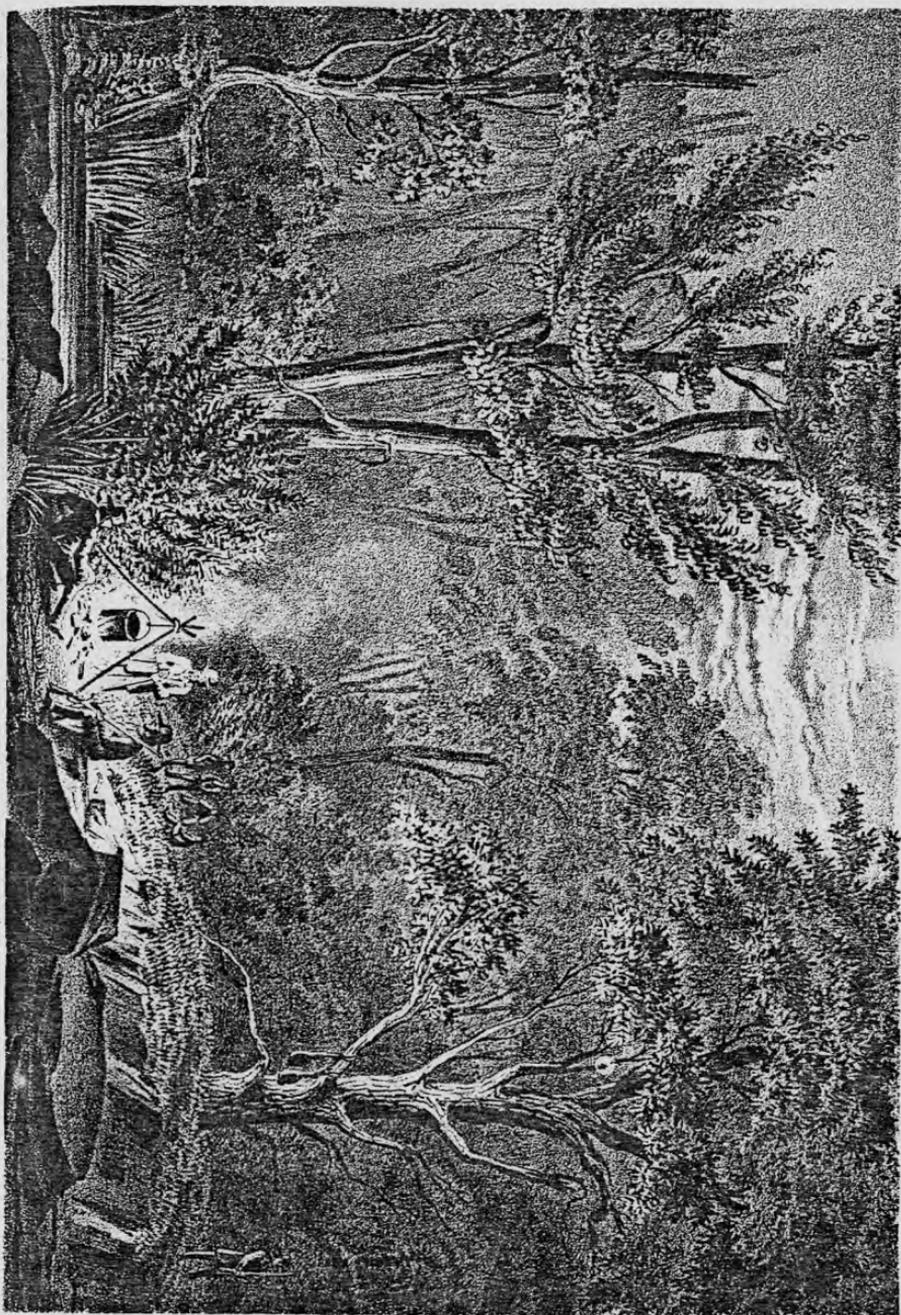
The land on which this inestimable combination of mineral wealth is situated has been obtained from the Mexican government many years ago by parties in Chihuahua, by a grant containing three leagues. As the Indians we particularly wanted to see were absent, our excellent friend, the Doctor, parted from us here and returned to Fort Thorn. Upon arriving at Ojo de Vaca the camp was found in perfect order and as our animals had recruited considerably on the pure water and excellent grass at these camps, every arrangement was made to leave the next morning on our journey. The company was divided into two messes, one to each wagon, each mess to stand alternate guard, the relief coming on at sunrise every morning and directions given for no man to leave the wagons 300 yards in daytime except detailed for hunting or other service.

On the second night from here when camped near a dry arroya, it being my first guard, a string of about a dozen camp fires were descried in the mountains to the south supposed to be the

Emigrants who had all gone by the Guadalupe Pass. Directly it commenced raining and such a rain it has never been my fortune to stand in, either in tropical climates or in California. The dry arroya soon filled to its banks and ran like a mill race, the ground was white with water. I had lately been reading a ridiculous article read by Dr. Antisell, (Park's Geologist) before the Academy of Sciences, on the rain-fall in this country and I heartily wished the gentleman in my place on guard, to get some practical ideas on the subject.

In the morning the sun shone bright, the sheets of water had disappeared and the Arroya was dry. The rain had "gone under" and in two hours our blankets &c. had dried and we moved on. We had not the same facilities for measuring rain-falls, as the learned Professor but we know that there was six inches of rain water in our camp kettle. It seems he takes the rain falls at Fort Yuma and Fort Fillmore as criteria for the intervening country. Now as you are aware that the country between these two places is intersected by five or six different ranges of mountains and as many valleys producing abundant vegetation, it seems to me unfair and ridiculous to take the rain falls of these isolated spots, where in fact it seldom rains, as a criterion for the intervening country intersected by valleys and mountains.

In two days more we came to the eastern slope of the dividing ridge of the Continent, the spur of the Sierra Madre which we ascended without difficulty and passing "La Puerta" were actually trundling down the western slope without lock or brace without knowing that we had actually passed the dividing ridge of the Continent and were now approaching the waters of the Pacific, the Rio Santo Domingo glittering in the sunlight relieved by its beautiful green border of willows and broad pastures. I am no Jehu but would have no hesitation in undertaking to drive a coach and four through "La Puerta" at a full gallop. The view opened on the Valley de Sauz and in the distance the white metallic looking grand range of the Chirichihui Mountains. "La Puerta" the door is well named, it was the spontaneous



CAMP VIEW NEAR TUBAC SONORA

April 1854.

exclamation of Gray's arriero and seems like a last flickering burst of enthusiasm from the brave old Spanish explorers dying out in the degenerate veins of a muliteer. If our mining enterprise succeeds I will subscribe \$1000 towards having an arch thrown over "La Puerta" and a statue of Col. Gray erected upon the dividing ridge of the Continent pointing the way to Europe and Asia, so that succeeding ages shall pass under his feet and do homage to his genius, his talents and his indomitable energy.

As we passed down the western slope, a single Indian came careering across the plain from the opposite side, mounted on a splendid black horse with silver mounted saddle and bridle, the spoil of some Mexican foray. He approached the wagons with great trepidation, continually calling out his great friendship for the Americans. We allowed him to approach without molestation and after a short interview he departed towards "La Puerta." Some of our men wanted to dismount him for the benefit of his fine horse and rigging and arms, but I told them it wouldn't do.

We had scarcely unharnessed by the cool refreshing waters of the Rio Santo Domingo, when our rear guard discovered a band of Apaches coming down upon us at a furious rate. Every animal was securely tied and our men fully prepared for a fight by the time they came in fifty yards. When they came in about that distance we called to them in Spanish to stop, or we would fire, and our rifles brought to the horizontal seemed to convince them we were in earnest. The chief and two men were allowed to come near camp for a parley. He said they were Coyotero Apaches and were just returning from a foray into Mexico and wanted to come into our camp and trade, that they had for traffic captives male and female, mules, horses, aguadiente, mescal &c. &c., and wanted to buy manta, (cotton cloth) ammunition, tobacco and some bread. We told them we had nothing to sell and did not want to buy, and that we could not admit them into camp. They seemed quite indignant at this and commenced putting on airs, when the conference was closed and they were told if they ap-

proached one vara nearer our camp, the fight would open. They retired and held a long consultation and after reconnoitering us at all points seeing but little chance for a successful attack they sulkily retired the way they came. They wanted to pass by our camp to the North and said it was their country and their road, one of the young braves made a dash at the road to pass ahead of us, but as I was standing on the hind wheel I soon covered him with my rifle and he abandoned the idea and retired with the elder and more sensible members of the party. I counted thirty three Indians and saw besides a great many in the distance concealed behind bushes, and have no doubt the whole party numbered from fifty to a hundred, in charge of captives, and all. The rascal who first came to us must have been a spy and I almost regretted preventing the boys lifting him out of the saddle.

This Valley de Sauz is the great *War-path* of the Apaches into Sonora and Chihuahua. After a short stay here we moved on to get a secure camp before dark, and the guard is now doubled to Tucson. The next day we commenced ascending the Eastern slope of the Chirichihui mountains, by the pass of Puerta del Dado, and found it a very laborious undertaking, occupying the whole day to accomplish the ascent and succeeding with much difficulty. In the pass of these mountains are pure sweet cool springs of water called by emigrants the Apache Springs, but on Park's map, either from ignorance or inattention, but few localities are named. It is impossible in my opinion for a railroad to be constructed through this pass; it is extremely difficult for wagons, and then what is the use of locating a road through this pass when there is one only a few miles south presenting no obstructions and leading into rich valleys of excellent pasturage and good land. If Gray had crossed with wagons so as to leave the wheel tracks, his route would be universally followed, but crossing with pack mules emigrants are uncertain about finding the trail.

After leaving Gray's road we had nothing but trouble and suffering. The next bad place is Soda lake—this was now full of water, say from two to four feet deep—unfit for use, offensive

and unwholesome. We had this to cross—and striking in a little after sunrise came out late in the evening on the Western side—animals and men all worn out. The distance travelled only 12 or 15 miles. The lake is now at least 150 miles in circumference and would undoubtedly yield much soda, but is rather unpleasant to wade through all day. We had now lost the road and it took another day to find it—animals and men having had no water for two days except what we brought from Apache springs.

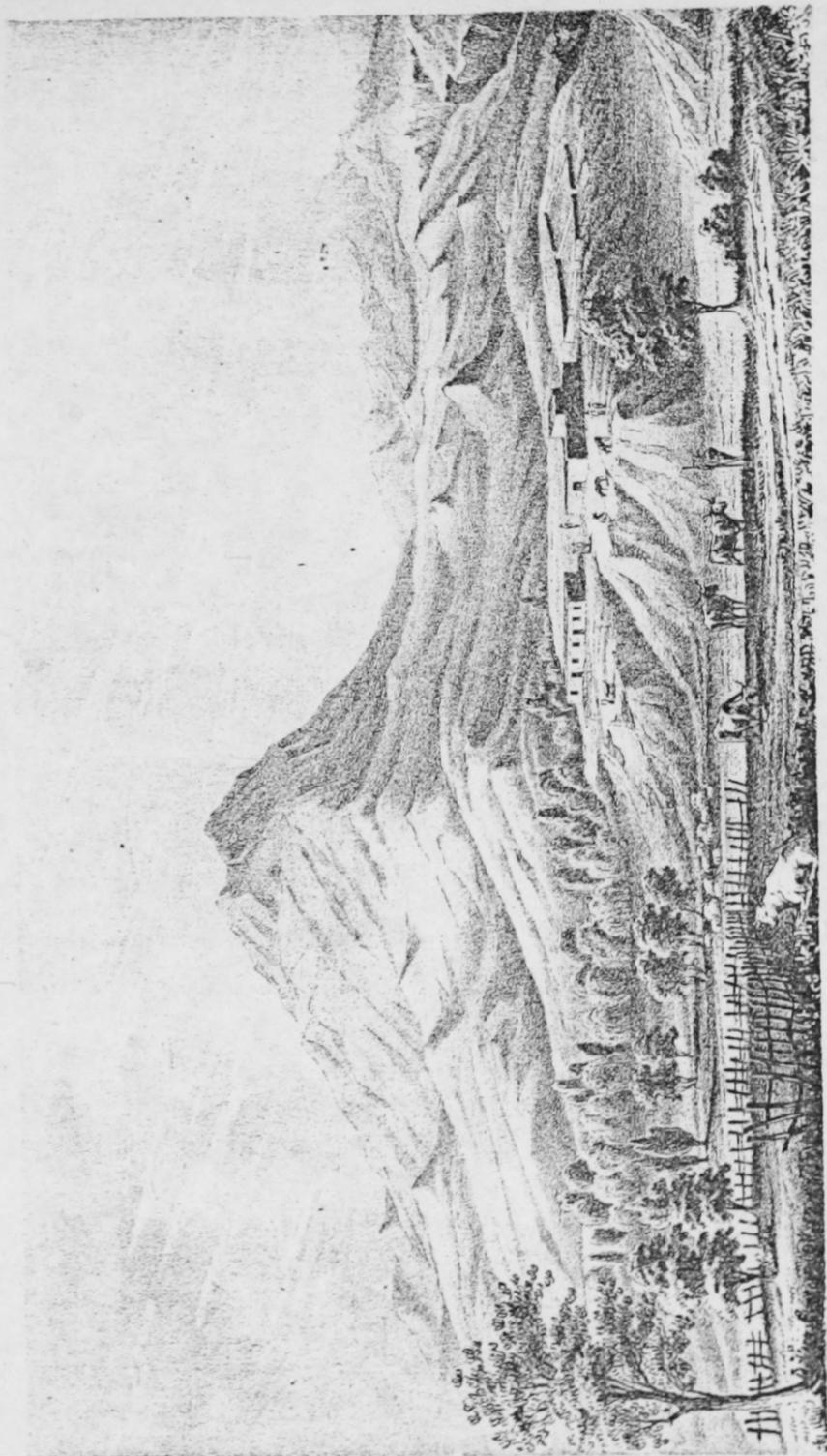
The next day by hard driving we reached the San Pedro—it had lately overflowed and the banks for nearly half a mile were a perfect bog. It required a day to find a crossing place and prepare for ferrying every thing across as the river was not fordable. Taking off our best wagon bed and putting botas and kegs at the corners and sides, a temporary boat was constructed. All of our things had to be packed across the bog and ferried over in this manner which consumed the whole day. We barely got across in time to lay down on the wet, marshy bank of the western side in a drizzling rain and tormented by millions of mosquitoes, the river rising and in continual expectation of having to attempt a night drive. In the morning we attempted a start when it was found utterly impossible to pull through the slough and the loads had to be taken out and carried on backs to dry ground. We lost fully three days at the San Pedro which is more than we shall ever lose at that fording place again. The country is sandy, barren and destitute of timber. The river banks have not a shrub growing upon them and you come right upon the deep, swift, muddy, little stream without being aware of your approach.

The next day I determined to make a push for Tucson and accordingly started very early in hopes of getting in by a swift ride before the heat of the day, but we were again turned aside by water and had a long, hot, exhausting ride. In the evening we reached the old mission of San Xavier del Bac, a grand old structure which from its elegant masonry and tasteful ornaments, must have been erected in times of great prosperity. It has

been occupied for the last eight years by a very intelligent old Mexican and a numerous squad of Mexican and Indian dependents—so there is no chance for quarters. In the evening Burch and myself went on to Tucson, about seven or eight miles, where we found quite a population—some 3 or 400 Mexicans and about thirty Americans, two American stores, one flouring mill, &c., &c. The houses are all of Adobes, and generally damp and unhealthy. The water is all strongly impregnated with alkalies and exceedingly disagreeable. There is a very small quantity of arable land on the river, and north, east and west it is a perfect desert. Tucson was under the Mexican government, a northern Presidio, to prevent incursions of Indians. It will be little more under American government and never a place of importance. The American population have been for about twelve months principally engaged in “waiting for the troops” as nothing could be done previously. Some of them had amused themselves lately by recapturing “calvallados” from Apaches who had taken them from Mexicans, and mules and horses were plentiful.

The only population in the territory is at Tucson. The vote at the election, which was held 1st September, was 66, and now having given them legal officers and a copy of the statutes, “law and order prevails in Tucson.” It is really the most orderly, quiet, civil community that I have seen and they seem determined to keep it so.

The San Bernardino, San Pedro, Calabazas, Babacomeri, Arivaca and the old mining town of Tubac, have been entirely abandoned on account of Apaches. The only settlements are the Arizona and Gadsona copper mines, (marked on Ehrenberg’s map, Ajo and Pajaro), three Germans at the old mission Tumucari, (three out of five.) The old town of Tubac was formerly occupied by a numerous and thrifty population engaged in agriculture and mining. It is the very centre of the mineral region in our territory and has probably 150 silver mines within 15 miles. Many of them were worked by the Spaniards and Mexicans in a primitive manner but not opened to any extent



Published by the U.S. Government, B.

CALABAZA,

SANTA CRUZ VALLEY, SONORA.

Included within the limits of the Gadsden Treaty.

because they had no sufficient machinery or mining tools, and it is not to be supposed that in this remote province the greatest amount of intelligence prevailed, as the most scientific miners were retained in the mines of Mexico, nearer navigation and under the protection of government.

Under the Mexican rule a garrison was kept at Tubac for the protection of the inhabitants but only of sufficient force to enable them to work their fields, the mines have not been worked for fifty years. When the Mexican troops were withdrawn, the inhabitants were compelled to abandon their houses and fields on account of the Apaches, and have gone to California, Mexico, Tucson and many have died and been killed. At Tubac there is pure, mountain water, wood, grass and plenty of game. The barracks occupied by the Mexican government are in a good state of preservation, sufficiently capacious and every way suited to the necessities of our company, so that I immediately determined upon taking possession of them and making "*Tubac*" our permanent head-quarters. There will be no difficulty about holding possession and securing a perfect title—they are entirely inadequate for our troops especially dragoons, they will have to build quarters on a much larger scale.

Under the circumstances I hope the company will approve this location as no better can be made and finding quarters all ready, relieves us of a great deal of labor and expense, and gives us immediate opportunity for exploring and commencing actual operations in mining and raising our own provisions.

[*Extracts from MR. EHRENBURG'S Letters.*]

Mr. Ehrenburg, the Topographical Engineer and Surveyor of the Company, who spent some three years in exploring and making acquaintance in Sonora, in a letter dated Tucson, 30 August, gives the following interesting account of the country.

Tubac, (see map,) an old Mexican Presidio, was abandoned by its Mexican garrison after the transfer of the territory. All the inhabitants fled, we have taken possession of the Mexican government buildings for the head-quarters of our exploring com-

pany. Many of the former inhabitants will now return and cultivate their fields and gardens. This place is finely situated, enjoys a delicious climate, wholesome water, good agricultural lands and a fine extensive cattle range; game is plenty and the surrounding mountains are traversed by mineral veins, several of which have been worked in remote times and were only abandoned on account of continued revolutions in Mexico or the rising of the Apache Indians. They have great fame, and I consider the reports no idle stories; moreover as the geological formations show unmistakable signs, not only of many, but also of rich and *regular* veins of metal. My experience warrants me in stating as much.

Tubac is for this section what Altar is for the coast range, the great mining centre of the surrounding country on account of location and facilities.

Our first aim shall be to secure by purchase the Arivaca Rancho, which is some 12 miles from Tubac; it is one of the finest places in the Purchase with splendid grass and abundance of water. I am told that on it and the adjoining hills, there is room and food for 50 or 60,000 head of cattle at least. But of its real value Lieut. Michler of the Boundary Commission will be able to give a better account than myself as also of some of the mines. It is held under an old Spanish title, (not Mexican). I have made it my particular business within the last year to ferret out all the circumstances connected with it and come to the conclusion that it is one of the few good titles in this section.

Within the limits of the Rancho there are known already some 20 silver mines; also a "Promontorio" of gold-bearing quartz; and undoubtedly much ore is concealed beneath the surface, few persons, however, only are acquainted with the particulars, while its great mineral wealth in general, is not doubted by any one.

Around the property there are numerous mineral veins, abandoned mines, to be explored and rediscovered, and which would or could be worked in common with the Arivaca establishment. And Arivaca itself would finally become the common center and

principal point, while the property at Tubac will only be available as a branch for those mines around that place and those east of the valley.

The great advantage of making the purchase is, that we will have no direct necessity of placing hands and houses at all the different veins, which will be necessary on public lands—the next is, that beside the Arizona region there is no greater and *reputed richer mineral region* in the whole state of Sonora and the Purchase.

Mr. Ehrenburg in company with the geologist of the company, an experienced and scientific mineralogist, intended to start immediately to explore, and from them we soon expect reports. They are both scientific and practical.

In the conclusion of this hastily written sketch, the officers of the company would beg leave to say, that in all the information here given they have desired to impart to those interested such a statement of facts as should give an intelligent knowledge of the magnificent undertaking in which they are embarked. It is an enterprise which has for its object the noblest of aims and involves not merely the acquisition of wealth for its projectors but the reclamation and employment for the purposes of civilization, of the richest and wealthiest section of our territory,—a territory which shall add to our national greatness and make our country more emphatically what we now fondly boast it to be, the greatest, wealthiest and freest of the nations of the globe.

FEBRUARY 9th, 1857.

The Company are now in receipt of reports and letters from their agents at Tubac as late as Dec. 4th, 1856. The exploring party was then in possession of a number of veins of silver ore, varying in width or thickness from $2\frac{1}{2}$ to 4 feet, and situated within ten or twelve miles of Tubac, where they were erecting a muffle oven and furnaces. The ores are rich, and yield, according to tradition, 10 per cent. of pure silver. A party of Mexican miners are employed in cleaning out the old shafts and opening new veins.

Maps, plans and reports can be seen by application at the Office of the Company, in the Odd Fellows' Hall, North-west corner of Third and Walnut Streets, Cincinnati.

Possessions and Prospects of the Sonora Silber Mining Co.

REPORT

OF THE

Sonora Exploring and Mining Co.,

MADE TO

THE STOCKHOLDERS.

SEPTEMBER, 1857.

These returns, although not quite so large as you anticipated, nevertheless, exhibit Silver Ores of very great value.—*Report of Assay by Prof. Booth, U. S. Mint.*



CINCINNATI:
RAILROAD RECORD PRINT.
1857.

OFFICERS OF THE COMPANY.

CINCINNATI.

MAJOR S. P. HEINTZELMAN, U. S. A., PRESIDENT.

W. WRIGHTSON, SECRETARY.

EDGAR CONKLING, GENERAL AGENT.

GADSDEN PURCHASE.

COL. CHARLES D. POSTON, COMMANDANT AND MANAGING AGENT,
AT TUBAC.

HERMAN EHRENBURG, TOPOGRAPHICAL ENGINEER AND SURVEYOR
AT TUBAC.

FREDERICK BRUNCKOW, GEOLOGIST, MINERALOGIST AND MINING
ENGINEER, IN CHARGE OF CERRO COLORADO DISTRICT.

CHARLES SCHUCHARD, GEOLOGIST, MINERALOGIST AND MINING
ENGINEER IN CHARGE OF LA ARIBAC AND SMELTING HACIENDAS.

REPORT

OF THE

Sonora Exploring and Mining Co.

This Company was formed as a private association in March, 1856, at the instance of some gentlemen who had then spent several years in Northern Sonora and the Gadsden Purchase. The object proposed was the purchase and development of one or more of the old mining ranches, abandoned by the Mexicans in consequence of Indian difficulties and insufficient Government protection. In pursuit of this object, the Company sent Col. CHAS. D. POSTON, accompanied by a Mining Engineer of fourteen years experience in Germany, and a party of hardy frontiersmen, fully armed and equipped, to the Gadsden Purchase, with instructions to explore the deserted ranches and selecting the one which they should deem of greatest value, and most readily available, secure its purchase, and commence its development.

After several months of exploration, the Agent of the Company, on Dec. 31, 1856, concluded the purchase of the Arivaca Rancho, near Tubac, in New Mexico, and established the headquarters of the Company at the old Mining town of Tubac, on the Santa Cruz River, and near the Santa Rita Mountains, and the northern spurs of the Arizona, or Arazuma Range.

PERMANENT ORGANIZATION OF THE COMPANY.

On the acquisition of this purchase, according to the original Articles of Association, the officers of the Company proceeded to complete its final organization, under the laws of the State of Ohio, which provide for the creation and regulation of Incorporated Companies, and filed the following certificate of incorporation, on the 13th day of August, 1857.

CITY OF CINCINNATI, }
 COUNTY OF HAMILTON, } ss. *AUGUST 11th, 1857.*
 STATE OF OHIO. }

We, the undersigned, do certify that we are associated together, under the provisions of an act of the General Assembly of the State of Ohio, passed April 8, 1856, entitled an act, supplementary to the act, entitled an act to provide for the creation and regulation of Incorporated Companies in the State of Ohio, passed May 1, 1852, for the purpose of mining and smelting silver and other ores, and manufacturing bars and ingots of the same, and for such other lawful purposes as may be necessary for carrying out the above described objects; that the amount of our capital stock is Two Million Dollars, (\$2,000,000), divided into Twenty Thousand Shares, (20,000), of One Hundred Dollars (1\$100) each; that our office and principal place of business is in Cincinnati, Hamilton county, Ohio; that some part of the business is to be carried on in the portion of New Mexico, known as the Gadsden Purchase, and in other parts of North America, and that the name and style of the company is The Sonora Exploring and Mining Company.

Given under our hands and seals, the day and year first above written.

S. P. HEINTZELMAN, [SEAL.]
 W. WRIGHTSON, [SEAL.]
 JOHN KENNETT, [SEAL.]
 E. C. MIDDLETON, [SEAL.]
 SAMUEL FLICKINGER, [SEAL.]
 GEO. MENDENHALL, [SEAL.]
 JOHN R. WRIGHT, [SEAL.]

THE STATE OF OHIO, }
 HAMILTON COUNTY. } ss.

Be it remembered, that, on this twelfth day of August, 1857, before me, a Justice of the Peace, for the Township of Cincinnati, County of Hamilton, and State of Ohio, personally appeared S. P. HEINTZELMAN, W. WRIGHTSON, JOHN KENNETT, E. C. MIDDLETON, SAMUEL FLICKINGER, GEO. MENDENHALL, and JOHN R. WRIGHT, who severally acknowledged the signing and sealing of the above certificate, to be their voluntary act and deed for the uses and purposes therein mentioned.

IN TESTIMONY WHEREOF, I have hereunto set my hand and seal, at Cincinnati, on the day and year last above written.

W. CHIDSEY, [SEAL.]
 Justice of the Peace.

THE STATE OF OHIO, } ss.
HAMILTON COUNTY. }

I, Thomas Spooner, Clerk of the Court of Common Pleas, in and for said County, do hereby certify, that W. Chidsey, before whom the foregoing acknowledgement appears to have been taken, was, at the time of taking the same, and now is, an acting Justice of the Peace, in and for Hamilton County, Ohio, duly commissioned and qualified, and that his signature thereto is genuine.

Witness my hand and the seal of said Court, at Cincinnati, this twelfth day of August, A. D., 1857.

++++++
| L. S. |
++++++

THOMAS SPOONER,
Clerk of the Court of Common Pleas, Hamilton Co. O.,
By JNO. L. THOMPSON, Deputy.

SECRETARY OF STATE'S OFFICE,
Columbus, Ohio, August 13th, 1857.

I, James H. Baker, Secretary of State of the State of Ohio, do hereby certify, that the foregoing certificate of association is correctly copied from the original certificate, filed and remaining of record in this office.

Witness my official signature, and the Great Seal of the State of Ohio, at the time and place above written.

++++++
| L. S. |
++++++

JAMES H. BAKER,
Secretary of State.

The Company is therefore now incorporated under the general laws of the State of Ohio, and possesses all the rights, privileges and immunities secured by these laws.

POSSESSIONS OF THE COMPANY.

The Arivaca Rancho, or as the Mexicans call it, La Aribac, is situated fifteen miles South of West from Tubac, and contains over *Seventeen Thousand* acres of agricultural land, with permanent water, wood and grass. It contains twenty-five Silver Mines, which were worked by the Mexicans previous to the Apache War, and which were famous for their yielding rich ores of silver, lead, and copper, and containing small quantities of gold. The most famous of these mines were Mina San José, Mina Santa Margarita, Mina Basura, Mina Blanca, Mina Arenias, Mina de Los Tajitos, La Mina de Amado, and La Purissima.

The report of the Engineer gives the following description of the agricultural resources of the Arivaca Rancho.

The Arivaca has much beautiful meadow land, fine pasture on the low surrounding hills for thousands of cattle; good oak grows in the gulches, mezquite on the hills, and on the lower ends of the streams, it is thickly lined, for five or six miles, with groves of cottonwood, ash, walnut, and other useful woods, for farming and mining purposes, in sufficient quantities to answer all the demands of the two districts.

The Company have also acquired title to *twenty-four* veins of silver ore in the Santa Rita Mountains, among which are the old mines of Salero, and Ojero. Seven miles to the North-East of the Arivaca Rancho, on the Cerro Colorado, the Company have opened *twenty-nine* veins of silver ore, among which are the Heintzelman Mine, Mina Carlos, Mina Maria, Mina Cesario, Mina Puertozito, Mina Guadalupe, Mina Amarillo, and Mina Longorenia. According to the report of the agent of the Company, dated August 5, 1857, the minerals of this mountain range, consist of silver ore, gold-bearing quartz, copper, lead, iron and coal. Water power is sufficient for all the machinery that will be needed. A wagon road from Tubac to the mines can be made and put in good order for \$500. On the San Coyetano Mountains, to the South-East of Tubac, the Company have also opened two veins of silver ore.

The Company have therefore possession of *eighty mines*, and nearly *twenty thousand* acres of land. These mines and lands will furnish occupation and subsistence to five thousand laborers, for an indefinite period of time.

TITLE TO LA ARIBAC.

The Sonora Exploring and Mining Company holds its title to this important Rancho, by purchase from Tomas and Ignacio Ortez, in whose family there is a perfect chain of title as far back as 1802, when the corner-stones were placed by their father, Ignacio Ortez. In 1833, the book of records shows that



C. Schuchard del.

Mina Blanca

Mina Arenia

ARIZONA.

Mt. Baboquivari

From the north west spurs of the Arizona mountains.

Engraved by Wallace & Co. Cincinnati.

the Alcalde of Tubac ordered full possession to be delivered of said land on the 2nd of June. At that time an affidavit was also filed, signed by three competent persons, that the corner stones of said land stood where they had been placed in the year 1802, by the father of Tomas and Ignacio Ortez. The boundaries to the land are as follows :

The North corner is on a high ridge of the South side of the mine known as the Tajito on a line of the mountain known as Buena Vista.

The corner to the South is on the low hill in front of the "Longorenia" mine, close to an Arroya full of trees.

The corner to the East is a little above the spring of water, on a Mezquite tree which has on it the sign of the cross, on a line of the mountain known as the Skull Mountain.

The corner to the West is at the point of water in a small hill in front of the Mountain Babaquivari.

Final Title granted by

Jose Maria Mendoza, General Land Commissioner of the State of Sonora, with the aforesaid boundaries and all their entrances, necessaries, customs, services, timbers, mountains, pastures, waters, tenajas, watering place of the cattle or place for watering hides (alreviadores), and all other appurtenances.

Conditioned, that they should populate the place, and not abandon the same unless on account of the Apaches.

Dated, 2d July, 1833.

The company have caused the title papers to this Ranche to be examined by Hon. Thomas Corwin, and he has given his opinion that "the titles exhibited to him give the Company a perfect fee simple in both the soil and minerals of that property."

The recent decision of the Supreme Court of the United States in relation to the Mariposa Claim of Col. Fremont, confirms most emphatically the title of this Company to its possessions acquired in this purchase. Inasmuch as the Court has decided that the purchaser's title is good against all claims of persons ignorantly squatting on the land and erecting valuable buildings and works, it follows that the title of this Company as a purchaser of this Ranche, which is entirely free from squatters, is above all question and litigation.

VALUE OF THE ORES.

The ores of the mines already opened have been assayed by Prof. Booth, of the United States Mint at Philadelphia, Prof. Torrey, of United States Assay Office in New York, Prof. Locke, of Cincinnati, and E. Kinsey, Esq., a manufacturing Jeweller of Cincinnati, as well as by the Mining Engineers of the Company at Tubac. The following are the results of the assays as made:

Assay by Prof. Booth, of the U. S. Mint.

PHILADELPHIA, Aug. 19, 1857.

DEAR SIR:—Much to my regret, your address has been mislaid for the last two weeks, and has prevented my sending you the returns of analysis of the silver ores which you left with me for the purpose. The two specimens assayed were Nos. 4 and 10, which severally yielded,

	Per cent. of silver.	Grains in the lb.	Value of the lb. Av. dpoise.
No. 4.....	3.540.....	247.80.....	67 1-10 cts
" 10.....	1.252.....	87.64.....	23 $\frac{3}{4}$

These returns, although not quite so large as you anticipated, nevertheless exhibit silver ores of very great value. I have no doubt that by running them out with the lead ores of the same region, you will be able to extract all the silver from them, and even obtain a larger yield, if the lead ores should contain silver, as is usually the case.

Respectfully yours,
W. WRIGHTSON, Cincinnati, O.

JAS. C. BOOTH.

Assay by Prof. Torrey, U. S. Assay Office.

UNITED STATES ASSAY OFFICE, }
New York, Aug. 24, 1857. }

Examination of Silver Ore from the Gadsden Purchase.

Samples of this Ore were left with me for assay by Mr. Wrightson. They were pulverized and carefully mixed, so as to obtain an average of the whole.

Several assays of 2½ ounces each were made, with the following results:

Silver in the proportion of 237 46-100 ounces to the ton of 2,000 lbs.; of the value of \$322.94.

The Copper constitutes 33 per cent. of the ore.

No gold was found.

JOHN TORREY, Assayer.

Assay by Prof. Locke.

CINCINNATI, May 18, 1857.

DEAR SIR:—I have examined the specimen of ore, and find it to contain copper, antimony, sulphur, silica, and 1.13 per cent. of silver,

Yours respectfully,

JOSEPH M. LOCKE.

To E. CONKLING, Esq., Gen. Agt. Sonora Ex. & M. Co.

Assay by E. Kinsey, Esq.

CINCINNATI, Aug. 25, 1857.

DEAR SIR:—Annexed we hand you result of analysis of two specimens of silver ore, from your Heintzelman Mine:

	Grains in the lb. Troy.	Per cent. of silver.	Value of the ore per lb. Troy,
No. 1	197.....	3.42.....	53½
" 2.....	432.....	7.5	1.17

We also found traces of gold in each of the above specimens. The copper constitutes a large proportion of the ore.

Yours, respectfully,

EDWARD KINSEY,

Silversmith.

W. WRIGHTSON, Esq., Sec'y. Sonora Ex. and M. Co., Cincinnati, O.

[A pound Troy contains 5,760 grains; a pound Avoirdupois contains 7,000 grains. The assay of Mr. Kinsey will therefore yield, when reduced to the standard of Avoirdupois weight, as adopted in the other assays, as follows:

	Grains per lb. Av.	Value per lb. Av.	Val. per ton of 2,000 lbs. Av.
No. 1.....	239.40.....	\$0.64 83-100.....	\$1,296.60
No. 2.....	525.00.....	1.42 18-100.....	2,843.60]

The average of the whole may be seen in the following table :

	Grains per lb. Av.	Value per lb. Av.	Value per ton of 2,000 lbs. Avoirdup.
Assay by Prof. Booth.....	247.80.....	\$0.67	\$1,342.00
" " "	87.64.....	0.23¼.....	475.00
" " Prof. Torrey.....	51.99.....	0.16	322.94
" " " Locke.....	79.10.....	0.21½.....	428.46
" " E. Kinsey.....	239.40.....	0.64 83... ..	1,296.60
" " "	525.00.....	1.42.18... ..	2,843.60
" " Mining Engineers at Tubac...	345.33.....	0.93¼	1,870.40
" " " "	520.00.....	1.40¾	2,816.60
Total 8 assays.....	2096.26	\$5.69.13	\$11,395.60
Average.....	262.03	0.71.14	1,424.45

The lead ores which will be used as fluxes in smelting the silver ores, yield of silver as follows, according to assays made at Tubac by the mining engineers.

	Grains per lb. average.	Value per lb. average.	Value per ton of 2000 lbs.
Longorenia Mine.....	18 11-48	\$0 04 93-100	\$98 60
Amarillo Mine.....	10 94-100	0 02 98-100	59 60
Arenia Mine.....	14 58-100	0 03 95-100	79 00
Average.....		\$0 03 95-100	\$79 06
Average of above silver ore.....			1,424 45
Average yield per ton of silver ore and flux.....			\$1,503 51

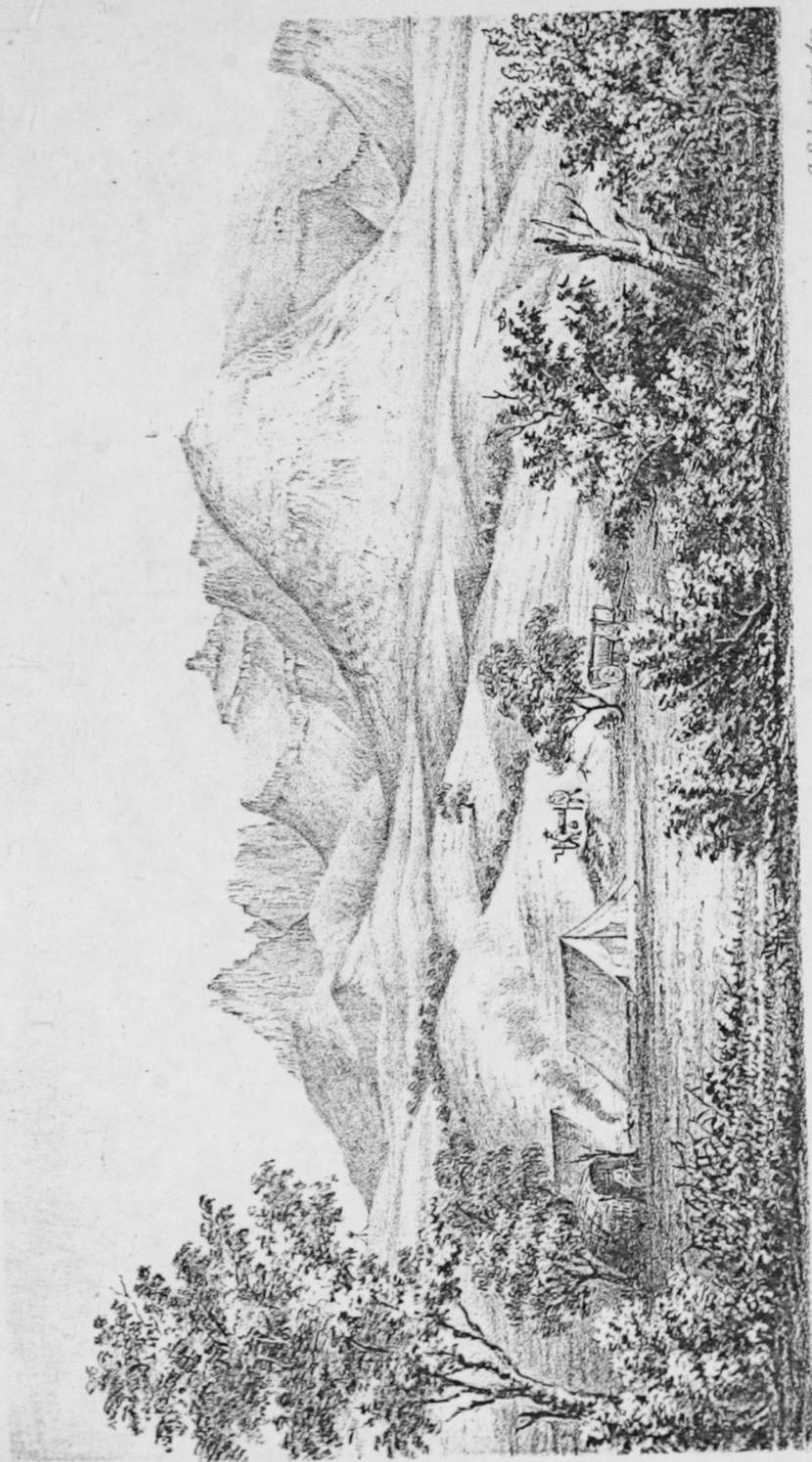
In addition to the above yield of silver, the ores of the company yield according to Professor Torrey, 33 per cent. of copper. In the report of Professor Dickerson on the mines of the Tennessee and Virginia Mining Company, three shipments of copper ores from the Cranberry Mine yielded as follows.

First Shipment.....	26.70	per cent.
Second "	29.00	"
Third "	23.60	"

This mine is worked entirely for the copper, and is found to be profitable. The yield per ton of the ores of the Sonora Exploring and Mining Company may therefore be very much increased by working for the copper as well as the silver. The ores of the Arivaca Rancho also yield gold according to the Reports of the Mining Engineer, and the assay of Mr. Kinsey.

PROGRESS OF THE WORK.

Up to the present time the company have been engaged in sinking shafts, cleaning out old mines, and preparing for the permanent business of mining, rather than in mining with reference to immediate results. They have cleaned out the



C. Schuchard del.

HEINTZELMAN MINE (NEAR ARIBAC)

From the South Side.

Middleton, Wallace & Co. Cincinnati, O.

Salero Mine to the depth of eighty feet, and are now waiting for the arrival of force pumps to lighten the labor of the miners. They have opened the Heintzelman Mine to the depth of fifty feet, and commenced work in the galleries. There is now thrown out of this mine and ready for smelting, ore which will yield from twelve to twenty thousand dollars. They have sunk a second shaft near the Heintzelman, to the depth of thirty feet. They have cleaned out the Arenias Mine, and the miners are now getting out the silver bearing galena from this mine.

The Report of the Engineer, dated June 30th, says :

“While at Arivaca we went down the Arenia Mine, situated about 500 yards from our hacienda. Mr. Schuchard has reached a depth of some forty feet, about. The vein bears Argentiferous Galena, and is stated to have a good deal of gold, as all the mineral deposits on Arivaca. I think the assay was between two and three marcs per carga. Such yield is splendid even if it does not approach that of the Heintzelman, for the yield of the latter is extraordinary. The veins traverse a number of sharp outrunners from the mountains in the rear, which is highly advantageous, as it will permit us to work by level or drift, and have a large quantity of metal above us, and employ a good many hands at once. At the end of the little gallery started in the shaft, it looked brilliant, and I only wish I could transfer that glittering *fronton*, as the Mexicans call it, to your office in Cincinnati. It is excavated in the heaviest kind of ore shining like pure silver all around.

“Wagons can roll up to the very mouth of the mine.”

The engineers have commenced building their smelting works at the Arivaca Rancho, and will soon be smelting the rich ores of the mines on that Rancho. These works are 500 yards distant from the Arenia Mine, and five miles distant from the Heintzelman Mine. They are conveniently located to wood, water and the mines. The assay furnaces at Tubac have been in operation for several months.

The company are also negotiating for the purchase of other valuable Ranches, with a reasonable prospect of a speedy and successful termination to the negotiations.

PROSPECT OF THE YIELD OF THE MINES.



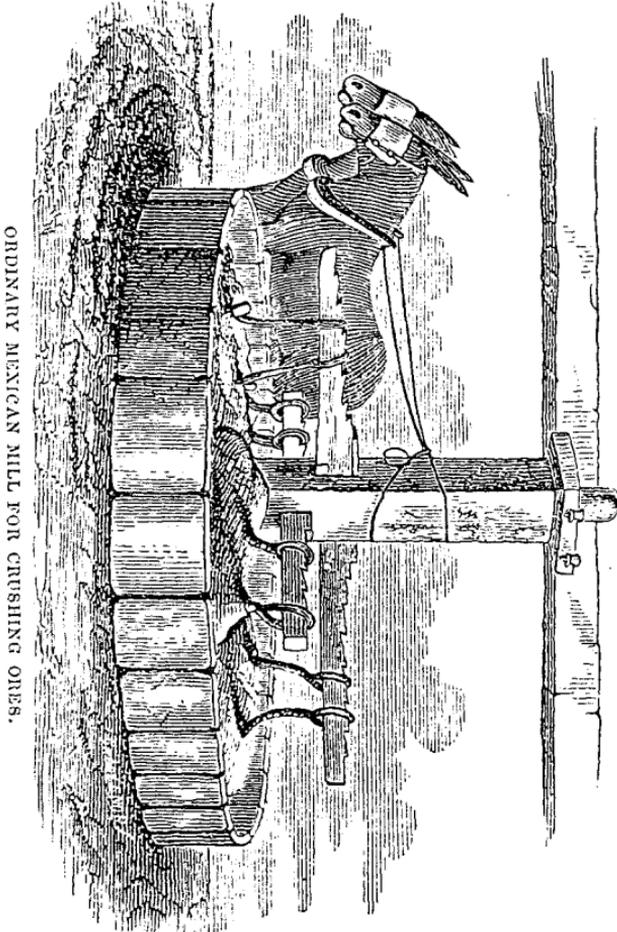
SHARPENING MINING TOOLS IN THE MOUNTAINS.

Mining like all other businesses, will pay in proportion to the skill, labor and energy which is employed in it. The mines of Mexico, which have yielded their owners the most immense fortunes, have been carried in many instances to the enormous depth of from 1000 to 2000 feet, and yet yielded returns ranging from \$100,000 to \$1,000,000 per annum, and in numerous instances even larger sums. They were worked with the rudest appliances, without skill or enterprise. The water was carried in raw hide sacks, on the backs of men, up ladders made of notched logs, from the bottom of the mines to their mouth. The ores were raised in the same tedious and laborious manner.

The ores when raised were crushed in mills worked by mules, and consisting of heavy rocks fastened by hurdles to revolving arms of timber. The grain for food was prepared in an equally tedious and laborious manner.

And yet such was the enormous wealth of this country, that in 1803, Humboldt estimated the whole produce of the Mexican mines at \$1,767,952,000.

There can be no question then but that these mines afford a suitable field for American enterprise. And that the mechanical skill, experience and ability of our people, when devoted to the development of the mines of this company will be abun-



ORDINARY MEXICAN MILL FOR CRUSHING ORES.

dantly repaid. This will be the more evident from a comparison of the yield of the ores of these mines, and of those of Lower Mexico, and the quartz mines of California. According to Humboldt and Ward, the average yield of the mines of Mexico is $2\frac{1}{2}$ ounces of silver to the hundred weight of ore.

	Grains Silver to the lb. ore.	Value per pound.	Value per ton of 2000 lbs.
Average of Mexican mines.....	12.	\$0,03 $\frac{1}{4}$	\$65,00

The Steamer Bulletin published in San Francisco, August

5, 1857, gives the following average of the crushings of quartz from leads near Grass Valley, Nevada county, at Gold Hill Mill, during 1856.

Lead.	Tons.	Yield per ton.
Missouri Hill.....	72	\$40 00
do	33½	23 00
do	20	25 00
do	110	26 00
do	76	25 00
Sebastopol	27	111 00
do	33	60 00
do	29	80 00
do	21	30 00
Allison's Ranch.....	21	370 00
Houston Hill.....	22	60 00
Gold Hill	11½	117 00
do	7½	117 00
do	226	23 00
do	7¾	63 00
do	7½	40 00
do	19	28 00
do	61	40 30
do	157	50 00
Osborne Hill.....	5	60 40
Ophir Hill	57	180 00
Massachusetts Hill.....	40	28 00
Rose Hill	120½	23 00
Redan Hill	39	26 00
Average 22 lots per ton.....		\$68,57
Or per lb.....		\$0,03 42-00

The same authority gives as the cost of raising the ore, transporting it to the mills and crushing and extracting about \$10 per ton, and states that ore yielding *twelve dollars* per ton can be worked with profit.

There is a vast difference of expense between mining, crushing, and amalgamating gold-bearing quartz, and mining and smelting silver ore, which will tell in favor of these mines.

The comparative value of the ores of these and the Mexican and California Mines may be stated thus:

Average of Mexican Silver Mines per ton,.....	\$65 00
“ “ California Quartz Mines,.....	68 57
“ Silver per ton in Lead Mines of Son. Ex. & Min. Co....	79 95
“ Silver per ton in Silver Mines of Son. Ex. & Min. Co.	1,424 45

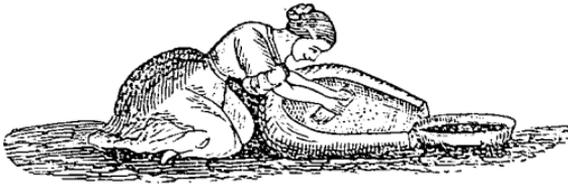
It is therefore evident that the ores of this Company, which yield according to assay, an average of \$1,424 45 to the ton, afford an ample margin for profits under the most expensive system of working, and give promise of at least a fair return under skillful and economical management.

This Company is the pioneer in the important work of developing an extensive territory of our country, now lying worse than idle—a territory which cost our Government *Ten Millions* of dollars, and through which lies the great highway that must be adopted for our Pacific Railroad. The surveys of the Southern Pacific Railroad, now in progress of construction, lie directly through Tubac, the head quarters of this Company. When this great highway for the world is completed, as it will be, it needs no prophet to foretell the value of the property already acquired by the Company. But it is not merely in the completion of the Pacific Railroad that this Company looks for a safe and easy access to the waters of the Pacific. The mines are distant but 200 miles from the Colorado River and the Gulf of California. This distance is traversed by a safe and easy wagon road, which can be used at all seasons of the year. A project is already started and surveys made, for a railroad through the populous towns and villages of Sonora, to the port of Guaymas, which will afford a direct and early means of access by railroad to this section of country. The mines of the Company can be worked, as they have been opened, by the aid of Mexican labor, and be made profitable. The following estimate will show the prospects of yield from the Heintzelman mine alone. In California, a *ton* of quartz is an average *day's work* for a miner. To be safe in making our estimate, we will assume that in the mines of this Company, which are certainly no more difficult to work than the quartz mines of California, each miner will raise a *carga* (300 lbs.) of ore *per week*. The following will then be the result :

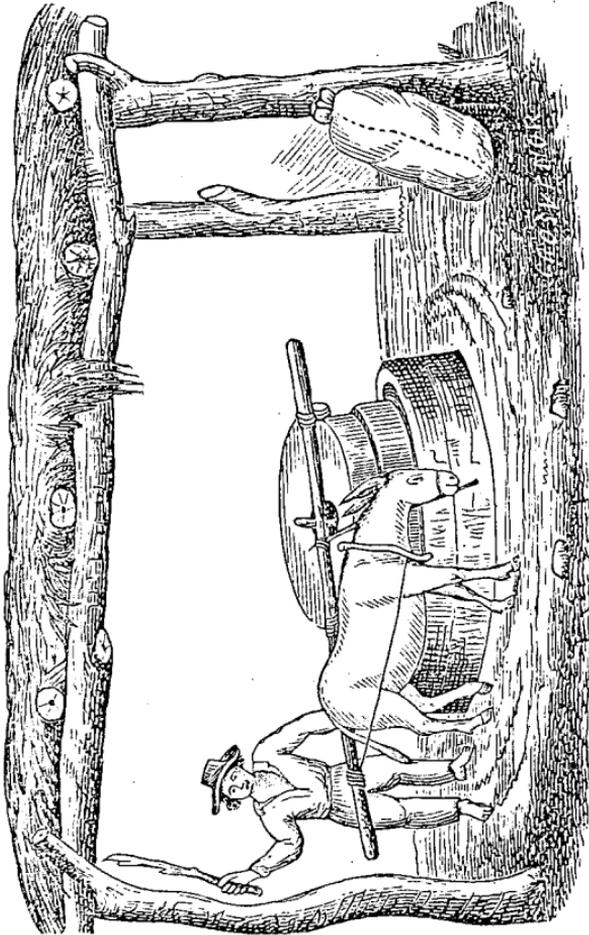
Each miner 300 lbs. $\bar{\text{p}}$ week, @ \$0 71 14-100 $\bar{\text{p}}$ lb.....	\$213 42
50 miners $\bar{\text{p}}$ week,.....	10,671 00
50 " " year, of 50 weeks,.....	554,892 00

That this estimate is not extravagant will be evident from the yield of the Mexican mines, with poorer ores, as given in the Appendix, composed of extracts from Ward's Mexico.

There is, therefore, a fair prospect that this Company will reap the reward of its enterprise in the development of its property, by the labor which is now at hand, and that the yield of its mines will increase as more intelligent labor is supplied.



PRIMITIVE FLOUR MILL AS USED BY THE MEXICANS.



MEXICAN IMPROVEMENT IN MILLS.—15 REVOLUTIONS PER HOUR.

APPENDIX.

FROM WARD'S MEXICO IN 1827.

The average annual produce of Sombrerete, from 1811 to 1825, is stated (though not upon the authority of registered returns) to have been 300,000, dollars, or about 200,000 less than the ordinary produce, from the time of the great Bonanza of the Fagoaga family, (when Eleven millions of dollars were raised in eight months, from the Mine of El Pavellon alone,) up to 1810.

The registered produce of the Mining Districts of San Louis Potosi, (the most important of which was Catorce) during a term of five years, before and after the Revolution (for which alone I have been able to procure Returns,) is stated in the annexed Table, (No. X.) by which it appears that there was a decrease in the latter period of 8261 Bars of Silver, (each of 134 marcs, or 1139 dollars,) which gives a total difference of 9,409,279 dollars on the five years after 1810.

The produce of the Mines of Catorce in ten years, (from 1816 to 1825 inclusive,) according to an extract from the Registers, which has been recently transmitted to me, was 5,994,000 dollars; which, if one half of this sum, (or 2,997,003 dollars) be added for the five years not included in the Returns in my possession, will give 8,991,000 dollars, as the Total, or 599,400 dollars as the average annual produce of that District, on the whole fifteen years. Before the Revolution, Catorce was second only to Guanajuato in the amount of the Silver raised, the value of which was estimated by Humboldt, (in 1803) at Three millions and a half of dollars annually.

The produce of the Biscaina Vein, at Real del Monte, in seven good years before the Revolution, (from 1794 to 1801,) was Six millions of dollars, or 857,042 dollars per annum. From 1809 to 1823, it only yielded 200,000 dollars in all or 14,285 dollars per annum.—*Vol. II, page 20.*

The Mines, in fifteen years, appear to have produced 153,276,972, (according to the Mint Returns,) or 165,000,000, if the Average, which I have taken, of Eleven millions annually, be correct; which, with the Seventy-two millions already in existence, give a Total of Two hundred and thirty-seven millions of dollars.—*Vol. II, page 27.*

The removal of the commercial restrictions, by which the progress of the Country had before been cramped, but which were much diminished in 1778 by the Decree of Free Trade, exercised so beneficial an influence throughout New Spain that the produce of the Mines increased, (in a term of ten years,) from 112,828,860 dollars, (which was the amount of Silver raised from 1760 to 1769,) to 193,504,554 dollars, which were yielded by the mines from 1780

to 1780, when the ameliorations introduced began to produce their full effect. From 1790 to 1799, still farther progress was made, the produce having amounted to 231,080,214 dollars.—*Vol. II, page 49.*

Captain Vetch, the Director of the Real del Monte Mining Association, in a Report dated the 26th September, 1826, after stating the produce of the mines of Count Regla, during the fifty years in which they were in full activity, to have been Twenty-six millions and a half of dollars, (Average 530,000 dollars per annum) calculates that, by working the two great veins, (La Biscaina and Santa Brigida,) at once, (which was never the case before,) the Company may expect to derive from them a yearly return of one million and a half of dollars:—He adds another million for the other mines belonging to the Company on the Veins of Moran, Acosta, San Estevan, &c., in the same district; and at Pechuga, Zimapan, and Ozumatlan; and declares his expectation, “that the mines, in the course of the year 1827, will cover their own expenses, and that, in 1828, the produce will be two millions of dollars; fully equalling, if not surpassing, the annual average amount derived from them before the year 1810.”—*Vol. II, page 100.*

The former produce of Catorce, during its best years was 2,854,000 dollars, (the average on five years, from 1800 to 1804).—*Vol. II, page 108.*

With regard to former produce, the mine of Arevalo, at Chico, is stated to have paid the King's tenth upon five millions of dollars, from 1804 to 1824; or to have averaged 250,000 dollars per annum.

The mines at Real de Arriba, in the district of Temascaltepec, produced, weekly, twelve bars, or 13,000 dollars, (yearly, about 600,000 dollars) Sta Rita, (at Zimapan,) upon the years 1791, 1792, and 1793, left a profit of 100,000 dollars.—*Vol. II, page 112.*

The first, (Santa Eulalia,) from its vicinity to the town of Chihuahua, was worked as early as 1705.

Its registered produce, from that time to 1737, was 55,959,750 dollars, or an average of 1,748,742 dollars per annum. From 1737 to 1791, it yielded something more than forty-four millions, making a total of one hundred millions of dollars during a period of eighty-six years.

The district was gradually abandoned during the last years of the last century, on account of the incursions of the savage Indian tribes; but in 1791, it possessed a population of 6,000 inhabitants, with seventy-three Haciendas for reducing metals, and one hundred and eighty smelting furnaces. All these are now in ruins, and the produce during the last thirty years, has been little or nothing; the whole receipts of the Provincial Treasury of Chihuahua having only amounted to 10,769,096 dollars from 1791 to 1825; but the possibility of restoring the mines to what they were, is, in the opinion of the natives undoubted.—*Vol. II, page 129.*

Mining in Mexico has, hitherto, been confined to a comparatively narrow circle: the immense mass of silver which the country has yielded since the Conquest, (Humboldt calculates it at 1,767,952,000 dollars, in 1803,) has proceeded from a few Central spots, in which the capital and activity of the first speculators found ample employment: yet, if we examine those spots, we shall find that three centuries of constant productiveness, have not been

sufficient to exhaust the principal mines originally worked in each, while by far the largest proportion of the greatest Veins remains unexplored.—*Vol. II, page 156.*

I annex a General Table of the total Coinage of all the Mints of Mexico, including that of the Capital, from the year 1733, when it was first placed under the direction of the Government, and returns of the annual coinage regularly kept.

By this it will appear, that the sum of 1,435,658,611 dollars has been registered as the produce of the mines of Mexico in ninety-three years, (from 1733 to June 1826.)

The work of Baron Humboldt enables me to add from Registers, which, but for his researches, would now have ceased to exist, (since not even the Mexican Government has been enabled to annex them to its official statements of the Mint Returns,) 272,514,825 dollars more, as the registered coinage of the Mint of Mexico from 1690 to 1733, with which year the present table commences.

This gives a produce of 1,708,173,436 dollars in a hundred and thirty-six years, proves both the constancy of the producing powers of the country, and the moderation of Baron Humboldt's calculations with regard to them, since he estimated the amount of silver raised from the Mines of Mexico in 1803, (from the Conquest 1521,) at 1,767,952,000 dollars, or 2,027,955,000 dollars, if one seventh were added to the Official Returns for unregistered silver.—*Vol. II, page 167.*

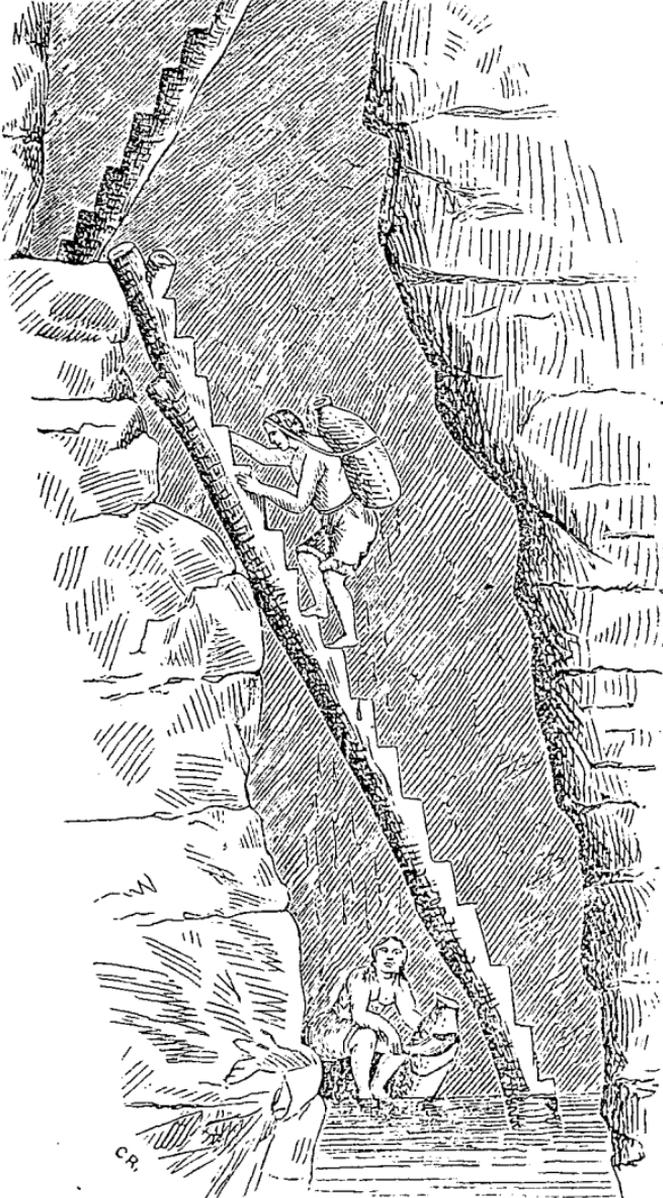
"It is in the immense mass of ores which they are capable of producing, and not by any means in the abundance of silver contained in them, that the richness of the Southern or Central mining districts of Mexico, consist, Before the Revolution, it was calculated that the three millions of marcs of silver, to which the average annual produce of the country amounted, were extracted from ten millions of quintals (hundred weights) of ores; so that the proportion of silver did not exceed two and a half ounces to the hundred weight"—*Vol. 11, p. 86.*

"That the great mineral treasures of Mexico commence exactly at the point where Humboldt rightly states the labors of the Spaniards to have terminated (about Lat. 24°), is a fact now universally admitted by the native miners, although hitherto but little known in Europe."—*Vol. 11, p. 127.*

"The metals seem to increase in richness as you approach the North; inso-much that in the Real, or District of Jesus Maria, in that great branch of the Sierra Madre, which separates the States of Durango and Chihuahua, from those of Sonora and Sinaloa, to the North and West—the ores of the mine of Santa Juliana (which does not exceed seventy yards in depth) appear, by a certified Report from the Diputacion de Minería, now before me, to average seven and eight marcs of silver per carga, of 300 lbs., which is the average produce of ten cargas of good ore in Guanajuato; while ores of the best quality yield as much as from four to ten marcs per aroba, of 25 lbs., or forty marcs per carga."—*Vol. 11, p. 227.*

"But it is upon record at Durango, that Zambrano, who was the proprietor of all the principal mines of Guarisamey and San Dimas, paid, as the king's

fifth, upon the silver raised from the mines, between the period of their discovery, (in 1788) and 1807, when he died, eleven millions of dollars. These immense riches were derived principally from five great mines, La Candelaria (at San Dimas) San Juan Nepomuceno, Cinco Senores, La Abra, and



Tapia; of one of which (La Candelaria) I possess the regular returns for five years, which prove the annual profits never to have been less than \$124,000, while in some years they amounted to \$223,082. The ores of the mines

during the whole of this period, appear to have produced from five to six marcs per carga (of 300 lbs.) and often to have yielded twenty, and even thirty marcs. Indeed, nothing of a quality inferior to the first could have covered the expense of extraction; as, when the Candelaria had attained its greatest depth, 300 Varas, (300 feet) the water was still brought up from the bottom of the mine in leathern buckets upon men's shoulders."— *Vol. 11, p. 130.*

"An examination into the sources of the wealth of the principal families of the Mexican nobility, will confirm what I have stated with regard to the towns, by leading us nearly to the same result. The family of Regla, which now possesses landed property to an immense extent in various parts of the country, purchased the whole of it with the proceeds of the mines of Real del Monte. The Fagoagas owe their present importance to the great Bonanza of the Pavellon at Sombrerete. The estates of the family of Vibanco proceeded from the mines of Bolanos. The houses of Valenciana, Ruhl, Perez, Galvez, and Otero, are all indebted for their possessions to the mines of Valenciana and Villalpando, at Guanajuato. The family of Sardenata (Los Marqueses de Rayas) takes its rise from the mine of that name. Cata and Mellado gave to their first proprietor (Don Francisco Matias de Busto) the Marquisate of San Clemente, with immense wealth, a part of which has been transmitted to his descendants. The Canada of Laborde, at Tlalpujahuá, with the mines of Quebradilla and San Acasio, at Zacatecas, all contributed towards the three fortunes of Laborde. The family of the Obregones owes its beautiful estates (near Leon) to the mines of La Purissima and Concepcion at Catorce; as does the family of Gordoá, the estate of Malpasso to the mine of La Luz. The son of Zambrano (the discoverer of Guarisamey,) wasted as his rightful property has been, is still in possession of four of the largest estates in Durango; and Batopilas gave to the Marquis of Bustamente both the means of purchasing his title, for which he paid by a loan of \$300,000 (60,000*l.*), to the Royal Treasury, during the Revolution, and the affluence which he is now enjoying in the Peninsula."— *Vol. 11, p. 151.*

"The great German mine of Arevala stands upon another little hill, nearly opposite the town.

"It enjoyed no sort of celebrity until the beginning of this century, when it fell into the hands of the present proprietor, Don Antonio Revilla, who, after working it for some time in an obscure way, was fortunate enough, in 1803, to fall in with a Bonanza, or mass of rich ore, which enabled him to carry on his operations upon a larger scale. In 1811, from one part of the level, called 'El Divino Pastor,' he obtained, in seven weeks, a clear profit of \$200,000."— *Vol. 11, p. 345.*

"The Biscaina vein had been worked, almost uninterruptedly, from the middle of the sixteenth to the beginning of the eighteenth century, when the two principal mines (El Xacal and La Biscaina,) which, in 1726, had produced 642,700, marcs of silver (4,341,600 dollars,) were abandoned by their proprietors in consequence of the difficulty of keeping down the water with the very imperfect machinery employed in those early days. The mines were then only one hundred and twenty varas in depth, and the known richness of the ores in the lower levels induced an enterprising individual, Don Jose Alexan-

dro Bustamante, to denounce them anew, and to attempt the drainage by the Adit of Moran, a part only of which he lived to complete. On his death-bed he bequeathed his hopes and his works, to Don Pedro Tereros, a small capitalist, who had supplied him with funds to continue his operations, and who, sharing in all Bustamante's anticipations of success, immediately removed to Real Del Monte, and devoted his whole remaining fortune to the prosecution of the enterprise. From the smallness of the capital invested, the work advanced but slowly, and was not completed until the year 1762; but in the twelve succeeding years, Tereros drew from his mines a clear profit of 6,000,000 of dollars; or about 1,200,000*l.* sterling. He obtained the title of Count by the munificence of his donations to the Court of Madrid; and never was title more dearly bought; for he presented Charles the III. with two ships of the line (one of 112 guns,) constructed at the Havana, of the most costly materials, entirely at his own expense, and accommodated him besides with a loan of one million of dollars, no part of which has yet been repaid. He likewise built the two great Haciendas of San Antonio and Regla, which cannot, together, have cost less than 1,200,000 dollars (240,000*l.*); and he purchased landed property to such an extent, that even in the present depressed state of agricultural interests of Mexico, the revenue of the present Count exceeds one hundred thousand dollars; and ought, in more favorable times, to amount to nearly two, (40,000*l.*)—*Vol. 11, p. 362.*

"It was discovered in the spring of 1826, by two brothers (Indians) by name Arauca, to one of whom a little maize for tortillas had been refused upon credit the night before. In two months they extracted from their mine \$270,000; yet in december 1826, they were still living in a wretched hovel close to the source of their wealth, bare-headed and bare-legged, with upwards of 40,000*l.* sterling in silver locked up in their hut."—*Vol. 11, p. 579.*

"I am aware that many of the statements contained in this, and the preceding books, respecting the mineral riches of the North of New Spain, will be thought exaggerated. They are not so; they will be confirmed by every future report; and, in a few years, the public, familiarised with facts, which are only questioned because they are new, will wonder at its present incredulity, and regret the loss of advantages which may not always be within its reach."—*Vol. 11, p. 600.*

"Of this, Catorce, 24° Latitude, furnished a memorable instance in the year 1773. It is impossible to conceive a more bleak and desolate spot than that upon which these famous mines are situated—the very summit of a mountain ridge, inaccessible, even at the present day, to anything but mules, without provisions or water, or resources of any kind; yet, in three years after the discovery, it had a population of five thousand souls, and the town now contains sixteen thousand inhabitants. The fame of its riches brought crowds of settlers from Guanajuato, Zacatecas, and Sombrerete; and notwithstanding all the local disadvantages which I have enumerated, these settlers have remained. But the mines of Catorce possess all the properties which characterize those of the North; they all began to be productive almost at the surface, and all yielded ores of a quality unknown in the neighboring districts of Zacatecas and Guanajuato.

"The metalliferous dust of the famous mine of 'Zavala,' which produced four millions of dollars in two years, was eagerly bought up, at the mouth of the mines, by Rescatadores (proprietors of Amalgamation works,) who came from Pinos, and even from Guanajuato (distance of fifty and eighty leagues) for the purpose, at the price of one dollar for the pound of ore (three hundred dollars per carga.)

"The owner of the mines of Santa Ana and San Geronimo (Capt. Zuniga,) after living upon their produce during his whole life, bequeathed, by his will (of which I have an authentic copy,) four millions of dollars, the greatest proportion of which was left to pious institutions. The mine of La Luz, which was denounced in 1804, and is still in full work, has given to its present proprietor, the Licenciado Gardoa, the estate of Mal Passo, near Zacatecas, for which he paid 700,000 dollars, and a million of dollars capital: the best ores, during this time, have sold, according to the Registers of the mine, at 340 and 350 dollars per carga, of 300 lbs.

"The ores of a particular level of the mine of La Purissima, which belongs to the family of the Obregons (*el ojo del cielo*) sold for 600, 400, and 380 dollars per carga: at which price they were bought as late as 1817.—*Vol. II, p.132.*

"A similar enterprise will shortly be attempted in England, by an English gentleman (Col. Bourne,) who has been long a resident in Mexico, in conjunction with Mr. Escalante, the representative of the State of Sonora in the Senate.

"They have taken up contracts for the mine of Arizpe about 30° north Latitude,) in a situation possessing great local advantages, a fertile country, the vicinity of two large rivers, and a communication by water with the Pacific. The mines themselves were formerly celebrated for their riches, and the capital required to bring them again into activity is very small.

"The specimens which I have seen of the ores extracted from them, almost induce one to adopt the theory, that the proportion of silver contained in the ores increases as you advance towards the North; a theory which is very generally believed, at present, in Mexico, and which is certainly confirmed by the superiority of all the Northern ores to those of the richest districts in the South.

"The idea probably originated in the discovery of the famous Bolas de Plata (Balls of Silver) of Arizona, in the beginning of the last century, which was, and probably still is, believed in Europe to be one of those fables, with which mining countries always abound.

"But the attention of the present government of Mexico having been drawn to the subject, a search was made in the Vice-regal Archives, by order of the President, for the correspondence, which was known to have taken place respecting it in the year 1736.

"This correspondence I have seen, and I have in my possession a certified copy of a Decree of Philip the Fifth, dated Aranjuez, 28th May, 1741, the object of which was to terminate a prosecution, instituted by the Royal Fiscal, against the discoverers of Arizona, for having defrauded the treasury of the duties payable upon the masses of pure silver found there.

"The Decree states the weight of the balls, sheets, and other pieces of silver discovered (*bolas, planchas, y otras, piezas de plata*) to have amounted to 165 arrobas, 8 lbs., in all (4033 lbs. ;) and mentions particularly one mass of pure silver, which weighed 108 arrobas (2700 lbs. ;) and another of eleven arrobas, upon which duties had been actually paid by one Don Domingo Asmendi, and which, as a great natural curiosity (*como cosa especial,*) the king states ought to have been sent to Madrid.

"The Decree ends by declaring the district of Arizona to be Royal property, as a '*Criadero de Plata;*' (a place in which, by some natural process, silver, was created;) an idea to which the flexibility of the metal, when first extracted, seemed, in those times, to give some color of probability; and by directing it to be worked upon the Royal account. This put a stop to the enterprises of individuals: the district was deserted; an attempt to send a sort of colony there failed; and, in a few years, the very name of Arizona was forgotten."—*Vol. 11, p. 136.*

SONORA EXPLORING AND MINING COMPANY.

THIRD

ANNUAL REPORT

OF THE

Sonora Exploring & Mining Co.,

MADE TO THE

STOCKHOLDERS,

MARCH, 1859.



New-York:

W. MINNS & CO., STATIONERS AND PRINTERS,

159 PEARL-STREET.

1859.

OFFICE SONORA EXPLORING AND MINING Co.,
CINCINNATI, *March* 21st, 1859.

SINCE the last Annual Report the Company has passed through one of those crises so usual to all new companies, operating in distant countries and on untried fields. The Board of Directors have however the pleasure to inform the stockholders, that now all their difficulties are over, and that the reduction works, both melting and amalgamation, are in successful operation. Should enough suitable ore be obtained, the Mexican Patio process can also be put in operation, at a small expense. The long, dry warm weather is peculiarly favorable for this process.

Early last year much uneasiness was felt by some of the principal stockholders, at the delay beyond the time first spoken of, in the establishment of the reduction works; at their earnest solicitation the President of the Company consented to visit the mines.

He arrived at Tubac on the 17th of August last, and immediately, in company with Mr. Poston, in charge of the operations on the ground, visited the mine. The Heintzelman mine, though perhaps not

so rich as our enthusiastic reports had led us to expect, was still sufficient to satisfy any reasonable man. There is no richer mine now known in the territory; with proper management it must yield a rich reward to those who had the foresight and energy to be the pioneers in such an enterprise, in an almost unknown country, filled with prowling Indians, and destitute of civil or military protection.

The month before my arrival a small upright furnace had been erected at Los Alamos, and another at the Heintzelman mine; the latter was now in blast, and the results entirely satisfactory. The yield was about \$100 per day, and running but four days in the week, it would nearly pay all the expenses at Cerro Colorado.

At San Diego we found the machinery for the amalgamation works, where it had been detained some two months, on frivolous excuses from the contractor. With much difficulty a new contract was made for its being hauled across the wide desert, between there and the mines, where it arrived about the first of September. Many difficulties now arose from the country being overrun by the Apache Indians, and from the scarcity of laborers and mechanics. The works were not put in operation until the first days of February, and then only two barrels, though the machinery is prepared for *ten*.

When the President arrived at the mines, the Company was without a dollar in the treasury

overwhelmed with debts, and almost without credit. Arrangements were at once made with the most clamorous creditors, and to pay the miners and laborers regularly every week. A stock of goods negotiated for in July, arriving in December, has satisfied the employees, and now all things go on well.

There was much sickness last summer and fall, and with the "fiertas" in Sonora, occasioned a very great scarcity of miners and laborers, and thus delayed all the operations. This difficulty is now in a great measure overcome, but arrangements have been made to enable the Board to decide upon the propriety of bringing miners from Europe.

The only mine now worked is the Heintzelman; this has been opened on the vein, horizontally 918 feet, with a gap of 312 feet, where the vein passes under an "arroyo." The diggings are not yet deep enough to connect the two parts, as the water might percolate through. When we get deeper the connection will be made, which will show a length of 1,230 feet. There is no doubt but that the vein extends much further, but for this distance it is known to be rich. The ores across the "arroyo" are equally rich, though it is by no means certain that they are from the same vein, as the diggings are not on the same line. This cannot be determined until after the connection is made. On this side we have recently discovered the Muriate and Iodide of Silver, rare ores, but indications of rich ones.

We have now seven shafts on the vein, on two of which are windlasses, and in the others ladders; besides these there is the main shaft, 60 feet deep, from the bottom a "fronton" has been cut 36 feet, till it cut the vein. Specimens of the ore received here, yields 1,800 ozs. per ton. On the opposite side of the "arroyo," at the depth of 10 feet, large quantities of ore have been found, yielding 1,184 ozs. per ton.

As soon as this "fronton" is connected with the upper diggings, all the ladders will be withdrawn, and all operations will be carried on through the main shaft. This will in a great degree put an end to the stealings, so common in all Mexican mines. No precautions yet devised, have prevented this entirely. When the ores are so extraordinarily rich, the miners will find some methods for eluding the vigilance of the "guardia del mina."

The main shaft was commenced on the 15th of February, 1858; on the 20th of October, it reached the first level, a depth of 60 feet; the dimensions are 11 by $5\frac{1}{2}$ feet, divided by the timbering into two parts—one for the ladders and pumps, the other for the windlass. The cross cut, or "fronton," to cut the vein, is $5\frac{1}{2}$ feet high and 4 feet wide, its length is about 36 feet. The main shaft will be continued, and at the depth of 30 feet more, another cut be made. The rock through which this shaft has been sunk is very hard, a species of metamorphic clay slate.

The first melting furnace was built at Los Alamos, and worked well; those at Cerro Colorado have been in operation since last July; the average yield is \$955 per ton. Ore fully as rich was sent to San Francisco, and was there melted, but the yield, from some imperfection in the furnaces, or some other cause, was 47 per cent. less than the assay. This scarcely paid the expense of sending the ore so far, and was the source of much embarrassment to the Company. No more ore will be sent away. After selecting over 50,000 pounds of this rich ore, the average of that left (some 300 tons,) is still, from many careful assayers, as high as \$200 per ton. The ore, since cutting the vein from the "fronton," has increased in quality and quantity.

The lead ore from the Arenia mines, on the Arivacca rancho, containing both silver and gold, was used at first as a flux for melting the Heintzelman ore. This ore has changed in character, and now contains so much quartz that it was deemed advisable to suspend operations, until we have more miners to spare. It is supposed that the ore will prove less quartz ore at a greater depth. Work there will soon be resumed, as miners are becoming plenty, and as we are charged the extravagant price of \$75 per ton, for all the lead ore used in our furnaces. It is found profitable to run them even at that cost.

From the same cause (the scarcity of laborers,) no other veins have been worked, though the Com-

pany holds several that appear to be rich. There is a vein of gold quartz not over four miles from Arivacca it is desirable to work, so soon as other labors are completed. The assays show a yield of over \$200 per ton.

The building and appearance of the mine at Cerro Colorado, will be seen from the accompanying wood cut, and the progress made can be seen at a glance by comparing this with a view of the same place in the Report of September, 1857. It was intended to furnish the stockholders with a view of Arivacca and its amalgamation works, but it has not yet arrived. These latter works have cost the Company some \$30,000.

A great expense is saved the Company by the discovery, both on Cerro Colorado and at Arivacca, of large deposits of metamorphic sand stone, containing an abundance of quartz crystals, cemented together by a very pure clay; this is suitable for lining the furnaces, thus saving the cost of fire-brick, in that country no inconsiderable expense. It resists fire better than the best fire proof brick. The Company has six furnaces, including those at Los Alamos. The principal furnace used is built of common adobes 10 inches square, and 8 feet high, and bellows made on the spot, at a cost for the whole concern of only about \$250. No experiments were made, but the first succeeded.

As there has been much said about the numerous veins of silver on the Company's lands, it may be

well to add some further information. There are numerous veins of gold, silver, argentiferous galena, copper, &c., in the Territory of Arizona; up to the present time, none but the Heintzelman vein has proved rich and productive, though doubtless many others will be so. We have several veins that will in all probability be of this class, and we will further prospect them so soon as we can spare miners and laborers from other more pressing labors. The aim of the management has been to put one mine in successful operation, and then proceed to others. There is a great difference "between a vein, the ore of which *is* rich, and one containing *rich* ore in a mass of quartz or gangue. The latter, on assay, may yield rich results, and still fail in paying expenses, as is generally the case. This kind of vein abounds in Arizona—but rich veins are scarce.

Many veins which will not pay now, will yield handsome returns when the means of transportation and cost of supplies are less. The introduction of supplies through the Port of Lobos, or even Guymas, free of duty, would at once produce such a result. The cost of transportation and the time, via. the Colorado, almost amounts to a prohibition. Our supplies of flour, panoche, frijoles, fruits, &c., are mostly obtained from Sonora. A custom-house officer at Colabezas, is considered by all a great nuisance, as we are without civil law, or sufficient military protection against the Indians.

The Santa Rita Company formed on a portion of

our possessions, went out under the management of W. Wrightson, Esq., your former Secretary, and arrived there early in January; he is pushing forward the works with great energy, and with the benefit of our experience and aid, we hope will soon be paying expenses. Mr. Grosvenor, the Agent first sent out, was placed by Mr. Poston in quiet and peaceable possession, and since, the titles have been transferred to their President.

The Sonora Company owning 4,500 shares of the Santa Rita stock, a stock dividend of *two* shares of Santa Rita, to every *five* of Sonora, has been declared by the Board of Directors, deliverable one year from this date.

Of the Capital Stock of the Company,
Shares have been disposed of.

The indebtedness amounts to.....	\$43,334 70
The net value of the ore out, 300 tons, at the very low estimate of \$150 per ton, is	45,000 00
The assets, consisting of stock of goods, rolling stock, horses, mules, cattle, due from individuals, &c.,.	35,682 31
Value of permanent improvements at Arivacca,.....	32,293 99
Value of permanent improvements at Cerro Colorado,.....	21,109 94
Value of permanent improvements at Tubac,.....	12,056 04
	<hr/>
Total,.....	\$65,459 97

The estimate for expenses for the coming year and yield, are:—

For labor, &c. at Tubac,.....	\$4,200 00
“ “ Cerro Colorado,....	32,100 00
“ “ Arivacca, (Amalgamation Works),..	19,380 00
Total,.....	<u>\$55,680 00</u>

To this we may add the cost of quicksilver, and such additions to buildings as may be necessary, and the total expense cannot fall far short of \$100,000 per annum.

This estimate is based on the reduction of 1,000 tons of ore, and estimating the yield as low as \$200 per ton, will give the yield from the amalgamation works and one furnace at \$200,000.

If the plan of sending out merchandise from New-York is properly carried out, the profits on the goods should pay nearly, if not quite, one half the expense of working the mines.

Thus it will be seen that the stockholders have a reasonable prospect of a handsome dividend at the close of the ensuing year.

Respectfully yours,

S. P. HEINTZELMAN,

Pres. S. Ex. & M. Co.

CERRO COLORADO, ARIZONA,

Jan. 6th, 1859.

TO THE EXECUTIVE COMMITTEE,
SONORA EXPLORING AND MINING CO.

Cincinnati, Ohio.

Gentlemen:

In accordance with a resolution of the Executive Committee of the Sonora Exploring and Mining Company, I left Cincinnati on the 1st of June, 1858, and took the steamer for San Francisco, where I arrived on the 28th of June.

In San Francisco I found Mr. Ehrenberg and Mr. Lathrop, the latter having preceded me one steamer. Together we visited the smelting works of Wass, Uznay & Warwick, who were then smelting the first ore received from our mines. The balance of the time I remained, was spent in preparing for the journey across the deserts to the mines, and in negotiating for a small stock of goods. This, through the business abilities of Mr. Lathrop, was accomplished to our satisfaction, and we (Mr. Lathrop and I,) took the next steamer, 3rd July, for San Diego.

There we found Mr. Conklin, the person with whom Mr. Poston had contracted to transport the ore we saw in the furnaces in San Francisco, and to carry back the machinery for the amalgamation

works at the mines. This machinery had been lying at San Diego some two months, waiting for him. The excuses he made for not complying with his contract were, that his mules were broken down when he arrived at San Diego with the ore, and had not sufficiently recruited; that some of the machinery was so long that he could not load it in his wagons without altering them, and he wished to know who would bear the expenses, &c., &c.

We had heard before that he visited Los Angeles, and had endeavored to sell his mules to the Overland Mail Company. On inquiry we soon learned, that his mules had been recruited sufficiently for some time, and on examining and measuring the wagons, we also found, that the machinery could be loaded without alteration of the wagon beds. He now assigned the true reason for not complying with his contract. He said that he could not afford to haul the machinery across the Great Colorado Desert, and the deserts on the Gila, for \$300 per ton, the sum for which he had agreed. From my knowledge of the route, I was satisfied that the compensation was not enough, and we at once agreed to give him more. He, however, asked the extravagant sum of \$500 per ton, and hauling of ore from the mines to the Colorado, for six months. He also declared that we had violated his contract, by not paying him for hauling he had not done. He left near two thirds of the ore at the Colorado, on his way in, and wished Mr. Ehrenberg to pay

him for hauling it, and let it go on the back freight. This Mr. Ehrenberg very properly refused to do, and only paid him for the work done.

We hesitated to pay this exorbitant demand; but the only alternative was, to re-ship to San Francisco, and thence to the mouth of the Colorado, and take the chances of wagons from there to the mines; taking this uncertainty and the delays, we determined that it would be for the interest of the Company to accept his offer. Accordingly a contract was entered into; but he would not sign it, unless I personally guaranteed its fulfilment. This I had to do, and we had the pleasure of seeing the wagons loaded, and leave the town of San Diego, on the evening of the 22nd of July, and half an hour later we started.

We were unfortunate in getting at San Diego a miserable driver. Our conveyance stalled on San Pascual Hill, and we had to get the aid of oxen to help us across. Our front axle was sprung at the same time, and as there is no blacksmith shop short of Fort Yuma, we had to cross the desert to have it adjusted. The Steamboat Company kindly permitted us to use their shop.

The season was uncommonly dry, and with less water in the desert than I ever met with before. The journey up the Gila is little better than the crossing of the Colorado desert. On the south side it is almost a continuous desert, and as far as the Maricopa Wells, only relieved by occasional turns

into the Gila for water and grass. Beyond this are two deserts without water, one of 40 and the other 80 miles. On the whole it is about as disagreeable a road as a man can wish to travel.

We arrived at Tubac, the head-quarters of the Company, on the 17th of August. Here we found Mr. Poston, and several of the original members of the Company. The next day in company with Mr. Poston, I visited the Cerro Colorado and Heintzelman mine, 23 or 24 miles from the former place. About half way, we passed the rancho and mine of Soperi. At Cerro Colorado, I examined the furnace there in operation, the mine, and various prospecting shafts and old mines in the vicinity. These were from a few scratches on the ground, to shafts in the rock to the depth of 30 feet, involving much labor and expense. Much of this is lost, as there is no regular record of these prospectings, and more will be, when all who have been engaged in them leave the mines of the Company. The question arises whether it would not have been better, to have delayed some of these explorations to some future period, and to have devoted the labor and expense to the development of a mine known to be very rich.

I next visited Arivacca, six miles, and saw the commencement of the building for the amalgamation works. A few men were at work making adobes. I also visited Los Alamos, one and a half miles further, where is situated the Arenia mine of argentiferous galma, from which we were then

getting the lead ore required to smelt the Heintzelman ore. Here is the finest establishment we have in the way of houses for the officers and Peons, furnaces, corrals and garden. A few miners were engaged in mining, with a full staff of officers. This establishment was made so complete, under a misapprehension of the value of the Arenia ore, in silver, from the result of some smelting near Hermosillo, in a "varo," after the Heintzelman ore. Since then the furnaces have been abandoned, and the lead and quartz ore proving scarce, the miners and officers have been withdrawn for the present.

On my return to Tubac, we at once went to examining the accounts. I found the Company heavily involved in debt, and the creditors surrounding me with importunities for their money. Mr. Poston furnished us with a list of the most pressing, amounting to \$6,763. These were provided for, by cash, short drafts, &c. For the pay of Peons, about \$150 per week more was required. I immediately advanced all my private means, and stretched my credit to the utmost, to obtain the money necessary to pay off the laborers regularly every week. Without it, it was useless to attempt to go on at the mines.

At Tubac we found two of the original members of the Company waiting for their stock, and to be paid up their salaries, to leave. I found great dissatisfaction amongst the old members of the Com-

pany, on account of the non-receipt of their stock. I satisfied the most clamorous, by transferring to them 200 shares of my private stock, and a portion of the 500 shares sent to Mr. Poston for sale, on our first issuing stock. From the non-receipt of this stock, the Company has already sustained a heavy loss, besides the great and just dissatisfaction.

We finally made arrangements to pay these two men and discharged them, with an order on the Company in Cincinnati for the balance of their stock. Their services for a long time were of no use to the Company. Since then we have got rid of most of the other useless members, besides reducing some, and the wages of others. Whilst the Company was without money and without credit this could not be done.

Sickness now commenced, and broke up our two establishments at Arivacca and Los Alamos. Mr. Poston went to Arivacca, and was taken sick, and Mr. Lathrop at Tubac; Mr. Schuchard at Los Alamos, besides many of the miners and laborers. Mr. Poston got a little better, and left Tubac on the first of October, to attend the "fiesta" at Magdalena, in Sonora, where he was again taken sick, and did not return until the 15th of December, and is still suffering. Mr. Lathrop was actively employed in the intervals, when not in bed, as this was our most trying time.

I soon found that the Director could not live in Tubac, and properly manage the affairs of the Com-

pany, so on the 6th October, I moved to Cerro Colorado, and took the active management of affairs. I here found every thing done in the most lax way, originating from our inability to pay wages and salaries, when due. I have used my best efforts to correct this, but have only partially succeeded. The only way to do so effectually is to discharge most of the employees, who have been here any length of time, and get others. This is not easily done, where the Company is in debt to all for wages, and where it is a mere accident when you can hire a mechanic.

The "fiesta" at Magdalena, in addition to the sickness, took off so many of our laborers, that the furnace stopped for a few days. We are still kept back by a scarcity of hands. Mr. Poston went early in September to Tubutama and Altar, to procure laborers and supplies. He returned with a contract for the erection of the amalgamation building and dwellings, the contractor to be here in *ten* days. He did not make his appearance until weeks after, and then sick and without laborers. In the meantime, I had sent men and recommenced work on the amalgamation building, and at the lead mine at Los Alamos.

When we arrived, we were assured that all things were provided but the quicksilver, to put in operation the amalgamation works. But in this country it is one thing to make a contract, and quite a different one to have it fulfilled. There were repeated

failures. The first of the "tablelas" for the roof of the amalgamation building were promised by the middle of October, and did not reach here until the 18th of November. A few days before I got some logs by sending a wagon into the pinery. The Indians stopped the contractor and took a yoke of his oxen, all his blankets and provisions. For a long time it was impossible to get any one to go and haul the logs, and we had no wagon to spare. On the 10th of December, the last of the "vigas" arrived, but some of the logs are still in the pinery, in the Santa Rita mountains. Below Los Alamos, are cotton woods, ash, walnut, and on the mountains oak, which will answer to complete the deficiency.

The machinery arrived at Arivacca on the 1st of September, and was received by Mr. Poston. Now a difficulty occurred about the freight, Mr. Poston contending, that Mr. Conklin had not complied with his contract, much to the damage of the Company, (see his letter dated Arivacca, September 5th, 1858;) the latter, that the Company had not, because they did not pay him for hauling the ore to San Diego that he left at the Colorado. There was another difficulty in their not being smelting ore, to furnish *ten* teams with *six* months hauling.

I was surprised on arriving at Tubac, to learn that there was a scarcity of ore suitable for smelting. Mr. Kustel had, early in January, decided that but a small portion of the ore from the Heintzelman mine was suitable for smelting, and that the amalga-

tion process should be adopted. In pursuance of this opinion, the amalgamation machinery was procured in San Francisco last March.

When Mr. Poston returned from Tubutama and Altar, we compromised, Mr. Conklin relinquishing his contract to haul ore, and we paying him *twenty* cents per pound for the hauling. The settlement was, I believe, satisfactory to both parties. We probably had the legal right, but it would not have been good policy, the way the Company was then situated, to enter into a law suit.

It is impossible, without remaining in this country some time, to understand the difficulties our people have had to contend with. Mr. Poston and his companions are entitled to a great deal of praise, for the energy and perseverance with which, under so many discouragements, they have accomplished so much. The greatest difficulty Mr. Poston had to contend with, was that the persons with him, though so competent to prospect, were not metallurgists, and had not the practical experience to commence the reduction of strange ores, or our furnaces could have been in operation months earlier. From Sonora, it was difficult to obtain the right kind of experience, the ores there being so different from what we had to reduce. The attempt made through Fermin, in the end failed. Mr. Kustel, in waiting for the machinery for amalgamation, put up an upright furnace, to which I have added another, and these with the refining and other furnaces, have turned out suffi-

cient silver to pay the expenses at this place, and leave a small surplus to meet expenses elsewhere.

With the furnaces, funds recently received and stock of goods on hand, I have no doubt of our ability to complete the amalgamation works. With the number of mechanics now employed, this must be in all of January. Every thing required is on hand but the quicksilver, and this is expected daily.

Mr. Poston is anxious to leave, and will do so, so soon as his health will permit. Mr. L. H. Lathrop, our treasurer, has been appointed Director at the mines, subject to your approval. Mr. Jarvis, who was associated with Mr. Wrightson and myself, arrived here on the 17th of September. He was soon after taken sick, and has not been able to attend to many of the duties for which he came.

Mr. Wrightson did not arrive here until January 5th. Thus all the labor and responsibility have fallen upon me. My private affairs will not permit me to remain here any longer. It was not my original intention to remain here more than a few weeks, but the affairs of the Company had arrived to that point, that without the most vigorous exertions, it would have failed in a few days. Its credit was gone, and not one cent of money in the treasury. With my private funds and credit I believe it was sustained, until substantial aid arrived from the States. It is now on a firm basis, and nothing but good management is necessary for it to prosper.

Mr. Kustel, who has the direction of the amalgamation works at Arivacca, is an accomplished amalgamationist, and has had much experience with the Fryberg, or barrel system of amalgamation. I have no doubt but that he will conduct the operations in the most economical and successful manner. His assistant, Mr. Brown, has had much experience in Mexico and South America, in reduction works and in the management of Peons. He is a most valuable man. We may lose him in the spring.

At Cerro Colorado, Mr. Brunckow, our original mining engineer, who joined the Company at San Antonio, has proved a most worthy industrious man. He has charge of the mine, and appears to be opening it in a scientific manner. He is the discoverer of the Heintzelman mine, and was a most indefatigable prospector. He has much valuable information about the surrounding country, which should not be lost to the Company. He is rather lenient in his management of our Sonora laborers. He will probably leave us in the spring.

Mr. Methner, who joined us about a year ago, and who, since Mr. Kustel went to Arivacca, has had the charge of the smelting and refining furnaces, is untiring in his devotion to his duties. Under the most discouraging circumstances, he has kept the furnaces in operation. He is entitled to much praise, for his energy and success. He is also rather lenient, in his management of Mexicans.

Mr. Schuchard has left the service of the Company. He is an excellent mineralogist, and was long and extensively employed in prospecting. There is probably no one remaining in the Company, so well acquainted with the character and quality of the many mineral veins for many miles around here, as he is. Unfortunately most of his experience, acquired at the expense of the Company, is lost to us, from his not being required to keep notes of his explorations.

At Tubac, Mr. Hulseman, the storekeeper, is familiar with several languages, and has an extensive acquaintance in Sonora, of great value to the Company.

Spanish is almost an indispensable, in an officer of the Company, as nearly all the persons with whom he comes in contact, in the way of business, speak only that language.

Since last August, many expenses have been much reduced. Tubac had become a mere hotel. The expenses for keeping up the house, for the first eight months of 1858, amounted to an average of \$240 a month. I have instructed the director, to hire either at Cerro Colorado or at Arivacca, and so soon as Mr. Poston leaves, the expenses will be reduced to the cost of the storekeeper and porter. For some time to come it will be necessary to keep up that establishment, as it is located where the only wagon road for this part of the country, from Sonora, debouches. It also commands the trade of

the Santa Cour and Sonoita valleys. This trade should more than pay expenses.

The large establishment at Los Alamos has also been nearly broken up. Mr. Kustel and his family reside there, and two vaqueros to take charge of our cattle, and boy for the sheep and hogs. Should it become advisable hereafter to work the lead mines in that vicinity, the Peon houses can be occupied by the miners, and the superintendent reside at Arivacca. The distance is but a mile and a half. There is a large garden enclosed, which will be cultivated.

Both here and at Arivacca, in the spring, the tule swamps must be ditched and drained, to endeavor to cut off the sources of the malaria, which has proved such a fruitful cause of so much sickness.

Gardens will also be established at Arivacca, with fruit trees and vineyards, for which the climate is well adapted. The valley is wide, and well supplied with water. The grazing inexhaustible. Below Los Alamos, a short distance, are large cotton woods, ash and walnut, and on the hills oak timber in abundance. Nearer at hand is Mosquita.

At Cerro Colorado, until the mine supplies water, there will be a scarcity, during the dry season. An unusually small quantity of water fell this past summer. With our small force, although there are four wells, we have at times been scant of water.

So soon as the amalgamation works are ready, the wagons to haul ore must be kept at Arivacca,

and these passing daily, will enable the women to go there to wash.

It is a question, whether it will not be better soon to move the smelting furnaces to Arivacca, as wood there is more abundant, and the different materials used in the furnaces, and as fluxes, are all at, or in the vicinity of Los Alamos, and more particularly if the proper kind of lead ores can be found there.

A few hundred dollars expended on this end of the road to Sonoro, will make it practicable for wagons to Tubutama, thus opening a route into the heart of Sonora, from whence we must receive our supplies of flour, corn, beans, panoche, fruits, &c. The road from here to Altar, is now an excellent one, and from 160 to 200 miles long, estimated. At Lobos is a warehouse, and fine running water, within a league of the Port. All that we now want is license from the Mexican Government, to introduce our goods in bond, or free of duty, through this Port. Until this is done, mining will be carried on in this section of country under many disadvantages. With the high freights on the Colorado river, and the exorbitant charges for land carriage from there, it almost amounts to a prohibition. With the delays, it takes four months to get an invoice from San Francisco. The freight on the river is \$65 per ton, four barrels measure a ton, and 14 cents per pound, land carriage. Through the port of Lobos, goods can be received in *forty* days, and at scarce the

tithe of the cost. Now I believe it will be a saving of time and money, to order goods from New-York, via Lavacca, Texas, and the Rio Grande.

There has from time immemorial been a difficulty to obtain miners in Mexico, and when you get them, as a class, they are lazy, and steal. I am collecting information to decide upon the propriety of obtaining miners, Germans or Wallachians, from Europe. The English or Cornwall miners, introduced by the English companies into Mexico, I believe did not answer the purpose.

We have not suffered recently from the Indians, only indirectly, though they are prowling all over the country. Sonora is overrun by them. They hide in the mountains and make marauding excursions into the plains and towns, killing and plundering all they meet, in the shape of Mexicans. Of our people they are a little shy, as most of them go armed and prepared to use them. The territory is very much in want of more military protection and the civil law. Only a few days ago, a cold blooded murder was committed at Tubac, and the murderer boldly made his appearance amongst his victim's old associates.

This country undoubtedly contains a vast number of mineral veins; but there is a great difference between rich ore and a rich mine. A large outlay of both labor and money will be required, to determine whether a vein is rich, and a much larger to put the reduction works in operation. Persons

coming to this country must have mining knowledge and great caution, or they will suffer much bitter disappointment.

In this section of the country there is not much running water, or land suitable for irrigation, and without irrigation no crop can be raised. With irrigation you can sometimes raise two crops. First barley and then corn, but the latter is liable to be cut off by the early frosts. Arivacca, the Santa Cour and Sonoita valleys must be from 5 to 7,000 feet above the sea. The highest peaks of the Rita mountains are said to be 12,000 feet, which I doubt, and all winter are covered with snow. Snow in the valleys seldom lays long, and the winter weather usually is delightful. March is very windy. May and June are the hottest months. Then comes the rains, and cools the air some. They last from early in July to September. There is another rainy season in winter, but irregular and of but little moment.

The two hills and rolling country are covered with a nutritious grass, on which countless herds can graze and keep fat all the year. The country around Cerro Colorado is rolling, and very slightly broken, and our mules, although used every day keep in tolerable order. They have never had any grain until recently. The Heintzelman mine is more favorably situated than most silver mines. A wagon can back up to the shaft, and the ore be emptied from the windlass into it.

Our road to the mouth of the Gila, via Tucson, is over 300 miles. The distance can be shortened one third by passing from here through the Papagoria. We have travelled the country, and find it mostly desert, but the Indians know sufficient water to cross it. Exploration will no doubt find a better road than the one now travelled. At all events this shorter road can be travelled with camels.

Last spring loaded wagons, without a guide, went via Poso Verde to Sonoita and back. The road to Port Lobos and Altar is good. There is a warehouse at Port Lobos, recently erected by Manuel Cepeda, of Altar, to ship grain to San Francisco. I believe permission was refused him by the Mexican Government, and he now ships to Guymas. He expected to ship the copper ores of the Ajo mine, but permission was refused him. We have permission to ship our ores through Guymas, but it is no longer advisable. Cepeda dug, at Port Lobos, three wells, 90 feet deep each, but only got salt water. One of his men died of thirst, when a Papago Indian came and pointed out running water, a league from the port. A man who lived at Altar, told me that there is plenty of water for large vessels; I have heard, *sixteen* feet. He also learned from Cepeda, that there is a ledge of rocks at which vessels can load so large that a wagon can turn around on it. All such information must be received with many doubts, and I only give it to provoke further enquiry. Rich gold diggings are not

far off, and also silver mines. Caberca will be a location, as the nearest point to the seaport, at which there is good water and arable land. The valley is half a mile wide.

Although Sonorans, when on our side of the line, pretend to be great friends, they have an intense hatred of the Americans. The intelligent and merchants know that, in contact with them, they cannot prosper. All will cheat and steal, from the Priest to the Peon.

Respectfully submitted,

S. P. HEINTZELMAN,

President Sonoro Exploring and Mining Co.

P. S.—The quicksilver arrived at Tubac on the 10th of January, the day after I left Tucson. Now every thing necessary to put in operation the amalgamation works is on hand.

There were 41,248 pounds of silver ore sent to San Francisco. The net proceeds, as reported by Wass, Uznay & Warwick, \$6,800 53. Cost of shipping the ore from Cerro Colorado, 20 cents per pound, not paying expenses. The smelting is 47 per cent. under the assay.

The furnaces commenced smelting in July, and the average of all the ore smelted, is \$955 per ton. This is from the richest ore. Of the ore for amalgamation, it is estimated that there are 300 tons on the surface, and valued at \$100,000.

The mine is open for a length of 918 feet, and an average depth of 35 feet. Between the extremities there is a break of 312 feet, which will be connected when the mine gets deeper, to avoid the water which might enter, when it passes under an arroyo.

The main shaft is 60 feet deep. From the bottom a fronton has been carried 26 feet, to reach the vein. This it was expected to reach, within ten days after I left, when a connexion will be made with the diggings above, and the windlasses and ladders be withdrawn, leaving those openings only for ventilation, and all operations confined to the main shaft.

S. P. H.

NEWPORT, KY., *Feb. 3rd*, 1859.

SONORA EXPLORING AND MINING COMPANY.

FOURTH

ANNUAL REPORT

OF THE

Sonora Exploring & Mining Co.,

MADE TO THE

STOCKHOLDERS,

MARCH, 1860.



New-York:

W. MINNS & CO., STATIONERS AND PRINTERS,
159 PEARL-STREET.

1860.

OFFICERS.

COL. SAM'L. COLT, *President.*
WM. T. COLEMAN, *Vice-President.*
CHARLES S. BROWN, *Secretary.*
S. H. LATHROP, *Superintendent at the Mines*
R. W. H. JARVIS, *Treasurer.*

DIRECTORS.

COL. SAM'L. COLT, *Hartford.*
WM. T. COLEMAN, *New-York.*
AUGUSTUS BELKNAP, *New-York.*
W. M. B. HARTLEY, *Hartford.*
CHARLES D. POSTON, *Elizabethtown, Ky.*
EDGAR CONKLING, *Cincinnati, Ohio.*
CHARLES S. BROWN, *Boston.*

R E P O R T .

It is with much satisfaction that the Directors meet the shareholders of the Sonora Exploring and Mining Company upon the present occasion. It will be in the recollection of the stockholders, that at the Annual Meeting in March last, it was resolved by you to remove your organization to New-York, or some other neighboring state, with due regard to existing guarantees. Your directors have now the satisfaction to inform you, that such an organization has been made in New-York, and that now, all that remains for you, is to surrender your certificates, and receive in place of them certificates for a like amount of stock in the new company, under the name of Sonora Exploring and Mining Company of New-York. The necessity for this change has become more apparent, since a majority of the shareholders not only require it, but the resident shareholders of New-York and the states east of it, and the facilities for conducting the business of the concern, require that New-York City should be its head-quarters.

The Directors have most sincerely to congratulate the shareholders upon the success which has hith-

erto attended the undertaking, and which they have no doubt will increase as they apply the means now provided for extending the operations. The Directors have studiously endeavored to avoid offering any speculative opinions which might tend to mislead, and although their own impressions have been highly favourable from the first, they have felt that it would be much more satisfactory to the shareholders who have entered bona fide into the concern, to hear of practical results, than to hear those results anticipated with a possibility of their not being realized. A truly substantial state of things now really exists, and the Directors flatter themselves that no interruption is likely to take place to the prosperity of the Company; it will occur to the shareholders that in the first settlement of an establishment of such an extent, and where strict attention to security of property is so essential, the services of many individuals must be directed to other objects than mining, such as erecting buildings, making roads, cutting and conveying wood, making charcoal, getting machinery in motion, &c. Very soon the greater part of the force will be applied to the service of the mines, and a just ground will then be afforded of judging of possible results.

The due arrangement for a good supply of provisions and necessaries for the establishment at the mines, has been a source of great anxiety to the Directors, as much on the score of humanity, as the sound policy of that important consideration. The

application of the disposable labors of the establishment is so valuable in the preparation of the present and for the future working of the mines themselves, that it would be impracticable, without interfering with the prospects of the shareholders, to detach any part of that labor for agricultural purposes. The engagement of a scientific and competent Engineer, who shall combine the knowledge of mining with the science of his profession, has for some time occupied the thoughts of the Directors to find an individual who should be every way qualified, is a matter of some difficulty, except at such a rate of salary as they have not deemed it advisable to submit to ; they however hope shortly to hear of a person who will be able and willing to undertake this situation at a moderate rate.

The examination of the progress of the working and the sketches of the mines, which from time to time have been presented in the extracts of the various letters and reports laid before the stockholders, cannot fail to excite surprise, that so small an extent of operations should have afforded such satisfactory results—that from an opening in depth one hundred feet, with three levels, thirty-six, twenty-six and twenty feet, so large a quantity of silver should have been raised, viz: about two hundred bars, amounting to more than twenty-four thousand dollars. Such, however, notwithstanding the difficulties which were to be expected in the outset, is the fact; and when it is considered that the same lode has

been traced upwards of four miles, the future prospects of the Company certainly become very flattering.

The Directors nevertheless deem it to be their duty again to caution the shareholders against the admission of anticipations of too sanguine a nature. All mining operations are necessarily subject to great alternations.

Much of the past year has been spent in preparing the mines for more extensive operations; increasing the accommodations for the laborers, building a wall around the mine for the safety of the ore, and preparing for the erection of the machinery purchased for the use of the Company, and expected to be at the mine in April. These works have not been unattended with considerable additional expense; while at the same time a large part of the available force at the mines has been employed in making these necessary preparations, little has been done towards developing the productions of the mines. Much time has been consumed in the working of the present imperfect and inadequate machinery; and long since it was apparent to your Directors that something of a more permanent and reliable character must be procured to produce results equal to your expectations, and accordingly two steam engines of the most approved pattern, and though nominally of 25 horse-power each, they are capable of working together 70 horse-power; with these, a turning lathe, shafting and belting

together with all needful appendages, were forwarded to the mines.

A quantity of merchandise suited to the wants of the country, amounting to near eight thousand dollars, has all been forwarded, and with the machinery may be expected to arrive in April. This gross outlay, including the cost of freight, which is over thirteen thousand dollars, will amount to more than twenty-seven thousand dollars. There are no debts against the Company here. The report of the Superintendent at the mines is annexed, and reference is made to that for the condition of affairs there.

From the early commencement of the operations of the Company, the Indians, a tribe called the Apaches, have been a source of great annoyance, from their savage and frequent thieving propensities during the eight months prior to January last. The estimated value of their depredations has been over eighteen thousand dollars, all of which was recovered but forty-three hundred dollars. Besides this heavy loss, the work has been often interrupted by these depredators, by the loss of oxen, mules and horses, and the withdrawing of our best men oftentimes for days in pursuing these marauders. It is gratifying to notice that our government are becoming awake to this important matter, and that the day is not far distant when our people can pursue their legitimate calling uninterrupted.

Your Directors have been long of the opinion

that the great outlay in expenses in keeping up the Tubac establishment, fully ten thousand dollars annually, without profit whatever to the Company, is a sufficient reason for abandoning it upon any terms; and at a meeting of the Board, the Secretary has been instructed to give directions to the Managing Agent at the mines, to lease the property to some party at any nominal price obtainable, and remove all the personal property of the Company to their quarters at the mines; and your Directors hope soon to be advised that these directions have been complied with, and the Company thus relieved from the expenses of this establishment, and many disadvantages attendant upon the location of the business head-quarters so far from active operations of the Company; at the same time the shareholders will retain their ownership of the property, which has a prospective value as a town surrounded by agricultural resources.

As already stated, the Company are believed to be free from debt, with cash on hand of eight thousand dollars, besides which you have fourteen hundred and ninety-two shares of stock not yet issued, which may be sold or divided pro rata among the shareholders.

The present number of shareholders is ninety-nine, holding eighteen thousand five hundred and eight shares. In the month of June last, by your vote, a dividend of stock was made to all shareholders, and to the employees at the mines, at the

nominal price of ten dollars per share, and thus you disposed of sixty-nine hundred and ninety-two shares.

The present managing agent at the mines having some months since indicated his desire to return to his family, the attention of the Directors has been particularly turned to the selection of some gentleman, who, possessing the entire confidence of the board, may be capable of undertaking the supreme management and control of the affairs of the Company at the mines, but which being an appointment of deep responsibility in every point of view, the Directors have not thought it expedient to hastily make any engagement, thus giving themselves the opportunity of carefully investigating the character and qualifications of every gentleman who may apply, or who may be recommended to them.

CHARLES S. BROWN,

Secretary.

OFFICE SONORA EXPLORING AND MINING Co.,
TUBAC, *January 1st*, 1860.

To the President and Directors :

It is just one year since I took charge of the affairs of the Company at the mines; in August previous, I arrived in the Territory in company with Maj. Heintzelman, the President, who took charge of all the active operations until his departure the following January.

At that time the amalgamation works, on a very limited scale, were nearly completed, so that the experiment of barrel amalgamation could be thoroughly tested. It had been hoped that the power would run at least six barrels, and the stampers to supply them with ore; but on examination I found only two barrels could be run, and they could not be run at the same time with the stampers.

The first silver from the amalgamation works was produced on the 18th day of March; from that time to the present, I have been able to run only two barrels four days in the week. The amount of silver produced from these two barrels (one-sixth

our capacity,) has been \$23,665 94. Amount ore reduced, 320,000 pounds, having required

1,480 lbs. Copper,	costing \$0 04....	\$370
575 lbs. Quicksilver,	" 1 00....	575
32,000 lbs. Salt,	" 0 04....	1,280
300 cords Wood,	" 2 00....	600

The experiment of reducing the ore from the Heintzelman vein by amalgamation, has been perfectly successful; the silver produced being 990 to 998 fine. The character and quantity of ore from this mine continues the same. I can see no material difference at the several levels, thirty, sixty, or one hundred feet. I hope to reach the one hundred and forty foot level in two months. Work on the main shaft has gone on slowly; lately I have worked but one set of hands. If thought advisable, this work can be doubled. I am confident it is for the interest of the Company to continue work on the main shaft without interruption, it can now hardly be said we are beyond surface working.

Previous to the experiment with the barrels, some portion of the rich ore had been reduced by smelting. As soon as this process had been thoroughly tested, it was found that the expense of smelting would not warrant keeping a single furnace in operation; only as a large quantity of ore is raised will it pay, selecting only the richest for smelting. The average of the ore smelted has been \$900 to the ton. This process was discontinued in April, and the ore from which the selection for smelting,

and twenty tons sent San Francisco, had been made, was transported to Arivacca for amalgamation. What force I retained at the mines was placed on dead work, and only the ore raised that was necessary to carry on the permanent work. The amount of silver reduced by smelting, only one small furnace ten inches square being used, was \$7,618.

The ore on hand January 1st, 1859, I estimated at 225 tons; the ore now on hand I estimate at 100 tons; this is partially crushed, it being the coarse from the stampers.

The main shaft is run to the depth of one hundred and twelve (112) feet; one fronton at sixty (60) feet, thirty-six (36) feet in length; one at the one hundred feet level, twenty-six (26) feet long, is already run. The next fronton I propose to run at one hundred and forty (140) feet; this I think will reach the vein at twenty (20) feet. Timbering the main shaft and fronton is nearly completed. Since the reduction of our force at Cerro Colerado, the work has been in charge of Mr. G. Haberman, a German of experience in such work.

During the past six months, about forty houses have been built at Cerro Colerado, so that I shall be able to provide for one hundred and fifty miners, with the ordinary number of families.

I am confident with the frontons now run, including the one to be run at the one hundred and forty foot level, and the shaft now open, we shall be able to obtain a supply of metal for our works at

Arivacca, on the arrival of the machinery from New-York and San Francisco. In this opinion I am sustained by Mr. Ehrenberg, Mr. Kustel, Mr. Brunckow and Mr. Methner, metallurgists and mining engineers of skill and experience; yet to make sure of no interruptions or delays, it is of importance that the work of raising a supply of metal be vigorously commenced at an early day.

The Company are already in possession of my opinion as to the means of procuring a sufficient number of miners and laborers. I am confirmed in the opinion that we should offer inducements to at least one hundred Yaquie or Opetá Indians with their families. By doing this we shall be sure of a sufficient force, and on reasonable terms. I am confident they can be obtained.

At Arivacca I have done what I could to be prepared to put the engine and machinery in operation. I have shops, quarters, store and store rooms, I trust, sufficient for all the Americans necessary to carry on the enlarged works. For the Peon laborers I shall be obliged to build one additional block, and I have some thousand feet of wall to build to inclose the works; this will be done as soon as the weather will permit.

As soon as I receive the drawings of engines and machinery, I shall make preparations for putting them up. The building for engines and machinery will require to be about thirty feet by forty-five. I am in hopes to have this building completed, and

foundation for engine and boilers ready before they arrive, with an ample supply of brick, lime and timber on hand. Should the weather prove favorable, I shall not be disappointed.

The works at Arivacca are now in charge of Mr. Beseler, a mining engineer and metallurgist of experience, who succeeded Mr. Kustel.

I inclose invoices of the property of the Company with other papers. The Company have no draft, note, or bill of indebtedness outstanding excepting one draft of \$840, held by some person in New-Mexico; this I have endeavored to find and pay.

At present, the two barrels I am able to run, yields about \$2,500 per month; this nearly pays current expenses. The expenses will be materially increased in putting up the machinery. The merchandise however now on the way out, will do much to aid me in putting the works in operation. A stock of merchandise is indispensable to us; aside from its being a source of profit, it is impossible to keep men without being able to furnish them with what they require; this fact is particularly applicable to Peon laborers.

My experience has shown nothing that will induce me to change my estimate made some months since; the estimate is for one year from the completion of the works. The Company are already in possession of that estimate in detail.

Expenses,.....	\$85,820
Receipts, estimating metal at \$150 per ton, which is lower than the yield has been.....	\$180,000
Or 4 per cent. profit on \$2,000,000 capital; or, engineers and met- allurgists estimate, at \$200 per ton, receipts,.....	\$240,000
Or 7 per cent. on capital.	

Mr. Ehrenberg, who has given the business great attention, estimates the yield much higher. I have preferred to take actual results, hoping my estimates are too low, and his nearer the truth. My calculations are based on the actual results of working two barrels.

The expenses the ensuing year will only be increased the additional cost of raising ore and handling it, with the additional cost of wood, salt and quicksilver; ordinary labor and outside work will be about the same.

Losses from theft and Indian depredations have been quite serious during the year. Thirty-five mules and horses have been stolen by the Apaches and not recovered. The value of these animals was at least \$3,500. The loss has not only been considerable, but it has sometimes been almost impossible to obtain mules to keep our power running. The expense of keeping them has also been much increased from the fact, that I was obliged to keep them corraled at nights, and guarded days. The

particulars of each depredation has always been given to the commanding officer of this Military Department, who has done all in his power to aid me; but he has no means at his command that can enable him to give us any protection. It is hoped the Company will place the matter before the Secretary of War, and that he may be induced to send a sufficient number of troops here to protect us in carrying on the only business that will make the country valuable.

The thefts committed by Mexicans have always proved a serious loss, not having proper means of securing the ore; neither have I been able to adopt a proper system of search, as is the universal custom in working rich mines, much of the richest ore having been stolen. Small furnaces have been put up on the Mexican side of the line, where our ore has been smelted; this fact accounts for the small yield of the ore now being amalgamated. As soon as the Company direct additional ore raised, I shall take proper measures to secure it. At Arivacca I am building a substantial wall to enclose the entire works. A small corral at the mine, by hauling the ore as fast as raised, will do much to prevent this thieving, always a serious loss to a Company.

It may be thought advisable to work some of the veins in the neighborhood of the Heintzelman. To some extent I think it is, yet I am confident that *the Heintzelman vein is the principal one*, and the yield will continue to the depth many of the mines

in South America and Mexico are worked, 2,000 to 3,000 feet. The smaller veins may be rich where they intersect the principal one, or even near it, and the ore may bear a strong resemblance to that from the principal vein; yet I have no confidence any number of them will ever prove of any permanent value.

It is hoped that during the ensuing year, the port of Guaymas will be opened; this will materially lessen our expenses. The cost of transportation from San Francisco and New-York, to this place, is from sixteen and twenty cents per pound; when we can ship by Guaymas, the cost will be only four or five. I estimate this will lessen our living expenses at least one third.

As pioneers in the business of mining and reducing metals, our Company have had much to contend with, and many obstacles to overcome. The utter destitution of the country when the mines were taken up, the excitement occasioned by filibuster expeditions, the depredations of the thieving Apaches, with the enormous expense of operating so far distant from supplies, would almost discourage the most sanguine. That many of these obstacles have been removed, is a source of much satisfaction to me.

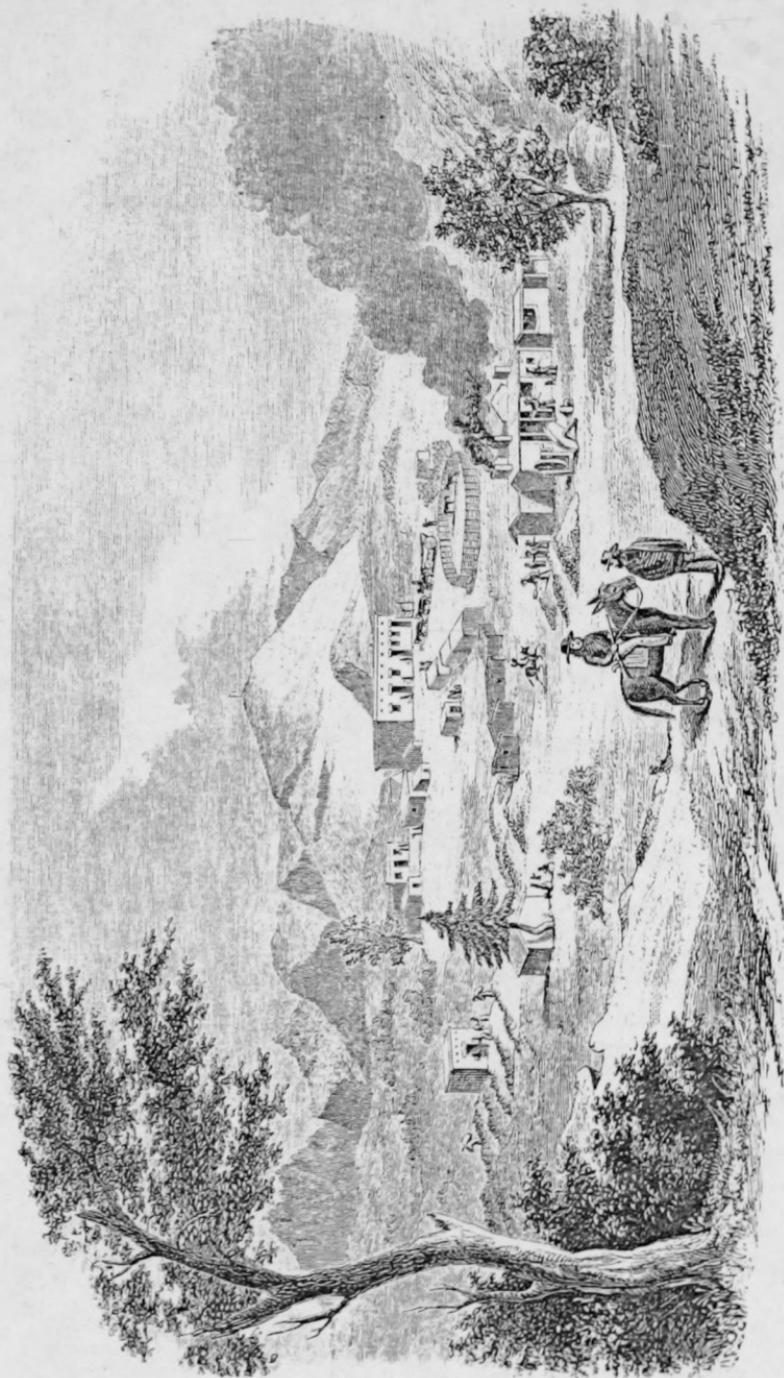
Had I not had the counsel and assistance of those who commenced the work, I fear the result would have been quite different. Although many of them are not now in our employment, they have always

shown a willingness to aid me in carrying out the wishes of the Company, and sustaining its interests.

I have the honor to be,

Your ob't serv't,

S. H. LATHROP, *Director.*



THE HEINZELMAN MINE, AT CERRO COLORADO, NEAR TUBAC, ARIZONA

The large Building at top is the Storehouse and Office. The mouth of the main shaft is covered by the stock building on the left. From whence Teams are taken with bags of ore. The Smoking and Boiling furnaces are at the right. A cord for mules, and hats for laborers complete the picture. The Catalina and Catalina Mountains are seen in the distance.

REPORT

OF

FREDERICK BRUNCKOW,

GEOLOGIST, MINERALOGIST, AND MINING ENGINEER,

To a Committee of the Stockholders

OF THE

SONORA EXPLORING & MINING CO.

UPON THE

HISTORY, RESOURCES, AND PROSPECTS

OF THE

COMPANY IN ARIZONA.

WITH AN APPENDIX BY THE COMMITTEE:



CINCINNATI:
RAILROAD RECORD, PRINT, 167 WALNUT STREET.
1859.

Officers of the Sonora Exploring and Mining Company
FOR 1859.

COL. SAML COLT, PRESIDENT.
WM. T. COLEMAN, VICE PRESIDENT.
COL. CHAS. D. POSTON, SECRETARY, PRO TEM.

DIRECTORS.

COL. SAMUEL COLT, of Hartford, Conn.
WM. T. COLEMAN, of New York.
COL. CHAS. D. POSTON, of Hardin Co., Ky.
AUGUSTUS BELKNAP, of New York.
CHARLES T. BROWN, of Boston, Mass.
W. M. B. HARTLEY, of Hartford, Conn.
HENRY HOWE, of Cincinnati, Ohio.

OFFICERS AND EMPLOYEES AT THE MINES.

S. H. LATHROP,
Director of Mines.

RICHARD W. H. JARVIS,
Treasurer.

GUIDO KUSTEL,
Supt. Amalgamation Works and Administrator, Arivaca

WM. M. BROWN,
Assistants do.

FREDERICK BRUNCKOW,
Administrator C. Colorado.

HERMAN EHRENBERG,
Mineralogist and Topographical Engineer.

T. METHNER,
In charge of Smelting.

J. L. POSTON,
Store-keeper, C. Colorado.

HABERMAN,
Mining Carpenter.

FREDERICK HULSEMAN,
Principal Store-keeper, and in charge of office, Tubac.

HENRY ELLFING,
Major-Domo, Tubac.

Number of Mexican Peons employed, 140.

INTRODUCTION.

IN "*The Arizonian*" of April 14, 1859, a weekly newspaper published at Tubac, Arizona, appeared the following paragraph :

"FOR THE STATES.—Mr. FREDERICK BRUNCKOW, of the Sonora Silver Mining Company, leaves, this week, on a visit to the States, after a residence of three years in Arizona. Mr. BRUNCKOW was one of the pioneers of the Sonora Mining Company. He came to the Territory with Colonel POSTON, and in company with that gentleman, shared the many hardships and disagreeable circumstances which naturally environed the first mining company in this far-off and isolated region. Now, having seen the Company triumph over many difficulties, and having assisted in developing one of the richest silver veins in the world, to a highly profitable condition, he proposes to pay a visit to the Atlantic States. Many friends wish him a safe and agreeable journey."

Col. SAMUEL COLT, President of the Sonora Exploring and Mining Company, in a circular issued to the Stockholders, in May last, says :

"We have also to consider the propriety—before entering into more extensive operations at the mines, which would seem to be essential to the obtaining of such results as will prove satisfactory—of procuring competent and skillful mining captains and metallurgists ; and in this particular, the advice of Mr. BRUNCKOW, who has long and faithfully served the Company, and who is daily expected in New York, will be of *great value*."

Mr. BRUNCKOW, thus heralded, arrived in Cincinnati early in June, and was present at a Stockholders' meeting, held there on the 10th instant : whereupon a committee was appointed by them to obtain information from that gentleman relative to the history, resources, and prospects of the Company in Arizona. This was obtained through the medium of written questions, the answers to which, in a continuous narrative, are herein respectfully submitted to the Stockholders, by the Committee.

SONORA EXPLORING AND MINING COMPANY.

REPORT OF

FREDERICK BRUNCKOW.

To Messrs. HENRY HOWE, JOHN KENNETT, and JOHN R. WRIGHT, *Committee of Stockholders of the Sonora Exploring and Mining Company:*

GENTLEMEN: I am gratified to give you herein the information inquired for in your series of questions. My unfamiliarity with the idiom of the English language, forms an obstacle to my doing so in a desirable manner.

Born and educated in Guestphalia, Prussia, in one of the most celebrated mining regions, I devoted myself to mining operations. Having a thorough elementary education in different schools, I was enlisted according to the governmental law of my native State, as a *private* miner. During three years I acquired the practical knowledge of the different methods of *working* in the different mining operations. Being examined by a board of governmental officers of the Royal Chief Mining Department, I was permitted to graduate at the Royal Mining Academy, at Berlin, after connecting my practical knowledge with the *scientific* branches of the art of mining, by another three years passed in study. I then gave the seventh year to a traveling purpose, visiting and examining the greater part of the principal mines of Germany, the Hartz mountains, and the most celebrated mines of Saxony, getting practically conversant with the different

methods of mining and reducing ores, so as to be able to superintend those operations.

JOINS THE MINING EXPEDITION TO ARIZONA, UNDER COL.
POSTON.

Circumstances forced me to emigrate to the United States. Being recommended to Col. Charles D. Poston, as a mining engineer, I joined, in the Spring of 1856, the expedition of the Sonora Exploring and Mining Company, to explore and open the mines of Arizona. In the latter part of August we arrived, after a severe journey, at Tucson, Arizona, 350 miles west of El Paso. We took possession of the old and deserted mining town Tubac, and commenced to erect permanent quarters. Disease and malarial fever soon appeared among us, and without any medical aid, without any physician, 50 miles distant from the little town of Tucson, from where our provisions were brought by mules, surrounded by hostile Indian tribes, we suffered a great deal, and would have been entirely destroyed if Col. Poston, who, in the meantime, had gone to Fort Yuma, Colorado river, had not returned with aid and a full load of goods. One of our party died of the fever.

EXPLORATIONS—DISCOVERY OF THE HEINTZELMAN MINE.

We commenced energetically exploring. Our progress was, however, very slow—detained by the natural circumstances of the country. We were forced to go into the mountains in parties, numbering from 7 to 8 well armed and equipped men, taking along provisions and water on mules. Between Tucson and Tubac, we found the skeletons of four young Americans, who, while exploring, had been killed by the Apaches. We took possession of the old mines at the Santa Rita Mountains, commenced operations, and some of our men, Americans and Mexicans, put up a permanent home. The old, caved in mine, Salero, we succeeded in clearing as far down as the water level, about 72 feet, while Col. Poston and myself were exploring the country.

On the 21st of January, 1857, I started out with some of our company, and several Mexican miners, to examine the present Heintzelman vein, where I had discovered on a previous expedition, several traces and some specimens of very rich silver ore. In the afternoon of the 23d of January, the vein was cut in one of the ditches. Ascertaining the enormous value of the Heintzelman vein, it was concluded by Col. Poston to suspend, at present, all the works in the Santa Rita, as well as in the Cajeda Mountains, in order to concentrate all the works and working force, which was, however, small, at the Heintzelman vein.

FILIBUSTERS.

The ranche La Aribac was bought at that time, and Mr. Schuchard went there to take possession of the same, and to open the old mines. In the month of April, if I am not mistaken, the unfortunate Filibuster expedition, headed by Crabb, fell into Sonora at two points, at Altar and Cavorca. In consequence of this, an embargo was laid upon the exportation of supplies from Sonora, when our provisions fell short and there was no chance to get more. Under these circumstances, Col. Poston gave me the order to discharge all the miners, excepting one for my personal services. It was totally impossible to carry on our mining operations, and we reduced everything to the utmost degree. Fortunately we received corn, peas, beans, and pumpkins, from the Pimos tribe, Col. Poston having sent a party to these Indians to trade brown cotton for such provisions as they might be able to get. Instead of flour, our men received corn, which they ground on stones with their hands.

Another bad influence was created by this Filibuster expedition; the feeling of the Mexicans became hostile against the Americans, and for a time it was impossible to engage Mexican miners and workmen from Sonora. Col. Poston concluded to go to San Francisco, taking along 30 lbs. of the best of our ore, to ascertain its yield in the different assay-

ing offices, and in the United States mint. According to the certificates given of the different assays, the ores yielded from \$5,000 to \$8,600 worth of silver per ton. Exactly the same yield I had ascertained before.

ORES SENT TO SAN FRANCISCO, AND ENGAGEMENT OF MR. GUIDO KUSTEL.

According to a contract made by Col. Poston, twenty-five tons of ore were sent forward to San Francisco in order to be smelted in a reverberatory furnace. The refractory and chemical character of the ore showed sufficiently that these ores would give far much better results in extracting the silver by amalgamation than by smelting.

Mr. Guido Kustel, agent of Messrs. Wass, Uznay, & Warwick, in whose smelting establishment the ores were reduced, was sent by these gentlemen from San Francisco to Arizona, in order to test and estimate the richness and character of the ores in the mine itself.

The result was that Mr. Kustel resigned his situation in San Francisco, to join the service of the Sonora Exploring and Mining Company, and bought shares at \$40 each, for cash, out of his own pocket. This gentleman graduated at the Royal Mining Academy at Freiburg, Saxony, the most celebrated mining academy in the world. He studied the amalgamation process in barrels, the smelting of the silver and lead ores in reverberatory as well as in blast furnaces, and acquired all the practical and scientific knowledge of the art of smelting. His opinion was, that a small quantity of the ores of the Heintzelman mine was favorable for the smelting process, while the far greater part of them could only be successfully worked by the amalgamation process, founded on the principles of the Freiberg method. The poorer and clayish ores could be worked according to the Mexican *patio* process. This was precisely my opinion, as I have shown by Mr. Kustel's and my own experiments.

THE SMELTING PROCESS OF REDUCING SILVER ORE DESCRIBED.

Let me state in few words the principles and different points of these three methods:

Our ores, as well as most of the Mexican ores, contain quartz in a nominal quantity, and the nature of the same proves how difficult they are to smelt, and it would be necessary to give, therefore, only the richest ore to the smelting process. The nominal yield on copper makes it necessary to add three parts of lead ore to one part of silver ore.

The lower part of our furnace which we use for smelting the ore, is built out of a fire-proof, quartz sand stone, of a very fine grained structure, found in the neighborhood. The upper part and the smelting house are built of brick dried in the air, (called "adobes.") The smelting room inside of the furnace is 12 inches square; the blast is a double bellows, constructed and built entirely at the place, which is operated by one man.

The molten lead accumulated in the furnace in the basin, runs in another basin, outside of the same. There it cools off a little, and the formed crust containing, to a large extent, sulphurets of copper, lead, etc., is taken off the top of the lead bath and kept separate. The lead itself is put in castings, in the form of cakes 10 inches in diameter, weighing 75 pounds. Six of these lead cakes are put on the edge, one near the other, leaving, however, some little distance between each, upon two declining iron plates; these plates nearly touch each other. Charcoal is put between and above the cakes, so that they are enveloped, and after kindling the same, the cakes must be protected in order to keep the air draught off. The heated cakes commence to smelt and sink, the lead runs from the furnace in a basin, from where it is put in castings. The lead obtained is now free of copper, and yields per ton about 40 pounds of silver.

Each of the lead cakes put upon the declining plates, which are made out of iron, leaves a skeleton, which is very

rich with copper, and yielding some silver; and in order to separate this from the copper it is broken into fragments and passed the furnace in company with the crusts taken from the lead in the first place, and with some other lead ore. By smelting the skeletons and crusts, which contain sulphurets, etc., lead will result, which is put in castings in the form of cakes; these cakes are put again upon the declining plates, and pass through the same process described before. The remaining skeletons contain this time very little silver; they are smelted in a copper refining reverberatory furnace and refined, and in the form of balls, delivered to the amalgamation process. These balls are needed for the amalgamation in barrels, and I will refer to them again.

The argentiferous lead, free of copper, is put in a cupella furnace, and passes the well known oxidating process; the silver remains and is refined. The resulting oxide of lead is added to the lead and silver ore, and again passes the blast furnace.

THE BARREL AMALGAMATING PROCESS OF REDUCING SILVER ORE DESCRIBED.

In amalgamating the ores in barrels, the ore is put under the stamps and passes three sieves. The siftings of the first sieve are put under the stamps again. The sifting of the second sieve is as fine as the grain of wheat, and the total sifting is delivered to the ore mill, Arastra, where it is ground with water, to a very fine powder; then it is dried and crushed. The sifting of the third sieve gives a powder fine as flour. This powder and the obtained fine ore powder of the Arastra mill is mixed with 8 per cent. common salt, put in a reverberatory roasting furnace, and roasted till all the metals are formed into chlorides; this process is done in five hours. Eight hundred pounds of this powder are put into the amalgamation barrel, together with a certain quantity of water and 75 pounds of the copper balls, previously men-

tioned. The barrels are brought in a revolving motion, so that the whole mass in the barrel will form, after a certain time, a paste stiff enough that the 400 pounds of quicksilver now added, find no occasion to form a separate body; they must be divided through the whole mass in minute globules, unseen by the naked eye. The barrels are set in revolving motion for 22 hours. The formed chloride of silver will be precipitated into metallic silver by the presence of the metallic copper; chloride of copper will be formed and this will be lost. The silver in the metallic state in contact with the quicksilver then forms the amalgam. The copper exists in the roasted mass as chloride of copper; it has no influence in the amalgamation process, and is lost in the residue. After 22 hours, more water is put in the barrels, in order to thin the paste, and to accumulate the minute globules of quicksilver and the formed amalgam in a mass. This will be accomplished in two hours, by setting the barrels in a slow revolving motion. The barrels are now opened, and the quicksilver and amalgam runs out in troughs, from whence it is put into strong canvas bags. The surplus quicksilver is pressed through the bags by its own weight, the remaining stiff amalgam is retorted, the silver, not being volatile remains and is melted, and cast into bars. The bars are marked with the Company's stamps, numbered, their yield according to the assay, and their value in dollars marked upon them.

THE PATIO AMALGAMATING PROCESS OF REDUCING SILVER ORE DESCRIBED.

In different places in Mexico the amalgamation process, called the Patio process, is introduced. This method of amalgamating differs entirely from the one just described, and can only be successful with a certain class of ore. The ore is crushed and grounded to a very fine powder in the arastra mill, and without first roasting the same, mixed with salt, moistened, and piled up on a floor in equal piles.

Quicksilver is added at certain intervals, and the mass kneaded and stirred up by driving mules through the whole of it. According to the providing of the chemical process and in order to regulate the same either lime or magistral (sulphate of iron) is added in certain quantities. The process is done in different time, according to the degree of the temperature; in the warm season, in the course of two or three weeks; in the cold season, much longer. The whole mass is worked, and the resulting amalgam retorted to fine silver.

This process gives a great quicksilver loss; is primitive, and would give good results with poor and easily ground ores.

ERECTION OF THE BARREL AMALGAMATION WORKS AT THE HEINTZELMAN MINE.

Having ascertained by experiments, we concluded to adopt the amalgamation process in barrels, and according to Mr. Kustel's plans and design, the necessary machinery, barrels, etc., for that purpose, were constructed in San Francisco, under his supervision.

In the first part of June, 1858, the machinery was completed. Mr. Kustel then shipped it to San Diego, and left that place with his family for Arizona. A well equipped train, in good order, loaded with silver ore for San Francisco, had already left the mines for San Diego, intending to take the machinery as soon as possible on the return trip. After a severe journey, leaving most of the freight at Fort Yuma, the train arrived at San Diego in such a dreadful condition that it was impossible to then return. Major Heintzelman and Mr. Lathrop, on their journey from San Francisco to Tubac, finally succeeded in persuading the owner of the train to take the machinery, and start as soon as possible. He arrived at the mines in October, 1858.—The rainy season had set in, the material on the mine, adobes, etc., had been destroyed, the contracts to deliver

the timber broken, and the workmen employed in building the works in Aribac, had left. We had no goods in the *tienda*, and those ordered and bought in San Francisco did not arrive; we could not pay the Mexican peons regularly, and they were unwilling to work. The staves for the barrels had become so dry that they did not fit. All these unforeseen obstacles delayed the erection of the amalgamation works, in spite of Major Heintzelman's constant presence on the spot, and the arrival of Mr. Brown, from San Francisco, as Mr. Kustel's assistant.

Mr. Brown having been employed as "azoguero" for 18 years, in Zacatecas and Real del Monte, those celebrated mines worked by English capitalists, gave his opinion in favor of the amalgamation by barrels; he studied thoroughly the same process there. He stated that at the time he left Real del Monte, 24 barrels were in operation. He was able by his knowledge of the Mexican language and customs, and his scientific education, to accelerate the erection of the works, and prompted this sufficiently by practically working.

Everything complete, the stamps were set to work and one barrel put in operation; in the course of time a second one, and when I left the mines, the third one was moving. My opinion is that only 6 barrels can be worked by mules. The results obtained by this excellent method of amalgamation are to be seen in the fineness and purity of our silver bars sent to market.

MIXING OPERATIONS AT THE HEINTZELMAN.

In the meantime the mining operations in the Heintzelman mine were going on finely. It was found necessary to open the mine deeper than 30 feet from the surface. In order to do so, a perpendicular shaft, striking the vein in a certain depth and opening the same by different cross-cuts, was projected. To accomplish this project, I put all the force I could upon it. The vein dips 80° to the West, and I thought

a perpendicular shaft 40 feet from the vein, striking it some 250 feet below the surface would, as the chief shaft of our mine answer all the purposes for a long time to come. The shaft was sunk in a solid rock and the whole mass was blasted with great difficulty. From the surface down, the cross-beams, 8 inches square, are set every three feet. By thus timbering the shaft, it becomes divided into two parts, one 6 feet and 4 feet clear, for hoisting the ore in buckets; the other 3 feet and 4 feet clear, to put in the necessary water-pumps, and to hang in the ladders for the miners. Sixty feet from the surface the vein was opened by a crosscut, or "fronton." Its width 30 feet from the surface was ascertained to be 2 to 3 feet, while 60 feet from the surface the thickness of the vein is 3 to 5 feet. Not calculating the increase of the thickness of the vein in this proportion, there is no doubt whatever, the vein will be found wider and richer at a depth of 100 feet than at 60 feet. The mass of ore is purer, and the corresponding ores in the depths of the mine are richer than they are above.

In striking the vein by the crosscut, the 60 feet level was driven in both directions, in order to communicate with the present 5 shafts which are sunk down in the vein. The ores from the 60 foot level were carefully assayed by me, and their yield ascertained to be from 1,000 to 4,000 ounces of silver per ton. Some, however, of the ore gave the enormous result of \$20,000 per ton.

The shaft is now sunk down 100 feet, and another crosscut at 100 feet is at present commenced. This crosscut will strike the vein, and the 100 foot level is intended to be driven in both directions. It is intended to stop the vein between the different levels, by bottom-stoppers every 7 feet.

The useless stones and earth which result in working must be piled upon the wood-work constructed for that purpose, as I have already constructed the same in the upper works. The vein crosses a little brook to the south, which, in rainy seasons, contains water. In driving the 30 foot

level, I should have come too near the surface, and it was not advisable to drive this level through. I therefore sunk on each side of the brook a perpendicular shaft close to the shafts, Los Animos and Carlos, intending to connect, however, the vein with the 60 foot level. At present this is accomplished.

On the other side of the brook some fine and very rare specimens of iodide of silver, and a composition of quicksilver and silver, not yet known, and rich silver ores, were met with.

My intention was to extend the level in both directions as far as possible, and to employ a greater number of hands. The vein seems to be traced the farthest to the South. The country, however, is there not favorable for surface examination.

From this you will perceive that the Heintzelman vein is opened so far that enormous quantities can be taken out, and that we are able to employ a great many hands.

Half a mile distant from Carlo shaft in a southern direction a shaft was sunk 26 feet deep. Some very good and rich ore was found, but the work was suspended on account of the scarcity of hands. One and a half miles nearly in the continuation of the southern part of the Heintzelman vein, I cleaned and opened an old shaft, where some fine ore was found. However, work was suspended at present, the cost of cleaning and timbering the shaft was too heavy. This old shaft belonged to the Mexican mine, Bapcura.

MINES IN THE VICINITY.

The whole country, nearly six miles square, was surveyed by me with the compass, and according to the survey a map was drawn, marking plainly all the new discovered veins, and the old Mexican mines. There are few old mines in the whole district. The map is in the office of the Heintzelman mine.

I opened a new vein one mile distant in a north-west direction from the Heintzelman mine, which was found three feet thick, and showing such fine and good ore that I was justified in opening it further. The vein is called the San Jose; the ore I assayed, yielded 300 ounces per ton.

RICHNESS OF THE HEINTZELMAN MINE.

Comparing the Heintzelman vein with the most celebrated mines of Europe, the very well known mines of the Hartz mountains, and of Saxony, which were opened long before gunpowder was invented, and with the best of Mexico, as the celebrated mine Real del Monte, we come to the conclusion that enormous and the most sanguine results will be obtained, by carrying on the mining operations in the right manner and on a large scale. We know from experience, and geology, also, teaches us, that the deeper a silver mine is opened, the richer the ore is found; and we may say that the Heintzelman vein will not be excepted from this rule; and in order to obtain the same returns, (35 per cent. on the capital,) as the English Company at Real del Monte, it is only necessary to place there the necessary works. This English Company bought the mines of the Count Regla, who did not work the vein, as it did not pay expenses, and they expended large sums in clearing the old workings, not knowing the character of the vein. Acquainted with the nature of veins in general, and always anticipating a great success, all the works were constructed on a large scale in the beginning, and the obtained results gave proof enough of their wisdom. I consider the Heintzelman vein as one of the richest silver mines in the world, and I see no obstacles in obtaining results equal to the most celebrated mines of Mexico. In carrying on the business on a small scale, the results of course, will be according to it.

ESTIMATED PROFIT OF THE HEINTZELMAN MINE WITH A FORCE OF 200 PEONS.

The motive power at Aribac for putting the amalgamation

process in operation is insufficient, and it is therefore advisable to send a steam power engine to the place as soon as possible. To amalgamate, that means stamping, sifting, washing, etc., 10 tons of ore in 24 hours, 12 barrels, 15 stampers, 2 Arastras, (mills,) and the necessary apparatus for sifting and washing, set in operation by a forty-horse power engine, will be sufficient. Taking 10 tons of ore out of our mine, we find, on average, that they give 7 tons of rich ore, especially for the amalgam process in barrels, and 3 tons of poor ore, favorable for the *Patio* process. Considering the yield of the richer ore at only \$300 per ton, and the same of poorer ore at \$100, we find the amount of silver in those 10 tons of ore, which we are able under the above stated circumstances to amalgamate at \$2,400, and calculating per month it would give \$62,400, and per year, \$748,800, which amount would be increased in two years, as the work extended and more hands were employed.

I think there will be no doubt whatever that the whole enterprise may be considered as a profitable one; as experiments, the study of the ore, and considering all the circumstances justify me in stating, that to mine, hoist, and transport ten tons of ore daily, a force of 200 men will be sufficient. The average wages per month, calculated at \$12,50 each man, will therefore be for 200 men \$2,500. Nearly all the money the miners earn per month, they bring back to the store, and taking 50 per cent. as the average profit on the goods, we must deduct at least \$800 per month from the wages, therefore, leaving the cash amount to be paid at \$1,700 per month. The cost of stamping, washing, sifting and amalgamating the ten tons of ore per day, calculated at the same cost as mining the ore, which would be, however, too high an estimate, and paying \$600 for superintending the works, we get an amount of \$4,000 per month. The amount of silver from all the ores mined per month, as stated before, was calculated to be \$62,400, and deducting the cost of mining and amalgamating the same, the *net*

profit per month would result to \$58,400, and calculated per year \$700,800. This valuation is not too high, as assays give proof enough, and the smelting result states further, that no ore of the Heintzelman vein was ever smelted, yielding under 45 cents per lb. The average yield of \$300 per ton compared with the different assays of ores yielding from \$1,000 to \$20,000, seems to leave some doubt. This, however, is explainable as the Mexican miner and the Indians, who are gifted by nature with no great calculating talents, are lazy and can not become accustomed to separate the poorer sort from the richer, even if the most careful supervision is kept over them.

According to my assays I found the red clay near the walls of the vein yielding 90 ounces per ton, too rich to be thrown away; and as ores can be mined in the greatest quantities, there is only one point to be considered—that is to have power enough to amalgamate them.

OTHER PROPERTY OF THE COMPANY.

The Rancho la Aribac, containing many mines, and seventeen thousand acres bought by the Company, will certainly add to the profitable results. It is of great value to them to possess such a fine oasis in the desert as the Rancho la Aribac. They could not, in fact, carry on their amalgamation, as the only water to be had in the environs is there. We opened and examined two of the many veins of this Rancho. Smelting furnaces were built, and some ore already passed the furnace: however, our workmen had to leave the place on account of the fever; and under these circumstances at that time, we found it advisable to stop the whole workings.

The veins contain solid Tetrahedrite, the German Fahlerz, and lead ore, yielding from 80 to 600 ounces per ton. The lead mines contain argentiferous silver. The yield of the gold is estimated according to assay, and one ounce of the argentiferous silver is worth \$1,50.

The walls of the amalgamation house are three feet thick, and all the houses on the Company's premises, may be considered the best in the territory. A good many well educated miners, acquainted some years with mining operations and mining localities, speak favorably of the Heintzelman mine, and are jealous of the owners.

We cannot estimate the whole value of the land of the company. I think \$2,000,000 is not too high an estimation.

The costs of all the machinery necessary for our amalgamation, the transportation, erecting, and putting it in operation, will not exceed the sum of \$25,000. It will be necessary to send a competent engineer to superintend the transportation of the engine, and to erect and run it. Parts of the machinery should be taken in duplicates. The boiler should be transported in three parts.

CONCLUDING REMARKS.

The Sonora Exploring and Mining Company and the Overland Mail did a great deal to the progress of the country. Tucson and Aribac improved, and everybody wished success to the pioneers of the Sonora Exploring and Mining Co.

Had this Company been unsuccessful in a land where only mining operations can add to its welfare it must have checked all the other mining enterprises for the future.

By the increasing population we are compelled to get our provisions from Sonora; and this land, so rich in silver, and favorable for agricultural purposes, ought to belong to our United States. This would be, (and all the well educated Sonorians agree in this respect,) a benefit to this poor-governed land; however any Filibuster invasion would entirely operate against American interests. The troubles occurring lately in Sonora are only personal, and the reports in home newspapers, which are anxious to give their readers every week a new Filibuster movement, are false, and of no consequence whatever.

We should have laws, and a strict observation of the same, in Arizona.

When I left the mines, as administrator, my assistant-engineer, Mr. Th. Methner, thoroughly educated in mining business, took charge of the mines and smelting works. He is competent for this office.

In looking at the history of the Sonora Exploring and Mining Company, and all they accomplished under so unfavorable circumstances, everybody will agree that under the skillful superintendence of Col. Poston and Mr. Lathrop, all the officers of the Company did their utmost duty, and the Company certainly will be pleased with the results.

All the business part is regulated, and goes on in a proper manner, as described. The Sonora Exploring and Mining Company will therefore in a very short time take such a position, as is anticipated by few men.

Having now given you a conscientious report of the whole, I can only add, I shall be happy to impart any further information upon the subject that you may wish, or any which I may have omitted.

Yours, Respectfully,

FREDERICK BRUNCKOW.

NEW YORK, June 24, 1859.

ARIZONA.

ARIZONA or the Gadsden purchase forms the southern part of the Territory of New Mexico. It originally was a part of the Mexican State of Sonora, from which it was acquired by purchase from the government of Mexico. It is about 460 miles in length, with an extreme breadth of 130 miles. Like most mineral regions, it is of small value for agriculture, possessing but little arable land, and in many parts is destitute of water. Its mineral wealth is enormous, principally in silver ores. The great Southern semi-weekly overland mail line, between St. Louis and San Francisco, traverses its entire length from East to West, giving constant communication with the first in 16 days, and with the last in 7 days time.

The two principal towns in the mining regions are Tucson and Tubac,—the first on the line of the overland mail route; the latter 52 miles south of it, and each containing a few hundred inhabitants. Tubac is the head-quarters of the Sonora Exploring and Santa Rita Silver Mining Companies. From Tubac to points of interest in the vicinity, the distances are as follows:—Heintzelman Silver Mine, at Cerro Colorado, 22 miles, six miles south of which on the Arivaca Rancho are the amalgamation works of this mine. Santa Rita Silver mines, 10 miles; Tumacacari Rancho, 3 miles; Sopori Silver mine and Rancho, 11 miles; Calabazas Rancho, 15 miles; Fort Buchanan, (garrisoned by United States troops) 40 miles; San Xavier Silver mine, 35 miles; Patagonia Silver mine, 48 miles; Ajo Copper mine, 135 miles. Distances from Tubac to prominent points out of the Territory, by the traveled routes are as follows:—San Francisco, 1074 miles; San Diego, 510 miles; Fort Yuma, (built by Major S. P. Heintzelman, U. S. A. in 1851) 330 miles; El Paso, 389 miles; Saint Louis, 1770 miles. Towns in Sonora, Mexico:—Santa Cruz, 54 miles; Magdalena, 51 miles; Altar, 95 miles; Hermosillo, capitol of Sonora, 229 miles; Guaymas, port of entry of Sonora, 329 miles; Lobos, on the Gulf of California, 175 miles.

Four of the mining companies in Arizona are incorporated under charters from different States. *The Sonora Exploring and Mining Company* was organized in 1856, under the laws of Ohio; capital, two millions of dollars; office of the Company, No. 88 Wall Street, New York. *Directors*, Samuel Colt, Hartford, Conn.; Wm. T. Coleman, New York City; Chas. D. Poston, Elizabethtown, Ky.; Augustus Belknap, New York City; W. M. B. Hartley, Hartford, Conn.; Charles S. Brown, Boston, Mass.; Henry Howe, Cincinnati, Ohio. *Officers*, Samuel Colt, President; Wm. T. Coleman, Vice President; Chas. D. Poston, Acting Secy.; S. H. Lathrop, Director of Mines; Richard W. H. Jarvis, Treasurer at the mines; Guido Kustel, Frederick Brunckow and T. Methner, Mining Engineers. First silver ore reduced in July 1858. Number of Mexican Peons employed 140.

The *Santa Rita Silver Mining Company* was organized in the year 1858 under the laws of Ohio; capital one million of dollars; office, No. 167 Walnut Street, Cincinnati, Ohio. *Directors*, Dr. Geo. Mendenhall, Cincinnati; Thos. Wrightson, Cin.; Thos. H. C. Allen, Cin.; John D. Park, Cin.; Chas. D. Poston, Elizabethtown, Ky.; Jas. O'Kane, Columbus, Ohio. *Officers*, Dr. Geo. Mendenhall, President; Thos. H. C. Allen, Vice Pres't.; Thos. Wrightson, Secy.; Wm. Wrightson, Director at the mines. Number of Mexican Peons employed 90. First silver ore reduced May 7th 1859.

The *Sopori Land and Mining Co.*, and the *Arizona Land and Mining Co.* were organized in June 1859, at Providence, R. Island.

APPENDIX.

We here annex extracts from private letters and other sources recently received from the mines, giving information. The first is from Herman Ehrenberg, Esq., Topographical Engineer, late in service of our Company, to Edward Conkling, Esq., and dated Tubac, Arizona, April 8, 1859. Mr. Ehrenberg has been a resident of Arizona for five years, and is reputed to possess a more complete knowledge of the territory than any other person living.

“Here everything goes on prosperously, and I shall shortly give you more information in regard to our mines.

“The barrels are worked by Mr. Kustel admirably; but, for want of sufficient motive power, only two out of eight are yet in operation, for about four days in the week, turning out about 1,200 ounces [\$1,536 in value] of the *very purest silver* in that time. A good steam engine is needed before doing *great things*, although we are more than making expenses now. The smelting furnace furnishes some 300 or 400 ounces per week.

“The main shaft at the Heintzelman is 85 feet deep. The ore richer and more of it below. We have about 150 men employed. General harmony reigns. Mr. Lathrop, [our business manager,] is doing well, and has much systematized affairs.

“No more stock ought to be sold, by any means. If, for engine and more extensive crushing works, more capital is needed, the company ought to borrow and pay a good interest on it. 1860 will pay us a heavy dividend on our stock, without fail.”

As promised in commencement of the preceding extract,

Mr. Ehrenburg again wrote Mr. Conkling, and on the 21st of May, from which letter we also extract :

“I hereby reiterate that no more stock ought to be sold at any price below par—that the money needed for putting up larger works, and payment of all debts to employees, should be raised by loans at reasonable interest, if possible. If a large amount of goods are to be forwarded, this should not be at the expense of stock—at least, this latter ought not to be thrown away.

“I really despair that our people will ever comprehend the true value of our possessions out here, and the proper way to make them so to the stockholders.

“It is strange that a Company owning possessions of such *immense value* as ours, should tinker along as we have done for years, while to develop these resources was so comparatively easy. Nothing but total ignorance, misunderstanding on the subject, or the want of faith somewhere, could have delayed us so long.

“In the Heintzelman mine, we own one of the richest in the world, if properly opened, worth *at least* the whole of our capital, and more undoubtedly.

“We own numerous veins in the same locality, not equal to the Heintzelman as far as known, but of a yield that would be considered very rich in Mexico and Peru.

“We have twenty and more veins of ore in the Arivaca Ranche, which are near our Reduction works, easily worked and show a good per centage. Messrs. Kustel and Lathrop investigated one, the “Longorenia” vein, the other day, about two miles from the Amalgamation works. It is an old abandoned mine. At a depth of ten feet they came to water. The vein is very regular. Mr. Lathrop broke off a piece of ore, at random, with a rock. This showed by assay at that depth, \$450 per ton. It is not probable this will be the average, but if it even yields \$100 only, it will be a valuable vein, as it can be so easily worked, and the ore transported to the works. There are undoubtedly others full as rich if not

richer. The name *Arivaca* is only second in fame to Arizona, and I worked two years before Mr. Poston's arrival here to secure it. Could I recall time, I would not again transfer it to the Sonora Exploring and Mining Company. Beside the mining resources, those for stock raising are the best in the country. Twenty thousand head of cattle can be kept in good order on its range.

"Next in value is our share in the Santa Rita mines, which seem to turn out better than I had supposed at one time. Next are our lands, lots and houses, in Tubac.

"It is of the utmost importance that all the old debts be settled at once, that the employees are all paid up, that machinery for the extension of the Reduction Works, principally a 40 horse engine, be sent out forthwith. These are important points, and should be attended to without delay. The Company is good for any sum borrowed for this purpose. We are paying expenses now, and perhaps a little more which is expended in building furnaces, houses, etc., but with our *picayune* machinery, it cannot be expected that we shall liquidate the old debts, many of which originated from want of experience or disappointments.

"This machinery, however, although small, was made with regard to *future extension*, as we knew that before a large Company like ours could begin to realize dividends, larger Reduction Works must be erected. Our principal aim *at first* was to ascertain the *proper process—to try*, and if possible pay expenses. In this Mr. Kustel has been *eminently successful*. His task is done—he goes shortly back to California to his family, but will return whenever the Company shall need his services for the extension of the Works.

"Nothing but this last is needed, and the proper opening of the mines around us, to make our Company one of the most prosperous and important in the United States; and with such prospects we ought to sell no more stock, if possible."

Extract from the Report of S. H. Lathrop, Director of the Mines of the Sonora Exploring and Mining Company, dated 31 May, 1859.

“I have to report a somewhat improved state of affairs. We have filled up our men at Arivaca to the usual number, and are going on with the work there as well as before the difficulty.

“At Cerro Colorado we again commence the week with thirteen peons, which enables me to put one-half the usual number into the shaft, and do a little other outside work. We continue to have assurances that more hands will soon come up.

“I shall commence the third “fronton” the next week, at the depth of 100 feet, and as soon as the vein is reached, will give the result of the reduction of a sample of ore.

“We have supplies, excepting merchandise and beef, for about three months, in case we work our full complement of men, 100 at Cerro Colorado, and 40 to 50 at Arivaca.

“Col. Bonneville and staff have paid us a visit. The gentlemen expressed themselves *much astonished at the extent of our works*, having a knowledge of the difficulties of carrying on operations in this out-of-the-way country. I am sure whatever they can do will be done for this section of the country. Mr. Jarvis and myself were enabled to entertain them respectably.

“The large profile of vein, view of mine, &c., is completed, and will be sent the first opportunity.”

Extract from Report of Guido Kustel, Master of Amalgamation Works, Sonora Exploring and Mining Company, dated Arivaca, Arizona, 15 May, 1859.

“The present condition of Amalgamation Works at Arivaca, with regard to insufficiency of power, do not permit me to reduce more than four tons of ore per week. If the two arrastras could be kept going day and night, a double amount

could be reduced. As you know, we have now three barrels, capable of receiving 1,060 pounds of ore each. I mean 1,060 roasted and prepared ore, which is equal to 1,100 pounds unground ore. The loss of weight, when turned into powder, is partly a mechanical one—carried up through the chimney, sifting and handling, but chiefly by calcination.

“Our horse power can stand four barrels of ore, if necessary, but they are too heavy for eight of our mules.

“The amalgamation is very satisfactory and well regulated. Some preparations are to be done yet by degrees, but they are not essential. Wood is chopped, over 200 cords. The consumption of wood is $1\frac{1}{4}$ to $1\frac{1}{2}$ cords to every ton of ore. To decompose the chloride of copper, it requires between three and four per cent. of lime to the quantity of ore. At present I use 8 per cent. of salt with the best results, and hope that it might do with six.

“Eleven barrels yielding 119 pounds of silver, showed a loss of 59 pounds of quicksilver. This is 4 oz. to the marc of silver.

“A great difficulty exists in the irregularity of speed by mule power injurious to the machinery and manipulation in every respect. In changing the animals and often stopping, three hours are lost out of twenty-four. Only a steam engine can remove this obstacle.

By reducing 35 tons of ore, we received till the 15th of May, \$5,189.53. This shows the average of \$148 per ton; but I must remark that about 6 tons of the 35 yielded only \$67 each. They were intended for the patio process.

“According to your wish to know the exact quantity of ore which can be reduced by aid of a 40-horse power engine, I calculated that 12 barrels, 15 stamps, 2 arrastras, agitators, sifting, &c., &c., will require 40-horse power, yielding 7 tons for the barrels and about 3 for the patio, in 24 hours.”

REMARKS.—In the above Report, Mr. Kustel gives the average value of the 35 tons of ore which had up to that time been *amalgamated*, at \$148 per ton, which is rich enough for

all *practical* purposes. But this is only partial truth; for including all the ores which had been *smelted* to that period, at San Francisco and at Cerro Colorado, the average of the ore *reduced*, was three hundred and thirty-four dollars per ton. This however is too high a yield for the average of all the ore thus far *mined*; as much surface ore remains to be reduced, and this surface ore is always the highest and poorest in a silver mine, and found to be so in the Heintzelman.

Average Yield of the Smelted Ore of the Heintzelman Mine.

The ore of the Heintzelman mine, it has been found by experiment, is mostly adapted to the amalgamation process. Only a small part of the ore is adapted to the smelting process, and it is the ultimate intention to amalgamate it all. The rich yield of that portion which has been given to the smelting furnace lifts up the average of the whole. In a private letter of Major S. P. Heintzelman, U. S. A., late President of the Sonora Exploring and Mining Company, to Mr. Thos. Wrightson, dated at the mines, October 27th, 1858, he thus speaks of the mine and the smelted ore:

“The mine is everything we can wish. Every step it proves richer and better. I have this moment been shown some ore from the vein in the new shaft beyond the ravine, where it is over three feet wide, and all impregnated with rich metal. All experience promises still richer results than we have yet had. Of all the smelted ore, the average has been forty-six cents a pound, (\$920 per ton.) This is certainly a *wonderful yield*. There are but few mines in the world yield any thing like this. The famous Real del Monte Mines, in Mexico, which *netted* the stockholders, by the Report of last year, *one million and a half of dollars*, does not yield near as high a per centage. All we want, is a little more time to develop our mine.”

*Notes upon the Operations of the Real del Monte Company,
Mexico.*

The following data is from a detailed Report, made by Mr. Buchan, the general Manager of the Real del Monte Company, in 1854, and upon the notes of Mr. E. L. Plumb, taken while on a visit to the Mines in 1857. These are one day's ride by diligence from the city of Mexico.

Mr. Plumb is the originator of the well-known "Mexican Pacific Mining Co.," owning lands and mines near the Mexican coast above Acapulco. In a letter to Col. Poston accompanying these statistics, he says:

"Thinking the herewith enclosed notes may perhaps be of interest and of value to you with reference to silver mining in Arizona, I beg to take the liberty of soliciting your acceptance of the same.

"They show what cannot usually be easily got at—the cost in detail of the actual working operation (so far as the reduction of ores is concerned) of a large Company.

"The Real del Monte Company is one of the most important mining companies in Mexico, and is under excellent management, as can well be inferred from the system with which every branch of expenditure is looked after. Nothing more reliable, or based upon a larger experience, can be had anywhere. Their ores, I may also say, are of the hardest and most refractory character. You will perceive, however, that they are not losing money."

STATEMENT of the mean cost of producing 3,000 pounds of Silver Ore at the Real del Monte Company's Reduction Establishment, of Sanchez, Velasco, San Miguel, and Regla, during the year 1854; showing comparative economy of the different Establishments, and of the different processes employed.

AT SANCHEZ, VELASCO, OR SAN MIGUEL, THE BARREL PROCESS IS USED: AT REGLA THE PATIO AMALGAMATION AND SMELTING.	BY BARREL AMALGAMATION AT			By Patio Amalgama ⁿ at Regla.	By Smelting at Regla.
	Sanchez.	Velasco.	San Mig.		
Stamping, mostly for labor,.....	\$00 64	\$00 59	\$00 60	\$00 26	\$00 30
Wear of Stamp heads,.....	24	25	88	28	28
Grinding in Arrastres, labor mostly,.....	78	70	08	83	....
Drying and lifting, mostly labor,.....	1 30	1 20	1 02	....	....
Calcination, mostly labor, (fuel below,).....	2 15	1 76	1 57	....	....
Amalgamation in Barrels and Patio, mostly labor,.....	1 41	1 04	88	3 95	....
Smelting in furnaces, mostly labor, (fuel below,).....	....	....	....	....	17 80
Wear of Barrels,.....	35	30	21	....	....
Distilling Amalgams, casting Silver into bars,.....	08	10	07	05	04
Repair of Machinery, Furnaces, &c.,.....	33	60	50	48	3 90
Sundry costs,.....	55	30	40	40	3 40
Fuel, Wood,.....	3 79	3 31	4 27	....	1 00
Fuel, Charcoal,.....	31	30	27	20	34 90
Salt,.....	6 70	5 37	6 60	3 64	....
Sulphate of Copper,.....	....	....	....	2 13	....
Litharge,.....	....	....	....	....	21 50
Tallow and Oil, for Machinery,.....	33	37	29	10	....
Quicksilver,.....	2 15	2 39	1 58	4 32	....
Steam Power, mostly fuel,.....	1 91	4 23	....	....	....
Animal Power, mostly forage,.....	2 14	....	....	....	....
Salaries, Expenses of Management, assaying, &c.,.....	1 31	1 14	1 03	1 09	6 80
Total cost of reducing 3000 pounds of Ore.....	\$26 47	\$23 95	\$20 25	\$17 76	\$89 92
Mean produce of Silver per each 3,000 lbs. of Ore,.....	92.88	94.80	62.40	65.92	518.40
No. of Cargas (of 300 lbs. each) of Ore reduced in 1854,.....	48.310	53.895	49.184	37.982	2. 86
Ounces of Quicksilver lost per each \$8,00 of Silver produced,.....	4.79	4.97	5.28	12.71	....

Average yield of Ore from the Company's mines:—From the Rosario mine, $13\frac{1}{2}$ marcs (\$8,00 each) of silver per monton (3,000 lbs.) of ore.

From the San Patricio mine 9 2-10 marcs (\$8,00 each) of silver per monton.

Poor and refractory ores from the Santa Brigada and Santa Inez, $7\frac{1}{4}$ marcs per monton.

“These latter, though not leaving a very large profit, have materially assisted the Company's finances; but now that the mines of Jacal and Rosario are supplying our Barrel Works with a richer class of ores, the extraction of the above is being gradually reduced, and left as a reserve.”

Average yield of all ores reduced in 1849 to 1854, 9 75-100 marcs per monton.

Total amount reduced by the Company in 1849 to 1854, inclusive, 684,845 cargas, (of 300 lbs. each,) or 97,835 tons, producing \$5,858,330, or 5,352,600 ounces, *being 54½ ounces per ton of ore.*

The Patio process lasts thirty to fifty days.

By Barrel process the ore, after being ground and sifted, is roasted in furnaces with 5 per ct. of salt, by which the silver is separated from its original mineral state of sulphurets, and converted into chlorides of silver. The ore thus prepared is next made into a stiff paste by revolving in large barrels, containing each 2,500 lbs. of ore, with water; and then after the addition of iron and quicksilver, the first ingredient, by superior affinity, again separates the chlorine from the silver, which is collected by the quicksilver, and converted into an amalgam, when by the subsequent process of washing, the amalgam is first separated from the refuse mud, and then by distillation the silver from the quicksilver. The process is performed in 24 hours, and destroys less quicksilver than the Patio, but requires more power and machinery for revolving the barrels, uses nearly double the quantity of salt, and consumes much fuel for roasting the ores.

“Thirty stamp heads, fifty to eighty strokes per minute, can grind of our quartz ores 100 tons per week, to an exceedingly fine sand. To effect our annual grinding of 25,000 tons not less than 60 tons of cast iron is worn away.”

Amount of silver left unextracted by the several processes is as follows: Smelting, 6 per cent; Patio amalgamation 15 per cent; at Velasco, by best barrel processes 16½ per cent; and on the average of the three Haciendas engaged on this process, (barrel) 19 to 20 per cent.

The salt used by this company is brought from San Louis by a land carriage of three hundred miles, at a freight of \$42 per ton, and from Campeachy by shipping to Tampico

and Tuspan. By either route it costs \$84 per ton. 1,700 tons are annually required by this company.

Consumption of wood in 1854 was 60,000 tons, or 450,000 cargass. The company's expenditure for fuel is at least \$150,000 per annum. All of it is brought a considerable distance on mules.

PROFITS OF THE REAL DEL MONTE COMPANY.

May, 1849 to December, 1852,	\$327,160
Year 1853,	582,328
“ 1854,	696,443
Total produce, 1854,	1,811,882

In 1857 these mines were yielding to the company \$60,000 per week in silver, or over \$3,000,000 per annum, of which over 50 per cent was net profit.

The same mines that are now worked by this company have been worked more or less since an early period.

Their produce from 1759 to 1781 was . . . \$15,000,000

After death of 1st Conde de Regla to the

Revolution, 10,000,000

While being worked by the English, . . . 10,481,475

Silver from the Amalgamation Works of the Heintzelman Mine.

The first bar of silver from the Amalgamation Works of the Sonora Exploring and Mining Company, was produced in March of this year. It was in value about \$49, or \$1.28 per ounce. It was sent on by the overland mail to Cincinnati, being only sixteen days in transit from Arizona to Ohio.

In the following month a larger bar was sent on from the Amalgamation Works—Bar “No. 7.” The *Arizonian*, of April 14th, thus describes it:

“SOMETHING WORTH SEEING.—At the office of the Sonora Exploring and Mining Company, in Tubac, a few days since, we saw a bar of fine silver, which was being boxed up, pre-

paratory to shipment to New York, via overland mail. This bar was number *seven*, since the Amalgamation Works have been put in operation, or rather a portion of them; it was fifteen inches long, five inches wide, two and one-half inches thick, and weighed 889.38 ounces, its value being *one thousand one hundred and thirty-four dollars eighty-four cents*. This bar was the result of three days' work of two amalgamation barrels. This is tangible evidence of successful silver mining, and even with only one-quarter of the Amalgamation Works in operation, the Company will hereafter turn out at least two such bars as the above per week. People who are incredulous about silver mining in this Territory, would doubtless be edified and comforted by a sight of a lump of pure bright silver, weighing nearly nine hundred ounces, assayed and stamped with its value, ready for the mint or the silversmith. It was something worth looking at. The bar was shipped to W. T. Coleman & Co., New York."

These are the only bars of silver that have thus far been sent to the Atlantic states, the remainder having been disposed of in the adjacent Mexican State of Sonora, or sent to the U. S. Branch Mint at San Francisco. By the *Arizonian* of May 26th we perceive that a larger bar than that described above was produced:

"*MORE SILVER.*—Silver bars, amounting to between \$1,600 and \$1,700 were received at the office of the Sonora Exploring and Mining Company, at Tubac, a few days since, from their Amalgamation Works at Arivaca. The largest bar was stamped with the value of \$1,199.99, or \$1,200, lacking one cent. The other two bars were small ones. This silver was the product of four days work of three amalgamation barrels."

Estimated Yield of the Heintzelman Mine.

On page 17, Mr. Brunckow estimates the annual net profit of the Heintzelman Mine, with a force of 200 men, at \$700,800. But the work need not stop at that point. The

mine itself is traced where it crops out on the surface of the ground, for more than a mile. The vein, like an immense wall, penetrates, doubtless, thousands of feet into the earth to furnish ores in inexhaustible quantities, for perhaps centuries. The ore, wherever tested on the surface, or sixty feet below in the mine, indicates the same extraordinary richness that originally attracted our efforts. It is the universal law in the deposits of silver ore, that they increase in per cent. of silver as they recede from the surface—the theory based upon this fact being that the convulsion of nature which threw up the veins, left the lighter particles of the molten ore, like froth, at the top. This law holds good in our mine, the ore of the lowest level yet reached proving better than that above. With such conditions it were idle to attempt to assign the limits which the future may enable us to reach, when accumulated means shall have been rolled together, and more and more galleries shall have been opened, to give room for increased and yet increasing numbers of miners—when ample machinery for crushing, pulverizing and amalgamating the ores, will be on the spot, and thus extract the silver for the use of man, as rapidly as industry can exhume it from its long burial place of ages.

Silver Mining in Central Mexico and Arizona Compared.—
By HENRY HOWE.

Humboldt estimated the total produce of the silver mines of Mexico, from the time of the conquest by Cortez up to the year 1803, at seventeen hundred and sixty-eight millions of dollars. Adding to this that not registered, and it exceeded two thousand millions of dollars. Yet silver mining there, as a whole, has not probably been more remunerative than the unexcitable employment of cultivating the potato—often not even as much so. It has been the well managed mines and the exceedingly *rich mines* that have there suddenly yielded those immense fortunes to individuals, the mere

mention of which is so alluring to the spirit of avarice, and which in contrast dwarf the largest fortunes acquired by trade in our own country.

The Mining Records of the Government of Mexico, made for the purposes of taxation, show that not unfrequently the annual produce of a single silver mine exceeded a million of dollars. Indeed, more than this was obtained, in the early part of this century, in one month, from the mine of El Pavellon alone. At different intervals, from the year 1793 to that of 1810, this mine produced in eight months, (though not in consecutive months,) eleven millions of dollars. From the mine of Saint Eulalia, in the 86 years prior to 1791, was raised a total of one hundred millions of dollars. Similar statistics to fill pages could be introduced here, if these were deemed insufficient for illustration. Since the beginning of this century, the mining of silver has decreased in Mexico, from the political condition of the country, which has been so unfavorable to all industrial pursuits.

Silver mining in Arizona possesses some great natural advantages over silver mining in Central Mexico, the part of Mexico where that business has been mostly carried on. Many of the latter are in the midst of lofty mountains, hundreds of miles from the sea-coast; only to be approached by almost inaccessible paths on the backs of mules, or over roads constructed at immense expense, thus greatly enhancing the cost of supplies. Heretofore, the expense of transportation to the mines of Arizona has also been so great as to seriously retard their development. A desert without water intervenes a part of the way between Tubac and the coast of California, so that freight from San Francisco to the mines has in some instances amounted to hundreds of dollars to the ton. This has been imperious from the political, not *geographical* position of the country, for a good wagon road connects Tubac with the Mexican port of Guyamas, 325 miles distant. Lobos, in Sonora, it is expected, will eventually become the seaport of the mining region of Arizona, from whence it is

distant but 175 miles, over a level country, with good pasturage.

By the laws of Mexico, the transportation of *machinery* through its territories is free. The basis of a treaty is now preparing between the agents of the Mexican and American governments, which is to permit the free transit of merchandise across the State of Sonora to Arizona. This treaty will probably be soon completed, and a new impulse thereby given to mining operations, in the comparatively low cost of transportation; Guyamas and Lobos each being of easy and cheap access, by water, from San Francisco and New York—the latter place via the Isthmus of Panama.

But the great distinguishing advantage of silver mining in Arizona, is in the *superior richness* of the ores, and in their *geological position*. That part of the silver deposit which in Central Mexico is sufficiently profitable to work, is generally found at great depths; while in Arizona rich *lodes* crop out at the surface. This confirms the theory of Humboldt in respect to the deposits of silver ore in North Mexico, viz.: That the proportion of silver in the ore would be found to increase as you advance towards the North. This is accounted for geologically by the *dip* of the veins, the rich portion of which being near the surface at the North, recedes from it as the lodes trend southward, until in Central Mexico it is often found only at a depth of more than a thousand feet in the bowels of the earth. Hence the immense cost there of mining, growing out of the construction of deep shafts, enlarged systems of drainage, raising of the ores from deep levels, aggregates of machinery, increased amount of labor, etc.

The mines of the Real del Monte Company are of this character. One of these exceeds 1,700 feet, or more than a third of a mile in depth. Ward, in his work on the mines of Mexico, states that the main shaft of some of these deep mines alone cost a million of dollars, and that on the preparations for draining "the Great Biscania vein," nearly two

millions of dollars had been expended when he left Mexico. By examining the statistics (pages 28-32,) we find that in the year 1854, the Real del Monte Mines produced, in round numbers, 29,000 tons of ore—that these yielded \$1,812,000, of which \$696,000, or more than one-third, was net profit, and that the average value of these ores, by our calculations reduced that year, was short of \$63 to the ton, while the mere clay of the Heintzelman mine averages \$90—"too rich to be thrown away." Three years later, in 1857, these mines yielded over three millions of dollars, of which one-half was net profit. This was the result of deep mining with ores of but a moderate value.

If the comparatively poor ores of Central Mexico, mined at such great disadvantages, and at such enormous expenses, have often yielded immense returns to an inert and unskilled race, what may not be expected from our own people, when under vastly superior circumstances, their energy and skill, and their desire for wealth, become the elements that fasten upon the business of mining for silver?

Gold, of late, by its accelerated production, has sunk in its relative value to silver; and this feature of this measure of property, in view of its continuous declination, is already attracting the attention of political economists. May not their estimates of results fail of a practical answer through the restoration of the equilibrium between these two leading precious metals by the increased production of silver? And is it too much to anticipate this restoration through the agency of American mind and industry directed to this new channel now opening with so much of promise before them?

A sanguine calculator estimates the future annual yield of Arizona in silver, at one hundred millions of dollars. Mexico, the great silver bearing country of the world, has never yet exceeded an annual yield of thirty millions: it is not therefore probable that the dream of this Arizonian visionary will soon be verified. But when we perceive with what rapidity our population, in its advance to the Pacific, spreads

over new territories—the energy with which it overcomes untold obstacles—the avidity it shows in launching upon novel enterprises, be they but promising—it is not perhaps too much to look for an honest measure of prosperity to that long, narrow strip of mineral bearing territory, purchased by Mr. Gadsden for us, of our Mexican neighbors, as a route for a railroad to the Pacific; and which in a spirit of anticipation has already received the dazzling appellation of the “SILVER STATE OF ARIZONA.”

EXPLANATORY.

THE annexed letter from Mr. HERMAN EHRENBERG, of Arizona, unexpectedly came to hand, and after the preceding pages were in type, but fortunately in time to be printed with them. It is valuable for its facts, suggestions, and estimates. The latter, based on actual results, are confirmatory of those given by Mr. BRUNCKOW. They were made independently, in Arizona, at the very date that the request was, by mere chance, offered for the other in Ohio.

The same mail which brought this document, also gave to the Company, in one of the regular weekly Reports of Mr. LATHROP, Director of the mines, the pleasant information that Mr. EHRENBERG was about to visit the Atlantic States. We trust it may not be deemed indelicate for us, in this connection, to quote a paragraph from that Report :

“Mr. EHRENBERG expects to leave for ‘the States,’ next week. He can give you much more information than I can write. He is perfectly well informed as to our wants, our difficulties, our position, and prospects, if we be properly sustained. With a perfect knowledge of this country, its people, he combines withal, sound judgment and unimpeachable integrity. I trust that his statements may have that consideration from the Directors to which they are entitled.”

 To facilitate the perusal of Mr. EHRENBERG's communication, we have inserted index lines wherever the variation of subjects occur.

LETTER

FROM

HERMAN EHRENBERG.

MINERALOGIST, AND TOPOGRAPHICAL ENGINEER, ARIZONA,

TO

COL. CHARLES D. POSTON.

SECRETARY SONORA EXPLORING AND MINING COMPANY, NEW YORK.

TUBAC, ARIZONA, June 11th, 1859.

COL. CHARLES D. POSTON, *Secretary Sonora Exploring and Mining Company, New York*, Dear Sir: Any thing calculated to throw light on our mining operations, both as regards the past as well as the future, must have a tendency to encourage you at home and facilitate your transactions with other parties by instilling confidence in our enterprise. It is only once more and but for a short time that we need outside help to procure that, which we and every other mining company must have, and which we did not have at any time, "a sufficient working capital" commensurate with the wants to "open the mines properly" and "to enlarge our reduction works," to reduce ores on an extensive scale.

ORIGINAL GOOD FORTUNE OF THE SONORA EXPLORING AND
MINING COMPANY.

Our Mining Company was fortunate in finding an extraordinarily rich mine which was not only their salvation but also that of the whole territory. Ordinary mines could

never have offered inducement enough to the explorers to battle with the ocean of difficulties, dangers and privations they had to contend with. To sketch them, it would take a volume, and the memory is only so far useful as they relate to the future. In an unknown, isolated, desert-locked country like Arizona, many errors by the first pioneers in mining operations were unavoidable, and these, with other unavoidable obstacles, well known at home, have delayed operations and augmented the expenses so much beyond what they would be if we had to do things over again. Taking it altogether, the whole amount expended is trifling, compared with that of the other companies in Mexico and Peru. Only those can be dissatisfied who like to reap without sowing.

No company could be better constituted for exploration than was ours. There was valor, knowledge, and money enough for all preliminary examinations. The result warrants this assertion; without such combinations Arizona would still be asleep—no Protectorate would have been spoken of.

Whether our labor, risk, and hardship will ever be recognized, is doubtful, very; but whether we shall yet reap the benefits in good time, depends entirely on the harmony and good faith of the parties at home, in whose hands we entrusted our interests. If harmonious, they must succeed in procuring capital enough—"working capital" for this, probably is the most brilliant enterprise in North America. We can work and worry along, bound to get through all difficulties in the end, but how long will it take to accomplish it? In this age of the electric flash no one likes to ride by ox conveyance.

ESTIMATES BASED ON THE ORES PRODUCED.

In a leisure hour I figured out the following which may lead to important reflections. The calculations as you will see, are based on facts and results only. I do not measure by the blowpipe atoms or the ounce assay, but by tons of ore.

According to the general estimate by Mr. Lathrop, and

the different engineers, the ore brought to the surface from the Heintzelman vein, amounted in quantity to 225 tons. I assume this to be correct, but think it low, but have based on it the following calculations. It was and is distributed as follows, and yielded in silver the amounts noted:

	TONS.	YIELD.	TOTAL VALUE.
1. Shipped to San Francisco.....	22	\$450 00	\$9,000 00
2. Smelted at Cerro Colorado.....	7	900 00	6,300 00
3. Ore stolen and sold in Sonora, at least.	11	900 00	9,900 00
4. Middling and poor ore amalgamated...	35	148 00	5,180 00
5. On hand yet.....	150	150 00	22,500 00
Total.....	225		\$53,780 00

Which gives an average of \$238 13 per ton of ore. This result, however, is not quite correct, as the ore sent to San Francisco was reduced by parties who had neither knowledge or material to do it properly. They themselves allowed that nearly \$5,000 in silver was still in the bottom of the furnace, the slag, and some other unknown places of which we were to get 75 per cent. The ores shipped to them were first selected as the richest to produce a large working capital soon. All subsequent selections could not have been better, and still the latter yield at our own furnace at Cerro Colorado \$900 00 per ton. It is then but fair to assume this, at least, of equal value. Corrected thus it stands as follows:

	TONS.	YIELD.	TOTAL VALUE.
1. Smelted at San Francisco.....	22	\$900 00	\$19,800 00
2. " " Cerro Colorado.....	7	900 00	6,300 00
3. Ore stolen and sold in Sonora.....	11	900 00	9,900 00
4. Amalgamated in Arivaca.....	35	148 00	5,180 00
5. Ore from which No's. 1, 2, and 3, were picked and now on hand.....	150	150 00	22,500 00
Total	225		\$63,680 00

True average then per ton ore, \$283 02.

NOTES.—No. 1 is already explained.

No. 2, actual yield as shown by the books of the company.

No. 3 is undoubtedly too low, as the ore sold was very choice, that stolen, of course, counted in selected specimens, some of which yielded one-half silver. One lot of the ore

I was informed was carried to Hermosilli, and Mr. Rodriguez told me it yielded nearly \$4,000. There were better furnaces at work at Saric, Magdalena, Santa Anna, Hermosilli, and other places, and no mines.

No. 4, ore from which the 1, 2, and 3, were selected, see from Mr. Kustel's report.

No. 5, the same as No. 4, but in my opinion too low, as that same ore yields now \$200 per ton in the barrels.

THE REAL DEL MONTE AND HEINTZELMAN MINES STATISTICAL-
LY COMPARED.

I have made this calculation,

1st, To come to the real value of the ore so that you may not be led astray, by Mr. Kustel's report of those amalgamated in Arivaca.

2d, To institute a comparison with the ores, yield, and cost of reduction of the ores at the Real del Monte mines, near Mexico. The engineer in his report to that company, at the close of the year 1857, says :

“ During the last five years ending December 31st, 1857, the company's mines (four) produced in silver \$11,823,803 00.

The yield in 1853 was.....	\$1,537,769 00
“ “ “ 1857 was.....	3,039,016 00

Of these mines the ores of three were reduced by barrel amalgamation and yielded as follows :

The Sanches per ton of ore.....	\$61 92
The Valasco, “ “	63 20
The San Miguel “ “	41 60
Average	\$55 57

The ores used in the “ Patio ” and furnace came from the Regla mines, and

Yielded per ton per Patio.....	\$43 95
“ “ “ Furnace.....	345 60

The whole average of all the ores was about \$52 per ton.

Cost of reducing one ton by Barrel process, average.....	\$15 59
“ “ “ Patio “ “	11 84
“ “ “ Smelting “ “	59 95

This shows that the barrel ore per ton, is only \$55 57 at the Real del Monte, while that of the Cerro Colorado, (our ore,) yields as shown, \$283 02 per ton, equal to 5,093 times as much as that of the Real del Monte; or in other words, the ore of the latter contains *only* 19 per cent as much silver as the ores from the Heintzelman vein.

I do not know what it cost us to reduce our ores. To make a correct calculation of it would be nearly impossible, as the reduction of ore and the erection of works, houses, furnaces, etc., at Arivaca can not well be separated at present; we are only creating, while the Real de Monte is finished even beyond material experiments. It is certain that for the present, we can not reduce so low as this company, but will in the course of time do it cheaper still, because,

1st, Real del Monte is farther from the coast than Cerro Colorado is from Port Lobos on the Gulf; all freight then, as machinery, quicksilver, etc., has to ascend 7000 feet above the ocean, to the Sierras of Meguois. Cerro Colorado is, on the contrary but 3000 feet above the Gulf, and the slope so regular that no hill over 100 feet high need be crossed; freight consequently must be cheaper.

2d, Those mines are in the mountains where all fuel has to be packed over 30 miles on mules. The Cerro Colorado has splendid wagon roads from the very shaft to all parts of the country, and wood is much nearer.

3d, The salt for roasting ores is brought to the Real del Monte, from a distance of 300 miles; for the Colorado the Salinos near the Gulf are numerous, 150 miles distant only.

4th, But the principal course of future great cheapness in extraction, consists in the greater richness of our ore, the relative value being 1 to 5,093. *All ores* whether rich or poor, have to undergo the same manipulation, which is quarrying, picking, stamping, sifting, roasting, grinding, and rotation for about twenty hours in the barrels before yielding their silver, consequently the Real del Monte company have over five times as much ore to manipulate, as we do to pro-

duce the same amount of silver. Expenses being the same, reduction will of course be proportionately cheaper. Our ores being so much richer require somewhat more quicksilver, copper, and salt, but this is not of very great importance. Each marc of silver consumes $3\frac{3}{4}$ ounces of quicksilver; each 1100 pounds ore 3 pounds copper, and the whole, perhaps, one per cent more of salt. Thus,

	YIELD.	EXPENSES.
1000 tons Real del Monte ore.....	\$55 570	\$15 590
1000 tons from the Heintzelman vein.....	283 020	15 590

This will be the case in the course of time only. What an immense difference. The yield at the Real del Monte being in 1857, \$3,039,016, and the general average \$52 per ton, the enormous quantity of 58,442 tons must have been reduced in the different ways. Your ore it would only have taken 10,737 tons to produce the same sum of dollars. The Real del Monte mine is an old establishment and under maladministration, while in the hands of English and Mexican companies, has been frequently on the brink of ruin. It is only the present company, probably, that has made it one of the greatest establishments of its kind.

SUGGESTIONS FOR FUTURE OPERATIONS.

The subterranean works and those of reduction are really gigantic. If I have tried to make a comparison, it is only done in reference to the quality of the ore, and not the quantity. As yet, all our underground works are mere scratches; the deepest level is sixty feet; but few men have room to take out ore. The main shaft is finished to 100 feet, but an unfinished cross-cut of 25 feet will only connect the vein at that depth. Our continual pressure for money has compelled us to follow a species of vein plundering, (of the richest parts,) in place of an honest, systematic opening for future grand operations.

There are three points now to be taken into consideration.

1st. To open the vein in all directions, regardless of quantity or quality of ores, to make room for the hands.

2d. To extend the reduction works as proposed in former letters, by adding steam power and additional stampers, barrels, arrastras, &c., &c.

3d. To finish the houses for the employees, and erect safe housing, ore yards, &c., for the ores, to prevent thefts. For this capital enough ought to be raised, without counting on the yield of the machinery in the mean time.

This I recommend to be on the safe side. What amount will be needed to pay our debts and carry out the above, you will, I think, find in Mr. Lathrop's letters.

We have conquered monstrous difficulties, but we have hard work before us yet, owing to a want of good mechanics and miners, and other matters. This, however, will vanish with the increasing importance of the Arizona mines.

The more chances of procuring work the greater will be the supply of it, and by paying up at the end of each month, we can expect every man to do his duty, especially when there are others to fill his place.

The disorderly and idle will, as everywhere, make room for the industrious and steady; but to induce the stay of the latter, they must be made comfortable, so that they can live decent. The very surroundings of the works, &c., ought to induce order and cleanliness in even those otherwise inclined. The regularity of the work, the increasing clank of the stampers, should remind all of their tasks, and the loud ring of the clock of the time of beginning.

Neglect and slovenness is catching; allow one to break the rules, and soon none will observe them.

This also refers to the Mexican miners. Those in our employ now are mostly from northern Sonora, a district where no mining is carried on, excepting some little gold washing from placers and crushing from ores by poor men. These miners are a kind of mixed animal, brought up as herders, farmers, miners, and laborers in general, with a slight touch of

the military. Such "Jacks of many trades" can of course not be expected to know one which they never learned. The proper way is to import some forty or fifty families from the purely mining districts of the South, from the mountains where mining is the only industry, where work at mining is preferred to change of occupation. This must be done in course of time, and the sooner we begin the better; but that capital is needed first.

ESTIMATE OF PROFITS.

The recommended machinery will at least reduce and crush 10 tons of ore per day, which, allowing 300 days per year, will reduce 3,000 tons, yielding \$283.02 per ton—the round sum of \$849,060.00. The cost of superintendence will not be materially increased, nor that of the white employees, as several at work now, are so for the extension of the works, which will cease whenever the works are completed. The same applies to many Mexicans who are engaged building houses and making adobes.

My estimate may seem high, and it is undoubtedly higher than that of Mr. Lathrop, and reported to the company, but I, for my part, come to no other conclusion.

What proportion of the yield it will take to pay expenses I cannot well tell now, without a great deal of work and observation, but I do not believe it will exceed \$90,000.00 per annum, which would make the cost of quarrying and reduction per ton of ore to be \$30.00 for the present, which is high to go safe.

Such a result must not, however, be expected in the first six months, (as the 150 tons, estimated at \$150, will first have to be worked up:) not until we are fully under way. It must take some time for the completion of the works, the sufficient opening of the mines, and the procuring of good officers and men.

ADDITIONAL SUGGESTIONS.

Before closing, I would again, as years ago, recommend a trial of the "Patio" process on a smaller scale; to find out the relative value of each method in this section of the country. During the warm weather the Patio will yield the silver in from fifteen to twenty days; and in a country like this it offers many advantages, among which is the non-consumption of expensive white labor; of wood, no roasting being necessary.

As soon as circumstances will allow a prospecting party of at least four men and one miner ought to investigate the adjoining veins in the Cerro Colorado district; and another, those of Arivaca. Until now nothing has been done, nor has the administration been able to attend to this matter; but as mining companies flock into the country, it becomes necessary.

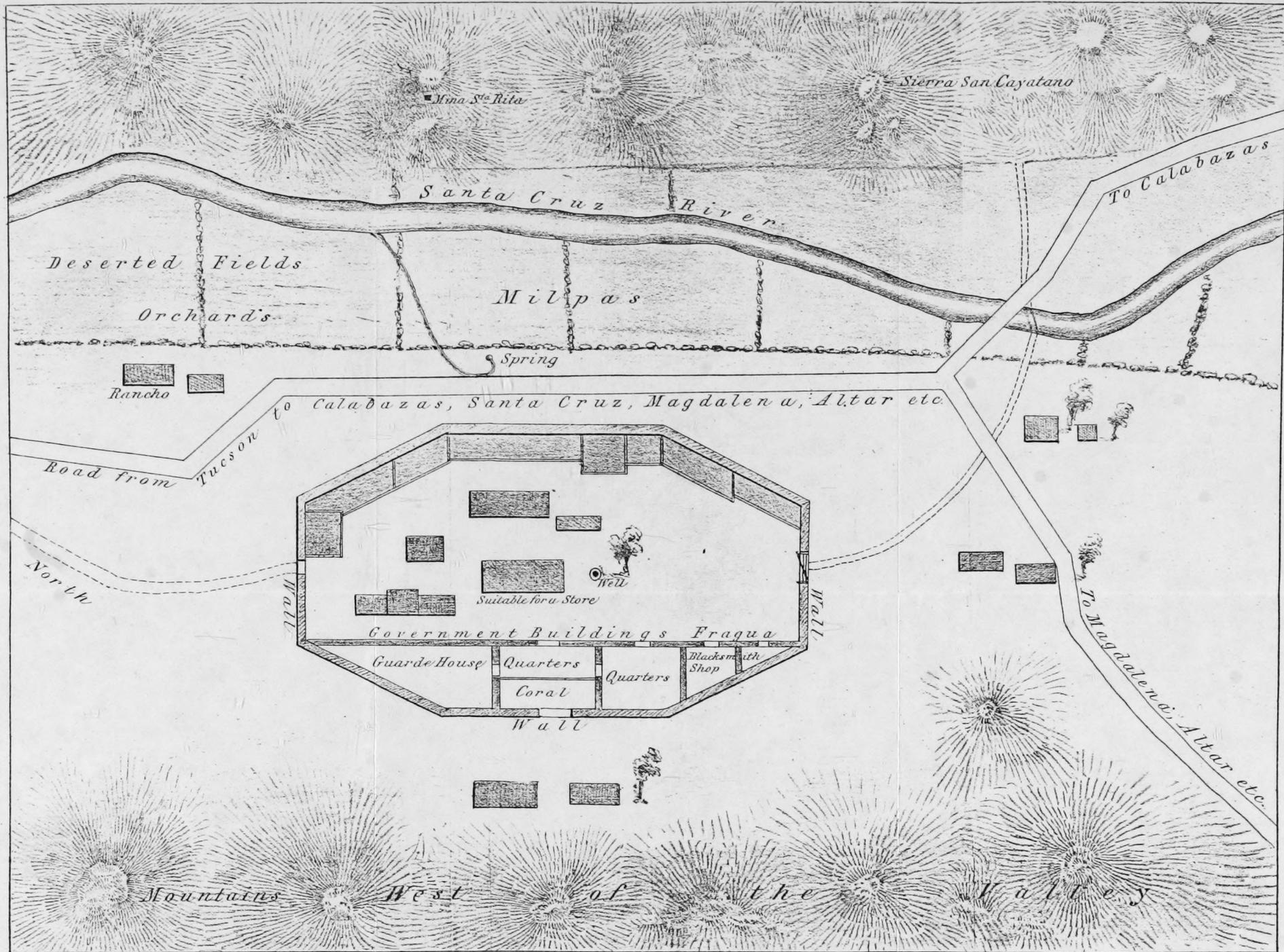
We do not know what fortunes we may thus lose at any moment. All eyes here are directed to the Cerro Colorado; only want of knowledge and means prevent others from exploring.

Very respectfully, yours,

HERMAN EHRENBERG.



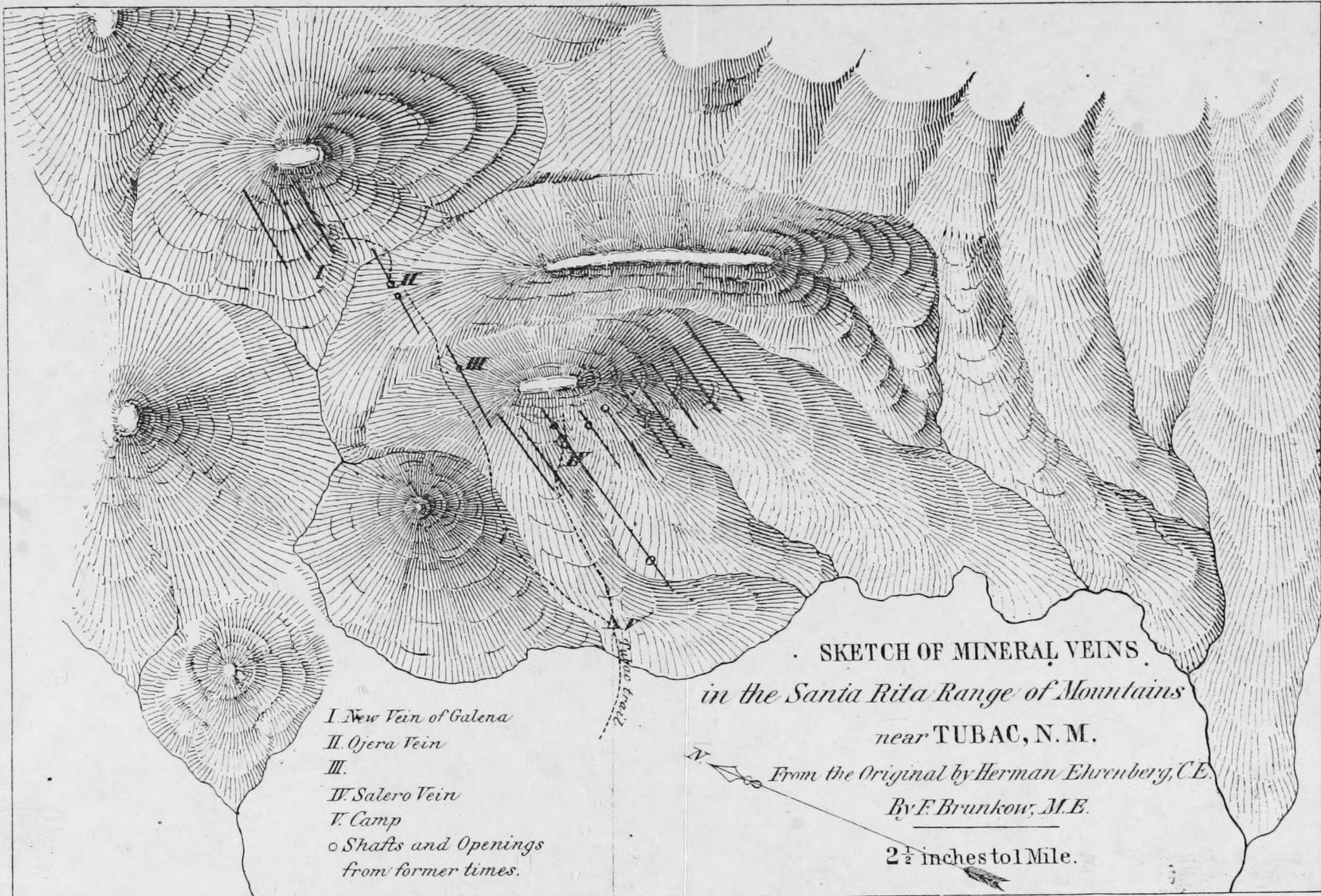
SKETCH OF
SILVER REGIONS
 around
TUBAC.



TUBAC

HEAD QUARTERS "SONORA EXPLORING & MINING CO"

For description of Country see Col. Gray's Rail Road Report.



SKETCH OF MINERAL VEINS
in the Santa Rita Range of Mountains
 near TUBAC, N. M.

From the Original by Herman Ehrenberg, C.E.

By F. Brunkow, M.E.

2 1/2 inches to 1 Mile.

- I. New Vein of Galena
- II. Ojera Vein
- III.
- IV. Salero Vein
- V. Camp
- Shafts and Openings
 from former times.

Middleton, Wallace & Co. Lith. & Engrs. O.



Middleton, Wallace & Co. Litho. Cov.

MAP OF THE MINERAL REGIONS
 on the proposed Southern Pacific Rail Road through Gadsden purchase.