

A HURRY-GRAPH

OF

COLORADO

AND ITS

SILVER MINES,

The
Paris



Exposition.

BY

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COLORADO AND ITS SILVER MINES.

COLORADO.

Colorado was organized as a Territory, March 2d, 1861. Its area is 106,475 square miles, almost as large as the state of New York, New Jersey, Massachusetts and Pennsylvania combined, or as England, Ireland and Scotland, and is undoubtedly one of the noblest and richest of our Territorial possessions. It is traversed by the Eastern range of the Rocky mountains, and in addition to its immense mineral resources, of which in reality scarcely anything is as yet known, it has over 4,000,000 acres of productive agricultural land. Many of the lands which have not been generally regarded as good for cultivation, under the improved system of irrigation are bearing extensively at present; the principal industry, particularly in Southern Colorado, is grazing, for which it is unsurpassed; the business of raising cattle and sheep is one of little risk and great profit; the table lands lying between the streams afford an ample supply of pasturage summer and winter; the rainy season during the spring and early part of summer causes a luxuriant growth of

gramma and other varieties of grasses to spring up and grow to maturity; during the drier months of the latter part of summer and fall, this growth of vegetation dries and is cured so that none of its nutritious properties are lost; the grass thus preserved makes a range for cattle, horses and sheep, during the winter months, until the grass springs again. Under this economical provision of nature, feeding is unnecessary, and beef and mutton of the first quality may be had without stall feeding, or any care whatever, except the expense alone of herding stock.

The future wealth of Colorado, however, must mainly depend upon its vast *mineral resources*; though mining thus far has been rude and imperfect, yet in the last nine years the product of gold and silver has reached \$30,000,000. Each year has shown an increase in efficiency and profit, and last year the result was estimated at \$4,000,000 from the gold mines of Central and the immensely rich silver mines of Georgetown. Large deposits of coal of the finest quality lie along the mountains, and supply the

miner and farmer with fuel; there are large mines of iron, and near the coal mine in the South Boulder a smelting furnace has been put into successful operation. During the past few years rich veins of copper ore have been opened in the county of Park. Salt works are in operation and throughout the territory there are many salt springs, and the salt manufactured is of excellent quality, and supplies the territory with this article for every purpose used. Petroleum has also been discovered, in Park county. Fire clay has been found also in Clear Creek near Boulder. There are successful manufactories of pottery, tile and fire brick near Golden City.

In Fremont county there are rich quarries of limestone, freestone, granite, marble and gypsum. In the variety, richness and vastness of its mineral resources, no portion of the union gives greater promise than Colorado. It is in itself an empire. Blessed with all that gives an empire strength, wealth, greatness and civilization, *nothing is needed but development.*

The climate of Colorado by reason of its elevation above the level of the sea, varying in altitude from 4,798 feet at Denver city to 13,000 feet at the pass over the range via Argentine, and the remoteness of any large body of water, is dry, mild and free from extreme moisture all the year round. The soil of the river bottoms is as fertile as that of the Missouri, and large crops of grain and vegetables are easily raised. The Geographical delusion that these vast plains formed a

great desert, and that vegetation could not be sustained, is dispelled by the mere fact, that for ages countless herds of the Buffalo, Elk, Antelope and Deer have roamed over them, and subsisted on their natural grasses, and even now the wild roaming Buffalo out-number the domestic horned cattle of the United States.

That the Highlands of the Hudson should lose their fame, and the White Mountains their present glory, when brought into competition with the mountain peaks and snowy ranges of Colorado, would, ten years ago, have seemed a dream.

The Kansas Pacific and the Denver Pacific Railroad will not only make this dream an assured fact, but it will make Colorado the watering place of America—the Switzerland of the American continent. No other State or territory presents such fine mountain views, and even the Alps lose in magnificence, when compared with the ranges and peaks of the Rocky Mountains, so remarkable for depth and height, and variety and beauty. A delightful prospect is everything to the tourist in search of rest and comfort; or the invalid needing health and repose, and the mountain scenery of Colorado is for two hundred miles in a single point of view, an ever-varying picture of natural beauty. Unmatched in grandeur and unequalled in climate, these mountain peaks are alike gladdening and inspiring—whether dancing in the sunlight or bathed in clouds—whether white with the snow that caps their summits, or dark with the rocks and trees which clothe their

sides. Berne cannot boast such a magnificent prospect as Denver, and the sea coast of the South American Pacific presents no such display of scenic beauty as the approach from the Plains of Colorado.

These Plains form a high rolling plateau, nearly 5,000 feet above the level of the sea, watered by the mountain streams, and capable of successful cultivation. This is the first natural sub-division of Colorado, comprising the entire width of the State eastward from the mountains. Adjoining it on the west is the great mountain region, one hundred and fifty and two hundred miles in width; range following range, and peak crowning peak, in this future Summer Home of the Continent. In the lap of these mountains, under the shadows of peaks from eleven to seventeen thousand feet in height, are the great natural Parks of Colorado. The best known of these are the North, Middle and South Parks. The first being the most elevated, is the coldest and least attractive, and the last is the most beautiful. Middle Park which lies between them, encircled by snow-topped mountains, is fifty miles wide by seventy long, but south of all these lies the San Luis Park, the largest and perhaps the most varied of this wonderful series of pleasure grounds with which Nature has enriched the Switzerland of America.

There are a number of other smaller and less noted, but not the less beautiful and enchanting, parks in this wonderful mountain region. But, to large and small alike, summer skies and summer scenes blend

in harmony with the refreshing verdure of spring and the cool breath of autumn. A wealth and variety of flowers bloom among these mountains, at a height of ten thousand feet, even, scarcely surpassed in form and shading, and unequalled in strength, by the exquisite flora of the tropics. The colors are more deep and delicate than in the richest garden flowers of New England; and though frost and snow may stiffen the blossoms every morning, yet such is the extreme dryness of the atmosphere that they continue to bloom in undiminished freshness and beauty until winter absolutely freezes them out. Vegetation ceases in the White Mountains at an elevation of less than five thousand feet, but those who will delight in the future but not distant watering places of the West, may carry home with them harebell and painter's brush from a height of eleven and twelve thousand feet above the sea.

The summer traveler can find nothing either at Newport or Long Branch to equal, for instance, an excursion to the summit of Berthoud Pass, where the waters of the Atlantic and the Pacific roll off on either hand on their way to the seas, and a descent thence to the Hot Baths of the Middle Park? These hot, sulphurous waters bubble up at three or four places, within a few feet, and infuse themselves into the dry atmosphere. Coming together into a pool they flow over an abrupt bank into a basin below and form a natural bathing-house, where a hot sitz and douche bath may be had, such as

can be found nowhere else in the world. The temperature of the water is 110° Fahrenheit, and, at the first touch the water seems almost of scalding heat. No bather can stand under the fall until his body has been accustomed to the heat by a few partial and experimental trials, but after these, the sensations are delightful. The famed glories of the Turkish bath are nothing in comparison with the transition from the heat of these springs to a temperature of 30° or 40° of the dry and inspiring atmosphere. At Idaho are the Hot Soda Springs, which, like the Hot Springs of the Middle Park, must become a famous summer resort at no distant day, while many hardier seekers after pleasure will annually climb the heights of Gray's Peak, Mount Lincoln, Pike's Peak and Long's Peak, from eleven to sixteen thousand feet above the level of the sea, for the finest mountain views in the world. These Peaks overlook all the magnificent scenery of which we have just been speaking, so wonderful, so inspiring and so sublime, that it is difficult to attempt a description without seeming to exaggerate.

THE CITY OF DENVER.

The inland city of Denver, the capital of Colorado, is one of the most beautiful, attractive and thriving towns in the United States. It may be taken as an example of the growth of this country, a growth which is the more remarkable because it represents the wealth and

progress of a community. Until the present time, far from any of the railroad lines of travel and commerce, with no connecting railroad links, and isolated as it were with all swift communications with the wealth-producing settlements of the Atlantic and Pacific states, yet Denver became and now is, a populous, thrifty, well built town, with a community as orderly and settled as any town in the United States. Ten years ago it was merely a straggling cluster of tents and cabins where the wandering Indian tribes and adventurous miners encamped. The Rocky Mountains are but twelve miles distant and the mountain towns are so many tributaries to its wealth and importance. Here is a city with one railroad completed, the Denver Pacific, connecting Denver with the Union Pacific railroad, with another, (the Kansas Pacific) nearly completed—with imposing buildings, with elegant, tasteful and solidly built private residences, with six churches, a Masonic Hall and several schools. It has a Catholic convent and two large seminaries under the auspices of the Methodist and Episcopal Churches. It has telegraph connections with the Atlantic and Pacific and South to Santa Fe, New Mexico—it has three daily and four weekly papers, among them a German paper.

There are some five hotels, among them an extensive brick. There are also two flouring mills, with planing mills and manufactories of sash and doors, tinware, guns, jewelry, cabinet furniture, and one woolen factory in the course of

erection. There are two theatres and several public halls and a fine Government mint. Just beyond the town the Agricultural Society of Colorado have established a race track (half mile) and territorial fair grounds; immediately adjoining is the Ford Trotting Park Association grounds, one of the most complete race courses in the West—with its solid concrete walls—grand stand—stables and mile track. Also two parks for summer resort. In fact, Denver has become a ripe, mature city, answering every condition of civilization, possessing all the comforts and advantages of the older Eastern towns, with a mild equable climate, and surrounded by the finest scenery on the continent. Perhaps in all the world there are no finer sunsets to be seen than at Denver, and so near that they seem to overshadow it. We have the magnificent ranges of the Rocky Mountains, their tops covered with snow even in mid-summer, and forming a framework of snow and greenery, in which the beautiful inland city nestles like a picture or a gem. Denver is the heart of the mighty region, the future metropolis of the Rocky Mountains and the plains.

CENTRAL CITY,

Now joined to the towns of Black Hawk and Nevada, making a continuous line of settlements three miles long, with a gradual ascent of 1,000 feet, is the chief town of Gilpin County and is surrounded on all sides by rich gold mines. It has now a population bordering on 9,000,

with fine blocks of brick houses, two daily and two weekly papers, foundries, machine shops, Templar, Masonic and Odd Fellow Halls, Miners' and Mechanics' Institute, fine churches, elegant residences, school, theatre, quartz mills, reduction works, and mining machinery in every direction. There are now running in Gilpin County, sixty-three mills containing 1,210 stamps, also twenty-six other mills, and one hundred and eighty one engines having an aggregate of 4,500 horse power.

GEORGETOWN,

Famous for its rich silver mines, is eighteen miles from Central and forty-eight miles from Denver, and is the grand centre of the silver-mining region, where hundreds of miners are digging day and night, sending forth ores, pronounced at the Paris Exposition "UNRIVALLED" and "UNEQUALED," and is the creation of the past three years, and now has a population of some 2,500, with fine houses, stores, banks, churches, schools, hotels, planing mills, saw mills, one weekly paper, *The Colorado Miner*, and in its immediate vicinity are thirteen amalgamatory smelting and reduction works, with a capacity of treating 110 tons of ore per day, and is destined at no distant day to become a wealthy and prosperous city.

GOLDEN CITY,

Situated on a romantic, hill-embowered valley at the foot of the Rocky Mountains and on the banks of

Clear Creek, twelve miles from Denver. The main road into the mountain gold mines passes through the town. The population of Golden City is some 2,000, and the town contains planing mills, tannery, paper mill, pottery and fire brick works, extensive brick kilns, foundries, flouring mills, one live weekly paper, fine stores and residences. four hotels, three churches, one seminary, and two schools. The location of the town is a beautiful one, and from its surroundings and natural advantages, promises to excel as a manufacturing centre, having abundance of own coal, timber, lime and fire clay near by, with unlimited water power.

PUEBLO,

Situated at the confluence of the Fountain qui Bouille with the Arkansas river, is the county seat. Of a steady, rapid growth, with a large and increasing trade, the natural centre of a vast stretch of agricultural and grazing land, with a mild, equable and salubrious climate. Pueblo, already the commercial metropolis of Southern Colorado, has a future before it bright and promising indeed. Its population though yet comparatively small, being but a little in excess of one thousand souls, is fast multiplying; and when it is considered that two years ago the total number of inhabitants was less than fifty, the ratio of increase can but be gratifying and satisfactory even to the most sanguine.

The moral and religious tone of society is good, and improving. The

Episcopal and Methodist denominations have each a large and commodious house of worship in this place. Good schools are maintained, all the learned professions are represented, and a weekly paper is published here.

COLORADO CITY,

The county seat of El Paso county is Colorado City, a beautifully located little town lying in the shadow of Pike's Peak. When railroads commence bringing their annual swarm of travelers to the mountains, Colorado City is destined to become a place of great resort. It combines, perhaps, more natural attractions than any other place in Colorado. Colorado City has good schools and churches, and an intelligent and active population. The celebrated rocks which, with their lofty and fantastic pinnacles, their crags and caves, and their variegated colors, from snowy white to blood-red, form the most picturesque spot to the artist and lover of nature to be found in Colorado, and known as the "Garden of the Gods," are situated adjoining the town of Colorado City, and which, together with the wonderful Soda Springs, will some day make this a famous watering place for the invalid, the tourist, and the visitor.

CANON CITY.

This town is located where the Arkansas breaks through the mountain range, on a beautiful level plateau of land, elevated thirty to

forty feet above the river. The canon of the river near this place presents one of the most wonderful scenes of grandeur and beauty that nature anywhere offers. The river, compressed into a very narrow space, is overhung by stupendous walls of rock from one thousand to twelve hundred feet in height. With an average fall of fifty feet to the mile, it flows through the immense gap for a distance of eight miles.

"Like a steed, in frantic fit,
That flings the froth from curb and bit,
The river chafes its waves to spray
O'er every rock that bars its way,
Till foam globes on its eddies ride
Thick as the schemes of human pride."

The town is surrounded on three sides by the mountains, and is the resort of tourists who make it their special object to study and admire the wonders of nature. In this place the several denominations have houses of worship, and a good school is maintained.

TRINIDAD.

This town contains a population of about five hundred, which number is increasing very rapidly. It enjoys a lucrative trade with the Moreno mines in New Mexico, and with the surrounding country. The principal roads from the States to New Mexico and from the northern part of the Territory converge here. The Catholic denomination predominates. It has a large church and is about to establish a convent school in connection with it.

There are, also, the thriving and flourishing towns of Boulder, Valmont, Burlington, Evans, Greeley,

Kit Carson, Fountain, Buckskin Joe, Hamilton, Laurette, Montgomery, Idaho, San Luis, Costilla, Gaudalupe, Fairplay, that now have a population varying from three to seven hundred, and bid fair to become towns of some importance when the Territory is fully developed.

Silver Mines of Colorado.

If we would search for precious metals we should give our exertions in prospecting where the indications of nature most directly point. She has lavishly distributed her gifts and a search for them should be directed by intelligent inquiry and not by hap-hazard or reckless effort. We have the authorities of the most eminent geologists and metallurgists for the assertion that the Rocky Mountains are the legitimate localities for true gold and silver bearing ores. Their situation and geological characteristics prove the early date of their existence, dating far beyond the deposits of the plains below. They present indisputable proof of their volcanic origin, vast and immense upheaval, they exhibit the true plutonic ores—the granite, the silver, the sulphurets of iron, copper, lead, antimony, tin, bismuth and all the attendants of precious metals in their primitive state, and in such profusion, such inexhaustible quantity, as to almost challenge our belief. All main lodes here are vomited forth from the mysterious depths of the earth by the convulsions below, and the seams or lines of surface, can be followed with a precision and certainty that is remarkable.

The silver fields now discovered and opened in Colorado, near Georgetown, are apparently in prominence and value beyond any known in the world, and the results that will be realized there in the next few years will constitute an epoch in the history of silver mining. Were it generally known to-day how rich and inviting the silver fields of Colorado are, we should witness an attention and investment there more conspicuous than any exhibited before during the present age. An excitement of magnitude is inevitable, and will come.

The wealth of the Silver mines is historic. We are informed by Humboldt in his *Essay Politique* that the yield of the Mexican mines since the conquest to 1803, had been \$2,027,952,000, all of which was produced from a few central spots, and the mining confined to a comparatively limited circle." The registered coinage of the mint of Mexico, from the year 1733 to 1860, shows \$1,742,573,107.

When we remember that the royalty to the king of Spain, to whom, until the commencement of the nineteenth century, the Mexican States paid tribute, was one-fifth, or 20 per cent. of the yield, and take into consideration the royal monopoly of quicksilver and gunpowder, the result seems astonishing. The Mexican method of mining was crude and simple. The ore, as well as the water from the bottom of the shafts, was generally brought to the surface upon the shoulders of *tene-teros*, (carriers) over ladders.

Their *Arastres*, or crushing mills, and amalgamators, were of the rudest possible character, and were run almost wholly by mule power. The following registered yields of a few mines on the American continent may be interesting to the reader :

Biscaina vein.....	\$ 16,341,000 00
Santa Anita vein.....	21,347,210 00
Valencia vein.....	31,813,486 00
Rayas vein.....	85,421,014 00
Veta Madre vein.....	235,935,736 00
Veta Madre of Guanguato,....	800,000,000 00
Veta Grande of Zacatecas....	650,000,000 00

The Pavelleon vein, when first opened, was said to have produced \$20,000 per day for five years, when a torrent of water from the mountains filled its shafts and swept away the improvements.

It was opened again, and for the succeeding ten years yielded \$60,000,000, when it was again abandoned in 1696, and not opened again till 1787, when it was vigorously worked for eight months. The ore taken from it in that period yielded \$11,500,000.

The different members of the *Fagoaga* family are estimated to have received during fifty years' working of two veins, over \$16,000,000 in profits.

The Carmen vein, north of Durango, in the State of Chihuahua, among the mines of Batopilas, upon the western declivity of the Sierra Madre, has produced enormous yields of silver. From this vein three masses of pure malleable silver were taken, weighing collectively 870 pounds.

A single instance of the result of an exploring expedition by some Mexican *Buscones*, (searchers,) into

the regions of Arizona, (contiguous to Colorado,) in the commencement of the eighteenth century, will illustrate the wealth of that region. Upon their return, the most wonderful accounts of richness, and in proof, 3,033 lbs. of pure silver, one mass of which, alone, weighed 108 arrobas, or 2,700 lbs.—the largest mass of pure silver ever found in the world. The fact is well substantiated by record.

In Nevada, the Comstock Lode yielded from 1856 to 1869, silver bullion valued at \$66,000,000, of which \$16,500,000 was extracted in 1866.

From the celebrated Terrible Lode, Brown Mountain, near Georgetown, Colorado, there has been extracted since 1868, 200 tons of first class ore, which yielded near \$100,000 coin; two hundred tons of second class ore, which has yielded over \$40,000, and from 2000 tons of third class ore, which yielded \$160,000, in all, a total of \$300,000. The Equator Lode, on Leavenworth Mountain, Colorado, yielded \$77,000 in silver in seven months.

The best silver mines are those of high elevation. It has been the experience in Mexico, and it is a well known fact, the mines of Great Potosi, which have produced over one thousand millions, are worked at a height exceeding that of Mount Blanc. Those of Colorado are at an elevation of from 8,000 to 10,000 feet above the level of the sea, yet in the vicinity of most fertile parks and unfailing streams.

The silver veins of Colorado have been examined by those famil-

liar with those of the richest districts of Mexico, who agree that they are fully equal to any they have ever seen, in fact, superior in their surface indications, having within a few feet of the surface distinct veins, in some instances from one to three feet, of the purest Argentiferous galena ore. Those that have been developed, among many others, is the Terrible mine, at a depth of 325 feet; the Brown, 150 feet; the Equator, 400 feet; the Boston, 150 feet; the Argentine, 40 feet, show their massive and solid proportions, and appear practically inexhaustible.

Fuller in his Treatise on Silver Mines, says: "Whenever, in any part of the world, silver mines have been worked, they are worked now; unless from some unexplainable cause—the lack of machinery, the existence of war, and the invasions of Indians, have, as in Mexico, familiarized our minds with the idea of abandoned mines. But they have all been abandoned for some other cause than that they are exhausted. We know of no silver mining regions in the world that have given out."

The mines of Mexico, originally worked by the native Aztecs, before the Spanish conquest, are worked still. The mines of the Andes, have given forth their wealth for more than three centuries. The mines of old Spain have been worked from the middle ages, and are in working condition now. In Hungary, the same mines worked by the Romans before the birth of Christ, still yield their steady increase. The silver mines of Frie-

burg, in Saxony, worked from the eleventh century, have no diminution. In Bohemia, Tyrol, Norway and Sweden, in the Ural and Atlas mountains, and indeed, wherever the discoveries of silver mines have made we believe, without exception, the mines continue to be worked to the present day, and are generally more productive now than at any time during their past history. "*Silver-mining, for permanence and rich returns, has had its parallels in no other business.*"

MINING BY TUNNELS.

It is a generally conceded fact among those in any way cognizant of the peculiar contour of the silver bearing mountains of Colorado, their great altitudes above the valleys of the streams and 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 those in the vicinity of Georgetown has never been questioned. Most of the mines that have reached any depth in most instances have solid granite walls, in many places striated both vertically and horizontally. Prof.

Whitney in his "Metallic Wealth of the United States," says "true fissure veins are continuous in depth, and their metaliferous 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 the 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 2,580 feet."

The same authority says, "several mines at Clausthal have been worked at a depth of 300 fathoms

or 1800 feet, at Kongsberg, Norway, 280 fathoms; at Schemnitz, Hungary, 200 fathoms; at Ivackimsthal, Saxony, 325 fathoms."

"On our own continent the same authority gives the depth of the Veta Madre mines at Guanaxnato, Mexico, at 300 fathoms, and of the Valanciana mine at the same place at 350 fathoms.

On the celebrated Comstock in Nevada, the workings have extended to a depth of over 1200 feet. The similarity of the veins in Colorado 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 the fissure veins in Colorado 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 that of Colorado. The mountains rise to an elevation above the valleys of from 1200 to 3200 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 inclines towards the surface, opening up a large amount of ground that can be mined cheaply, and the

mined ore brought to the surface on *tram ways*. It is estimated on 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 bearing, and has given birth to many grand, stupendous achievements in the engineering world. There is not now and never can be any question, but that drainage by tunnels is the cheapest and most economical, and in support of this, Overman 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 Guanajuato, Mexico, says, "It is indeed strange that mines of such richness have no tunnels for draining. When the neighboring ravines of Cata and Marfil and the plains of Tumascetio, 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 amalgamating works."

In the report of the committee of the Mechanics Institute, San Fran-

cisco, we find the following in regard to the English Real Del Monte Co., Mexico. "They became in 1823 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 by running a tunnel 9000 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 portion of the vein being worked out, he was compelled to go below the water, and the water encountered required 1200 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 slower or 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 tunnels constructed, the mines have been abandoned and the proprietors ruined." R. N. Strech, Esq., State Mineralogist of Nevada, says of the Comstock: "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 pump, 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 a great 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 thirty to forty 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.

The Harz mines yield but \$500,000, per annum in precious metals, and they found it a matter of necessity and economy to run a tunnel fourteen miles long in the Harz mountain, in order to obtain an additional drainage of 300 feet.

The Rotherhoeber tunnel at Freiberg, Saxony, which is not quite completed, will be eight miles long. In Hungary, at the celebrated mines of Schemnitz, a drain tunnel exists, called after the Emperor Joseph, the second, which has a length of over nine miles.

Baron Von Beust, chief of the mining department of the Kingdom of Saxony, does not hesitate to declare, that a deep adit should be designated as one of the most healthy, most useful and most hopeful mining enterprises which could possibly be undertaken, and for that very reason, deserves the highest consideration in a financial, politico-economical and scientific view.— Then again, Bernhard Von Cotta, Prof. of Geology, at the Mining Academy of Freiberg, says: "That there can be no question, that the opening up of a lode by a deep tun-

nel, will facilitate to quite an extraordinary degree, mining upon the same, and in every other regard, make it more profitable. And he claims the following advantages in working the mines by means of a tunnel. "a. In facilitating drainage and ventilation. b. In facilitating transportation not only of the ores from the mines, since reduction works may be established near the mouth, but also of the material and timber required in a portion of the mines. c. In facilitating the entry and exit for the miners. d. In any case the possibility will be acquired by means thereof, to work the lodes to a much greater depth than without the tunnel, and it is probable in the highest degree, that the tunnel will open up new and similar lodes."

Julius Weisbach, Dr. Phil. Royal, Saxonian Mining Councillor and Professor at the Mining Academy at Freiberg, says: "The execution of a tunnel will not only save mines from approaching abandonment, but will be the means of very largely increasing their yield. A tunnel which with a length of about one German mile, opens up rich ore at a depth of 2,000 feet, secures to a professional mining engineer the most welcome and surest means for profitable operations, particularly in a country where no cheap fuel exists for the purpose of generating steam. Such a tunnel removes the necessity of using pumping engines for many years to come, it facilitates and cheapens it, gives furthermore, many opportunities for additional exploration of the country and discovery of new bodies of ore,

The tunnel also, makes it possible to derive a profit from the great masses of poor ores."

Dr. H. Von Dechen, Acting Privy Councillor of the King of Prussia and late chief of the Mining Department, confirms the views of all the eminent authors we have quoted, and says: "That the plans of constructing a deep tunnel to the gold or silver mines, corresponds with the approved rules of mining engineering, and will carry with it the most happy results.

H. Koch, Esq., Royal Prussian Chief Mining Engineer, say: "It cannot be doubted, according to all mining experience, that the mineral bearing lodes near Virginia city, will continue downward at least 2,000 feet. Equally probable is it, that by means of a tunnel, a mining district of high importance will be opened, the working of which will only be made possible by means of a tunnel, and at the possibly smallest expense."

Bruno Keer, Professor at the Royal Mining School of Berlin, remarks: "That only by means of a tunnel, can a metalliferous mountain range be opened properly, according to the principles of mining engineering, a well regulated extraction can take place with such a tunnel, and poor ores may be taken out with advantage along with the rich ores, on account of the cheap transportation. This is absolutely necessary if the durability of the mine is to be secured; while *piratical mining*, the extraction of the best ores alone, will always soon ruin any mine."

Dr. Phil. Burkhart, Royal Prussian Privy Councillor, claims the following advantages to be derived from tunnels: "1st. They cheapen drainage, compared to the application of machinery. 2d. They permit not only an examination of the country traversed, and the discovery of the metalliferous deposit contained therein, but also a rational and regular system of mining. 3d. They facilitate ventilation, transportation and extraction of ore, therefore, decrease the expense in these operations, and consequently: 4th. Allow the extraction and reduction of poor ores which otherwise could not be turned to account. 5th. They increase the yield, and the profits of the mine owners, and also, what is to be considered more particularly: 6th. They make it possible to reach far below the tunnel level, and to extract the ores occurring there, at a profit. 7th. Thereby putting into operation gold and silver which these ores yield—a dead capital, slumbering in the bowels of the earth, increasing the national wealth." And in alluding to the silver mines of Mexico, he says: "That the losses occasioned in Mexico by neglecting the timely construction of deep tunnels cannot be given in figures. The high expense for pumping those for exploration, preparation and transportation, but especially the fact that ores had to be left behind in the mines, which could have been extracted by a rational system of mining.

The Committee on Federal Relations of the Nevada Legislature, made an elaborate report on the ne-

cessity of tunneling the Comstock lode, from which we quote: "Many difficulties present themselves in deep mining, which increase in a fearful ratio as depth increases, and the profits which have already dwindled down to a small amount, soon thereafter will be absorbed entirely, and then be exceeded by the cost of mining. The fate of these mines, if no remedy is found, is therefore clearly foreshadowed.

Necessity of a Tunnel.

The only remedy, positive and sure in its operation, which presents itself is the construction of a deep adit or tunnel. It will cut the mines at a depth of 2,000 feet, draining off the water to that depth by its natural flow, securing the best ventilation, cooling the atmosphere in the mine, furnishing facilities for transportation, and making it possible to dispense with all pumping and hoisting machinery, for the miner can enter the mines from below, work upwards, and the ore will fall by its own gravity; whilst a railroad in the tunnel will transport the same at small cost to the adjacent valley. Such are some of the considerations which present themselves, and which show that the proposed work is a matter of vital importance, and one of absolute necessity to the State of Nevada, and the necessity of providing means for draining the Comstock lode, by means of a deep drain tunnel, and the immediate construction of such a work is endorsed:

The Bank of California.

Messrs. Chas. Bonner, Supt. of Gould & Curry, S. M. Co.

Jno. B. Winters, Pres't Yellow Jacket S. M. Co.

F. A. Trute, Pres't Belcher S. M. Co.

H. Beckwith, Supt. Mexican Mines.

O. H. Frank, Supt. Central S. M. Co.

P. N. McKay, Supt. California S. M. Co.

Jas. Morgan, Pres't Sides Co.

S. F. Curtis, Supt. Savage Mining Co.

With twenty-nine other Presidents and Superintendents of Mining Companies, as also, by Messrs. John Parrott; Louis McLane; W. C. Ralston, Bankers, San Francisco; Paxton & Thornburg; Hasting & Co.; Ruhling & Co.; Paul & Co.; Maynard & Flood, Bankers, Virginia City, Nevada.

Dr. Geisslen, in his report on the Ernst August tunnel, in the Harz district, says: "There has been drain tunnels in the Harz for a long time, which were used as canals, for the transportation of ores already. At the commencement of the sixteenth 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 two hundred years," but about the middle of the 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 Gitelde, a little town at the foot of Harz Mountains, and it was estimated that twenty-two years would be required for its completion, but it only took a little over half that time, for it was entirely completed in twelve years and eleven months. This tunnel has a uniform fall of 7 4-10ths inches to each 630 feet. Its height is 8 feet 3 inches, its width 5 feet 6 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 water course is covered over to be used as a sidewalk for the miners.

Messrs. P. Forney Spear and W. H. Trego, of Baltimore, Md., who visited Colorado to examine the mines, report that "Tunneling is proved to be the only true method of working mines where the Mountains are favorably formed."

Prof. Blatchley, who has been engaged under J. Ross Browne, late Government Commissioner to collect statistics on the mines, made the following report in 1867, when the Silver Mines of Colorado were but partially developed:

"Having recently made an examination of the Silver Mines in the vicinity of Georgetown, I am enabled to give the following facts concerning them.

Amount of Ore.—The silver-bearing veins are very numerous, and many of them of large size, carrying a good per centage of ore that can be profitably reduced.

Extent of Veins.—Having been but recently discovered, no deep shafts have been sunk, to prove whether the favorable appearance at the surface continues to a great depth. But as veins of large size, and carrying the same varieties of ore, have been found from the bottom of Clear Creek Canon to the summit of the surrounding mountains, an opportunity is afforded of examining the veins for a vertical height of over three thousand feet. This is a better proof of their depth and continuity than finding good ore at the bottom of a shaft two thousand feet from the summit of the mountains.

Tunneling.—The veins are found in the abrupt and precipitous sides of the mountains, and offer great facilities for opening and working by means of tunnels, thus obviating the necessity of expensive machinery for hoisting and pumping. In mines thus worked, one or two miners can open a vein and extract the ore with no other capital than their own labor. With veins of large size, and such facilities for extracting the ore, the amount of ore that will be taken from these mines for some years to come, will be limited only by the facilities for reduction."

The America Mining Company of Colorado report that "By means of tunnels very important advantages are gained: 1st. The expense of hoisting is saved; 2d. The mines become self-draining, and the use of costly pumping engines is obviated; 3d. Transportation from the mines to the mills is greatly reduced; 4th. The mines are worked at greater depths, where the ore is much richer,

and the lodes wider, than nearer the surface; 5th. New lodes are discovered, which do not show on the surface, thus increasing materially the value of the Company's property—experience having demonstrated that the country is full of 'blind lodes,' equal in extent and richness to the best.

"This Company, in opening up its tunnels, found two 'blind lodes,' covered by the debris which had worked down the mountain side. One of these lodes contains over two feet of mineral-bearing quartz, and is of considerable value. It is believed that many more such lodes will be developed as tunnels progress, and that in this way the Company's property will eventually be doubled in extent."

Hon. J. B. Chaffee, United States Senator elect from Colorado, and President of the First National Bank of Denver, asserts that "in regard to Leavenworth Mountain in Colorado Territory and the Silver Lodes in it, I can justly state that I am personally acquainted with several Lodes on that mountain, and believe it to be as rich as any yet discovered. There is no doubt in my mind that a tunnel properly located to cross the veins, if properly constructed, will be a paying investment. It is the cheapest and most expeditious way to work the mines, and this mountain affords an excellent opportunity for such purposes, enabling you to reach the Lodes at a great depth from the surface.

"I look upon this way of mining as by far the best and most economical on every point, embracing the catalogue of mining expenses.

Such enterprises about Georgetown, where the facilities are so great and the shape of the mountain so advantageous, cannot well fail to be successful."

Hon. O. J. Hollister, Collector of Internal Revenue, Utah Territory, and author of "The Mines of Colorado," in referring to the mines of Clear Creek County, remarks that "the quartz mines now engage the principal effort; they are considered first-class, and are universally well located for tunneling. The advantages of tunneling where the ground will permit, for instance, where there is ample room on the creeks for the rubble, and where the hills rise at an angle of 45 degrees or more, from the streams to a great height, can hardly be over-estimated. Its cost in Colorado at present is between \$25 and \$30 a foot. All ground above the tunnel may be broken down instead of up, which in itself is a great saving of time, labor and powder, as every practical miner knows. The water runs off through the tunnel and the ore may be conveyed on dump cars through the same channel into the mill, saving costly hoisting and pumping machinery and power, the construction of surface roads, a great deal of heavy teaming and excavating for wheel and shaft houses. *Mining by means of tunnels ought to pay handsome dividends on unwatered capitals on ten dollar rock; provided the veins are of average size, regularity and richness, and where a tunnel can attain a depth of one, two or three thousand feet, in the course of a reasonable length, the ground above will be seen to be clear gain,*

when it is remembered that beyond a certain depth it is unprofitable to mine, because the expense of hoisting the ore and water, overbalance the value of the ore. The advantages of unlimited water power and mining by tunnels, are common to every part of Clear Creek County."

Prof. F. V. Hayden, United States Geologist, in a communication, says: "The Brown Mountain is solid massive granite, and is tunneled with great difficulty, while the Leavenworth seems to be so broken up by jointage that it is tunneled with comparative ease."

Prof. F. Schirmer, Superintendent of the United States Mint, Denver, reports: "The mountains are very steep and abrupt, and consequently the true method of working these mines is by tunneling; by this means the mines are drained free of cost, and the expense of working them is greatly reduced."

In the *New York Herald*, December 4th, 1869, we find the following from its special correspondent in reference to mining in Colorado:

"The contour of the mountains, which rise from a thousand to over three thousand feet above the level of the valleys, some nearly perpendicular, but most of them at angles ranging from twenty-five to forty-five degrees, is particularly favorable for tunnels. The strike of the veins with the bend of the mountain enables them to be cut at right angles by the tunnels at a depth to which the sinking of shafts would be exceedingly expensive. Levels and inclines can be run in different directions, from which large quantities of ore can be taken at a com-

paratively trifling cost and run out of the tunnels upon tramways. This mode of conveyance supercedes the hoisting of ores in buckets out of shafts, and the expense of steam power attending it, as well as the cost (which is heavy) of hauling ores from the mouths of the shafts to the mills. The tunnels are run in on a slight incline so that the water flows out along the gutters on each side, and the mine is self draining. This does away with the inconvenience and expense of draining, as in shafts, by means of pumps or buckets. Altogether the tunnels will ultimately prove eminently economical and advantageous, and, it is truly said, are destined to be the keys that are to unlock the silver treasures of these mountains."

Mr. Charles Burleigh, of Fitchburg, Mass., the inventor of the celebrated "Burleigh Machine Drill," visited Colorado, and we quote from the *Denver News* that "he is really enthusiastic over the richness of the ores, the number and proximity of the lodes, the favorable character of the ground for tunneling, the beauty of the country, the character of the people, the probable results to himself, the drill company of Colorado generally, of his proposed enterprise, and means to get at it as soon as possible, within a very few weeks," and since then Mr. Burleigh has been successfully engaged in tunneling in the Sherman Mountain, and when we last visited his tunnel, it had been driven in near six hundred feet, and again we find in the *Denver News* of April 23d, the following interesting item in reference to the success of mining by tunnels:

"Such announcements as the following, from a reliable correspondent at Georgetown, should set at rest any doubts as to the value of Colorado ores, or the profitableness of mining properly conducted.

"We've a big thing in the mountains,
And are sure to strike it yet."

In fact, we have struck it, and keep striking it, richer and richer every time.

GEORGETOWN, April 21, 1870.

EDITORS NEWS: It affords me great satisfaction to inform your readers that mining by tunnels is a success in Clear Creek County. Last night the workmen in the Morris Tunnel, situated on Columbia mountain, Griffith district, "struck" a solid vein of mineral, three inches wide, that assays \$6,142 per ton. I send you the first silver button from this new wonder.

On the Sutro tunnel, in Nevada, on which work was commenced a short time since, and which is now in over a thousand feet, will be, when completed, twenty thousand one hundred and seventy-eight feet in length, cutting the Comstock one thousand nine hundred and twenty-two feet below the floor of the Savage works.

In order to show the great feasibility of driving tunnels in the mountains of Colorado, 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 sum-

mit of Leavenworth Mountain and 1,970 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 in a distance of 2,050, and will pass under the left hand fork of South Clear Creek in 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 1,080 feet, and the summit of the mountain 3,200 feet deep in a distance of 3,500 feet.

The National, of 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 1,150; the Lilly 1,311 feet deep in a distance of 1,580 feet, and the Summit of the mountain 2,140 feet deep in a distance of 2,710.

The Merchants and Mechanics' Company, of Baltimore, have a tunnel near the Burleigh, that will strike and cut the mines on its course at nearly the same distances as the Burleigh.

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 feet.

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

The Rhodes tunnel, on Leavenworth Mountain, will cut the summit 970 feet deep in a distance of 1,790 feet and will cut the George Law mine in a distance of 100 feet 65 feet in depth; the Peep-O'-Day mine in 160 feet 100 feet in depth; the Rocky Mountain mine in 425 feet 260 feet in depth; the Gilpin mine in 1,070 feet 664 feet in depth.

The Faughn and Croston tunnels are to run in on the same mountain. These tunnels are all being actively driven at the present time with every indication of success. Besides these are the Nash and Linn tunnels, which are also being driven into Leavenworth mountain, but from which we have not the figures. Among those projected, and which will soon go into active operation, are the Philadelphia tunnel in Brune mountain and the Wagstaff 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 Harz; 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, and thus is the "key" being forged that will unlock the great treasures confined in the Everlasting Hill of Colorado.

Cost of Mining by Tunnels.

We have given our reasons supported by undoubted authority why mining should always be conducted, wherever practicable, by tunnels. We now propose to examine into the cost of this branch of mining.

The Hare Castle Tunnel on the Trent and Mersey Canal, England, 58,778 feet in length, sectional dimensions 14,416 feet, cost \$57.05 per foot lineal.

The Blissworth Tunnel on the Grand Junction Canal, England, is 9,240 feet in length, sectional dimensions 16½,418 feet, cost \$24.18½ per foot lineal.

Edge Hill Tunnel on the Liverpool and Manchester Railroad, England, is 6,600 feet in length, sectional dimensions 22,160 feet, cost 30.15 per foot lineal.

The Nenhe Tunnels near Marseilles, is 15,153 feet long, the cost of mining the body of the tunnel was \$139,79 1-24 per running yard.

The Sutro Tunnel in Nevada which is 20,178 feet, will cost \$1,683-616,49, or cost per lineal foot \$98,25- In Colorado, the Marshall Tunnel paid \$16.800 for tunneling 600 feet or \$28.00 per lineal foot. The Helmick Silver Mining Company of Washington, are paying \$30 a lineal foot. The Morris Mining Co. of Washington pay the same price, and from estimates made, the Rhodes, Faughn and Croston (Anker's) Tunnels, can be driven in at a cost not to exceed \$25.00 per lineal foot. These prices include labor, timber, track iron, tram ways, picks, drills, powder, &c. In the annual report of the State Mineralogist of the State of Nevada, for 1866, page 93, it is stated that the cost of sinking the shaft of the Gould and Curry Silver Mine, *exclusive of engines and machinery*, was \$75,378.40, depth attained 692½ feet, per foot \$109.36, showing

conclusively that in the matter of cost for actually opening a lode, it is cheaper to mine by tunnel than by sinking shafts

THE ANKER TUNNELS AND SILVER MINES,

Consist of the Rhodes tunnel, which is located at the base of Leavenworth Mountain, Griffith Mining District, Clear Creek County, Colorado, about one mile from Georgetown, and is one of the best commenced and well timbered tunnels that has been started in that vicinity. It has been already driven in some twenty feet, with the dimensions of eight feet wide and seven feet high.

This tunnel is so located as to strike at right angles, among many others, the following named Lodes: At a distance of 100 feet, the "George Law," 65 feet deep; at 160 feet the "Peep-O'-Day," 100 feet deep; at 200 feet the "Castillo," 120 feet deep; at 270 feet the "Washington," 165 feet deep; at 320 feet the "Montezuma," 195 feet deep; at 300 feet the "P. H. Rhodes," 212 feet deep; at 300 feet the "Gregory," 240 feet deep; at 425 feet the "Rocky Mountain," 260 feet deep; at 600 feet the "Simpson," 335 feet deep; at 685 feet the "Lorenzo," 430 feet deep; at 970 feet the "Jackson," 612 feet deep; at 1070 feet the "Gilpin," 664 feet deep; at 1120 feet the "Livermore," 690 feet deep; at 1300 feet the "Cambria," 800 feet deep; at 1790 feet the "Winnesheck," 970 feet deep; at 1880 feet; the "Hickory," 920 feet deep; at 2000 feet the

"Brooklyn," 860 feet deep; at 2070 feet the "Bendigo," 830 feet deep; at 2120 feet the "Ben Wade," 800 feet deep; at 2180 feet the "Adrian," 750 feet deep; at 2300 feet the "Rose," 685 feet deep; at 2440 feet the "Bank," 600 feet deep; at 2545 feet the "Mercer County," 565 feet deep; at 2660 feet the "Apache," 520 feet deep; at 2750 feet the "Cataract," 480 feet deep; at 2810 feet the "Kane," 458 feet deep; at 2890 feet the "Dunderberg," 420 feet deep.

The Croston Tunnel lies between the Rhodes and the Faughn tunnels. Has been driven about the same distance, and will cut nearly the same veins as the Rhodes.

The Faughn Tunnel is nearly a thousand feet higher up the creek and beyond the Rhodes tunnel. Is now in a distance of over thirty feet. It is eight feet wide by seven high, to allow a double track for cars suitable for carrying out ore and rock. Having been started within a few feet of Clear Creek, it possesses an additional value from its proximity to water, which, in the future, will be necessary for ventilating and other purposes. The following mines, beside many others, will be struck by the tunnel: The Square and Compass, the Indigo, Troy, Tom Thumb, Creole, Peep-O'-Day, Argentine, George Law, Mountain View, Rocky Mountain and Washington.

In connection with, and in the immediate vicinity of the tunnels, is a very valuable mill site and water power, having a front of 600 feet, with a depth of 300 feet. The volume of water is sufficient to furnish any amount of water

power for propelling machinery. An excellent wagon road, leading from Georgetown over the Snowy Range to Snake River, passes by the property, making it easy of access.

Two buildings erected for the use of the miners who have worked on the mines, one being 16 feet by 36, containing three rooms, the other about sixteen feet square, belong to and accompany the tunnels and mines.

TOM THUMB LODE—666 $\frac{2}{3}$ lineal feet.

This Lode is situated on Leavenworth mountain, a short distance east and above the great Equator lode. The crevice is full eight feet wide, showing well defined walls, and carrying a strong deposit of very rich mineral, from four to eight inches in width. The discovery shaft has gained a depth of twenty feet. Some of the richest ore found in Colorado has been taken from this mine. Large pieces, by actual test, have been found to contain silver at the rate of \$1,000 to the ton.

The ore carries a large quantity of sulphurets of silver, with considerable argentiferous galena of a very fine grain.

Select specimens of ore from this mine have yielded by fire assay \$1,200 and \$3,000 per ton of 2,000 pounds.

Prof. N. P. Hill of the Colorado Smelting Works, made the following returns on 1087 pounds of Tom Thumb ore:

1087 lbs. wet weight,
1077 * dry weight,
.538 ton.

Assay 590 ozs. silver per ton.
590 ozs. at \$1.20 per oz. \$708 per ton.
.538 ton at \$708, 389.90
Freight added 8.30

389.20

(Signed.)

N. P. HILL.

Prof. A. Von Schultz, Assayer at Central City, Colorado, made five assays of ore taken from this mine, with the following result:

Silver per ton of 2,000 lbs. No.	coin value
1 565.33-100 ozs.	\$676.30
2 564.84-100 ozs.	677.33
3 564.30-100 ozs.	677.33
4 570.68-100 ozs.	684.81
5 566.65-100 ozs.	679.98

From Prof. N. Hill, of the Colorado Smelting Works.

BLACK HAWK, June 17th, 1870.

M. ANKER, ESQ.—DEAR SIR:

In reply to your questions about the quality of the ore sent to our works from the Tom Thumb lode, I would say, that Mr. Crane sent us at one time 1076 lbs. which assayed 590 ozs. of silver per ton, and was worth \$716 per ton. I paid him at this rate for the ore.

Yours truly,

N. P. HILL.

STATE OF IOWA,

JEFFERSON COUNTY, ss.

George Craine being first duly sworn, upon his oath deposes and says, that during the summer and fall of 1869, he worked on the "Tom Thumb" Silver Lode, situated on Leavenworth Mountain, Clear Creek County, Colorado Territory, and that he is perfectly familiar with the character of this mine.

Affiant further says, that said silver lode has a crevice of nearly or quite eight feet between the walls with a streak of rich sulphuret ore, varying from four to ten inches in width, that will yield by assay from five to fifteen hundred dollars per ton.

Affiant farther says, that the result of the first fourteen days work done on this mine, commencing from the surface of the ground—two men seven days—was ten hundred and some odd pounds of ore, that he (this affiant) sold to Prof. N. P. Hill, for \$389, besides as much more of second class ore, supposed to be worth about \$150 per ton.

Dated at Fairfield, Iowa, this 22d day of June, 1870.

GEORGE CRAINE.

STATE OF IOWA,

JEFFERSON COUNTY, ss.

I, George Craine, being duly sworn, on oath depose and say, that the above and the statements therein made and signed by me are true as I verily believe.

GEORGE CRAINE,

Subscribed in my presence and sworn to before me this 22d day of June, 1870.

WM. K. ALEXANDER.

Justice of the Peace.

CREOLE LODE—666 $\frac{2}{3}$ lineal feet.

The "Creole" is situated on Leavenworth mountain, 250 feet north of the Tom Thumb, and has a shaft twenty feet in depth. The crevice of the lode is over six feet in width, and in the bottom of the shaft there is a mineral vein of about eight inches in thickness, of ore, very similar to that on the surface,

assaying from \$500 to \$1,000 per ton. The ores obtained near the surface of the shaft, contain a large percentage of galena, green and blue carbonates of copper, and apparently some grey copper. Specimens from this mine, contributed to the Paris Exposition, held in Paris in 1867, were among the ores that received the first gold medal.

ARGENTINE LODE—666 $\frac{2}{3}$ lineal feet.

The "Argentine" lies above the Creole lode, and is one of the oldest discoveries of the Silver Belt. From its massive crevice, strong vein, and large amount of mineral, it has secured the well deserved reputation, of being one of the largest and most valuable mines discovered in Colorado, not so much for the quality of the ore, but from its immense quantity.

The width of the crevice varies from five to ten feet, has one mineral streak of over twelve inches of solid argentiferous galena and antimony, that contains from \$50 to \$100 of silver to the ton, besides an average proportion of lead, of but little less, if any, of fifty per cent. An assay of ore made by the British and Colorado Mining Bureau, London, gave a return of 67 $\frac{1}{2}$ oz. silver per ton, and 51 $\frac{1}{2}$ per cent. lead. The German Reduction Works of L. Huepeden & Co., at Georgetown, in 1869, treated one ton of second class ore—all the Galena ore, (first class,) having been picked out—that yielded 43 ozs. silver, or \$55.90.

The lode is opened by two shafts, one having a depth of thirty to forty feet. On the ground by the deepest shaft there is now out from about twenty tons of first and second class ores. The vein has been proved to be continuous, not having varied much from the first indications, which was *one foot* of solid mineral, enclosed in second quality of ore, from three to four feet in thickness.

TROY LODE—266 lineal feet.

The Troy lode runs parallel with the "Tom Thumb," and but a short distance from it. The vein has the same characteristics as the Tom Thumb—shows similar ore—though in a smaller quantity, and with further development, will undoubtedly prove valuable and remunerative. Has a shaft ten feet deep, with a crevice of four feet, carrying from one to three inches of sulphureted ore.

ROCKY MOUNTAIN—100 lineal feet.

The Rocky Mountain lode is opened between the Gregory and Simpson lodes. Is well developed by a shaft and drift of twenty feet, from which several tons of ore was taken. It now exhibits several inches of fine mineral, that consists principally of argentiferous galena. The lode has been opened by a second shaft of twelve feet deep, where the vein shows very favorably, and gives promise of large returns. From an assay made by

Chas. H. Moor, Esq., Chemist, the rich result of \$484.84 of silver to the ton was obtained.

PEEP-O'DAY LODE—200 lineal feet.

The Peep-O'Day lode is immediately above the George Law lode. A shaft on the discovery has been sunk to the depth of twenty feet, showing a five foot crevice, with six inches of fine looking mineral—mostly galena, containing sulphurets to a small extent. An assay made of some of the ore gave a result of \$11.14 silver to the ton, which is the smallest exhibit returned from the mine.

GEORGE LAW.

The George Law lode is opened by a shaft, within a few feet of, and below the Peep-O'Day lode. Has a strong and large crevice which carries a number of inches of ore, rich in argentiferous galena and sulphurets—also showing carbonates of copper. A specimen of the ore was lately assayed and found to contain \$17.00 silver to the ton. The lode ranks among the most valuable on the mountain, and further development will undoubtedly prove it to be one of the most profitable.

RIGHT BOWER—200 lineal feet.

The Right Bower lode was discovered at the base of the mountain, near the creek, about one hundred feet from the Brazilian lode,

at which place a drift of twenty feet was run in on the vein, exposing when the work was suspended a strong vein of quartz with an ore streak of several inches, the mineral being principally argentiferous galena.

BRAZILIAN—200 lineal feet.

The Brazilian lode as the "Right Bower," was opened at the base of the mountain. But little work having been done on the lode, no ore has been found—though the indications are favorable for it.

FORBES—666 $\frac{2}{3}$ lineal feet.

The Forbes lode runs parallel with that below the Tom Thumb lode—and is developed by a shaft ten feet deep, exhibiting ore similar in character and quality as the Right Bower lode.

COSTILLA—666 $\frac{2}{3}$ lineal feet.

The Costilla lode is opened about two hundred feet below the discovery of the Rocky Mountain. Has a shaft ten feet deep. A crevice five feet wide. Shows good quartz and but little mineral.

P. H. RHODES—1400 lineal feet.

The P. H. Rhodes lode is opened on the discovery by a shaft fifteen feet in depth. The crevice is from four to five feet wide, carrying a dark stained quartz interspersed

throughout with galena, and from an assay made by L. Huepeden & Co., we find the ore to yield 21 ozs. of silver to the ton.

LIVERMORE—1000 lineal feet.

The Livermore lode lies below (?) the Gilpin, and is parallel with it. Was drifted on sixteen feet. The crevice is one of the largest on the mountain—having a width varying from five to ten feet. The mineral vein is from six to sixteen inches wide. Eight or ten tons of ore and quartz are now out at the surface of the mine, and the ores assay variously from \$86.00 to \$190.00 to the ton of 2,000 lbs.

HARRISON BERRY—400 lineal feet.

The Harrison Berry lode, is about one hundred and twenty-five feet north of the Argentine. The lode being drifted upon, shows a four foot crevice, though both walls have not yet been obtained. There is about four inches of ore in sight—and as no assays of the ore have been made, we cannot with any certainty speak of its value.

GREGORY—200 lineal feet.

The Gregory lode lies, and is opened in a northwesterly direction from the Peep O'Day, about two hundred feet distant. But little developed. Has a strong vein of quartz and no mineral yet in view.

MONTEZUMA—666 $\frac{2}{3}$ lineal feet.

The Montezuma lode is near the P. H. Rhodes lode. Has been opened by a shaft ten feet deep, that shows a strong crevice of quartz, apparently but a short distance from mineral.

The Lorenzo 700 feet; Simpson 700 feet; Croston 1400 feet, and Eclipse 1400 feet lodes have had but little development, and as yet there character and value cannot be determined. Lying, as they do, among some of the richest mines, and in the true silver belt of Colorado, there is a reasonable supposition to presume that they will ultimately be of value, and all of the above described tunnels, mines, mill site and water power are on Leavenworth Mountain, Griffith Mining district, Clear Creek county, Colorado territory.

—
*From General F. J. Marshall,
 President of the Marshall Silver Mining Co. of Georgetown,
 Colorado.*

GEORGETOWN, COL. TERRITORY,
 June 3, 1870.

M. ANKER, Esq.—DEAR SIR:

Yours of the 29th ult. duly received and contents noted. In reply I must say, that I am well informed in reference to the mines on Leavenworth mountain, as I am now engaged in driving a tunnel through it for mining purposes.

The tunnels that you propose to work through this mountain, to wit, the Faughn and Rhodes are well located and must necessarily cut all the lodes in the front and the largest proportion of them at very great depth below the surface, thereby placing them in condition for a cheap and economical mining.

There is perhaps as many as fifty lodes discovered on Leavenworth Mountain which you will cut, in running through it from the points your tunnels are located, a great number of which are evidently true fissures, and from the enormous richness of the ores at or near the surface, we are compelled to the conclusion that they are of very great value.

Among others that are held at a high estimate by this mining community and which will be cut by your tunnels are the Tom Thumb, Argentine, George Law, Great Eastern, Rocky Mountain, Washington, Livermore, Gilpin and Heaton. You will also doubtless cut many valuable veins that have not been discovered on the surface on which you will be able to preempt and hold, your full compliment of feet (say 1400 feet) by right of discovery.

When you cut lodes by means of a tunnel, the surface owner cannot interfere with you until they sink down to your lode and drift with you. The great depth at which you will cut many of the lodes on this mountain, would require a very long time for them to reach you, and when they have done so, *the great cheapness of working mines through a tunnel over that of hoisting water, rock and ore from great depths by steam power, would enable you to derive a large revenue from the owners of the mines for the privilege of working their mines through your tunnel.*

If you did not own a foot of property on the surface, it would be a *grand and practical enterprise to work your tunnel through the mountain for the lodes you may discover and for the tribute which the surface owners would find to their interest to pay you for the privilege of mining their veins through your tunnel.* Very respectfully,

F. J. MARSHALL.

—
*From D. H. Moffatt, Cashier
 First National Bank, United
 States Depository, Denver,
 Colorado.*

FIRST NAT. BANK, U. S. DEPOSITORY,
 DENVER, COLORADO, June 6, 1870.

MR. M. ANKER—SIR:

It affords me much pleasure to say that

I consider any statement made by Gen'l F. J. Marshall of Georgetown, Colorado, in reference to mining and the mines of Colorado, *worthy of the most undoubted credit*

Respectfully, &c.

D. H. MOFFAT, JR.,
Cash'r 1st Nat. Bank.

*From Prof. Frank Dibben, Supt.
of the International Mining
Co. of Colorado.*

GEORGETOWN, June 1, 1870.

M. ANKER, ESQ.—DEAR SIR:

In reply to your enquiries respecting the Leavenworth Mountain Silver property, I would state that the Argentine, Tom Thumb and Rocky Mountain lodes, were discovered by a mutual prospecting company consisting of six members, in 1865.

I worked the Argentine Lode to the depth of thirty feet, and found the vein continuous and does not vary much in width from the first indications which was one foot of solid mineral in thickness, and this solid mineral enclosed in second quality of ore from three to four feet in thickness. Six tons of the first quality ore I sold to the Georgetown Smelting Works, which averaged seventy dollars per ton, the amount realized from this ore was sufficient to pay all expense incurred in opening and developing the mines, leaving some twenty tons of second class ore now on hand at the mines. The Tom Thumb Lode is much richer but has a narrower pay streak than that of the Argentine, and has been opened by a shaft some 15 feet in depth and the ore continues to show the same richness, averaging in yield from actual working some \$600. per ton. The Rocky Mountain Lode is strong and well defined, and is developed about twenty feet in depth with a six foot crevice, varying much in quality. These veins with the others controlled by you, together with the tunnel sites, I consider to offer one of the most favorable opportunities for profitable and extensive mining in the Territory.

Yours, &c.

FRANK DIBBEN.

*Office of the German Reduction
Works, L. Huepeden & Co.*

GEORGETOWN, COL., June 1, 1870.

M. ANKER, ESQ.—DEAR SIR:

In reply to yours of May 31st, we would say that we know the location of the Rhodes Tunnel on Leavenworth Mountain, Griffith District, here, pretty well. *The Leavenworth Mountain has furnished most of all the ores which we have treated in our works for the last three years, and we consider the same as one of the best mountains as far as richness of ore is concerned, in the vicinity of Georgetown. The location of your tunnel site we consider as a very good one, the mountain being very steep there, so that in striking lodes you will strike them at a considerable depth, where without doubt, they will prove to be much richer as near the surface. Of the different lodes which your tunnel is to intersect, we do not know any but the Argentine lode; the crevice of this lode is very wide, and the richest ore is its galena ore. We only worked a small batch of this lode, one ton second class ore, which did not contain any galena, or very little, the galena being dressed out for the smelting process. For the details of this batch of ore we refer to enclosed duplicate certificate.*

Yours, very respectfully,

L. HUEPEDEN & Co.

German Reduction Works of Huepeden & Co
GEORGETOWN, COL., January 18, 1870.

This is to certify that one ton of ore from the Argentine Lode, Griffith District, treated by us for Mr. J. H. Rhodes, gave the following results by fire assay, average sample:—Silver 43 oz., coin value per ton of 2,000 lbs., \$55 90; per cent of assay saved 80. *The ore was second class ore, all of the galena ore first class ore having been picked out.*

L. HUEPEDEN & Co.

Assayed by H. STOELTING.

*From Hon. Chas. A. Cook, mem-
ber of the Colorado Territorial
Council and late Director of
the First National Bank, Den-
ver, Colorado.*

DENVER, June 6, 1870.

MOSES ANKER.—DEAR SIR:

In reply to your communication, I would

inform you that I am thoroughly acquainted with all the prominent Silver mines on Leavenworth Mountain, and *I consider both the "Tom Thumb" and Argentine Lodes as TWO VERY VALUABLE SILVER MINES.* The ore of the Argentine is not as rich as that of the Tom Thumb, but the width of the crevice and the great quantity of ore makes it fully as valuable. I do not know the exact location of your tunnels, but any tunnels well located cannot do otherwise than strike your valuable lodes, but also those of the Equator, Gilpin and others, *and must consequently prove of immense value.* Taking into consideration the valuable property you now have and the other lodes that will be struck by your tunnels, *I consider you control the most valuable mining property in Colorado.*

Yours sincerely,

CHAS. A. COOK.

From John Turck, Esq., Director of Colorado Central Railroad and one of the owners of the celebrated Equator Lode.

GEORGETOWN, COL., JUNE 4, 1870.

M. ANKER, ESQ.—DEAR SIR:

I am well acquainted with the "Argentine Lode" situated on Leavenworth Mountain, having examined it very frequently, and *I consider it a valuable lode*, being of wide crevice and having one foot of solid ore, AND IN MY OPINION IT IS A TRUE FISSURE VEIN. Of the other lodes I know nothing.

Yours, &c.,

JOHN TURCK.

From Hon. George T. Clark, Treasurer of Colorado Territory and late Cashier of First National Bank, Denver, Col.

TREASURER'S OFFICE,

DENVER, JUNE 6, 1870.

M. ANKER, ESQ.—DEAR SIR:

In reply to yours of the 3d, I will say that I am well acquainted with all of the

mining Districts of Colorado, having done business in the most noted of them since the year 1861. On the discovery of the silver deposits in and around Georgetown, I established a Banking House under the name and style of "Geo. T. Clark & Co." at Georgetown, which business I disposed of June 1869, to the firm of J. B. Chaffee & Co. Being in this business brought me in contact with the miners—and all Companies engaged in mining for silver in that District, and from my knowledge of the District and from conversation with the mineralogists sent here from different parts of the world, I think *I am safe in saying that no richer silver mining District exists (in the United States at least) than the Georgetown District.* As regards the Tom Thumb and Argentine Lodes, I will say that they are considered by all who have examined them, as first class mines, and when developed as other mines have been, will prove equally as rich.

No mountain about Georgetown has produced richer mines than the Leavenworth Mountain, and I consider it one of the best locations for tunnels in that District. Your tunnels are well located, and will no doubt cross many other rich veins besides those indicated in your list. With our Railroad communication, cheap freight, low price provisions and labor, there is no doubt of the future of silver mining in this territory. I am, very respectfully,

GEO. T. CLARK, Treas. Col. Ter.

From Geo. T. Marsh, Esq., Civil and Mining Engineer, and Supt. of the Morris Silver Mining Company.

GEORGETOWN, COL., JUNE 3, 1870.

M. ANKER, ESQ.—DEAR SIR:

After numerous surveys and repeated examinations of tunnels and mines in this vicinity, *I unhesitatingly say, that no mining enterprise ever presented such surety of success as that of driving tunnels into the Leavenworth Mountain.* The veins are numerous, massive and rich. The most prominent lodes are the "Equator," "Tom

Thumb," "Argentine," "Creole," "Geo. Law," "Peep-O-Day," "Rocky Mountain" and "Gilpin," each of which has a good reputation among miners and scientific men.

The accompanying maps and diagrams show the peculiar advantages of your tunnels.

Very truly, yours,

Geo. E. MARSH,
Civil and Mining Engineer.

From Hon. Bela M. Hughes,
late President of the Denver
Pacific Railway.

DENVER, COL., June 6, 1870.

M. ANKER.—DEAR SIR:

I am well acquainted with the character of the "Tom Thumb" and "Argentine" Lodes on Leavenworth Mountain, near Georgetown, as I am interested in the Linn Tunnel near these lodes, and we expect to cut through them at some time not far distant, and I can state that in my opinion these lodes are surpassed by none in promise, in the same mountain. I regard your interest in these two lodes as very valuable and are certain to pay handsomely, judiciously worked under contract per foot.

You know my opinion of the proper, safe and economical way to work such mines. I ought to say that your tunnel privileges are of great importance and ultimate value.

Many of the mining enterprises have failed by reason of the incapacity of the managers, often through their dishonest practices, and more frequently in consequence of their senseless and wicked extravagance. Let me hope you will profit by the wrecks all around you.

Your friend, &c.,

B. M. HUGHES.

From John Cree, Esq., Post-
master of Georgetown, Col.

GEORGETOWN, June 3, 1870.

MR. M. ANKER.—SIR:

You ask me if I am acquainted with the location and general character of Leaven-

worth mountain, and the general character of the ores of said mountain, also of the character of the Argentine Lode on said Mountain. I answer, I have been nearly all over this mountain, and consider it well located and available for working the lodes, and can with assurance say, it contains an abundance of rich ore. I have visited the Argentine Lode several times, it is a large vein of rich mineral ore, and I consider it a very good lode.

Very truly,

JOHN CREE, Postmaster Georgetown.

From Chas. O. Baldwin, Esq.,
Supt. of the West Argentine
Mining Company of Colorado.

GEORGETOWN, COL., June 1, 1870.

M. ANKER, ESQ.—DEAR SIR:

In reply to your enquiries, I can state from personal knowledge, that I am well acquainted with the "Argentine" and "Tom Thumb" lodes. The former is remarkable for its size and quantity of its ore. The quality of the ore is argentiferous galena, containing a large per cent. of lead. From an assay made by myself of the ore, I found it to contain seventy-five per cent. of lead and 47 ounces of silver. In my judgement it is one of the best and largest veins in the country.

In the Tom Thumb lode, the sulphuret ore predominates. Some of the richest ore mined in this country, has been taken from this lode. The Rhodes tunnel will strike the above mentioned lodes and many others of the same belt, along the line of the tunnel.

Very truly,

CHAS. O. BALDWIN,
Supt. West Argentine Mining Co.

From Hon. Frank Hall, Acting
Governor of Colorado.

TERRITORY OF COL., SECRETARY'S OFFICE,
DENVER, June 7, 1870.

I am familiar with the reputation of the Tom Thumb and Argentine silver bearing veins, located in Leavenworth Mountain, near Georgetown, Clear Creek county, in this Territory. They are well defined veins

of ordinary strength, containing ores, which so far as tested, have proven to be of great value in silver.

Very Respectfully,

FRANK HALL, Sec. of State.

From F. A. Pope, Esq., Attorney at Law, Georgetown, Col.

GEORGETOWN, COL., May 20, 1870.

M. ANKER, ESQ.—DEAR SIR:

In response to your enquiries relating to certain property on Leavenworth Mountain, I will state that some of the lodes you mention I have visited, among the number the *Tom Thumb* and *Argentine*, both of which I regard as among the most valuable properties in this District. The *Tom Thumb* is a well defined crevice, carrying a good vein of rich ore. The ore in the *Argentine* lode is not so rich, but there is such an immense body of it that the lode is bound to be one of great value. I know the Rhodes, the Cros-ton and the Faughn tunnel sites; the last named tunnel being in some forty feet.

I think the location is the best one for a tunnel site that I know of in this District, in respect to the number and richness of the lodes it will cut, the short distance and great depth at which it will cut them, and the convenience of the tunnel to all things necessary in its construction—there being a good wagon road passing by it, abundance of wood close at hand, and a magnificent water power connected with it.

In haste, I am very truly yours,

F. A. POPE.

From Prof. H. H. Hewitt, a well known Colorado Miner.

GEORGETOWN, C. T., June 7, 1870.

M. ANKER, ESQ.—

Concerning the "Argentine" and "Tom Thumb" lodes, situated on Leavenworth Mountain in Griffith Mining District, Clear County, Colorado Territory, I will say, that I have been acquainted with the lodes by reputation since their first discovery, and about one year since visited and exam-

ined them personally. The *Argentine* lode is a massive vein carrying nearly a foot of argentiferous galena, and is from four to six feet in width between the wall rocks enclosing the vein. I am not informed as to the assay value of the ore. But from my knowledge of ores, would pronounce it a first class lode. The *Tom Thumb* lode situated on the same mountain, does not carry over one-half the quantity of ore that the *Argentine* does, but the ore is very rich, having run as high as \$480. per ton, coin value in a mill. The character of the ore is sulphuret of silver and intermixed with brittle silver. Both lodes are favorably situated for working by means of a cross cut tunnel. From an experience of ten years in mining I do not hesitate to pronounce both lodes first class mining property.

I could not give exact data without making a more minute examination of the mines.

Most respectfully,

H. H. HEWITT.

From F. J. Wood, Deputy Postmaster, Georgetown, Col.

GEORGETOWN, COL., February 17, 1870.

DEAR SIR:—

Your favor of 5th inst. at hand. You ask about the *Tom Thumb* mine, and in reply I would say, that I have worked on said mine from tip down to its present depth, have also taken out ore, and know what it is worth in this market. The mine is situated on the south side of Leavenworth Mountain, near the *Equator* mine, and in one of the very best belts of silver in this country. Said mine is easy of access at any time of the year. It can be worked very economically by tunnel (as the mountain is very abrupt at this point,) or by shaft. The vein is fully five feet wide, with a nice crevice of ore almost from the grass roots down. The shaft is about thirty feet deep with a good solid foot wall, showing that it is a large true vein. The ore that was taken out last summer from the surface, and worked by Prof. Hill of Black Hawk, run 590 ozs. per ton of 2,000 lbs., which stamps it at once as one of the

very best mines in this country; in fact, after a residence of almost eleven years in the mining districts of this Territory, and the larger part of that time actively engaged in mining, I have failed to see a mine with the same amount of development, that looks better than the "Tom Thumb" mine.

Yours very truly and Respectfully,
FRANK J. WOOD,
Depty. Post Master, Georgetown, Cal.

*From two well known experienced
Colorado Miners.*

GEORGETOWN, COL. TER.

June 3, 1870.

M. ANKER, ESQ.—DEAR SIR:

At your request we have examined Leavenworth Mountain and the lodes and tunnel situated thereon, and in our judgment we consider it one of the first mountains in this District or in Clear Creek Co. We find on this mountain the celebrated Equator, considered the best of any developed mine in the District, also the Squaw, Compass, Broadway, Ni-Wot, Bull-Dog, Empire, Tom Thumb, Gayoso, Argentine, Creole, Hunsell, Rocky Mountain, Peep-O-Day, McClellan, Heaton and various others too numerous to mention, nearly all of which are in process of active development. We find them all so situated, that they can be easily worked by means of tunnels crossing them at right angles. We find the Marshall Tunnel driven in some six hundred feet, crossing several lodes, also the Linn Tunnel, the Faughn Tunnel, the Croston Tunnel and the Rhodes Tunnel, so situated as to strike the best belt of lodes on the mountain. We also consider tunneling to be the only true mode of developing and working silver mines in this section of the country.

Respectfully submitted,

T. F. SIMMONS.

A. C. EDWARDS.

*From Wm. N. Byers, Esq.,
General Manager of the National
Land Company for Colorado,
and Editor of the Rocky
Mountain News, Denver, Col.*

OFFICE OF THE NATIONAL LAND CO.

DENVER, COL., June 7, 1870.

M. ANKER, ESQ.—DEAR SIR:

In answer to your inquiry about the richness of silver mines upon and around Leavenworth Mountain, near Georgetown, Colorado, I can only give an opinion in general terms. The vicinity named has the general reputation of being one of the richest in Colorado. Some of the most celebrated of our wonderful rich silver mines are upon Leavenworth Mountain, and more attention has been directed to tunneling in that one than in any other of the many rich mountains surrounding Georgetown. Hoping you will be successful in your very promising mining enterprise there, I am,

Very truly yours,

WM. N. BYERS.

*From Wm. H. Cushman, Esq.,
Manager of Banking House of
J. B. Chaffee & Co., George-
town, Col.*

J. B. CHAFFEE & CO., BANKERS,

GEORGETOWN, COL., June 3, 1870.

M. ANKER, ESQ.—SIR:

The Equator, Compass and Square, Gilpin county, Argentine, Tom Thumb, Indigo, Winnebago and many other Lodes supposed to be among the most desirable of any of our rich silver lodes, are situated on Leavenworth Mountain, in Griffith Mining District, Clear Creek Co., Colorado. Leavenworth Mountain has been and is now considered by our miners as the most desirable on which to locate a tunnel site, and a number of tunnels are now being driven to strike the above mentioned lodes. The Marshall Silver Mining Company's Tunnel having now reached a distance of some six hundred feet, and is being pushed forward with energy. Respectfully Yours,

WM. H. CUSHMAN, Manager,

Banking House of J. B. Chaffee & Co.

From P. S. Bailey, Esq., a prominent citizen of Georgetown, Colorado.

GEORGETOWN, COL., June 2, 1870.

M. ANKER, Esq.—SIR:

I have examined several silver bearing veins on Leavenworth Mountain, among them are the Troy, Tom Thumb, Argentine, Creole, Montezuma, Rocky mountain and Peep-O-Day, and am satisfied they are good lodes, the crevice between walls averaging from three to five feet.

Leavenworth Mountain is the best producing mountain in this District, having many other lodes being mined that yield a profit to their owners.

Also the Faughn, Croston and Rhodes tunnels are located at the base of the mountain, which will cut the above named lodes at a depth of from one hundred to five hundred feet. Respectfully Yours,

P. S. BAILEY.

From George E. Marsh, Mining Engineer.

GEORGETOWN, COL., June 4, 1870.

M. ANKER, Esq.—DEAR SIR:

In response to your inquiry concerning the "Livermore," "Montezuma," "P. H. Rhodes," "Troy" and "Brazilian" Lodes on Leavenworth Mountain, I will reply as follows:

The "Livermore" is opened by a drift on the lode about fifteen feet in length, and shows an extraordinary vein, with considerable mineral scattered through it.

The "Montezuma" has a shaft sunk to a depth of ten feet; the walls are not defined and no ore is visible, yet the indications are favorable for a strong vein.

The "P. H. Rhodes" shows some mineral, and the surface work shows fair assays of silver.

The "Troy" exhibits a fine streak of ore in a shaft about eight feet deep.

The "Brazilian" is opened at the creek and presents a crevice three feet in width, but its situation at present prevents its being worked at a profit. Yours truly,

GEORGE E. MARSH.

Civil and Mining Engineer.

From Geo. H. Barrett, Esq., who is now driving the tunnel for the Helmick Tunnel Co., of Washington, D. C.

GEORGETOWN, COL., June 2, 1870.

M. ANKER, Esq.—DEAR SIR:

In reply to your inquiries about Leavenworth Mountain and the lodes thereon, I would say that I am personally acquainted with the most of them. Leavenworth mountain is located in the heart of the silver mines of this section, and has produced as much, if not more silver than any other mountain. The veins are large and well defined, and the mineral is generally high grade. Could these lodes be worked by a tunnel driven from the base of the mountain where there is plenty of water for mill purposes, they ought to pay handsome profits, as the ore could be delivered at the mouth of the tunnel at much less cost than it could be raised through a shaft to the surface. Mines that would run behind by sinking shafts would pay largely when worked by tunnels.

Very truly yours,

GEORGE H. BARRETT.

From Mr. Wm. H. Nichols an experienced miner and Brother of Jno. A. Nichols, Esq., President of the Resolute Insurance Company, Baltimore, Md.

GEORGETOWN, COLORADO.

M. ANKER, Esq.—DEAR SIR:

In answer to your inquiry in regard to lodes situated on Leavenworth Mountain, I would say—I have visited and am acquainted with those mentioned by you; my attention was particularly drawn to the Rocky Mountain, Tom Thumb, Argentine, and George Law Lodes.

I believe them to be the best lodes of that section on Leavenworth Mountain, and when more fully developed will not be excelled by any on the mountain.

The Faughn, Croston and Rhodes tunnels are particularly located for the further development of mines. The water-power

near the Rhodes tunnel, will in my opinion be of great advantage to any company working the above property.

Respectfully,
WM. H. NICHOLS.

From the Editor of the Colorado Miner.

PHILADELPHIA, March 28, 1870.

DEAR SIR:

Learning that you are endeavoring to interest capital for the purpose of developing the "Tom Thumb" lode, situated on Leavenworth Mountain, near Georgetown, Colorado, induces me to say that from the developments already made I believe it to be fully as valuable as any mine in that vicinity. The ore produced by the mine is a rich sulphuret, and I know it has paid large profits, sufficient to warrant me in saying that they would be largely increased when the mine is opened so as to produce ore in large quantities.

Fully believing that the property you are offering is first-class, I have no hesitancy in given your project my hearty endorsement.

Yours truly,
A. W. BARNARD.

From Hon. S. F. Nuckolls, Delegate to Congress from Wyoming Territory.

WASHINGTON, D. C., June 16, 1870.

M. ANKER, ESQ.—DEAR SIR:

In reply to your inquiries, I will state that I have resided at Georgetown, Colorado, and believe I am pretty well acquainted with the region.

The silver mines in Griffith District are in my opinion the richest discovered on our continent. Those on Leavenworth Mountain are believed to be as rich as any around Georgetown. Leavenworth Mountain is excellently situated for tunneling. A tunnel favorably located upon it, can not fail to cut rich lodes. The Argentine

lode has a good reputation. The prospects for rich returns from the mines at Georgetown were never so promising as now.

Your Obedient Servant,
S. F. NUCKOLLS.

From Judge C. H. Morgan.

GEORGETOWN, COL., Feb. 10, 1870.

DEAR SIR:—

You ask my opinion of the Tom Thumb lode. The best evidence of the value of a lode comes from the Miners, unless by personal working and manipulating the ores. I have never been at the lode, but have seen a great amount of ore from it; and taken together I have not seen a like quantity from any lode equal it in richness, and good miners who have worked on it, inform me they would rather have it than the Equator lode. It certainly has the reputation among the miners, second to no lode so far as developed, but beyond that and the character of the ore, I cannot say.

Respectfully yours,
C. H. MORGAN.

From Genl. W. H. Lessig, Surveyor General of Colorado.

SURVEYOR GENERAL'S OFFICE,
DENVER, C. T., June 10, 1870.

M. ANKER.—DEAR SIR:

In reply to your enquiries, I would state, that I am acquainted with some of the silver mines in Leavenworth mountain, Clear Creek County, this Territory, and know them to be among the most valuable of any in the Territory, and any tunnel striking those lodes, cannot be other than a most profitable enterprise.

Yours truly,
W. H. LESSIG,
Surveyor General of Colorado.

CARD.

To continue the developments of the "Anker Tunnels and Silver Mine," a moderate amount of capi-

tal is required, and for the purpose of the immediate enlistment of the required capital, *extraordinary* inducements are offered. Circulars containing full particulars, together with references, can be obtained until August 1st, 1870, from me, at Barnum's Hotel, Baltimore, Md., or if desired, will be mailed to any address. To parties desiring the original of all letters published in reference to the mines, will be shown with pleasure, by me.

M. ANKER.

[From the Marshall Silver Mining Company's prospectus.]

"Immediately above the Compass and Square lode is a group of lodes running in close proximity to each other and known by surface developments to be large, strong veins, and of immense richness; the "*Tom Thumb*" belongs to this group and has produced ore which yielded from five hundred to one thousand dollars per ton coin value, and select specimens assay even two thousand dollars per ton. The Indigo lode, belonging to this same group, produces argentiferous galena, which yields by assay, one dollar per pound. The Argentine lode, belonging to this group, has, perhaps, the *strongest paying vein that has ever been discovered in this country*. The pay vein in this lode, ranging seven to nine feet in thickness and of richness from forty to sixty dollars per ton, which can be dressed or concentrated so as to make it yield from two to three hundred dollars per ton, and regarded by experienced miners to be of very great value,

perhaps not inferior to any discovery in the country. Richness of the ores as shown by assays and treatment of a portion of the lodes in Leavenworth Mountain, is as follows, to wit:

Assay of the Tom Thumb lode of select ore, \$1,000.

Assay of the Indigo lode of select ore, \$2,000 per ton.

Assay of the Argentine lode, \$50 per ton. The average width of this vein is seven feet.

Assay of the Rocky Mountain lode, \$150 per ton.

It is not expected that these enormous results will be obtained from these ores under ordinary treatment or reduction. It is estimated by well informed metallurgists that the ores from the various mines on Leavenworth Mountain will yield, on an average under treatment, of at least one hundred and fifty dollars per ton, while the average of the great Comstock, of Nevada, is only twenty-eight and a half dollars per ton. The Equator lode on Leavenworth Mountain, first-class ore, by actual treatment in the reduction works at Newark, N. J., yielded about \$500 per ton; second quality from this vein, treated at Georgetown, C. T., by amalgamation, about \$200 per ton.

The estimates are all based on coin values.

NOTE.—The Marshall Silver Mining Company own no interest in any of the above mentioned mines except the Square and Compass.

VICE PRESIDENT'S CHAMBER,
Washington, Jan. 14, 1870.
DEAR SIR:—I have only time

amid multiplied duties, to reply, that all our party learned in regard to the Silver Mines at Georgetown, Colorado, in our brief visit there in 1868, can be found in Bowles' "Switzerland of America," published by S. Bowles & Co., Springfield, Massachusetts, of whom I suppose it can yet be obtained.

In great haste,

Respectfully, yours,

SCHUYLER COLFAX.

in number, *there is no apparent limit to their depth, one hundred feet, three hundred feet, and four hundred feet have the miners sunk shafts, and did we descend, but the veins of ore hold their course and their richness undiminished, oftenest enlarged: the chiefest development of these mines in this Territory (Colorado) lies along and up the Clear Creek and centres around its sources some forty miles up and in the mountains west of Denver.*"

Mr. Samuel Bowles, Editor of the Springfield (Mass.) *Republican*, in a letter to Hon. Schuyler Colfax, says: "Of the wealth of the regions we visited in gold and silver ore no adequate conception can be formed or expressed, the mind stands amazed before its revelations, but it does not lie around loose on the surface of the ground and is not to be exploited in brokers' offices in Wall street and 'The City. Patient and intelligent labor, in fields well chosen for their nearness to market and supplies, with capital, skill and integrity, are the inevitable laws of great success in mining. The first need of our mining is the Pacific railroad; this gained and no interest is likely to make more valuable returns for well invested capital and labor,' and in his well known work, 'Across the Continent,' page 33, he says, 'This whole vast range of mountains (The Rocky) that divides our continent, seems indeed crowded with veins of rich mineral ore, they run into and through the hill sides as the bars of a gridiron, every hundred feet; every fifty feet, every twenty feet, there is no end to them

In his "Switzerland of America," he says: "There are great tunneling schemes proposed and started at Georgetown silver district by which the various veins are to be cut deep down in their depths and the wealth brought out of a single mouth in a valley at a much cheaper rate than by digging down from the top and hauling up, 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 to two and a half millions; next year it will be at least a million more, perhaps one, one and a half or two millions, and the increase will go on indefinitely. *For the business is now taken hold of in the right way, and every year must see improvements in the ways and means of mining and treating the ores. Inexhaustible is Colorado's mineral wealth. Hence, my faith in its prosperity and its influence among the Central States of the continent.*

[From the Mining Journal, Jan. 23, 1869.]

"There has been no time since Colorado was first discovered that its mines have paid so well as at present. At Georgetown, the centre of silver mining operations, located at a point that four years ago was a wilderness, there are now five reducing works now erected of very limited capacity. Messrs. Schirmer & Bruckner, proprietors of the principal reducing works, took off on Saturday, 164 pounds troy of silver bullion, coin value \$2,646.80 (from seven tons of ore) Messrs. Hupeden, Walters & Co., have just taken from retort and shipped to New York \$4,454.65 in silver bullion from 217 tons of ore. Prof. Stewart produced 2,615 ozs of silver bullion in his small way of working by a three stamp mill during the month of November. If such results could be obtained from the Comstock Lode, Nevada, millions of capital would be eager to invest; but being in Colorado, where millions have been expended by inexperienced people in mining and worthless processes, capitalists have not the temerity to invest.

—

Bishop Simpson—the well-known bishop travelled through Colorado, and the following extract from his letter is taken from the *Christian Advocate*:

"The people who emigrated there were generally poor—to carry on lode mining requires capital—a man or Company with \$50,000 would be almost certain of realizing immense profits."

Extract from a letter written by Prof. E. N. Kent, of the New York Assay Office:

"During my stay in Colorado, I made several assays of mill products—the results of which appeared to be almost incredible. I have therefore repeated the assays since my return, upon twenty-five different samples, which I brought home with me—these assays have corroborated those made before. As to the extent of the mines of Colorado, I am not prepared to give an estimate, but as to the richness of them, I have no hesitation in saying that I believe them to be the richest ever discovered. With science, capital and a Pacific Railroad, Colorado is destined in my opinion to rival or supercede California and Australia, and become the *El Dorado of the West*."

—

From the speech of the Hon. H. P. Bennett, member of Congress, delivered in the U. S. House of Representatives, Washington:

"All things considered, there can be no safer investment than in the stocks of the bullion banks of Colorado. The vaults of these banks are filled with an inexhaustible treasure, placed on deposit there by the Almighty hand, and made subject to the draft of man. These banks are always specie paying, and their vaults are numerous, long, wide and deep. There is no risk in this business. The capitalist is but following in a beaten path. The experiment has been made by those who have gone before, and their success is inviting him to follow

quickly. Ten, twenty, fifty, a hundred, five hundred million dollars may find ready and very profitable investment, without any possibility of failure, if he will but exercise the most ordinary precaution."

Bayard Taylor says: "one theory is certain, *the mines of Colorado are among the richest in the world*, I doubt whether either California or Nevada contains a greater amount of the precious metal than this section of the Rocky Mountains. These peaks, packed as they are with deep rich veins, seamed and striped with the outcropping of their hidden wealth, are not yet half explored, and if *properly worked, will yield a hundred millions a year for a thousand years!* Colorado alone ought to furnish the amount of the national debt within the next century, all that is needed is invention, intelligence and properly organized enterprize.

From the silver mines of Colorado, Albert Reideneker, of the Polytechnic School, of the kingdom of Wurtemberg, made seventy-six assays, with the average result of \$121.64 to the ton of 2000 lbs., and deposed that said ores taken for assay were only a fair average of the ore from the mines from which they were respectively taken, and that they came from a depth not exceeding twenty feet, and in most cases from within five feet of the surface.

From thirty assays made by F. Eckfeldt, melter and refiner at the U. S. Branch Mint Denver, an average assay was obtained of \$130.28 to the ton of 2000 lbs. he deposing that the ores so assayed were but a fair average from the mines from which they were taken.

From the report of the U. S. Geological Survey of Colorado, 1869, we quote:

"There is an important question which suggests itself to one attempting to study the mines of Colorado, and that is the cause of the wonderful parallelism of the lodes, the greater portion of them taking one general direction or strike, north-east and southwest. We must at once regard the course as deep-seated and general, for we find that most of the veins or lodes are true fissures, and do not diminish in richness as they are sunk deeper into the earth. All the lodes have more or less clearly-defined walls, and some of them are quite remarkable for their smoothness and regularity.

* * * *

I would simply remark that *my observations indicate to me that the silver mines of Georgetown are very rich and practically inexhaustible*, and that under the present system of working them they are becoming daily more and more important. The amount of labor that is continually expended in opening mines and driving tunnels is immense, and their future importance as a source of wealth to the country greatly increased. * * *

There are some remarkably rich lodes, which have yielded the enterprising miners untold wealth, and some that will continue to do so. In the majority of cases, where proper management and economy have been employed, the mines have been a great source of wealth to the miner. It is not necessary to enter into the causes of the wonderful failures and swindling operations which have brought Colorado into such disrepute in the past. It is sufficient for me to state my belief that the mining districts of Colorado *will yet be regarded as the richest the world has ever known.*

The French Commissioner, Professor *Simonin*, stated "after an examination of the Silver mines of Colorado, that the geological characteristics of their formation gave indubitable evidences of great wealth; that the ores were true Silver ores, and that the mines were almost identical with those of Mexico, of which they were a continuation."

CAMBRIDGE, MASS.,

January 17, 1870.

DEAR SIR:—Mr. Agassiz begs me to acknowledge your favor of the 12th, and to say that he is prevented by illness from answering it himself. He desires to add that he has visited Colorado for scientific purposes, and has seen the richness of its resources.

Very respectfully, yours,

E. C. AGASSIZ.

[From the *Rocky Mountain Herald*.]

"The products of our mines, as known by statistics, gives a gratifying exhibit of the progress of this branch of our industry. The amount of bullion produced during 1869 is more than double the product of 1868; and although only about one-fifth of the product of the mines passes through the mint, the deposits in the Branch Mint at Denver shows an amount of \$1,193,432.03 for 1860 against \$565,506.56 for 1868.

[From the *Colorado Miner*.]

We have a magnificent specimen from the Creole Lode. This specimen, obtained from near the surface, contains galena, green and blue carbonate of copper, and, we think, grey copper, although the decomposed nature of the material would not allow that point to be determined with certainty. The "Creole" is situated in Leavenworth Mountain, between the Argentine and Troy lodes, and has a shaft twenty feet in depth. The crevice of the lode is over six feet in width, and in the bottom of the shaft there is a mineral vein of about eight inches in thickness, of ore very similar to that on the surface assaying from \$500 to \$1,100 per ton. We understand that the owners of this lode purpose to continue the working of the same. The property is in a section noted for the richness of the ores contained in the lodes, and we believe that development will prove the "Creole," to be second to no vein in the district wherein it is located.

Extract from address before the Colorado Agricultural Society, by Hon. Bela M. Hughes.

Our mines, so long the subject of wild speculation and experiment, have at last an assured value, and our miners, so long the foot-ball of fortune, the victims of patent processes and plausible schemes, have reached a satisfactory, profitable and enduring basis. * * * * *

After drifting about so long in the sea of doubt, the haven of security in full view, our people, like mariners just escaped from an ocean tempest renew their strength, and move on to that rich reward so well deserved by their indomitable courage in adversity, their patient waiting of events, and unyielding confidence in the value of their property. The stubborn ores, at the command of science, at last give up the precious metals held by them, and is now beyond all doubt a fact, to be disputed no more than the light of the sun, that our mountains may challenge all the world, as they did lately, and triumphantly at Paris, for a comparison of ores.

These ores of gold and silver in our mountains we all do know to be inexhaustible, while their average value far exceeds that of any body of mines in any other country; the methods by which they are now reduced being certain as to profitable results, of comparatively cheap construction and operation, and within the reach of all who possess good lodes.

A change, however, taking its place in our system. The time has come at last when the mining for ores, and their reduction, are pro-

claimed properly to be separate branches of industry. We witness now the erection of mills devoted to the new order of things, to the purchase of ores at the shaft and the tunnel, for the account of their enterprising and skilful proprietors. From this division of labor and care, we may augur greater attention to details, and stricter economy in expenditures; indeed, the grandest consequences to that hardy meritorious class of our citizens, who, armed with pick and shovel, have compelled the reluctant mountains to surrender their richest treasures to the resistless miner.

While many of our lodes of gold and silver, by fire assay, yield an amount per ton fairly astounding, a careful examination of the experiments on the great body of these ores, demonstrates that they will yield, under the reduction process, not less than one hundred and fifty dollars per ton. When it is considered that this class of ores, are really boundless in extent, who can be bold enough to question the enormous wealth of Colorado, to cast a doubt upon her future, or calculate the mighty results to flow to our people from well directed skill and persistent labors?

[From the New York Tribune.]

"At the Paris Exposition where the glittering ore wealth from the richest and deepest mines in the world was on exhibition, Colorado, in presence of princes, savans and statesmen, was awarded the grand medal for being the richest mineral country on earth."

Is Mining Profitable in Colorado?

This query is best answered by the following statement of facts:

The Black Hawk Company running 800 lb. stamps, crushed 10,000 tons of rock from the Gregory mine during the year, producing \$275,000; of this \$165,000 went to pay expenses, leaving \$90,000 profit; the extra expense incurred on account of bad drainage was \$27,000.50.

The Sensenderfer Company took out in eighteen months, bullion to the value of \$155,000, of which \$110,000 has been paid to the stockholders in dividends, showing the expense to have been \$45,000 less than 30 per cent. of the gross yield.

The Smith & Parmalee Company, in ten months, yielded \$76,000, but we have no estimate of their expenses during that period.

The Wilson & Cass Mining Company near Georgetown, commenced paying a monthly dividend of two per cent. coin in January 1st, 1870.

The Schneider Mining Company of Trenton, N. J., have been paying

since their organization an annual dividend of thirty-six per cent. in coin.

The Equator Mining Company—located on Leavenworth Mountain, have been paying an *annual dividend of one hundred per cent.* The net yield of their mine in the past seven months was \$77,000.

The Brown Mining Company paid a dividend of 12 per cent. coin the first year of their organization, and twenty-four per cent. in coin the second year.

The Terrible mine yielded \$300,000 in two years. We have no estimate of the expenses, but it will suffice to know it is a paying mine when the sum of \$500,000 in coin was paid for 650 lineal feet on the lode by British capitalists within the past three months.

The President of the Marshall Mining Company informs the writer, that when their company was organized, their stock was sold at \$42.50 per share, par value \$100.00, and subsequently sold at par, and that now there is no stock of that company for sale.

The Wilson & Cass Reduction Company, at Georgetown, Colorado, pay the following prices for Silver Ores, for Sulphuret Ores, where zinc blend predominates:

For ore assaying	40 lbs. silver	\$10
" " "	50 " "	15
" " "	60 " "	20
" " "	60 to 200 lbs. silver,	40 lbs. less than assay.

Ores of higher value subject to private contract. Galena Ores carrying not less than 15 per cent. Galena:

For ores assaying	40 lbs. silver	\$15.00
" " "	50 " "	22.50
" " "	60 " "	30.00
" " "	60 to 200 " "	30.00 less than assay.
" " "	210 to 300 " "	25.00 " " "
" " "	310 to 400 " "	20.00 " " "

