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Comet and Par

THE

SILVER MINES,

GEORGEROWN, COLORADO.

CHICACO: Frand MENNIL (SIC): Toquers and Stationers, SPCINF.

THE COMET

$Silver \ Mining \ Company$

OF CHICAGO,

is duly Incorporated and Organized under the Statutes of the State of Illinois, with a paid-up

Capital Stock of \$200,000.

Officers of the Company.

LUTHER L. GREENLEAF,		PRESIDENT.
A. E. BISHOP,	Vice	PRESIDENT.
HENRY M. KIDDER, -	SECRETARY AND	TREASURER.
JOHN B. OWEN,	Super	UNTENDENT.

*** For the purchase of Shares, or the transfer of Stock, apply to HENRY M. KIDDER, Secretary and Treasurer, at 51 Clark St., Chicago.



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The State Historical Society of Colorado

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Comet and Par Silver Mines.

SILVER MINING IN THE UNITED STATES.

It is only within a few years that much attention has been paid to mining for silver in the United States. Indeed up to this time, no silver mines, properly so called, have been found east of the Rocky mountains, although considerable quantities of silver have been extracted from the lead ores (argentiferous galena), found in different localities, and also from the copper mines of Lake Superior.

In 1854, small quantities of silver were discovered in California, but its production from that State, even from the castern counties bordering on Nevada, is not yet large. Only about ten years have elapsed since it began to be known that our country contained rich silver deposits.

In 1859, the Comstock lode of Nevada was accidentally discovered. Since that period silver to the value of more than \$100,000,000 has been extracted from that one vein. Stimulated by such an extraordinary result, exploration for silver has recently been very active in the central portions of our continent, and has been rewarded by numerous discoveries.

SILVER IN THE ROCKY MOUNTAINS.

The original prospectors of the Rocky mountain regions were, like those of California, chiefly intent on finding gold. They neither knew of the existence of silver in those mountains, nor how to recognize it if found.

In 1866, some quartz veins at Georgetown, which had been worked for gold, proved to be principally valuable for the silver they contained. It was soon found that silver veins in that local-

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ity were numerous and rich, in fact, that Georgetown was the center of a great silver-bearing region, in which tall mountains are creviced and permeated with silver-bearing ores. These veins have a prevailing trend from north-east to south-west, and having been traced for a distance of thirty miles or more, they are now recognized as parts of a graud system of deposits known as the SILVER BELT of Colorado.

Fortunately for the country at large, as well as for the region itself, these discoveries have been made gradually and apart from the wild excitements which have usually prevailed in the first development of mining localities.

From such excitements which have repeatedly prevailed on the western slope of our continent, Colorado itself has not been free. The rush to Pike's Peak in 1859, and the gold excitement of 1864, which proved so disastrous to many Eastern speculators, will not soon be forgotten. Mr. Bowles, of the Springfield *Republican*, has well described the transition by which the early gold excitements of Colorado were let down to a reasonable basis.

Writing from there in 1868, and referring to a former visit in 1865, he says:

NOTICES OF COLORADO.

The change in material affairs and prospects, since we were here three years ago, is most marked and healthy. Then, the original era of speculation, of waste, of careless and unintelligent work, and as little of it as possible, of living by wit instead of labor, of reliance upon eastern capital instead of home industry, was, if not at its hight, still reigning, but with signs of decay and threatening despair. The next two years, 1866 and 1867, affairs became desperate; the population shrunk; mines were abandoned; mills stopped; eastern capital, tired of waiting for promised returns, dried up its fountains; and the secrets of the rich ores seemed unfathomable. Residents, who could not get away, were put to their trumps for a living; and economy and work were enforced upon all. Thus weeded out, thus stimulated, the population fell back on the certainties; such mining as was obviously remunerative was continued; the doubtful and losing abandoned; the old and simple dirt washing for gold was resumed, and followed with more care; and farming rose in respectability and promise. The discovery and opening of specially rich silver mines near Georgetown kept hope and courage alive, and freshened speculation in a new quarter; but the main fact of the new era was that the people went to work, became self-reliant, and, believing that they "had a good thing" out here, undertook to prove it to the world by intelligent and economic industry.

These were the kernel years of Colorado; they proved her; they have made her. Her gold product went down, probably, to a million dollars say, in each of 1866 and 1867; but it began at once, under the new order of things, to rise; and agriculture also at once shot up and ahead, and directly assumed, as it has in California, the place of the first interest, the great wealth. No more flour, no more corn, no more potatoes at six cents to twelve cents a pound freight, from the Missouri river; in one year Colorado became self-supporting in food; in the second an exporter, the feeder of Montana, the contractor for the government posts and the Pacific Railroad; and now, in the third year, with food cheaper than in "the States," she forces the Mississippi and Missouri valleys to keep their produce at home or send it East. She feeds the whole line of the Pacific Railroad this side the continental divide, and has even been sending some of her vegetables to Omaha. Her gold and silver product is up to at least two millions this year, got out at a profit of from twenty-five to fifty per cent., is now at the rate of nearly if not quite three millions, and will certainly surpass that sum in 1869. Her agricultural products must be twice as much at least, certainly four millions for 1868, and perhaps six millions; though it is difficult to make as certain estimates in this particular.

A few-additional paragraphs from the same writer are added, to illustrate the condition and prospects of things as he saw them in 1868.

Some silver mine discoveries have recently been made in the Central City region; indeed there is silver in all the gold ores, and gold in all the silver ores of the Territory, and lead and copper in most besides; but the headquarters of the silver business is at Georgetown, ten or a dozen miles over the mountains from Central City, at the head of the south branch of Clear creek. Around and above this now thriving and most beautifully located of the principal mining villages of Colorado, at nine thousand, ten thousand, on even to twelve and thirteen thousand feet above the sea level, almost unapproachable save in summer, and then only by pack mules or on foot, are many marvelously rich silver veins in the rocks. Hundreds of mines have been opened; but only a dozen or twenty are now being actually worked with profitable results. The rest await purchasers from their " prospectors," or capital to develop them. The ore from the leading mines ranges from one hundred to one thousand dollars a ton. Only two mills for reducing the ore are in operation; one treats the second class ore, such as will average, say, two hundred dollars a ton, reducing it by crushing or stamping, then washing with salt to oxydize it, and then amalgamating with quicksilver, at a cost of from fifty to one-hundred dollars a ton; and the other smelting the higher priced ores, at a cost probably of one hundred to two hundred dollars a ton. The latter establishment buys outright most of the ore it reduces, and has paid all the way from five hundred to six hundred and seventy-five dollars a fon for it. Both processes get out from seventyfive to ninety per cent. of the assay value of the ore; but they are imperfect and expensive, and much of the best ore is sent East for treatment.

Georgetown now has a population of about three thousand, and the best hotel in the Territory. It is one of the places that every tourist should visit,

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partly for its silver mines, partly because the road to it up the South Clear creek is through one of the most interesting sections of the mountains, and partly that it is the starting-point for the ascension of Gray's Peaks. The traveler can go up to the top of that mountain and back to Georgetown between breakfast and supper; and if he will not take his tour by the Snake and Blue rivers to the Middle or South Park, he should certainly make this day's excursion from Georgetown. Central City and its neighborhood are much less interesting to the mere pleasure traveler. That town, with its four thousand or five thousand inhabitants, is crowded into a narrow gulch, rather than valley, torn with floods, and dirty with the debris of mills and mines that spread themselves over everything.

There are great tunneling schemes proposed or started in the Georgetown silver district, by which the various ore veins of a single mountain are to be cut deep down in their depths, and their wealth brought out of a single mouth in the valley, at a much cheaper rate than by digging down from the top on the vein's course and hauling up. The "Burleigh" drill from Massachusetts, that has been in use in the Hoosac tunnel, has been introduced here for this purpose; and successful mining on a grand scale will soon take this form, not only here, but in Nevada, and indeed in most of our mining States.

There is apparently no limit, in fact, to the growth of the mineral interests of Colorado. The product this year is from two millions to two and a half; next year it will be at least a million more, perhaps a million and a half, or four millions; and the increase will go on indefinitely. For the business is now taken hold of in the right way; pursued for the most part on strictly business principles; and every year must show improvement in the ways and means of mining and treating the ores. The mountains are just full of ores holding fifteen to fifty dollars' worth of the metals per ton; and the only question, as to the amount to be got out, is one of labor and cost as compared with the profits of other pursuits.—Bowles' Switzerland of America.

RAILROAD CONNECTIONS.

One grand and peculiar event, bearing upon the development of Colorado, was the opening of the Pacific Railroad in the summer of 1869. The Coloradans were disappointed in having the main branch pass 100 miles to the north of Denver, their capital. But this very circumstance is likely, in the end, to prove an advantage, in bringing to them several railroads instead of one, and thus securing the advantage of competition in fares and freights.

The Denver branch of the Union Pacific is already constructed half-way from Cheyenne to Denver, and will be completed in the summer of 1870. About the same time, the Kansas Pacific will reach the same point, and already several other lines are projected bearing towards that terminus.

Denver lies twelve or fifteen miles east from the base of the mountains, and whatever western or south-western railroad connections it may hereafter secure, it is destined soon, perhaps this very year, to have a railroad built up the valley of Clear creek, tapping the Gold Centre at Central City, and the Silver Centre at Georgetown. At Golden City, near the base of the mountains, where Clear creek debonches into the plains, there is an abundant supply of coal, lime, and clay for fire brick, and already preparations are in progress for extensive reduction works for silver ores.

Thus, the time is very near at hand when this great silver region will not only be accessible by railroad, but will be furnished with all the appliances and advantages of modern improvements, stimulated by healthy competition.

GEORGETOWN AS A SILVER CENTRE.

Georgetown is the seat of Clear Creek county, and the centre of the Griffith mining district. In this district, and within a few miles of Georgetown, are the principal silver mines that have been tested. None of them are as yet fully, or even fairly developed, but several of them even at this stage have already taken rank among the silver mines of the world. One of the number, of which some notes will be given further along, has for some months past been shipping an average of one ton of selected ore per day to Swansea, in England, for treatment. The smelters retain the lead, zinc and copper as compensation for their labor, returning the silver bullion to America.

The London Mining Journal, October 22, 1869, says:

The first ten tons of silver ore shipped to England by the Terrible Mining Company of Georgetown, Colorado, U. S. A., have been received at the British and Colorado Mining Bureau, London. We learn that the assay value of the ore was forty per cent. of lead and four hundred and ninety-six cunces of silver to the ton, which is expected to yield a profit, after paymen, of all expenses (mining included), of about £90 per ton, or £900 on the shipment.

The same paper sent a correspondent to Georgetown to examine the mines. He reports:

I was much surprised to find such rich lodes here not worked. Copper ores are here in any amount, and of the best quality—gray, black, yellow,

peacock, maleable and malachite—but they are not taken the least account of—no more than if they were sand. If English capitalists could only be made acquainted with the enormous profits made from working the mines about here, I should very soon expect to see these mountains swarming with miners.

The reduction of silver has never been attended with the difficulties that embarrass the extraction of gold, although until quite recently there has not been occasion for giving much attention to it in this country. The occasion has now arisen, and the quantity of silver ores about to be accessible, opens to capitalists and scientific men a field of enterprise, that, so far from being neglected, is likely to be cultivated with that tact and energy for which Americans are celebrated. Although so short a time has elapsed since the discovery of profitable silver deposits in the Rocky Mountains, yet at the opening of 1870 Georgetown has seven establishments for treating silver ore in actual operation, and large preparations in progress for more. As a pertinent illustration of what is being done in the two departments of mining and reducing silver, the Georgetown bullion report for 1869, as published in the *Colorado Miner*, is here given :

BULLION REPORT FOR 1869.

Our readers in the country are aware that we have been on the mountains with the miners during the past summer and autumn, and we have been very careful in making up our estimates of the amount of ore out at the different mines in this county.

The figures showing the amount of bullion shipped were obtained from reliable sources, and are as follows, to wit:

Warks.	Tons.	Oz. Silver.	· Coin Value.
Huepeden & Co	639 .	78,052	\$71,143.50
Brown S. M. Co	318	62,819	80,000,00
Stewart.	637	65,679	62,974.00
Franklin Co		4,000	2,737.00
Young America			3,000,00
Baker S. M. Co			15,000.00
McIntyre Mill			5,000.00
G. S. S. Co		7,775	10,000.00
	1,594	248,325	\$249,854.50
Forty tons John J. Roe lode treated at Brown C	o.'s Wo	rks	\$10,000.00

Total \$259,854.50

Average value per ton of all ore treated, \$134.32, coin. We have not been able to obtain an accurate estimate of all the ore shipped for treatment, but the following may be relied on as correct:

Silver Mines.

ORES SHIPPED FOR TREATMENT.

Mines,	Tone.	Coin Val.
Equator	30	\$18,000
Terrible	100	50,000
Good Hope	20	10,000
Snow Drift	10	7,500
Sterling, 2		11.1==
Federal, 5		
Anglo Saxon, 10	191/2	25,000
Tom Thumb, 21/6		

1791/2 \$110,500

ORES ON HAND	· .		
Mines	Toos.	Val. per ton.	Total.
Griffith	2,500	\$60	\$150,000
Franklin.	Soo	<u>΄ δο</u>	64,000
International	350	8 0	28,000
Belmont	100	60	6,000
Baker	100	150	15,000
Gilpin	50	75	3,750
Comet	50	75	3,750
Par	10	500	5,000
La Plata, Capital	100	200	20,000
Caledonia	5	200	1,000
Choctaw	12	165	1,980
Highland	10	100	1,000
•	4,087		\$299,480

GRAND TOTAL.

Bullion produced, coin	
Add ore shipped	\$289,854
Ore on hand,	110,300
	115,565

The above estimates, after a careful examination of all the facts in regard to our mining industry during the past year, we are satisfied are substantially correct.

Bullion, gold dust and ore, shipped in 1869.4 Bullion shipped in 1868	\$400,354.00 91,829.35
Balance in favor of 1869 Increase per cent., 425.	\$308,524.65
Total value of assessable property for the year 1869	\$977,361.50 666,330.00
Increase in value of property in one year Increase about 50 per cent.	\$311,031.50
The total number of votes polled in 1869, was The total number of votes polled in 1868, was	1,037 787

Thus we have shown that our population, the value of our real and personal property, as well as our shipments of bullion, are all rapidly increasing.

The future of Clear Creek county we will not undertake to predict. We simply say, come up and occupy the land, for the fatness thereof is great, and the precious metals are exceedingly abundant.

In the above report, no allusion is made to the dressing works of the Wilson & Cass Company, which only went into operation about the close of the year, but which are now running successfully, and dressing some 15 tons of ore daily, and proposing to develop a much larger capacity during the current year. These works are upon a plan that has been experimented in Germany for centuries, having for its object the separation of rocky and worthless matter from low grade ores, and a concentration of the metalliferous particles preparatory to smelting.

The Georgetown paper also speaks of an additional establishment just opening :

COLLOM & Co.'s Reduction Works at Swansea, four miles below Georgetown, will soon be complete, and prepared to reduce galena ores, containing from 50 to 70 per cent. lead, and from \$10 to \$50 in silver per ton, at rates that will make the mining of such ores highly profitable. Ores containing less lead and more silver also will be cheaply reduced. Hurry up the mining.

THE COMET MINE.

In order to convey to stockholders some just idea of the location and advantages of this mine, a map has been prepared, showing a miniature profile of a section of Griffith mountain at the western foot of which, Georgetown is located. (See frontispiece.)

Near the top of this mountain, and directly opposite the city, is the spot where the mine under notice was first discovered, in August, 1867.

A discovery shaft having been sunk, claims were recorded for 1,500 feet each side of it. The north-eastern portion is still held by the discoverers, Messrs. Taft, and worked by them on a small scale with satisfactory results. The south-western half, 1,500 feet, extending down and along the mountain, is now, by purchase, the property of the Comet Silver Mining Company of Chicago, and also, by pre-emption, * a mill site and water power of 15 acres, just over the mountain on one of the branches of Chicago creek.

In the expectation that the Comet lode will, in due time, occupy a prominent place in the history of silver mining, it is thought proper to place on record at this time, some of the statements of practical men who have examined it, and by whose opinion the

See Appendix.

gentlemen forming the company were induced to undertake the purchase and development of the property.

It should be observed that what is called the discovery shaft, is on the dividing line between the eastern and western sections of the lode, and that the western section has great advantages for being worked by tunnels and drifts run in on the vein, whereas the eastern part can only be worked by shafts from the surface. Up to June, 1869, the only work done on the property had been in the discovery shaft, which was 64 feet deep, with two short drifts. At, and prior to that stage, the following statements were made by intelligent men having no interest in the property.

From Mr. D. T. GRIFFITH,* Agent of the Wilson & Cass Mining Company.

GEORGETOWN, October, 1868.

"The Comet, from the time of its discovery and during the first development of 24 feet by the Taft brothers, had a well deserved reputation second to none for its development in the district, and now since its further development, it has proved to be one of the largest and richest mineral veins of the Colorado Silver Belt.

"The rich pay vein ascertained by the present development is much larger and richer than the average of the district, paying from \$225 to \$800 per ton, and is from 9 to 24 inches in thickness. Besides this, there is a second class ore which is worth from \$30 to \$80 per ton, which will pay largely with good dressing works. This second class is from four to twelve feet in thickness, and will dress ten tons into one, and even more, and will be worth from \$300 to \$1,000 per ton of the silver riches; and the second class ore of this mine will more than pay all expenses of mining and milling the entire ore, leaving the first class ore for profit.

"This rule will not only apply in working this mine, but will hold good in operating any of the best mines of the district when proper dressing works are completed.

• "The silver riches found in dressing the second class ore is much more valuable per ton than the main pay vein is per ton; and the cost of reducing per ton will not exceed \$5.

"To avoid any suspension of work from delay in waiting for reduction or sale of ores, this mine should have a cash working

* It is proper here to say that Mr. Griffith bas, since the close of 1869, become a stockholder and director of the Comet Company.

Silver Mines.

capital of ten thousand dollars, and will pay dividends on a capital stock of \$500,000, if worked according to the diagram and recommendations herein.

"This fifteen hundred feet is sufficient to employ the full force of a company for generations to come."

From JAS. MCLAUGHLIN.

"GEORGETOWN, Oct. 24, 1868. "I hereby certify that I am a mining contractor, and have been working in the gold and silver mines of Colorado for nearly nine years. I have worked the Comet lode on Griffith mountain, Georgetown, Clear Creek county, Colorado, for some three months, the past summer, and from all the indications, so far as I am capable of judging, in its present state of development, I look upon it as one of the finest silver ledges of Colorado."

From BENJAMIN F. DARRAH, Owner of the New Boston Mine.

"GEORGETOWN, Oct. 21, 1868.

"This is to certify that I have visited the Comet lode frequently and believe it to be a true fissure vein, and cheerfully recommend it as first class property."

From WALTER D. W. TAFT.

"GEORGETOWN, Jan. 27, 1869. "I am intimately acquainted with the parties who made the discovery of the Comet lode, and sunk the shaft, the first, 25 feet, and since the shaft was that deep, I have been living close by the lode and have had opportunities of seeing and judging for myself. The shaft at this time is about 64 feet deep, with a perpendicular vein of galena and zinc-blende, varying from three to six inches in width all of the way down. Then there are strata or pocket veins, lying nearly horizontal, but all of them pitching somewhat to the north. These are sulphuret of silver veins, and vary in thickness from one to eighteen inches, and are from three to six feet apart. Then there are innumerable fine veins of galena and zinc, with pyrites of iron running through the quartz vein in every direction. At the bottom of the shaft there is a cross-cut, running 26 feet north from the south wall without finding any indication of a north wall, so that we can only conjecture what the width of the lode may be at this point. There are small veins of mineral all through the quartz as far as the cross-cut extends. There is a

gouge of clay and gritty material on the south side of the lode, extending down unknown depths, which greatly facilitates the working of the lode, as this gouge can be picked down below the bottom of the shaft some three feet at time, and the whole length of the shaft, thereby giving the rock a chance to give way when the shots are put off. The shots will do four times the execution with the gouge picked down, that they would with it all solid.

"One hundred feet east of the discovery shaft there has been a cross-cut in the earth, sunk down to the vein on the south side, then run north on the vein till it was ascertained to be thirty feet wide at this point.

"As to the quality of the ore, I can only give such assays as I know about, which are but a small portion of those that have been made. Assays of blue soft stuff found in the gouge gave thirty-seven dollars per ton, some from gangue rock gave forty dollars per ton, some from the galena and zinc vein gave seventy-five dollars per ton, while assays of the sulphuret ores gave from five to seventeen hundred dollars per ton.

"Now, considering the width of the vein and the richness of the ores all through it, I cannot help thinking that it will prove to be one of the very best lodes in the Territory. For some distance west of discovery, it will be perfectly easy to strike the vein anywhere, and the chances for tunneling in on the vein are admirable, thereby draining the lode at no expense, taking out ore all the while, with facilities for running it out on a level grade at an immensely less cost than hoisting up a deep shaft.

"Many experienced miners, and others, conjecture that by following these sulphuret stratas, streaks or veins, as you may be pleased to term them, which all pitch to the north, to the north wall, then go down on it, you would come to a place where they *all* concentrate, and there would be untold millions in a body. But my opinion is, that it would be far safer and more satisfactory to work that that we know about, than to follow anybody's theory about things unknown. You can see by the assays that the poorest rock in this lode exceeds the average of the ore in the celebrated Comstock lode in Nevada in richness. This Comet lode, so far as known, is equally as large as the Comstock, and by putting the rich and the lean ores together, it is safe to suppose that it will average three times as rich as the ores of the Comstock. Which, considering the immense amount of ore that can be taken, at greatly

Silver Mines.

reduced cost, over the expense of working a small vein, I think should be sufficient to satisfy any candid man living."

From J. H. McMurdy, Attorney at Law.

"Georgetown, C. T., April 6, 1869. "Yours received. Have delayed answering for three days in order to find 'Commodore' Decatur, whom I desired to inspect the Comet and make out a report for you. His report accompanies this letter. He is the 'prince of prospectors,' and an old '59er,' a man of the very best judgment concerning our mines; and one, in fact, whose opinion concerning a locle is almost universally sufficient here to condemn or make the reputation of all lodes in this vicinity. Being entirely disinterested, as well as remarkably honest, I do not doubt that you can rely on his statements fully, and also can act on what he states. As far as my own opinion concerning the lode and its value is to be received, I think it about as good property, partially developed, as this (Griffith) district contains. With the expenditure of a small amount upon the Comet, I am sanguine that it would handsomely remunerate its owners. It is an unusually wide vein-as wide as the celebrated Comstock of Nevada, and four times richer. Our veins are generally less than six feet wide, and rarely are they ten feet wide. This vein is from forty to fifty feet wide. Altogether, I unhesitatingly pronounce it a splendid property."

From STEPHEN DECATUR.

"JOHN H. MCMURDY, Attorney at Law: "DEAR SIR- At any

"DEAR SIR—At your request I examined the 'Comet lode' last Saturday. It is one of the *largest* silver veius in Griffith mining district. The vein matter, to a very great extent, is decomposed; a good indication of the value and richness of the lode. The south wall is developed to a depth of about sixty feet, by a shaft. At a depth of about forty feet, a '*cut*' has been run north about twenty feet, disclosing, with the shaft, about thirty feet of 'pay ore.' The indications on the surface are (several prospect holes having been sunk on the lode to determine its width), that it is from forty to fifty feet wide, The great width and vast deposit of mineral in this lode may startle you, but a personal inspection will dispel all doubts. The 'dump pile,' after the first class ore *has been selected*, is a good indication of the worth of a lode always. There is silver enough in the dump pile to more than pay all the cost of all the work done on the lode. I have no hesitation in saying that the Comet is a mammoth true fissure vein. Money invested in the purchase and proper working of such silver veins, is judiciously invested for the present, and for all time. It is located at a great elevation, which is in its favor. For rich silver mines, 'tarry not on the hill sides.'

> "Up to the line of the towering pine, "Up where the sulphurets sparkle and shine.

> > " Truly, your obedient servant,

"STEPHEN DECATUR."

Following the above allusions to the character of the Comet lode, it may be well to introduce an extract explanatory of the terms used by scientific men in reference to mineral veins:

Segregated veins are what their name implies. They are supposed to have been formed by the segregation of particles of similar nature from the gneissoid and schistose rocks in which they occur, while the mass was cooling down from a molten state.

Practically, the most important feature of this class of deposits is that they cannot be depended on in depth as true veins, as they seem always to be richest near the surface, and frequently terminate altogether at no very considerable depth. Nor is the ore or metallic matter distributed through them with as much regularity as in the true veins, forming often a series of nests and pockets ranged in a general linear direction, and connected by mere threads of ore or barren vein-stone.

Gash veins hold an intermediate position between segregated and true veins. Like the latter, they occupy pre-existing fissures, but they are of limited extent, and not connected with any extensive movement of the rocky masses. They occur in sedimentary rocks but slightly metamorphosed, and owe their origin to unequal contraction of the strata by shrinkage. They may have been filled with mineral matter either by sedimentary deposit, or segregation, or both. They are still less reliable than the segregated veins, but sometimes their great number makes up for the want of continuous extent, and they are worked with profit.

A true vein is a fissure in the solid crust of the earth, of indefinite length and depth, which has been filled more or less perfectly with mineral substances; or, in other words, an aggregation of mineral matter, accompanied by metalliferous ores, within a crevice or fissure which had its origin in some deep-seated cause, and may be presumed to extend for an indefinite distance downwards. True veins sometimes attain a length of several miles. They vary much in thickness, and nobody has ever yet seen the under edge of one. They are the principal repositories of the ores of the useful metals, and their exploitation is a matter of lasting importance, involving the employment of both skill and capital. They are rarely found singly, but rather in groups, often in a complicated net-work crowded into a narrow space. This is so true of Cornwall and Saxony that centuries have not fully developed even the more important facts concerning them. Usually but a small proportion of the matter in the fissure is valuable ore. The earthy or nonmetallic portion is called "gangue" or "vein-stone," and is most commonly composed of quartz.

The veins of Colorado occur in groups, like those of Cornwall and Saxony, often presenting the most complicated net-work on the surface, which is not much untangled as they are worked. They exhibit phenomena which can only be explained by referring their origin to different geological epochs, show displacement, cross and intersect each other at all conceivable angles, but still preserve the general course of the main belt, which is also the true course of fissure metalliferous veins the world over—north-east and south-west. These groups are usually a mile or two in width, and two or three in length, and there may be two or three quite distinct groups abreast of each other in what we have termed the mineral belt.—Hollister's Mines of Colorado.

WORK ON THE LODE IN 1869.

About midsummer a few men were set to work on the Comet, with two objects in view: 1. To open a tunnel on the vein at a distance of about 670 feet down the mountain, from which a profitable drift may be run to intersect the discovery shaft at a great depth; 2. To test more thoroughly the character of the lode at the discovery shaft.

. UPPER TUNNEL.

Almost at the mouth of the tunnel, now referred to, a new lode was struck, which was recorded in the interest of the company to the extent of 2,800 feet. It is called the ZODIAC lode, and is described as a massive deposit of good quartz. The course of the vein varies 26 degrees north from that of the Comet which it crosses. This lode can be very easily and cheaply exploited by running an adit on the vein from the point of discovery in the tunnel. Cross veins have often proved very valuable, and the Company is advised to test this one at its earliest convenience by driving in the proposed adit at least 100 feet, by which time a depth of about 60 feet will have been reached.

The head of the Upper Tunnel is now in 62 feet, and according to survey is within 16 feet of the north wall of the Comet lode. The very next work to be done is to push it on until the lode is reached, and then drive it along the vein towards the discovery shaft; thus gaining about six inches depth for every foot of distance, and securing easy access to an unmeasured quantity of mineral.

DISCOVERY SHAFT.

Mr. GRIFFITH, who superintended the work on the Comet in 1869, says at the close of the year:

"Our working during the past summer at the main shaft, has resulted in little more than determining the character and extent of the lode, which on the whole is very satisfactory, having demonstrated what was before believed, that the Comet is a true fissure vein between well-defined walls, and partaking more of the character of a ledge than of a lode.

"At the depth of 31 feet we ran a cross-cut on the sulphuret vein deposit and found that it determined (as do all the richer deposits and veins found near the surface,) toward the north wall. The ore raised from this cross-cut gave very good results, but as it was simply a 'prospecting' cross-cut, and done under great disadvantage, it could not be expected to pay, but served to guide us in future working.

"After reaching a depth of 71 feet in the main shaft, we ran a drift on the south wall, the distance of 34 feet, to the south-west. This drift discovered a continuous vein of mineral, varying from seven to thirty inches wide, carrying about 23 per cent. galena, but very lean in silver, about \$12 to \$26 per ton. This fact indicated that the rich surface deposits that had so universally 'dipped' across the vein to the north, had carried the silver with them. After sinking the main shaft five feet below the 34 feet drift, with a view of ascertaining whether we were correct in our theory, we caused another cross-cut, at a depth of about 65 feet, to be made directly across the lode from wall to wall, a distance of 47 feet. In making this 'cut' we passed through various veins of 'sulphurets' and other 'silver bearing' minerals, all dipping towards the wall we were approaching. When we came within eight feet of the north wall we struck a well-defined body of quartz 'in place,' which indicated that the principal mineral deposit would be found on that side of the vein. When we reached the wall we found perfect 'casings,' and about three and a half inches of good ore, worth by assay from So to 277 ounces silver per ton. But as the various veins we crossed, as above referred to, following their 'dip,' would not reach the north wall before a distance of from 30 to 100 feet had been reached from the level of the lower cross-cut, it is evident that the best deposit of ore is far below. and will not be reached before a depth of from 100 to 150 feet is

gained. As I have said before, this is a large and well-defined lode or ledge, and when properly explored, large and rich 'Bonanzas' of ore may be expected.".

Mr. Griffith adds the following summary in reference to the mineral character of the Comet at the discovery shaft:

"The ore at the surface on the south wall for the first 26 feet is composed of black sulphurets of silver and argentiferous galena, with small quantities of zinc-blende, but begins at the depth of 23 to 30 feet to dip across the vein toward the north wall. The ore in the lower level is argentiferous galena and zinc-blende, but though there is a good vein of lead ore, 12 per cent. lead, it is lean in silver. The rich sulphuret veins above carried the silver with them toward the north wall. The character of the ore as struck on the north wall by the cross-cut is very fine, being sulphurets and galena, the last assay showing 277 ounces of silver to the ton."

The following is a list of some of the assays of Comet ore made by different metallnigists at different dates:

Assays by S. H. Foster.

November 4, 1867.	Oz. Silver, per ton.	Coin Value, per ton.
November 26, 1867		\$455.90
November 29, 1867.	**********	474.45
February 27, 1868	******	632.05
		686.44

Assay's by Charles A. Martine.

November	2 1868	Oz. Silver, per 1on.	Coin Value, per ton
November	*, 1000		
	4, 1000		701.00

Sample from Shaft on South Wall, 70 feet deep.

Date Oz, Silver, per ton, July 26, 1869.....\$153.40

Samples from S. W. Level or Drift.

No	· · ·	z, Silver, per ton.	Colo Value berry
N.			Per ton.
110.	2		\$15.70

Average Sample of nearly a ton worked by J. O. Stewart.

Date		J. O. Olewart.
September 4,	Oz. Silver, per ton. 1869	Coin Value, per ton.

Sample from North Wall. Oz. Silver, per ton, Coin Value, per ton.

Date.

SOUTH-WESTERN EXTENSION.

In view of the extraordinary size and righness of the Comet vein, it is not surprising that great anxiety should have existed among prospectors and others to find its south-western extension. Circumstances, however, have proved unfavorable to its discovery below the 1,500 feet owned by the Company. The mountain being steep, has, during past ages, accumulated vast heaps of debris, which renders its exploration on the surface expensive and uncertain. Hence, although much time and labor have been spent in endeavoring to trace and secure the extension of this great vein, success has not yet been attained. The Comet Company, and the gentlemen in its employ, in mining and surveying, have been able to consider this subject from the most practical point of view.

As a result, a general tunnel site has been located for the Company at a favorable point far down the mountain, as indicated in the frontispiece to this pamphlet.

LOWER TUNNEL.

The credit of planning and executing/this fine conception, is due to Mr. Griffith, our late Superintendent. A part of his report on the subject is herewith given:

"GEORGETOWN, Colorado, Dec. 13th, 1869. "Col. H. M. Kidder,

Sec'y Comet Silver Mining Co., Chicago, Ill.

"DEAR SIR :--- As per instructions from your office, I have procured a map of the Comet lode, made from an accurate survey of the lode from the discovery shaft near the top of Griffith mountain, to the base of the same. For a definite understanding of this report you are referred to said map.

" I have located and recorded the 'Comet Silver Mining Company's Tunnel' about 386 feet up from the base line of said survey, the course of which tunnel is south 60° 30' east, and will cut the Comet lode by driving on said located course 280 feet, at a depth of 226 feet. In making the location of this tunnel for your Company, I have not confined the object of the same to the exploiting of the Comet lode, but have recorded it as a general tunnel site, under the laws of Colorado. Should this tunnel be driven under the apex of Griffith mountain, on its recorded course, the depth gained

2

Data

Date

Silver Mines.

The Comet and Par

would be about 2,450 feet from the floor of said tunnel. The distance to be run would be about 3,200 feet. The depth to be gained by drifting on the Comet lode after it is found in this tunnel, is fully shown by the levels on the map.

"Many other lodes are known to run parallel with the Comet, but have not been discovered on the surface immediately over the course of your tunnel, owing to the heavy deposit of debris. The mouth of your tunnel is very accessible by wagon road to the water powers of South Clear creek, and the mills of this district. The trend of the belt of lodes which lie south of the Comet, is such, that your tunnel will cut them at right angles, and at great depth."

It is proper to add, that the general course of the Comet lode is directly in the line of Leavenworth mountain, and of a great number of valuable lodes on that mountain, such as the Equator, Square and Compass, George Law, Lady Franklin, Great Eastern, etc., already known, and more or less worked.

This company's tunnel may, therefore, be expected to cut the castern extensions of all those lodes, few of which have hitherto heen discovered, owing to the difficulties encountered on the lower surface of Griffith mountain.

Although the map herewith presented is very condensed, yet an intelligent inspection of it will suggest the immense advantages which will follow an intersection of the Comet lode on the line of the lower tunnel.

Some of them may be stated as follows:

1. A new claim of 2,000 feet may be recorded, owned and worked by the Company.

2. A new tunnel, branching from the original, can be laid on the line of the lode through the whole mountain, to tap from beneath, not only the vast deposit already owned by the Company, but all that lies beyond it, which will be too deep for working from the surface.

In fact, as may be seen from the provisions of the tunnel bill now before Congress (see p. 34), this branch of our lower tunnel will legitimately acquire all the mineral deposits of this rich and mammoth lode (whatever surface discoveries may be made) below the line of 700 feet from the top of the ground.

On the supposition that the vein is continuous in depth, according to the law which usually prevails in true fissures, also that its demonstrated richness continues, to say nothing of possible increase, and that it may be under-run by a tunnel more than a mile long, it would be difficult for the human mind to conceive of a grander opportunity for the extraction of silver.

If the question be asked, what if the Comet extension cannot be found? it may be answered, that any lode that may be found will probably run in a parallel or approximating direction, and will enable the Company to tunnel, not only cheaply, but remuneratively, towards the Comet deposits in the heart of the mountain.

If it be further asked, will not the driving of this tunnel be very expensive, as well as uncertain in results? To this it may be replied, that a very ingenious and valuable inventiou has recently been brought into use, by which, at a moderate cost, the mineral character of a mountain can be ascertained without the expense of time and labor necessary to make a full sized tunnel. The invention referred to is thus described by its American manufacturers:

LESCHOT'S PATENT DIAMOND-POINTED STEAM DRILLS, adapted to every variety of Rock-drilling. The unequalled efficiency and economy of these Drills are now acknowledged both in this country and Europe. The reputation which they acquired at the Mont Cenis Tunnel has been sustained by their complete success in the mines and quarries of this country. These Drills are built of various sizes and patterns, both with and without boilers, and bore from one to six (1 to 6) holes at a time, at a uniform rate, per hole, of three to five (3 to 5) inches per minute in hard rock; eight to ten (8 to 10) inches per minute in slate; and sixteen to twenty-two (16 to 22) inches per minute in coal. They are adapted to Channeling, Gadding, Shatting, Tunnelling, and open cut work; also to deep boring for testing the value of mines and quarries. Test Corres, in the form of solid cylinders of rock or mineral, are taken out by the "Prospecting Drill," showing the character of mines at any depth. Used either with steam or compressed air. Simple and durable in construction. Never need sharpening.

The following extracts report on the actual working of the Prospecting Drill in Colorado:

THE DIAMOND DRILL.—This Drill, now at work in the tunnel of the Incas Bullion Mining Company, in Fletcher mountain, Clinton Gulch, Summit county, Colorado, is, it seems, notwithstanding the severity of the weather, making good progress.

The tunnel has been driven, in all, six hundred and fifty feet, leaving nearly that much more to be driven to reach the lode desired. The Diamond Drill was introduced for the purpose of testing the ground ahead, and began its operations, therefore, in the heading of the tunnel. The. Drill cuts a hole two and a half inches in diameter, and brings out the core, thus giving a perfectly reliable visible index of the character of rock, and presence or absence of mineral, about which nothing could otherwise be known without the actual driving ahead of the tunnel.

The State Historical Society of Colorado

The Drill is worked by means of compressed air, sent through pipes from the mouth of the tunnel, and the same difficulty, in cold weather, is experienced in its use for this as for the Burleigh Drill.

The compressors use water as a lubricant, and the damp air, under a pressure of from thirty to forty pounds to the inch, on escaping from the drill expands so rapidly as to produce intense cold, and clog the drill with ice.

The latest advices from Fletcher mountain are that the drill has reached a distance of two hundred and twenty feet from the heading of the tunnel, and is making a daily progress (12 hours) of about twenty feet.

Under favorable circumstances, it is claimed that it will bore 100 feet per day.

If for no other purpose, this drill is admirably fitted at least for exploration of ground suspected to be mineral bearing. If all that is claimed for it be true, any of our tunnels will have it in their power to prove certainly and surely the nature of their property, and that, too, at a rapid rate and comparatively light expense.

The tunnel in Fletcher mountain is a heavy enterprise, and one, we believe, that will be successful. The Diamond Drill has disclosed the existence of four lodes in all—one of which contains six inches of sulphurets. —Georgetown Miner, Dec. 30, 1869.

We are informed that the contractors running the Diamond Drill in Ten Mile district, have, in spite of a variety of hindrances, reached a distance of two hundred and twenty feet from the heading. Under favorable circumstances, they find no difficulty in boring from three to five feet per hour, or at the rate of about one hundred feet in twenty-four hours. They are now making about twenty feet every twelve hours, being hindered by the peculiarity of the circumstances under which they labor. They have crossed one vein of sulphurets six inches in width, and three other veins showing crevice material.—*Central City Register*.

It is proposed to make an exploration on the course of the lower tunnel of the Comet Silver Mining Company, by means of the diamond drill, as soon as may be found convenient.

The advantages of this tunnel site for general purposes, over and above its promise with reference to the Comet lode, can hardly fail to be great. There is no example of any tunnel in the surrounding mountains having been run far without striking blind lodes, or lodes not previously known to exist, and as the path of this proposed tunnel runs at right angles with the silver belt known to cross the mountains, both east and west of it, it must be seen that its promise is good.

In reference to the general advantages, and indeed the demonstrated necessity of mining by tunnels, the reader is referred to an able article inserted (p. 28) under the head of The Par Tunnel, and to numerous statements in subsequent pages.

THE COMET SILVER MINING COMPANY

of Chicago, has been organized under the liberal and ample provisions of the statutes of Illinois. It is based upon a paid up capital stock of \$200,000, divided into 2,000 shares of \$100 each. To supply an ample working capital, 1,000 shares (\$100,000) of the stock have been deposited in the treasury of the Company for sale or hypothecation, as occasion may require.

Owing to this arrangement, a limited quantity of the stock of the Company is now open to purchase from the Treasurer, or such agents as may be duly authorized to negotiate the same.

The plans of the Company, so far as matured, are to commence work both on the upper and lower tunnels heretofore described, early in the summer of 1870, and from both levels to drift into the mountain on the walls of the lode; with what prospects of securing a vast quantity of valuable ore the reader may judge from the foregoing statements.

A notice of the Comet property, copied from the *Colorado Miner* of Jan. 20, 1870, gives the latest intelligence received from it, prior to the preparation of this pamphlet:

GRIFFITH MOUNTAIN.

COMET LODE.

Surely there is a vein for the silver .- Job xxviii. 1,

The discovery on the above great true fissure vein is situated almost on the summit of Griffith mountain, at an elevation of nearly eleven thousand feet above the level of the sea. The outcrop of the vein is massive, and can be traced for quite a distance on the surface. The developments, consisting of two shafts, which have reached a considerable depth, and several prospect tunnels and "cuts" west of the "discovery" on the lode, clearly demonstrate the immense structure of the vein, proving conclusively, also, that between the walls of the Comet lode there is a vast amount of silver-producing ore and quartz.

The trend of the vein passes transversely in a north-easterly and southwesterly direction, over the summit of the mountain. The vein having been cut a long distance west of the discovery, and a considerable distance below the summit of the mountain, the facilities, therefore, for mining on a cheap scale, by driving adits on the vein, and gaining depth from the surface, are excellent; thereby, also, avoiding the cost of hoisting the ore to the surface and draining the mine by the use of expensive machinery.

The Comet and Equator, on Leavenworth mountain, belong to the same belt of lodes.

The Taft Brothers are sinking a shaft which has reached a depth of fifty feet, on the east half of the mine, with good results; and the Comet Silver 26

Mining Company are prospecting their territory west, and establishing the fact that the Comet has a uniform course and width of crevice between walls as the lode is uncovered down the mountain.

THE PAR LODE.

The Par lode is situated on the south face of Republican mountain, about one-half mile west from the west line of the town of Georgetown, Griffith mining district. It was discovered by Richard Symonds, in July, 1865, and placed on record on the 5th day of June, A. D. 1866. On the 7th day of June, 1869, Rich ard Symonds sold the east half of said Par lode to David T. Griffith, and deeded the same by warranty deed. About six months after discovering this lode and sinking the discovery shaft on the north wall, Mr. Symonds found what he first thought to be another lode some 300 feet east from the discovery shaft; but after making more developments, the new lode he supposed he had found proved to be the south wall of the Par lode, and developments made by Mr. Griffith, since his purchase, show the Par to be a true fissure vein 27 feet between the wall rocks. The present working shaft lies between the two shafts sunk by Mr. Symonds before mentioned.

The outcroppings of the ledge are bold, and the width of the crevice, between well defined walls, is twenty-seven feet. There are two pay ore veins, one on the north and one on the south wall, the former being twenty inches and the latter fourteen inches in width. They are divided by a key rock composed of feldspar and quartz. The quartz, no doubt, when depth is gained, will give place to rich mineral. The ore veins are composed of malachite, argentiferous galena, zinc-blende, and stromeyerite, or silver copper glance, a mineral never before detected in the silver mines of Colorado. Charles A. Martine, Assayer and Analytical Chemist, a gentleman of large experience in the science of metallurgy, and a resident of this place, is the fortunate discoverer of this rare mineral in the "Par," and we are informed by him that stromeyerite is found in the Hentzelman silver mine in Arizona and in the silver mines of Chili, South America, and also in Siberia.

The crevice has been proved up by open cuts in a number of places, for several hundred feet, showing the ledge to be of uniform breadth, and continuous for a long distance. A sufficient amount of work has been done on the lode to warrant the belief that the Par is a true fissure vein, carrying a strong deposit of very rich ore. A number of test runs have been made which show that the first-class ore is worth $\$_{1,000}$, coin value, per ton of 2,000 pounds. We are credibly informed that the average ore by fire assay, is \$669.72 per ton. Three assays of selected ore, made respectively by Professors Martine, Hoyt, and Brown, yielded $\$_{2,211,51}$, $\$_{2,412,08}$, and $\$_{2,359.50}$, coin value, per ton.—*Colorado Miner, Oct.* 21, 1869.

THE PAR TUNNEL.

With a view to thorough development and advantageous permanent working of the Par lode, Mr. Griffith located the Par tunnel, on the 27th day of September, A. D. 1869, but having secured the right under the tunnel laws, he also located the Par tunnel as a general tunnel site, running from the mouth of said tunnel, near the base of Republican mountain, to the main shaft on the Par, from thence north, 40 degrees west, a distance, in all, one and one-half miles. This course of the tunnel will cut all the principal lodes and mines of Republican mountain, and their extensions, at right angles. For a more particular description of the tunnel, reference is made to the notes gathered at the time by the editor of the *Colorado Miner*, published at Georgetown, and here copied. The notes were made on actual examination and a thorough acquaintance with the subject.

See also the map of the Par property.

PAR TUNNEL.

This tunnel had been pre-empted by D. T. Griffith, Esq., for the purpose of ultimately exploring the rich belt of lodes that have been discovered on Republican and Sherman mountains. The immediate object of securing this tunnel site is to explore and develop the Par lode. The face of the tunnel is situated immediately below and south of the discovery of the "Par." The ground is favorable for gaining great depth,—the estimated distance from the mouth of the tunnel to the lode being about three hundred and fifty feet, and the depth gained being nearly four hundred feet.

Work has already been commenced on this great and judicious enterprise, and responsible parties have offered to drive the tunnel one hundred feet for eighteen dollars per foot, lineal measurement, and do all the necessary timbering. We consider the location of the Par tunnel site one of the very best in Griffith mining district.

The projected line of the tunnel will cross the following well-known lodes: Par, Monster, Caledonia, Hise, Silver Eagle, William Lee, Omaha, Snow-drift, Silver Plume, Sterling, and Amador. These lodes, and a great number more, the names of which we have been unable to obtain, situated on the south face of Republican and Sherman mountains, will find an outlet for their untold ore wealth through the Par tunnel when this gigantic enterprise shall have been completed.

There can be no doubt concerning the existence of "blind lodes," rs they are termed by miners, in all mountains where true fissure years are discovered on the surface. This fact, therefore, taken in connection with the lodes already discovered on the above named mountains, renders the expenditure of capital in the construction of tunnels certain and profitable for all future time. We refrain at present from making any more remarks on this

subject, as an article will appear in our next issue on the importance and feasibility of developing our great mineral wealth by means of tunnels.— *Colorado Miner*.

CERTIFIED ASSAYS OF ORE FROM THE PAR LODE.

By C. A. Martine, Analyt	ical Chemist and Assayer.	
Date.	Oz. Silver, per ton. Coin Value, per ton.	
September 10, 1869		
September 15, 1869		
September 23, 1869		
September 25, 1869	1,711	
December 2, 1869		

By Charles A. Hoyt, Analytical Chemist and Assayer.

By Theo. Brown, Assayer of Wilson & Cass Co.'s Works.

Date.	Oz. Silver, per ton. Coin Valu	ie, per ton.
September 28		52,359.50
November 8		505.44
November 30		756.60
November 30		1,333.80
December 3		9,308.00

MINING BY TUNNELS.

It is a generally conceded fact, among those in any way fully cognizant of the peculiar contour of our mountains, their great.altitude above the valleys of the streams, and their abrupt or precipitous sides, on which the silver veins outcrop, running parallel with the longitudinal axis of the mountains in most cases, that tunnels are the only practical and economical mode by which these silver veins can be worked, provided that they are continuous to great depths.

CONTINUITY OF VEINS.

The continuity of the true fissure silver veins of Colorado, and more especially of this and adjoining districts, has never been questioned. Most of our mines that have reached any depth, in most instances, have solid granite walls, in many places stririated both vertically and horizontally. Prof. Whitney, in his *Metallic Wealth of the United States*, says:

"True fissure veins are continuous in depth, and their metalliferous contents have not been found to be exhausted, or to have sensibly and permanently decreased at any depth which has yet been obtained by mining."

Baron Richthofen, an eminent European geologist, says:

"There is no reason to doubt that the equality of average produce and yield throughout the entire length of the Comstock vein, will continue downward to any depth; besides the very obvious theoretical conclusion that vast amounts of silver could not be carried into the fissure from the overlying or enclosing rocks, but naturally had to rise from unknown depths, through the channel of the fissure itself, to be deposited in it where the conditions for sublimation or precipitation were given in its open space; experience in other countries by no means shows of a regular decrease or increase in yield as of common occurrence, though either of them may happen. More commonly, the produce of true fissure veins in precious metals has been found to be about constant."

J. Arthur Phillips, in his great work on Mining and Metallurgy of Gold and Silver, says, "the most productive silver mines of the Harz are those in the neighborhood of Andreasburg, of which the most extensive are the Samson and Neufang mines, which are worked to a depth of 430 English fathoms," or 2580 feet,

The same authority says several mines at Clausthal "have been worked at a depth of 300 fathoms," or 1,800 feet. At Kongsberg, Norway, 280 fathoms; at Schemnitz, Hungary, 200 tathoms; at Joachimsthal, Saxony, 325 fathoms.

On our own continent, the same authority gives the depth of the Veta Madre mine, at Guanaxuato, Mexico, at 300 fathoms, and of the Valenciana mine, at the same place, at 350 fathoms.

On the celebrated Comstock, in Nevada, the workings have extended to a depth of over 1,200 feet.

The similarity of our veins to many of those mentioned above, together with the fact that the country rock is of the same character, and the ores true silver-bearing, forces the conclusion that our fissure veins are continuous in depth.

TUNNELS.

No mining country on the American continent has been more admirably fitted, by the hand of nature and "nature's God," for working mines by tunnels, than this. The mountains in this and immediate adjoining districts rise to an elevation above the valleys of from 1,200 to 3,200 feet, in many cases almost perpendicular, but generally at an angle between 25 and 45 degrees. The veins, running parallel with the sides of the mountains, offer superior inducements for the driving of tunnels from the base of the mountains to cut the veins at right angles, from which levels can be run long distances each side of the tunnels, and incline toward the surface, opening up a large amount of ground that can be mined cheaply; and the mined ore brought to the surface on tramways. It is estimated, by competent authority, that the cost of mining and bringing the ores to the surface will be from 40 to 50 per cent. less than by shafts.

But the greatest benefit to be derived from this mode of mining is the facility with which the mines can be drained. This question of drainage is one that has, from the first discovery and working of mines, been agitated and canvassed in all its bearings, and has given birth to many grand and stupendous achievements in the engineering world. There is not now nor never can be any question but that drainage by tunnels is the cheapest and most economical, and, in support of this, Overnan, in his *Treatise on Metallurgy*, says, "Where the amount of water, received by infiltration or otherwise, is great in a mine, it is, in all cases, if practicable, advisable to excavate a drift for drainage."

Humboldt, in his Assay Politique sur la Nouvelle Espagne, published in 1803, in reference to the Veta Madre of Guanaxuato, Mexico, says:

"It is, indeed, strange that mines of such richness have no tunnels for drainage, when the neighboring ravines of Cata and Marfil and the plains of Tunnascetio, which are below the level of the lowest works of the Valenciana mine, would seem to invite the miner to commence works which would serve for drainage, and at the same time afford facilities for transporting materials to the smelting and amalgamation works."

In the report of the Committee of the Mechanics' Institute, San Francisco, we find the following, in regard to the English Real Del Monte Company, Mexico:

"They became, in the year 18_{23} , the possessors of the Biscanya and several other veins, the former having been worked for many years, and having yielded large amounts of silver, prior to 1749. At that date, an intelligent miner, named Bustamente, concluded to run an adit, or tunnel, in order to effect their drainage. He labored long and patiently, and was supplied with means by Don Pedro Terreros, who continued the work after the decease of Bustamente. In 1759 the vein was reached, after running a tunnel 9,000 feet in length, cutting the vein at a depth of 600 feet beneath the surface, and exposing to view an immense body of ore. Terreros, in the twelve succeeding years, drew from his mines a clear profit of \$6,000,000.

"His successor, the second count, continued the working of the mines, but not with equal profit, for the upper portions of the vein being worked out, he was compelled to go below the water, and the water encountered required $r_{,200}$ horses to pump it out, at an annual expenditure of \$250,000. After struggling for many years, and after a depth of 324 feet under the adit had been reached, the work was abandoned, and the mine allowed to fill with water.

"After the mine had reached a depth of 710 feet under the adit (1,310 feet below the surface), the difficulties of drainage had so increased, both from augmented quantity of water and the greater height to raise it to the point of discharge, that three powerful steam engines could barely stem the coming waters of the mine.

"A deeper adit, which had to be driven a distance of 13,500 feet, had been commenced by the second count. The English company unfortunately adopted the more speedy plan, as it was supposed, of employing steam engines, instead of the slower but surer plan of driving home the deep adit, which could have been done with the investment of but little more capital than that expended in applying steam engines, and would no doubt have given a very different turn to the fortune of that company."

The report further says, "the history of the Real Del Monte mine teaches a valuable lesson, confirmed by the result of almost every similar enterprise in Mexico. They show that after a certain depth has been reached, and no drain tunnels constructed, the mines have been abandoned and the proprietors ruined."

R. N. Stretch, Esq., State Mineralogist of Nevada, says of the Constock:

"If we take into consideration the cost of machinery, of annual additions and repairs, and of consumption of fuel, wages of employees, delays caused by breaking of pumps, expense of explorations, obstacles in securing good ventilation and increase of heat with the depth, and the financial result of past years, we are forced to the conclusion that the mode now adopted of working these mines cannot long be prosecuted with profit to the owners." The most remarkable work of this kind in Great Britain is the great adit in Cornwall, of which an English writer says:

"The advantages of working mines by adits are well shown at the United mines, near Redruth, where an adit has been driven, commencing only a few feet above the sea level, which, with its branches, has a length of from 30 to 40 miles, and a depth under the mines of from 180 to 420 feet. By means of this work a saving in the consumption of coal is effected amounting to 24,000 tons per annum. This magnificent undertaking was completed in 1768."

Dr. Geissler, in his report on the Ernst August tunnel, in the Hartz district, says:

"There have been drain tunnels in the Hartz for a long time, which were used as canals for the transportation of ores. Already, at the commencement of the 16th century, mechanical means to remove the water from the mines were insufficient, and drain tunnels were constructed at that early period. The first tunnel was commenced in 1525, another in 1548, one in 1551, and still another in 1573. By aid of these tunnels mining was continued in those districts for 200 years, but about the middle of last century it became difficult again to master the water.

"In 1850, after careful surveys and due consideration, the construction of the Ernst tunnel was resolved upon; it was to commence at Gittelde, a little town at the foot of the Hartz mountains, and it was estimated that 22 years would be required for its completion, but it only took a little over half that time, for it was entirely completed in 12 years and 11 months.

"This tunnel has a uniform fall of 7 4-10 inches to each 630 feet, or t in 1,400; its height is eight feet three inches; its width, five feet six inches, and its shape that of an egg. The water has a sufficient depth to allow the use of long flat-boats, for the transportation of ore. A part of the watercourse is covered over, to be used as a sidewalk for the miners."

The great Sutro tunnel, in Nevada, on which work was commenced a few days since, will be, when completed, "20,178 feet in length, cutting the Constock 1,922 feet below the floor of the Savage Works."

In order to show the greater feasibility of driving tunnels here, not only for drainage but also for cheapening the expense of mining and delivering the ore at the surface, we give the figures of the length of tunnel and depth from the summit at which some of these enterprises will reach:

The Marshall tunnel will be 1,922 feet in length when under the summit of Leavenworth mountain, and 1,051 feet in depth. The whole length of the tunnel, when completed through the mountain, will be 3,912 feet.

The Helmick tunnel, in the same mountain, will cut the summit 1,250 feet deep, in a distance of 2,050 feet, and will pass under the left hand fork of South Clear creek, into Griffith mountain, 400 feet below the surface of the water.

The Burleigh tunnel will cut the Terrible mine, on Sherman mountain, over 800 feet in depth in a distance of 1,580 and the summit of the mountain 3,200 feet deep in a distance of 3,500.

The Baltimore tunnel, in Brown mountain, will cut the Brown mine, in a distance of 622 feet, 465 feet in depth; the Coin, 915 feet deep in a distance of 1,110; the Lily, 1,311 feet deep in a distance of 1,580; and the summit of the mountain 2,140 feet deep in a distance of 2,710.

The McAfee tunnel will cut the Murley lode 500 feet in depth in driving 450, and the summit of Sherman mountain 1,500 feet deep in driving that distance.

The Par tunnel will cut that vein 400 feet deep in driving 350.

The Morris tunnel will cut the summit of Columbia mountain 1,500 feet in depth, in a distance of 1,800 feet.

These tunnels are all being actively driven at the present time, with every indication of success. Besides these there is the Linn tunnel, which is being driven into Leavenworth mountain, but for which we have not the figures. Among those projected, and which we hope will go into active operation before long, are the Philadelphia tunnel, in Brune mountain; the American tunnel, in Saxon mountain; and the Webster, Faun and Croston, in Leavenworth mountain.

By comparison between the figures given of the length and depth from the surface of tunnels here, and the Sutro in Nevada; the Ernst August in the Hartz; the United, near Redruth, in England, and the Biscanya, in Mexico, it will be seen that Colorado offers superior inducements to this class of mining. Who will say that the "key" is not "being forged that will unlock the great treasures" confined in these "everlasting hills," and that too, without Government assistance ?--Colorado Miner.

The following extracts from the *Miner* are inserted in the order of their publication from time to time:

REPUBLICAN MOUNTAIN,

PAR LODE,

We stated last week that the crevice material in the Par "was assuming a more compact form, and the indications were that a large deposit of rich silver-bearing ore would soon be reached."

Yesterday, in company with the owner of this lode, D. T. Griffith, we visited the Par, and found that the workmen had just struck a large bonanza of rich ore. The sight in the bottom of the shaft was truly gratifying, and satisfied us that there was no discount on the Par.

An assay of two samples of average ore, made by Prof. Brown, Metallurgist of the Wilson & Cass Company, gave a yield of \$756.60, and the other \$1,333.80 per ton, and one sample, half rock and half ore, assayed by Chas. H. Martine, gave a yield of \$721.43 per ton.

The ore at the mine, properly hammer-dressed, is worth, at a low estimate, \$1,000 per ton.—Colorado Miner, Dec. 2, 1869.

PAR LODE.—The shaft on this lode is being pushed down night and day. The ore vein is increasing in width and richness constantly. The metallurgist, Mr. Brown, of the Wilson & Cass Co., made an assay of first-class Par ore that gave a yield of \$9,308 per ton.—Col. Miner, Dec. 9, 1869.

PAR is a very encouraging word on 'Change in all cities, but one thousand per cent. above par in the mountains is still better.—Col. Miner, Dec. 16, 1860.

PAR TUNNEL.

The survey of the Par tunnel has just been completed, by Albert Johnson, Deputy United States Surveyor. The following is a list of some of the principal lodes that the tunnel will cut as the work progresses on this great enterprise:

Salle Ward.	Caledonia.	Snow-Drift extension.
James Guthrie.	Hise.	Madison.
Morning Star.	Dundas.	Sterling.
Emperor.	Marshall.	Sunburst.
Ben Harding.	Silver Eagle.	Mancinetta.
Par.	Henderson.	Adams County.
Four lodes, names un-	Kitwinning.	Silver Plume.
known.	Good Hope.	White.
Monster.	Snow-Drift.	Orkney, Emma Dean

When the tunnel shall have gained a point directly under the summit of the mountain, the distance gained from the surface will be three thousand, three hundred and sixty-five feet, and the whole length of the tunnel will be 7,920 feet.

The rich belt of lodes the tunnel crosses is so well known that we deem it unnecessary to occupy space in describing it at present.

A contract has been let to drive the tunnel to the Par lode, a distance of 689 feet, and the workmen are driving ahead into the mountain at the rate of 18 feet per week.

Should the progress continue its present rat: for 23 weeks, all the internediate lodes, and the Par, will have been reached, and the practicability of mining by tunnels in Clear Creek county will have been established beyond a doubt.—Col. Miner, Jan. 13, 1870.

As a means of enabling the reader to form some idea of the advantages and value of a well located tunnel, running through a rich silver belt, like that indicated above, attention is invited to the rights which legislation has confirmed and proposes to confer, as an encouragement to the working of tunnels.

Upon the organization of the Territory of Colorado, its Legislative Assembly hastened to reassure the miners against fears of molestation of their rights by the passage of the following act "concerning lode claims," which was approved November 7, 1861:

"SEC. 4. That if any person or persons shall locate a tunnel claim, for the purpose of discovery, he shall record the same, specifying the place of commencement and termination thereof, with the names of the parties interested therein.

"SEC. 5. That any person or persons engaged in working a tunnel, within the provisions of this act, shall be entitled to two hundred and fifty feet each way from said tunnel, on each lode so discovered."

In the Territorial Incorporation Law, approved March 11, 1864, it is provided that the certificate of incorporation of tunnel companies shall specify where the proposed tunnel is to be run, where to begin, course, termination, and the minerals designed to be excavated. Such companies to have and hold 250 feet on each side of their tunnel on all lodes discovered by them while excavating it; one hundred feet on all lodes discovered by others crossing said tunnel after the commencement of the same; and through all

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The Comet and Par

lodes discovered previous to such commencement, the right of way .-- Hollister's Mines of Colorado.

Still more complete and liberal provisions for the encouragement of tunnelling are contemplated in a bill now before Congress, expected soon to become a general law of the United States. Witness the following summary:

PROVISIONS OF THE CONGRESSIONAL TUNNEL BILL.

tst. Persons locating and working a tunnel shall mark the beginning thereof, and the course by compass to be run, and the end thereof, and record the same on the records of the county in which it is located.

2d. Persons working a tunnel shall own 500 feet on each side of said tunnel, on all lodes discovered in said tunnel which were not discovered (and recorded) on the surface previous to location of the tunnel.

3d. Persons working a tunnel shall have, after the floor of their said tunnel has reached a depth of 700 feet from the surface, the right to all ore, in all lodes they may cut (whether previously discovered or not), lying below the floor of their tunnel, and after 800 feet depth has been reached, all ore below, and the right to stop up 100 feet; and after 900 feet, all below and "up" 200 feet; and after a depth of 1,000 feet, all below and up 300 feet, etc.

4th. Persons who have made discoveries on the surface previous to the location of a tunnel, who claim that a working tunnel has crossed their property in its working, must work down from the surface, following the line of their crevice until they shall intersect with the tunnel, which shall be proof of their ownership; until which time, the persons working the tunnel shall have the right to extract ore from said disputed lode for their own proper use.

If the reader will now turn to the map of the Par tunnel, and observe the possibility of some 30 silver lodes becoming tributary to the future traffic of that one thoroughfare into the bowels of the mountain, he will be able to form some idea of the extraordinary opportunity there furnished for profitable work. The owners of lodes already discovered are directly interested in having the tunnel driven under their property, since even after full payment for the use of a tunnel track, they can run out their ores much cheaper than to hoist them up through shafts above. In the light of these facts, it is not difficult to believe what has been stated on high authority, viz.: "Were a tunnel run only to the Par lode, the property would constitute one of the most valuable estates in the world." It should be borne in mind, that while for ordinary pur-

Silver Mines.

poses the bore of a mining tunnel needs only to be a few feet wide, yet, when occasion requires, it can be enlarged at a moderate cost to accommodate any number of tracks that its business may require. In the case of the Par tunnel, the contiguous water power is not only convenient, but of sufficient capacity to move all the ore cars back and forward, and also to drive any species of machinery that may be needed in the valley.

The following notices of mines located over the course of the Par tunnel, are clipped from the *Colorado Miner*, as valuable "surface indications" of what may be expected when proper depths are reached:

REPUBLICAN MOUNTAIN.

The custom of naming mountains and assigning to them geographical boundaries is right and proper. It enables discoverers to designate the locality of their mines with certainty, and gives persons who visit us, as soon as they post themselves in regard to the trend of the mountains, a better idea of the mineral wealth they contain. All that section of country situated between Silver Creek and Cherokee Gulch is denominated on the map of Clear Creek county as Republican Mountain, an 1 hereafter, in referring to mines, we shall give their locality on mountains as they are designated on the map to which we have referred. We have not time or space in this article to give the boundaries of all the mountains situated in Griffith mining district, and shall only allude to the boundaries of Sherman mountain.

This mountain is situated west of Republican, and has Cherokee Gulch on the east and Brown Gulch on the west.

The Snow-Drift and all that rich belt of lodes grouped around it, are, for the reasons assigned above, situated on Republican Mountain.

MONSTER LODE.

This lode is situated about one hundred feet above and has a parallel trend with the Par. The owners, Messrs, A. J. Randall and Richard Symonds, have sunk a shaft on the veint to the depth of fifteen feet, and a well developed crevice two feet wide, showing six inclus of pay-vein matter, is the result of their labors.

We trust that the Monster will be exploited.

SNOW-DRIFT LODE.

This lode is being placed in admirable working order for drifting and stoping, and will, by next spring, furnish ore sufficient to supply reduction works of ten tons capacity per day.

The mine is yielding large quantities of very rich ore, and depth is being rapidly gained in several shafts which are being sunk on the lode.

We return thanks to D. Peters, Esq., for rich specimens from the Snow-Drift.

Silver Mines.

STERLING LODE.

This lode is situated a short distance above the Snow-Drift. This property was sold a short time since at fair figures. The east half is now owned by a number of capitalists residing in Philadelphia, Pa., and the west half by C. T. Bellamy, Esq., of Georgetown.

There are several shafts sunk on the lode, having gained a depth from the surface of from twenty to thirty feet. The crevice in all the shafts is large, the walls well defined, and we have no doubts about its being a true fissure vein, and a first-class mine. The characteristics of the vein matter are similar to that of the Snow-Drift, being decomposed feldspar and quartz, and the ore vein mostly argentiferous galena, solid and decomposed. We saw thirteen sacks of first-class ore at the mine that will yield at the rate of $\mathfrak{F}_{1,000}$ per ton of two thousand pounds, and several sacks of second-class ore that will make a good show when it is treated.

It is the intention of the owner of the west half of the mine to ship two tons of the first class ore to Newark, N. J., for treatment. There will be another excitement at the Reduction works of Ed. Balbach, Jr., when the ore from the Sterling is treated.

SUNBURST.

This is a new discovery, and is situated a short distance above the Sterling. The crevice is about five feet wide, and the discovery shaft is about thirty feet deep. East of the discovery, about forty feet, there is another shaft sunk on the vein, which is twenty-five feet deep. The vein matter is decomposed, and easily worked. There will be a silverburst from this new discovery ere the buds on the aspens begin to swell.

MADISON.

And now here comes the news of still another new discovery. We found G. W. Cox at the discovery, which has gained a depth of twenty-six feet. The crevice is very wide, and the vein matter is similar to that of the Sterling.

ORKNEY.

North-west from the Sterling, and still higher on the mountain, the above lode is situated. Here we found an old miner, C. A. Kimberlin, who has just struck a rich deposit of ore and gray quartz sixteen inches wide in a shaft about fourteen feet deep. The crevice is about six feet wide, and shows indications of increasing in width as depth is gained.

A test run of two or three tons of ore from this mine will be made in a short time, when we shall have something more to say about the Orkney.-

It is known that not only the test, but several succeeding runs from the Orkney were very satisfactory. The Elijah Hise and Indigo lodes were represented at the Paris Exposition by ores which, according to Commissioner Blake, assayed respectively, in silver alone, $\$_{1,656.20}$, and $\$_{1,804.83}$. It has been estimated that the cost of extracting ores through the tunnel, when placed in proper order, will not exceed \$2.00 per ton.

THE PAR MINING AND TUNNELLING COMPANY.

To effect a vigorous prosecution of the splendid enterprise just described, a Company has been organized and incorporated also under the laws of Illinois, and with its home office in Chicago.

The capital stock is \$500,000, divided into 5,000 shares of \$100 each. Of this, a deposit of 1,000 shares is held in reserve to form the working capital of the Company, in case it is found necessary to expend money faster in driving the tunnel than it is realized from working the mine. Thus far, the mine, though worked on a very limited scale, has more than paid all expenses incurred in driving the tunnel—a result, perhaps, never attained before.

It may here be remarked that a contract has been let for driving the tunnel on very favorable terms, and that the work will be prosecuted night and day in hope of reaching the Par lode during the current year.

Persons desiring to secure an interest in the stock of this Company, can apply to the Treasurer, Mr. H. M. Kidder, at Chicago.

As the parties who have organized the Companies represented in this pamphlet, have strong confidence that the results of both enterprises will, in due time, speak for themselves more convincingly than any language or figures that it might now be deemed prudent to use, they choose to make no predictions for the future, but simply to state the conditions and prospects for success as they understand them.

For their own convenient reference and that of their friends they have thought proper to subjoin in an Appendix some miscellaneous information in reference to silver-mining, abridged and condensed from various authentic sources.

PRODUCTION OF SILVER.

Table showing the approximate yield of the principal silver producing countries, according to Philips.*

	180	ю.	185	:0.	180	۵ <u>۶</u> .
· · ·	Pounds troy.	Ratio per cent.	Pounds troy.	Ratio per cent.	Pounda troy.	Ratio per cent.
Kussian empire	58,150	2.5	60,000 20,400	2.1	58,000	1.5
lartz russia szony Sther German States, ustria rance. taly pain	141,000	6.0	48.500 31.500 21,100 63,600 2,500 87,000 5,000	1.7 1.1 0.7 1.2 0.1 3.1 0.2	60,500 18,000 68,000 80,000 2,500 91,000 18,000 18,000	15 0,6 1,7 2,0 11 0,4 0,4
ustralia, etc h1]i olivia	18,300	0.8	125,000 10,000 238,500	4 4 0.4 8.4	110,000 9,500 200,000	2.8 0.2 7.3
eru ew Granada razli	401,850 5.003	17.2	130,000 303,150 13,000	4.6 10.7 0.5	130,000	3.1
alted States.	1,410'200 1,410'200	61.7	675 1,650,000 17,400	\$8.4 0.7	1,500 1,700,000 1,000,000	0.4 42 3 25.0
Total	1,337.300	100.00	2,817,425	100,00	4,017,000	100 00
· · · · ·	37,396,800	••••	\$45,238,800		\$64,272,000	••••

* The Mining and Metallurgy of Gold and Silver, page 320.

† Obtained from the Island of Sardinia, where it is found associated with galena.

The above table is very valuable, showing, as it does, the relative importance of the different silver-bearing regions of the world, and also the constant increase of silver production. Thus at the beginning of the nineteenth century, the United States produced none; in 1850, less than one per cent. but now 25 per cent. of the total silver product of the world.

The silver production of Mexico has not only been maintained during the last 68 years, but increased-a fact indicative of what is likely to occur in the United States for a long period to come. It will be borne in mind that the silver mines of the United States are found in the same great mountain chain which has been so productive of this precious metal, not only in Mexico, but in Bolivia, Peru, and Chili.

Chevalier estimates the silver production of the mines of Bolivia and Peru up to 1845, at \$2,493,426,880; that of Chili, at \$41,722,156; that of Mexico, at \$2,605,739,000.

The present annual production of these countries is estimated, in round numbers, as follows:

Bolivia, (mines of Potosi).\$10,000,000 | Chili.....\$ 3,000,000

Appendix.

There are no equally satisfactory statistics in reference to the silver production of Europe and Asia, although the relative importance of different countries may be seen by reference to the second of the foregoing tables.

Silver mines in Germany that have been worked since the sixteenth century are still producing from great depths. Those of Kongsberg, Norway, were discovered in 1624, and having been worked from that time continuously, presented the best exhibit of ores made at the Paris Exposition, Some of the shafts have reached a vertical depth of 1,680 feet. From the bottom of the King's mine at that depth, a rich specimen was shown.

THE COMSTOCK LODE.

The great silver epoch of modern times commenced with the discovery of ore near Virginia City, Nevada,

" In June, 1859, two men, while washing for gold, made an excavation to hold water upon the hill-side, and uncovered tich silver ore upon the ground now belonging to the Ophir Company. A man named Constock was employed to purchase the claim, and thus his name has been given to the vein. As soon as the true nature of this ore was ascertained, miners flocked into the Territory, and claims were located upon the supposed course of the vein for a distance of about six miles.

"The subsequent developments have shown this vein to be one of the largest and richest ever discovered, ranking with the celebrated Veta Madre of Guanajuato, and the Veta Grande of Zacatecas, Mexico. It is evidently what is termed a true fissure vein, and may be followed to a depth which will be limited by the costs of mining rather than by the absence of vein.

"The elevation of this vein above the sea is about 6,000 feet, and it comes to the surface on the eastern slope of a porphyritic mountain which has been named Mount Davidson. Its course or direction is nearly north and south, and its general dip or inclination is towards the east. In width it varies from a mere seam to over 200 feet, and it is often broken up into several parallel branches which include large masses of the 'country' rocks, It is remarkable for its large selvages of clay, filled with broken portions of the vein and walls, much worn and rounded by the attrition to which they have been subjected by the movement of the adjoining surfaces. Only the harder, and, in general, the more barren. parts of the vein, show upon the surface as 'croppings.'

"Excavations along the line of the vein have extended by shafts to a depth of 700 to 800 feet. Several long tunnels have been run to drain the vein, the principal one being the Latrobe, commenced in 1861, and now about 3,200 feet long, which drains the mines at the north end of the lode to a depth of about 600 feet. A new tunnel, to be 20,378 feet long, and to drain the lode to a depth of 2,000 feet, is projected by Mr. A. Sutro. It is estimated that this work will occupy three or four years for its construction, and cost about \$2,000,000."-Blake's Report upon the Precious Metals.

The Comstock lode has been traced for a distance of about four miles. Forty-seven companies have been organized upon it, with claims varying from ten feet to two thousand feet in length. Most of the companies were organized in California, and the engines, machinery, and supplies, were, until the opening of the Pacific Railroad, freighted over the Sierra Nevada at a heavy cost.

"The various companies had excavated, before 1866, about twenty-eight miles of tunnels and drifts, and about five and three-quarters miles of shafts, winzes, and inclines, exclusive of stopes. The dead work of one mine alone,



APPENDIX.

THE USES OF SILVER.

Silver is a favorite and valued metal, not only in civilized but in barbarous nations. It has been used and highly prized from remote antiquity. The enlarging commerce and the multiplied inventions of modern times intensify the demand for its production. In medicine and in the useful and ornamental arts, its uses are almost innumerable, while it forms an important part of the coinage of all nations.

The silver coinage of the United States, prior to Fuly, 1868, had reached one hundred and thirty and a half millions of dollars. It is stated that one establishment in the United States, the Gorham Manufacturing Company, uses up 26 tons, or 2,000 ounces a day in the production of silver ware and plate. How much is used annually in the whole country no statistics tell.

THE PRODUCTION OF SILVER.

The following statistics are taken principally from the report (on the precious metals) of W. P. Blake, one of the United States Commissioners to the Paris Universal Exposition of 1867.

The report was issued from the Government Printing Office, Washington, 1869.

" Aggregate production of Gold and Silver up to 1868.

A. D. 14	to 800, 1	(amoun	t supposed	to be on	hand)	 51,790,000,000
800 to 1.	403					 345,000,000
1402 to 1	801					 5,820,700,000
1803 to 1	848					 2,484,000,000
1848 to 1	868					 3,571,000,000
•						
· (Grand	total				\$ 1,010,700,000

"This total is at best only an approximation, and is exclusive of the production of Asia, except a nominal allowance of 510,000,000 per annum for the last 20 years, and, with one or two exceptions, is without any allowance for loss in transportation or by wearing.

"The first item includes what was supposed to be on hand in the time of Augustus, and does not include any allowance for the production during the period, of which, in reality, nothing definite or satisfactory is known."

(39)

the Gould & Curry, was, in 1865, about 12,750 lineal feet of shafts and tunnels.

"There are 76 mills, or reduction establishments, supplied by ores from the Constock lode. These are scattered through Storey, Lyon, Ormsby, and Washoe counties. The value of the mills and machinery of Storey county alone is estimated at \$3,500,000.

"The mills are expected to return in bullion 65 per cent. of the assay value of the pulp, which is about the average working result. There is thus a loss of 35 per cent., or about \$\$,000,000 annually. The cost of working ordinary ores is from \$12 to \$15 per ton. A few years ago \$20 and \$25 per ton were paid for working. One chief element of this great expense of reduction is the cost of fuel, which is scarce in the region and commands from \$15 to \$20 per cord. A dwarf pine, the pinon, is chiefly used, and is hauled a distance of ten or twelve miles. The annual consumption of firewood is estimated at 144,000 cords, and is valued at nearly \$2,000,000.

"The lumber is brought from the Sierra Nevada, some 12 miles distant, where the supply is practically inexhaustible. The annual consumption is estimated at 35,000,000 feet, board measure, worth about \$1,400,000, one-half of which is for freight."-Blake's Report.

The statistics of the more important of the companies working on the Comstock vein have been published in great detail, showing large successes and heavy failures.

The following table indicates the character of operations during a period of prosperity. It is inserted to show the possibilities of silver mining even from the surface, and with all the disadvantages alluded to above:

Three Months' Work of a few of the Comstock Silver Mines in 1865.

Name of Company.	No. of Feet in Mine,	Nominal Capital,	Total Work- ing Capital paid in.	Yield for three months, ending April, 1865.
Yellow Jacket Savage Gould & Curry Chollar Belcher Potosi Imperial Empire Confidence Ophir Bacon	1,100 800 1,200 1,400 1,400 1,400 1,400 1,400 1,400	\$1,200,000 1,600,000 2,400,000 4,480,000 3,120,000 1,400,000 2,000,000 909,600 780,000 7,040,000 7,040,000	\$ 100,000 108,000 150,000 143,000 11,003 86,100 49,080 None. No report. do.	\$720,107 50 605,213 40 447,183 98 410,000 00 314,140 31 308,120 00 201,154 55 119,208 49 80,042 10 57,713 20 41,080 07

Thus it will be seen that the Savage Mining Company, with only \$108,000 working capital paid in, yielded for three months over \$605,000 in bullion; the Belcher Mining Company, with only \$21,008 working capital, yielded \$314,140.31; and the Empire, on seventy-five feet of lode, and with no paid capital, produced over 119,000 dollars.

MODE OF MINING ON THE COMSTOCK,

"Mining on the Comstock is carried on almost exclusively through perpendicular shafts, explorations having penetrated below the deepest adits, which are now used almost exclusively as drains, to avoid the necessity of hoisting the water to the surface. The original shafts were much less substantial than those now in use, being merely lined with planks about three

inches thick, the compartments being two or three in number and about four and a half feet square. The principal shafts now in use are fine specimens of mining engineering. The Curtis shaft of the Savage Company has four compartments, three of them, for hoisting being five feet square, and the fourth, which is occupied by the hoisting machinery, five fect by six.

"TUNNELS AND DRIFTS -- From these shafts drifts are run to the vein, generally about 100 feet apart vertically; but it seldoin happens that the levels in any one mine correspond with those in the mines adjoining. This arises from the mines being worked entirely independent of each other. But few of these tunnels will stand without protection. The main working drifts are usually timbered every five feet, the timbers varying from eight to twelve inches square, according to the nature of the ground to be sustained. In many places, even 12-inch timbers cannot resist the immense pressure brought upon them by the slacking and expansion of the material through which the drifts are run, immediately on its exposure to the atmosphere. It is not uncommon to see timbers completely crushed, notwithstanding the utinost precautions, in six months after they have been placed in the mine. Main working drifts, after timbering, are usually about six feet high in the clear, three and a half to four feet wide at the top, and somewhat more in the bottom. Temporary prospecting drifts are much smaller in size, and generally left untimbered, if practicable, till they develop something of value. In each drift is laid a wooden track shod with iron, on which the material extracted from the mine is run out to the shaft in dumping cars, holding from 1,000 to 1,500 pounds. To avoid repeated handling of the ore or waste, the same cars are hoisted on the cage to the surface, and their contents there distributed to the proper places.

"STOPING is universally conducted by opening a level below the body of ore to be extracted, and working upward on the vein. On the Comstock, the openings made in mining the ore are so large that a complicated system of timbering is requisite to replace the material extracted. A rectangular system of timbers is usually adopted, the posts being about seven feet in length, twelve inches square, and placed about five feet apart from center to center. These are retained in their places by 'caps' and 'sills,' and further to secure the mine, each floor, as far as practicable, is filled up with waste material as soon as it is worked out. In early days too little attention was paid to this last precaution, resulting in extensive 'caves,' or giving way of the ground from the superincumbent pressure. If a body of ore is entirely extracted, the result is not serious; but should any remain untouched, the cost and difficulty of securing it after a 'cave' has occurred in its vicinity is usually greatly increased from the broken and shattered condition of the ground. The quantity of timber used in these stopes is immense. Any means which would diminish its price would be a great gain to the

entire community. "In this connection the advantages of a community of knowledge and interest among the mining superintendents would be of immense value, the experience of all becoming available by each, thus reducing the cost of explorations by showing in what portion of the different mines deposits of ore are most likely to be found, and thus directing attention more particularly to them. Every dollar spent on an unproductive mine is so much taken out of the aggregate net profits of the mining interest, and every dollar which can be saved would be equal to the same amount distributed in dividends. But because a mine on the Comstock is unproductive to-day, is no reason why it should be abandoned. The only point to be considered is how it may be developed in the most economical inanner, and the plan suggested above appears to afford a solution of the difficulty. The inefficient character of the results obtained by many companies working on the Comstock lode, when compared with the money expended, is well known to persons familiar with our mines, and can only be remedied by some such organization.

"YIELD OF ORE PER TON.—Some mines, owning mills of their own, work rock yielding as low as \$15 per ton, but no record of this becomes public. From information furnished by the superintendents of the following mines, the yield per ton appears to be—

"Savage mine-30,350 tons, produced in the last six months of 1866, yielded an average of \$42.93 per ton.

"Hale and Norcross mine-16,836 tons, produced in the same time, yielded an average of \$30.33 per ton.

"Gould and Curry mine — 62,425 tons, produced in 1866, yielded an average of \$28.64 per ton.

"COST OF REDUCTION.—The following details, taken from the published reports of mining companies, show a material diminution from the cost in former years, due in great measure to improvements in machinery, systematization of labor, and increased knowledge of the method of reduction:

 Savage mine, average for 12 months ending July 1, 1867	614	04	Ł	
Savage mine, for the previous year	16	74	ł	
Hale & Norcross mine, average for 12 months ending March, 1867	-14	20	÷.,	
Gould & Curry mine, average for 11 months ending November, 1866	13	10		

-Browne's Mineral Resources.

PRESENT CONDITION.

The present condition and prospects of the Constock mines are indicated by the following extract from a Report on the Mines of the West, made by R. W. Raymond, U. S. Commissioner of Mining Statistics, published in 1869:

"Very little of the productive portion of the vein is now standing. Nearly all the mines contain low-grade ore, some of them even in large quantities; but these ore reserves lie, for the most part, at or near the surface. The Hale and Norcross croppings, for instance, have scarcely been touched. They cannot profitably be worked at the present current expense of beneficiation.

"Considering that the average width of the Comstock is 175 feet, and the greatest depth attained is only 1,210 feet below the surface, (Bullion shaft,) while the work of testing the ground in horizontal directions has not kept pace adequately with the depth; attained, we may say that explorations have not been very thorough; but the fact remains that, although there is much undeveloped ground on the Comstock vein, the work thus far does not present very encouraging results for the *immediate* future.

"THE SUTRO TUNNEL.—The future of the Comstock mines depends on the discovery and successful exploration of new bodies of ore, and the reduction of expenses so far as to permit the extraction and beneficiation of the low-grade ores which are expected by good judges to predominate in depth.

depth. "For both of these results some change in the present system of mining is vitally important. Mr. Sutro's plan for a deep adit, starting near the Carson river, and cutting the vein 1,970 feet below the outcrop, presents one solution of the problem.

"The developments of the past year, and the present condition and prospects of the Constock mines tend to establish more positively than ever the absolute necessity of this great work. The barren ground now presenting itself should be underrun with a tunnel, and the necessary dead-work cheapened. A few remarks will show what interest the government possesses in the question;

"I. The bullion product of the United States is decreasing every year. There are various reasons for this decrease. Some of them are beyond the reach of legislation, while others are themselves the results of unwise legislation. Everybody admits the decrease to be, especially at this time, a national misfortune.

"2. One great cause of trouble is the fact that mining has not on the whole been profitable to individual adventurers. And of this fact the Comstock lode has furnished a striking example. The reason is simple. Unnecessary labor has been employed, and vast sums of money wasted in extravagant speculations and litigations; and the root of the whole evil lies in the system of scattered, jealous, individual activity, which has destroyed, by dividing, the resources of the most magnificent ore deposit in the world. Thirty-five or forty companies, each owning from 10 to 1,400 feet along the vein, and each (almost without exception) working its own ground independently; forty superintendents, forty presidents, forty secretaries, forty boards of directors, all to be supplied with salaries, or, worse yet, with perquisites, or, worst of all, with opportunities to speculate; an army of lawquisites, or, worst of all, with opportunities to speculate; an army of law-yers and witnesses, peripatetic experts, competing assayers, thousands of miners, uniting to keep up the rate of wages; these things explain the heavy expense of Comstock mining. Aside from this immense drain of money, amounting to 20 per cent. of the whole production, the labor actually performed has been, for want of united action, often useless. There have been tunnels enough run by different companies into the Constock lode to make, if put together, the whole length of the Sutro tunnel. Hardly one of them is good for anything to-day. The Bullion company, which has the deepest shaft on the lode, never had any ore, but has spent more than a million of dollars in prospecting, while some neighboring mines, like the little Kentuck, have been in bonanza for long periods. Now this division of a vein, which gives the rich chimney to one owner, and the barren intervals to another, is not conducive to economy. The result has proved to be that both owners waste money. All the explorations in the barren mines of the Constock could have been executed with the money flung away by the mines that have had, for a time, rich ore.

mines that have had, for a time, fich ofe. "The Sutro tunnel will do four most important things: it will settle the question of the continuance of the Constock in depth; it will inevitably unite the mining companies in many respects, and remove much of the expense of separate pumping, hoisting, prospecting, and general administration; it will render possible the beneficiation of low-grade ores, absolutely the only basis for rational and permanent mining; and, finally, by assuring the future, it will kill that speculation which thrives on ignorance of the future. "The direct saving in drainage is doubled by the fact that the water now

lifted at great expense, by steam, would, if allowed to fall instead, itself gen-erate a motive power, to take the place of steam. Hydraulic engines utilizing this source of power are common in the deep mines of Europe, but have never been introduced in this country. In the case under discussion, the conditions would be extremely favorable, permitting a hydraulic column of 2,000 feet. Fifty gallons of water per second, with a fall of 2,000 feet, create a working capacity of 1,800 horse-power. Another way of utilizing the water of drainage would be the erection of water-wheels underground, by which various operations requiring machinery could be conducted. This, too, is very common in Europe, and, like the use of hydraulic engines, may be introduced with advantage wherever there is deep tunnel-drainage. In the absence of deep drainage, both these economical devices of science are out of the question. If the Sutro tunnel is completed to the lode, and connected with deep shafts, the conditions for further explorations to still greater depths will be more favorable than they were at the very surface; since the immense power of the hydraulic column will be at the service of the miner."

WHITE PINE.

The other silver mines of Nevada are very numerous, but those only of the White Pine district, located 120 miles south-east of Austin, have proved remarkable for their richness. A few extracts from Commissioner Raymond's report of 1869 will show the character of the White Pine ores, and enable 46

the reader to institute comparisons between them and those of Georgetown, given in different parts of this painphlet:

"The ore deposits of Treasure Hill are richer than any that have been discovered during the present century; but, according to all the data that have yet been collected, they are not fissure veins. These data, though they all point one way, are necessarily incomplete, since no shaft on the hill is deeper than 60 feet, and no horizontal drift longer than too feet.

"Not long before my visit, the miners of the district held a meeting, at which they were strongly urged to adopt at once the system of 'square locations,' and abandon the farce of staking out claims on ledges which do not exist. This proposition was defeated; and every man on Treasure Hill now claims so many feet of a vein, running, he does not specify in what direction, and dipping, he cannot tell at what angle, from a hole which he has made at random in the neighborhood of some already exposed body of ore. If he gets down to the ore, all the better; he can then work night and day, extract a large quantity of rich chloride, and send it away, before the neighbor, who has a prior location, can prove the identity of the deposit. In the utter absence of any real distinctive features of lodes, the principle has been set up by the White-Piners, that proof of such identity must consist in absolute continuity of chloride of silver from the working of the prior locator to those of the alleged trespasser. In one case, that of the Eberhardt and Bluc Bell, this astounding demand was satisfied. A drift from the Eberhardt opening thirty feet to the Blue Bell shaft, passed through a mass of horn-silver, such as human eyes have rarely looked upon; and, as a consequence, the Blue Bell was united to the Eberhardt. The Keystone is, without the shadow of a doubt, on the same deposit as the Eberhardt. There is only a wall of two feet between them; but this wall is amicably let alone, and the 'two veins' are therefore held by miners' law to be distinct! In another case which came to our knowledge, a claimant was endeavoring to protect himself from robbery, by tracing the ore into the works of a new-comer, close by, and had successfully arrived within a yard of his object, when the occurrence of a piece of calc-spar across his path defeated him. The intruder, protected by that bulwark, laughed his claims to scorn, and continued to extract and carry away the ore, which was, under miners' law, in a distinct vein, separated from the other by a 'wall.' All the 'walls' thus far discovered on Treasure Hill are of this wholly indefinite and untrustworthy character-mere seams of calc-spar in limestone; and, under the present regulations, there is no such thing as security of title. Even if one had a regular fissure vein, he might be cheated out of all but a few feet of it by some accidental shoot of calc-spar across it; and when we consider that calc and limestone are chemically the same, and that a little trickling of water might deposit one of these so-called walls anywhere, we shall see what protection is offered to capital by such a rule as has been adopted in White Pine.

"This is an instance of the danger of allowing the first miners in any district to make, without limitation, such laws as they please, governing the rights of property. This splendid district is now subjected to two styles of operations—grabbing on the spot, and gambling away from it. A great many worthy, honest and industrious men are at work there; but they will acknowledge that they are merely putting off the evil day of litigation and chaos Others are interested in claims, which they want to sell to capitalists; and they may sincerely believe their claims to be valid and well-defined. No one is accused of intentional deception in the matter; it is only to be lamented that the inhabitants did not, by adopting at once a rational basis for mining titles, introduce order among conflicting claims."

Remote and difficult of access as the region was, such discoveries soon drew together thousands of adventurers, and the results were about as they had been at Fraser River, Washoe, and other localities of wild mining

Appendix.

excitement—a fcw succeeded—the many failed. After the lapse of about two years from the commencement of operations at White Pine, a correspondent of the *Chicago Tribune* writes as follows, under date of January 8, 1870:

THE WHITE PINE REGION,

"The reaction from the undue excitement of last spring has nearly depopulated White Pine. That is to say, large numbers of people who hurried hither at that time, eager to become suddenly rich, having been disappointed in their expectations, returned to the places whence they came, and left us barely a sufficient number of men to work the many really rich mines of the district. But, notwithstanding the depletion in the population of the past summer, there is an active working force still here, and the mines will be developed as rapidly as the nature of the case will admit. All the croaking of the disappointed ones, and the deprecatory remarks of the dablers in wild cat stocks, cannot alter or disguise the fact that this is the richest mineral district ever discovered. Were there up other proof extant, the fact that the constantly increasing facilities for milling have not yet been sufficient to meet the demand would be enough to convince the most skeptical. Offers of custom work are tendered to millmen weeks before their buildings are completed, and, in some instances, one mine alone supplies ore enough to keep a ten-stamp mill running all the time.

"It is true that the exodus of so many people, and the advent of the winter, have had a depressing effect upon a great many interests dependent on the presence of a large population; but the real wealth and productive industry of White Pine are, after all, centered in its mines.

"THE ORES OF TREASURE HILL.

"The best authorities agree in stating that chloride silver has never been found below a depth of five hundred feet, and that the cases of its discovery at so great a distance from the surface are very rare. There is reason for believing that the ores of Treasure Hill, much less than five hundred feet in distance from the surface, will change to sulphurets. The amount of roasting that will then be required will depend upon the freedom of the ore from admixture with baser ones. A new mines on the hill are even now producing ore unfit for milling, on account of the presence of galena therein in large quantities.

"Litigation has hindered the rapid development of many of the best mines of Treasure Hill. The oldest location, the 'Hidden Treasure,' is only just out of difficulty, occasioned by a vexatious lawsuit brought by the Rathburn Mining Company. The 'Hidden Treasure,' is, according to present appearances, the richest mine in the district, not excepting the famous 'Eberhardt.' For, while the latter has produced certain quantities of ore of extraordinary richness, the 'Hidden Treasure' constantly exhibits an enormous yield of one of a greater average value. A few other mines also excel the 'Eberhardt' in the average value of their ore.

"The bullion product of Treasure Hill, at the beginning of the year 1870, makes a better showing after two years working of its mines, than did that of the Comstock Iode, in the same time, in spite of the difficulties in the process of reduction spoken of below.

"ERRORS IN THE REDUCTION OF CHLORIDE ORE.

"Many people are surprised at the great disparity between the results of all quantitative assays of ore in this district, and those obtained by mill process. Scarcely any mill here has hitherto been able to return eighty per cent of the assay value to the owners of ore. Some even fail to return this per centage of the *pulp* assay in retorted bullion. One case has lately occurred in which only 45 per cent, of the pulp assay was returned. These results

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The Comet and Par Silver Mines.

are discreditable either to millmen or to the ores of Treasure Hill. No other district has ever shown such disproportionate returns of bullion, compared with the assay value of the ore."

In the nature of the case, a new and remote district, like White Pine, will have many difficulties to overcome which may be more easily grappled with at the base of established civilization. But the apprehension of the best miners and geologists is, that the deposits will not continue deep. Time and labor, however, can only settle questions of that kind. In any event, it is now believed by many that the advantages of Georgetown, as a silver centre, are, on the whole, superior to those of either Washoe or White Pine.

THE ADVANTAGES OF GEORGETOWN.

Without any direct comparison with other localities some of the actual advantages of the Georgetown mines may be summarily stated as follows:

1. Accessibility. During 1870, it will be about as easy to go from Chicago to Georgetown, as to New York city. Railroad connections all the way will reduce fares and freight, and make every species of supply cheaper than were ever before known in a silver mining locality. Direct accessibility will not only make certain large investments of capital but also the prompt introduction of all actual improvements in machinery and in the manipulation of ores. The Rocky mountains, as the "Switzerland of America," are certain to be hereafter a great resort of tourists from all parts of the world, and, consequently to be soon filled with population and varied industries.

It is said that about one-half of the lead consumed in the United States is imported from foreign countries. Colorado, alone, can produce enough lead to supply the home market of the United States, without resorting to expensive foreign importation.

Already the attention of capitalists especially at St. Louis is turned to this fact, and preparations are in progress for the construction at Georgetown of works for the smelting and manufacture of lead.

2. Cheapness of living and labor. The salubrity of the climate, the grandeur of the scenery, and the cheapness of the staple articles of food, will make Colorado the favorite country of miners throughout the world.

"Mining and agriculture are the two great forms of productive industry. Strictly speaking, agriculture is the most important, since without it men could not exist; yet mining is almost as essential, since without it men could only exist as savages. All human activities, in material things, are based upon the products of these two, their manufacture and exchange."—Raymond's Report.

"Inexhaustible as is Colorado's mineral wealth; progressive as hencetorth its development; predominant and extensive as are its mountains; high even as are its valleys and plains,—in spite of all seeming impossibilities and rivalries, agriculture is already and is destined always to be its dominant interest. Hence my faith in its prosperity and its influence among the central States of the continent. For agriculture is the basis of wealth, of power, of morality; it is the conservative element of all national and political and social growth; it is steadies, preserves, purifies, elevates. Full one-third of the territorial extention of Colorado,—though this third average as high as Mount Washington,—is fit, more, rich for agricultural purposes. The grains, the vegetables and the fruits of the temperate zone grow and ripen in profusion; and through the most of it, cattle and sheep can live and fatten the year around without housing or feeding. The innucliate valleys or bottom lands of the Arkansas and Platte and Rio Grande, and their numerous tributaries, after they debouch from the mountains, are of rich vegetable loams, and need no irrigation. The uplands, or plains, are of a coarse, sandy loam, rich in the plosphates washed from the minerals of the mountains, and are not much in use yet except for pastures."

"The soil yields wonderfully. There is authentic evidence of 316 bushels of corn to the acre, in the neighborhood of Denver this season; 60 to 75 bushels of wheat to the acre are very frequently reported; also 350 bushels of potatoes; and 60 to 70 of both oats and burley. These are exceptional yields, of course, and yet not of single acres, but of whole fields, and on several farms in different counties. Probably 30 bushels is the average product of wheat; of corn no more, for the hot rights that corn loves are never felt here; of oats say 50, and of barley 40, for the whole State. Exhaustion of the virgin freshness of the soil will tend to decrease these averages in the future; but against that we may safely put improved cultivation and greater care in harvesting."

"These great interests of mining and farming shade naturally into others, and already there are the beginnings of various manufacturing developments, as there are the materials and incentives for such undertakings without stint. Some fifteen or twenty flouring-mills are in operation throughout the State. The Colorado wheat makes a rich hearty flour, bearing a creamy golden tinge; and I have eaten nowhere else in America better bread than is made from it. The wheat will rank with the very best that America produces, and is more like the California grain than that of 'the States.' Coal mines are abundant, and several are being profitably worked along the lower range of the mountains; as, indeed, they have been found and opened at intervals along the line of the Pacific Railroad over the mountains, and are already supplying its engines with a most excellent fuel,-a hard, dry, brown coal, very pure and free-burning; in Boulder valley and Golden City, iron is being manufactured from native ore; at Golden City, there is a successful manufactory of pottery ware and fire-brick; also a paper mill and a tannery, and three flouring-mills; the State already supplies its own salt; soda deposits are abundant everywhere, and will be a great source of wealth; woolen mills are projected and greatly needed, as wool-growing is the simplest of agricultural pursuits here; a valuable tin mine has been lately discovered and its value proved, up in the mountains; and next year the railroad will be one of Colorado's possessions, and bring harmony and unity and healthy development to all her growth, social, material, and political. Also, by that time she will be a State, and so responsible for her own government, be it good or bad."-Bowles' Switzerland of America.

3. Facilities for mining by tunnels. So many illustrations of this important point are given in foregoing pages that nothing more will be added here.

4. The number and richness of the mines. On actually productive mines, as a grand basis, permanent and large success in mining must ever rest. No detailed comparisons will here be entered into, but the reader is requested for himself to compare the figures that are given in various parts of this pamphlet in reference to the Georgetown mines with the statistics of any other silver mines of the world, those of White Pine not excepted. While it, is believed that low-grade ores will soon be worked economically and profitably at Georgetown, actual results show that very high averages of ore are maintained not in a few merely, but in many of the mines. While, indeed, it may be accepted as a principle, that "the only sound mining basis is reduction of ore in great quantities at low rates,"* and while it is true that "the wealth of the Mexican mines consists more in the abundance than in the richness of the silver ores," which, perhaps, average at 70 ounces or \$91 per ton; still if abundance and richness can both be had, the miner gains the advantage.

Commissioner Blake significantly remarks "that the proportion of profit increases with the richness and decreases with the poverty of the ores; thus one yielding \$75 per ton, gives more than twice as much profit as \$45 ore, although not twice as rich." This principle applied to \$300, \$500, and \$1,000 ore, will show a continually enlarging ratio of profits.

NOTES ON SOME OF THE GEORGETOWN MINES.

Partly to illustrate the foregoing point, and in part to enable the reader to comprehend the meaning of some of the gentlemen who have described the Comet and the Par mines as "second to none in the district," a few sketches of prominent mines of the Griffith district are here copied from the Colorado Miner, supposed to have been written by that "prince of prospectors," "Commodore Decatur."

GRIFFITH MINE ON GRIFFITH MOUNTAIN.

"We visited this property last Saturday and piloted by the polite Superintendent of the mine, Benjamin C. Cattren, went down the main shaft and through the levels and examined, carefully and minutely, the crevice and workings of the mine. The main shaft has reached a depth of 127 feet. The air shaft, 170 feet east of the main shaft, has reached a depth of 75 feet. At a depth of 65 feet from the surface, the first level has been driven east 118 feet. This level will strike the air shaft at a depth of 160 feet from the surface. The second level commences at a depth of 127 feet from the surface, and will strike the air shaft at a depth of 225 feet. The work on this mine is being pushed vigorously night and day, and every day in the week, except Suchays. Thirty men on the pay roll of the mine; average wages \$4 per day in currency. Work nearly all done by contract. The amount of mineral de-posit in ledge is enormous. The average mineral deposit in the shafts and levels is two feet wide. At a very low estimate there is at the mine foo tons of first-class ore already raised. We examined a great many certificates of assays of average ore from different depths of the mine made by Professor Bruckner and others, and are satisfied that the whole 600 tons will run \$200 in currency. About 25 per cent. of the above 600 tons is lead. The whole cost of sinking the shafts, driving the levels, timbering, etc., is \$8,500. The total available assets on hand, not counting 150 tons of lead, is therefore \$111,500. The amount of mineral in sight in this mine is enough to astonish old miners and create a profound sensation among capitalists. The mine has only been worked a short time. In one year more, the Wilson & Cass Co. will begin to realize the true value of their mine."

Some thousand of tons of the ore of this mine are now being dressed at the Wilson & Cass Company's works, and the silver riches being sent forward at the rate of five tons per day for smelling at Newark, N. J.

THE EQUATOR LODE ON LEAVENWORTH MOUNTAIN.

"A complete and thorough examination of the Equator mine shows the following conditions, viz.: Mineral, quartz, and feldspathic rock in place,

* Commissioner Raymond.

the slickensides walls standing almost perpendicular, an average width of crevice material of six feet, and the containing 10ck primitive.

"We are of the opinion that the foregoing conditions rank the Equator among the true fissure veins which are now being worked in Colorado.

"There are five shafts and two levels on the mine, having an aggregate depth sunk and distance driven on the vein, of 8.55 feet, the main shaft having gained a distance from the surface of 275 feet. In all the shafts and levels, a deposit of ore can be seen. The best evidence of the amount of ore contained in the mine and its value, is the following statement kindly furnished us by L. Huepeden & Co., of the number of tons of second-class ore treated at their reduction works since the first of last April, up to the first of the present month, November, 1869:

"We are informed by W. O. Carpenter, Esq., that during the time above mentioned, eighteen tons of first-class ore have been shipped to Newark, N. J., for treatment, and that the value of the ore was \$550 in coin per ton of 2,000 lbs.

Eighteen tons first-class ore	\$ 9,900 Total in coin\$59,447	7.80
Currency value	12,870 Total in currency	- 14

"There was, in addition to the above, at a very low estimate, \$5,000, in currency, worth of ore at the mine when we were there a short time since, which would make the total aggregate yield in currency, for the last seven months, \$82,222.14.

"We cannot forbear to express the satisfaction we feel in regard to the yield of the mine, and also in regard to the complete success of L. Huepeden & Co., of the German Reduction Works in treating our second-class silver ores in such a skillful manner, thereby demonstrating that a large per cent. of the precious metal can be saved.

"The timbering of the mine is permanent and substantial, ensuring safety to those who mine out the glittering ore. There are at the mine one hundred and thirty cords of dry wood and all the appliances for minining successfully, during the coming long winter months.

"And now comes the cheering news that the miners who have been sinking through lean ground in the deep shaft, have struck it large and rich. The Equator will not be in complete working order for stoping until next spring."

N. B.—The Griffith mine is a short distance north-west of the Comet, on the same mountain. The Equator is in the same line with the Comet, on the opposite mountain. The Brown and the Terrible are in the same line with the Par, a mile or more beyond, and south-westerly from Georgetown.

BROWN SILVER MINING COMPANY.

"The lode property of this company consists of 800 feet on the Mammoth, 1,600 feet on the Brown, and 1,400 feet on the Coin. These lodes are parallel veins lying in close proximity to each other. The mountain where these lodes lie rises quite abruptly. A tunnel 180 feet long has been driven into the mountain, striking the crevice of the Brown at a depth of 130 feet from the surface.; From the point where this tunnel strikes the vein, one level has been driven east 50 feet, and one west 125 feet. From the discovery shaft on the lode a level has been run west 200 feet. The ground here is favorable for gaining depth. About 75 feet from the mouth of the upper level a winze has been sunk, connecting the upper and lower levels by a shaft of 110 feet in length. A level has been driven west from the discovery shaft on the Coin, 60 feet. The west shaft on the Coin is about 50 feet deep and the drift east and west is about 75 feet long. Making a sum total of 740 feet drifted and sunk on the Brown and Coin.

"At the mouth of the tunnel there is a substantial ore house, 18 by 60 feet, where the ore is dumped out of the car as it comes out of the mine, and sorted. Here can be seen one of the wonders of the Rocky mountains, an arial railroad, 1,250 feet long, extending from the ore house to the mill at the base of the mountain. It was built at a cost of \$6,500, and reflects great credit on the Superintendent of the Company. By this simple and unique arrangement all the ore from the mines is delivered at the reduction works by gravity with very slight cost. The reduction works have been described heretofore, and it is only necessary to say that their capacity will be greatly increased soon by the erection of one roasting furnace and one smelting furnace. By doing this the company will be enabled to run their works constantly and greatly increase their bullion shipment every month. We were permitted to examine the books of the Company by the gentlemanly clerk, George B. Walker, and find that since the first of January, 1869, up to date, 137 tons of ore have been smelted, producing one ton and fifty-eight pounds of silver, worth, as shown by the certificates of the United States Mint at Philadelphia, \$32,104 coin value, the ore producing at the rate of \$234 per ton in coin. We wish our readers and exchanges to note the fact that we have rich ores in Colorado, and that legitimate mining will pay. Thirtyfour men on the pay roll of the mine and mill. Average wages, \$4.25 in currency, men furnishing their own board. Wood delivered at the mill at \$5 per cord in currency. We cannot close without alluding to the smelters, the Lynch Brothers. The shipment of the huge masses of silver, the largest ever shipped from any smelting works in the world, attest their skill and knowledge of their art, and are a better recommendation than can be bestowed by mere words."

The Miner of October 28, 1869, contained the following items:

"Monday morning last, we saw at the bank a button of silver bullion, belonging to the Baker Company, refined at the Brown Company's Works, weighing 1,815.05 troy ounces; coin value, \$2,178.09."

"The Brown Company shipped, on Monday last, 517 pounds, troy, or 6,204 ounces of silver-bullion; coin value, \$8,375.40; currency value, \$10,888.02. The mine is in most excellent shape, and producing sufficient ore to guarantee the assertion that there will be no lack of bullion shipments for several months to come."

THE TERRIBLE MINE.

"This noble vein, the pride of Georgetown, and an example of what pluck, energy, and business-like management can produce, is situated on Brown mountain, Griffith mining district, about one and a half miles from Georgetown.

"The strike of the mine is north 61 degrees, 31 minutes east, and the dip of the vein, from the surface to a depth of one hundred feet, is perpendicular; from that point, the dip changes to an angle of 12 degrees.

"The crevice varies in width from four to seven feet, and the walls are smooth and solid. The fissure is filled with the ores of the mines and a gangue of quartz and feldspar, with a small admixture of white shining mica. This gangue, although composed of the same minerals that constitute granite, differs very materially from the dark granite which forms the walls or 'country rock' of the mine. The latter consists of white, flinty quartz, feldspar, slightly tinged with red, and a dark colored mica. The 'country rock' of the mine is excessively hard, while the gangue is comparatively soft.

"Slickensides, as smooth in many cases as polished mirrors, are found in all parts of the mine. The solid ore streak varies from two to twenty-four inches in thickness, averaging about ten inches. In but three instances, and those due to a small 'horse' in the mine, was the ore vein lost sight of; and on driving through the barren spots, the same rich, massive ore was found.

"The ores of the mine are zinc-blende, galena, (both coarse and fine grained), Fahlerz, stephanite, (brittle silver) ruby silver, gray copper, and silver glance, and a slight admixture of iron and copper pyrites. Zincblende and galena are, however, the predominating ores of the mine, the ore yielding from 25 to 50 per cent. of lead. The Fahlerz is found in considerable quantities, the brittle silver, ruby silver, gray copper and silver glance being mingled through the ore in the particles. Massive specimens of brittle silver have been found in the mine.

"The ore near the surface carried from \$150 to \$275 in silver per ton, (2,000 pounds), increasing in richness as depth was gained, until, at the depth of 75 feet, the average yield per ton, of the ore, was \$500; that from the lowest workings yielding about the same.

the lowest workings yielding about the same. "Nearly all of the first-class ore has been shipped to Newark, N. J., or to Swansea, Wales, (England,) for treatment; the owners claiming that they can make the ore pay better by shipping than by having it treated in Colorado. "The second-class ore, yielding from \$150 to \$250 per ton, is treated

"The second-class ore, yielding from \$150 to \$250 pet ton, is the Stewart & Co., and L. Huepeden & Co., of Georgetown, by chick roasting, and a subsequent amalgamation. By this process eight of the silver is obtained, at a cost of treatment of \$55 to \$60, c yields ton.

"The third-class ore, assaying from \$60 to \$150 per ton," ing about \$100, is being piled up on the ground at the four tain, for future treatment. From 1,500 to 2,000 tons during the two and a half years the lode has been work

"Work was begun on the Terrible in the spring of the year the shaft was sunk fifty feet and a short drift run a shaft 185 feet deep, and six drifts, one each way fro respectively of 50, 120, and 180 feet; aggregating in the winze has been sunk, 100 feet east of the shaft, from the levels; and 100 feet west of the main shaft, an air shaft the first level. About 180 fathoms of stoping has been each second level, making the total amount of ground excavated fathoms.

"Two hundred tons of first-class ore have been extracted; which yie nearly 100,000, coin; 200 tons of second-class ore, which has yielded over 4,0,000; and from 1,500 to 2,000 tons of third-class ore, estimated to carry at least \$80 per ton, or \$120,000 in all; a total of \$260,000, or \$800 per fathom.

"The Terrible shows no evidence of giving any less yield in its future workings; all parts of the mine showing the same strong, well-defined vein."

COMPARATIVE PROFITS OF GOLD AND SILVER MINING.

Remons who have not given attention to the subject will be surprised at the higher value per ton of silver ores.

"In Colorado, the daily average of all the stamps running is about \$8 per stamp working gold.

"In California, the daily average per stamp working gold quartz does not exceed \$15.

"Washoe, in 1864, had 1,700 stamps running—daily average nearly \$45 silver.

"The Reese River mills, the daily average per stamp was about \$225 silver.

"Hence the Reese River product of silver of each stamp per day is over 5

The Comet and Par Silver Mines.

four times as large as Washoe, fifteen times as large as California (gold), and twenty-eight times as large as Colorado (gold)."

Commissioner Raymond's report, speaking of some of the best gold mines of Montana, says: "The average vield of the ore cannot have been far short of \$20 and \$25, coin, per ton. The highest yield from any portion of the mine consisted of an average of \$80, coin, per ton, from 300 tons of selected ore."

According to the same report, the highest production of some of the best (quartz) gold mines of California is from \$25 to \$50 per ton; vast quantities are worked at from \$15 to \$35.

The foregoing pages show how much better averages are secured from even low grades of silver ores,

PATENT FOR MILL SITES.

ton in cold. "Intertain the numeral claims, commissioner transmissioner transmiss

longing to A mill-site as part of the mining claim, provided it is so held weighing local mining laws or customs, and to include it in the patent with Arcin or lode; and actual contiguity between the lode and mill-site is not it, fined absolutely essential. In no other manner, however, than as a part of a mining claim, does the Act authorize the issue of patents for millsites."

GENERAL FACTS AND PRINCIPLES IN RESPECT TO MINING.

MINING AND AGRICULTURE.

" Mining, like farming and every other business, has its period of preparation, in which money must be expended in the prospect of ultimate return and profit. Not only must seed sowing precede a harvest, but plowing and fencing must precede seed-sowing. This class of expenses corresponds to what miners call the 'dead work' of sinking shafts, driving funnels, etc., preparatory to the harvest of ore which is expected when due preparations are accomplished. There is one point, however, at which the resemblance between mining and agriculture fails. When a harvest of ore is once gathered or 'stoped out,' it is once for always. The space from which it was taken can never be profitable again; whereas by proper tillage the farmer may expect to repeat his crops year after year from the same soil. The only compensation the miner can offset here is the supposed inexhaustibility of true fissure veins. Nevertheless, in comparing old mines with new ones, the former are actually diminished in value by all that has been taken from them whether saved or wasted. Thus the Comstock mines are now actually poorer by more than \$100,000,000 than they

Appendix.

were at discovery, and the Mexican mines, as a whole, poorer by the nearly $\$_{2,\infty,\infty,\infty,\infty}$ that have been taken from them. In accordance with this principle, the silver mines of Colorado are now at their highest value, however little available for lack of the means of extraction. It may thus be seen that one of the most important financial interests of our nation is involved in the enterprise of realizing promptly and economically the present generation's share of those long-hidden treasures. The truth is, that all the experimenting hitherto done upon other mines, and all the improvements made in reducing ores, together with many other improvements of modern times, have been combining to confer increased values upon the mineral deposits just now being discovered and demonstrated to exist in our, hereto-fore, worthless Rocky mountain ranges.

J. Ross Browne's Report for 1868 contains the following:

" PROVING AND WORKING MINES.

"Vein mining for the precious metals will be the principal sourcewhich they will be obtained in the future. The product of place will will grow less and finally cease, but the product from vein miincrease for an indefinite period. If the miners on the Pacific sihave the benefit of each other's experience, how many million-ite annually.

"One of the fundamental errors in mining is to maker the value of the mine, the amount and richnes; of ther extracting them. The richest mining districts contaid/ not pay to work, and great care is required to know for working or not. Locality is very important: if a large mining community where labor and materials the cost of working will be greatly less than in new where the pioneers must take all supplies with them, high, or wood and water very scarce, as in a steril extensive mining districts the cost of opening a mine, extensive reducing it, can be quite accurately determine a find its value extensive workings as admit of no serious mistake, especially known what varieties of ore can be profitably reduced by the reduction practiced in the district. In new districts, unless freigh low, mines of gold and silver only will pay to work, and they mit rich and large that there is no question of the quantity and quality of their ores. If a vein produces rich ore, the next point to ascertain is its size, and what quality of ore it will yield. First, thickness; if a vein is not four inches or more in thickness its value is very doubtful, unless remarkably rich. Very rarely a vein is discovered like the Oro, in Bear valley, Mariposa county, California, which was not more than two inches thick, but paid wonderfully for a short time, and then gave out. No confidence can be placed in the extent of such small veins, for the extent of a vein is usually in the ratio of its thickness.

"It is a general rule that the larger the vein, other things being equal, the less the cost per ton for extracting the ore.

"The improvements of the present time in mining machinery render the working of a mine much more rapid than formerly, and as much ore can be taken from a mine in twenty years as in three hundred, when the ore was carried on the backs of men up rude ladders out of the mine. By this rapid method, mines can be worked at much less cost than when the work is done very slowly; thus a mine that contains 400,000 tons of ore, at 100 tons per day, will be exhausted in about fifteen years, but at eight or ten tons per day it will require 150 years, and the cost of keeping the water out and repairing the timbering in the shafts and drifts would give a good profit on any moderate sized mining enterprise."

The Comet and Par Silver Mines.

"HOW NATIONS ARE ENRICHED BY MINING.

"The owner of a rich mine cannot dig out the pure, precious metal unassisted: he must employ a great number of laborers, and his money runs all through the community and stimulates every branch of industry. The whole nation feels rich, and it purchases for one day's work the productions on which other nations have spent two days. The gold and silver are sent abroad to purchase those things which can be made cheaper abroad where labor has not felt the stimulus."

Raymond's Report discusses at length the relations of governments to mining, He says:

"Although history abundantly shows that mining flourishes best when the property in minerals is distinguished from the ownership of the soil, it rems to me good policy for the United States, in selling the mines, to sell the surface. In most cases the land will never be taken up for agricul-137 built of silve irposes, and if the miner does not buy it no one will. I do not mean ot silve poses, and a the inner does not buy it no one will. I do not mean Philadely United States has both for sale, both should be sold to the same have rich only afterwards dispose of either as he likes. The present law have non our its this policy by selling inclined locations at so much per four men on the

Jour men on the currency, men fiber, at \$5 per cord inter-I have the honor to recommend, as necessary smelters, the Lynch gent law, the following provisions: silver, the largest every decided by patent and the number of feet upon the their skill and know obtry law, in spite of all conflicting miners' customs, can be bestowed by cessflusted by agreement among owners; but it should be the state will hereafter regard the loca-

The Miner of lonsequ'at the United States will hereafter regard the loca-

The Miner of ionsequiat the onice states with interactive logard the location we to claim, say, 200 feet on each side of the vein; that "Monday profile Missequently made within that distance will be recognized longing to A mill sit subsequent locations made within less than 200 feet weighing locat, of the first location will be shorn of so much of their width with or in or 16 being limited by the elder locations; that the patentee shall pay It find absord States, say, \$5 per acre for his land, and a fee of, say, \$10 for of a inininate vein discovered and worked within the tract, after the first sides ", on which the issuance of the patent is based. The right to follow the vein, its dips, variations and angles, should remain unaltered, and all ores found within thirty feet of the vein in the hanging or foot wall should be considered as belonging to it. In a case where two veins cross in depth, the elder location should keep its right to thirty feet in either wall; if the veins unite and become one, the elder location would take the whole vein below the junction, but not the whole spur above, being restricted on that side to its right of thirty feet."

"Nor should patents be granted on veins not opened and traced. When a man has chosen a vein, worked it to the extent of \$1,000 expenditure, and determined to buy it, he is entitled to the special protection of the second section of the law."

PROCESSES FOR REDUCING SILVER.

As might be expected from the vast amount of ores that will soon need treatment, invention and experiment are now very active in perfecting the processes of reduction. Among the plans and patents recently put forward as great practical improvements, may be named Krom's Dry Concentrator, the Hagan Furnace, Bruckner's Chloridizing Cylinder, and Stetefeldt's Roasting

Appendix.

Furnace. Fortunately for mine owners, the competition between these various plans and processes of extracting silver, bids fair both to cheapen the cost of reduction and to obviate the formerly supposed necessity of each mine or company building a mill. It is well known that wrong views on this subject, or the misfortune of attempting great things before the proper time had come, have heretofore, in many cases, proved disastrous. A wide spread prejudice against the whole mining interest has been a result that is likely for a long time to make many persons unwilling to risk capital in mining enterprises. Reflection, however, will show that failures of ill-timed and misdirected efforts in gold and silver mining afford no better ground of objection to measures enlightened by sound judgment and multiplied experiences, than do the early failures of those who attempted to construct steam engines, railroads, telegraphs, and sewing machines-also that the present is a favore ble time, not likely to be repeated, especially in any region so promithe neighborhood of Georgetown, for securing very valuable provery low prices.

THE SMELTING OF SILVER ORES.

A NEW ERA IN MINING-EVERY MINER A SMELTE PRODUCTS --- A GROWING INTERL

(Abridged from the San Francisco But

A new life has been infused into the business last three or four months, by the success which those who have been engaged the past season Base Metal Range, at White Pine. The abunda ores attracted the attention of all who visited that covery, and the determined efforts of some of them to in the way of their economical reduction, have been fer plete success.

BASE METAL ORES.

Most of the ores classed as base metal ores are those in which is associated with carbonate of lead, or with galena, and are easily Copper, antimony, iron, and zinc, are sometimes found in small quantity associated with the lead and silver, but the proportion is seldom great enough to interfere materially with the smelting. A large portion of these ores carry fifty per cent. of lead. Some carry much more, and few of those carrying less are receiving much attention at present, unless very rich in silver. We may assume that, as a general thing, two tons of ore will yield one ton of base bullion; and it the ore contains one hundred dollars in silver, the bullion should contain twice that amount. The ores of the Base Metal Range, which are being smelted, contain from forty to fifty dollars up to two or three hundred dollars per ton-say an average of seventy-five to one hundred dollars. Those of Eureka district are of a much higher grade. There being no stamps, pans, settlers, retorts, or quicksilver used in smeling, nor any very extensive building required, the expense of running smelting works probably does not reach, and certainly does not exceed, ten dollars to the ton of ore, under ordinary circumstances,

HOW ORES ARE SMELTED.

Charcoal is the fuel used, and is fed into the furnace at the top, with alternate layers of ore, which operation is continued night and day, until it becomes necessary to stop to re-line the furnace or make other repairs. The metal is drawn from the bottom and put into moulds to cool, forming pigs from seventy to one hundred pounds each. In fact, it is conducted very much like the smelting of iron. Some of the smelting furnaces at White Pine are constructed by lining an iron cylinder with fire brick and setting it upright, like the smoke stack of a steamboat. A steady and powerful blast is kept up by a small engine.

Those foreigners professing an acquaintance with the business, under whose direction the trials at smelting have hitherto been conducted, either knew nothing about it, or too little to enable them to adapt it to the different circumstances under which they had to operate in this country. Perseverance on the part of our people, combined with a determination to conquer, has finally resulted in complete success. Some failed in their attempts, because they could not get a material for lining their furnaces that would stand fire. Others did not have the right kind of a furnace, or could not get a good draught. Others, still, could not get all the silver out of the ore, since a large proportion would be found in the slag; or they could not find a proper the their ore. The successful furnace, however, is an upright or cupola 137 th similar to those used in our iron foundries.

of silvewerful blast, sufficient heat is obtained to fuse the silver as well Philadel Plenty of sandstone, or fire clay, or other material that will resist ton in coir found in the vicinity of the mines, and experience has demonhave rich occurres must be properly mixed for smelting, so as to contain four men on thorm a flux, or the deficiency will be made up from the four men on the or in a hux, or the denciency will be made up inon the currency, men fill used for lining, thereby destroying or burning out the at \$5 per cord in the guantity of coal required to the ton of ore varies smelters, the Lyncr circumstances, but may be estimated at six to ten silver, the largest ever d their skill and know obta y ince parties, knowing the value of the ledges can be bestowed by obta ying works similar to those in the Base Metal

can be bestowed by: cessfully have been for a month past shipping by the The Miner of onsequilatly have been for a month past shipping by the on we to by did not have to wait for capitalists to come "Monday with Monday in the Mise quiring months of time to construct them, but longing to mill sit sr, and at a slight cost, and before the public at a weighing local cost of such a place, they are making large weighine local

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THE COST, ETC.

that, under favorable circumstances, the labor of extracting the bre and delivering it at the furnace costs five dollars per ton, and the actual cost of smelting is ten dollars per ton, we have the resulting product. of base bullion, costing, under the most favorable circumstances, thirty dollars per ton. We may allow a liberal margin for accidents, etc., and call the average cost fifty dollars per ton. Freight from White Pine to Elko, when the roads were good last fall, was fifteen dollars per ton. The railroad charges twenty-two dollars per ton from Elko to this city, being one-half the rate of merchandise. At these rates the bullion delivered here costs eightyseven dollars per ton. The lead it contains brings, in this market, four and a half cents per pound, or ninety dollars per ton, and the silver brings one dollar per ounce, the quality of each being ascertained by assay. Thus the lead pays all the expenses and the silver is a clear profit. The lead, when separated from the silver, is worth six and a half cents per pound, or one hundred and thirty dollars per ton, and the silver is worth, after separa tion, one dollar and twenty cents an ounce, affording a very liberal profit, after paying the cost of parting the metals. The rapid growth of the smelting interest will doubless son create competition, and give the miners a better market for their lead. Those having very rich base bullion, however, like that produced at Eureka, can send it East by rail to a better market, and it is probable that a large proportion of the product of Eastern Nevada will next season find its way to an Eastern market.

It would be difficult to estimate very correctly the quantity of silver and lead now being produced daily by smelting, but it is much greater than the public is prepared to believe. No account of the amount sent to this city, or of its value, has been furnished to the public by the few who are concerned in it. The great and increasing importance of this new industry can hardly be over-estimated. Many business men, well informed on the subject, believe that the value of the base bullion produced this year, will equal that of the silver bullion produced by the mills.

This would more than double the product of the silver mines for 1869, amounting probably to fifteen million dollars.

LODES OVERLYING THE PAR TUNNEL.

The following article from the Georgetown paper of February 17, 1870, has a special interest in reference to the Par Tunnel, which will under minute all the veins mentioned, and thus become the most feasible outlet for of their ores as may be found at great depths:

"MINING INTELLIGENCE.

"The recent discovery of a large body of extremely rich ore diate neighborhood of the Hise and Par lodes, both well kn veins, and both of which have heretofore yielded large d grade ores, has drawn much attention to that locality, examination of a group of veins upon that mountain extensively and systematically developed. Among discovered in 1865, at present opened by two sha fifty feet in depth, and two or more drifts or adity were taken large quantities of extremely rich December in 1865, and January, 1866, a shaft some eighteen to twenty feet in depth, was excav. which was taken about seven tons of mineral, rich of silver, such as stephanite, ruby, and brittle silver about \$9,000, coin value. This ore was to a great extent of consequently concentrated by atmospheric and other influences quent trials demonstrated the fact that the main body of or reach of these influences was extraordinarily rich in silver. from time to time, during the sinking of the shaft, as follows: De 12, 1867, \$1,342.57; ditto 18th, \$705.91; ditto 19th, \$758.10; ditto 23rd, \$1,339.03; February 13th, 1868, \$1,685, proved the value of the ores. Several quantities treated by smelting showed the average value of the ore to be nearly \$450 per ton, in coin. A quantity, 2 168-1000 tons, worked in August, gave a net yield of \$384.50 per ton, coin; the second quality uniformly averaging \$125 to \$175 per ton. In the present bottom of the deep shaft is a vein of ore from two to two and one-half feet in width, eight inches of which is mineral, which yields from \$200 to \$700 per ton, and averages about \$400 per ton. The strike) and conformation of the vein afford, the best evidence as to its strength and continuity, and force the belief that it is of itself a vein of great value.

"The Marshall lode, located a short distance above the Hise, though equal-"The Marshall lode, located a short distance above the rise, though equai-ing it in width of crevice and characteristics of a true silver vein, does not carry so rich an ore, the yield of its mineral in silver ranging from \$125 to \$354 per ton, and averaging at \$150. It is, however, rich in galena, and will yield from 1,000 to 1,300 pounds of metallic lead to the ton. Immediately below the Hise are the Monster and Kit Carson lodes, similar in strike, dip, and general conformation, carrying an ore which contains in bulk \$200 to \$350 per ton, accompanied by unmistakable signs of copper, and yielding fifty to fifty-five per cent. of metallic lead. These crevices are from four and one-half to seven and one-half feet in width at the surface.

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The Comet and Par Silver Lodes.

"Below these are two veins known as the Geo. D. Prentice and Sallie Ward; the former of which closely resembles the Marshall lode, its crevice being four to five feet wide, carrying a gangue of feldspathic rock and heavy mineral, rich in lead, and containing one hundred to one hun-dred and fifty ounces of silver per ton. The Sallie Ward, on the contrary, is more like the Hise. It is opened by a shaft thirty feet or more in depth, which exposes a crevice four and one-half to six feet in width, and a vein of ore which yields, under treatment, \$500 to \$600 per ton, in silver; the crevice pitches slightly to the north. The pitch of this group of veins induces the belief that at depth they join into two or three stem or mother veins, which may reasonably be expected to yield large quantities of ore, similar to that above described. Nothing but such thorough and systematic development as may be secured by the judicious expenditure of thirty or forty thousand dollars, is wanting to make these veins add twenty to thirty per cent, to the gross production of the district, and prove a source of evenue to their owners. The impetus given to development here by 137 to none in this mining region."-Colorado Miner.

Philadel ton in coir have rich on

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RECENT LEGISLATION.

four men on the sistature of Colorado, 1869-70, by a bill which has become currency, men filer the minimum law of Congress and the previously existing currency, men files and to be bounded, logg 10, by a bin which has been at \$5 per cord in the mining law of Congress, and the previously existing smelters, the Lyncr ference to "lode claims," that when parties, in good silver, the largest event were dree thousand feet on a lode, no previously existing their skill and know obta? construed as to prevent such locators or pre-emp-can be bestowed by locas ly number of feet allowed by the laws of Congress, The Manuel functional

The Miner of imsequati

"Monday mohe Mase" recorded and being worked, has the ownership of longing to at mill-si styt discovered and recorded prior to the record of the weighine local to leet from the centre of the tunnel on each side, the entire

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a mining the above items of legislation and construction are very favorable the the interests represented in this pamphlet, as indeed to all practical investments in tunnels in Colorado.

0734 The State Historical Society of Colorado