

THE GOLD AND SILVER MINES OF THE WEST.

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THE most important event in the history of mining in the United States was the discovery of gold in California, which led to the rapid development, not only of a new industry, but of a new empire. The settlement of the Pacific slope was making but slow progress under the inducements of a scanty commerce in furs and hides. The liberal grants offered by the Government to agricultural pioneers in Oregon, had attracted to the Willamette Valley and other favored points in that Territory a limited population; but the government of the Mexicans in California was positively unfavorable to enterprise. It is true that gold was known to exist in the country. Rumors of it were current among the trappers, and placers had actually been worked in what is now Los Angeles county; but the *padres* of the neighboring mission of San Fernando had discouraged the business as demoralizing to their flocks; and the existence of the precious metal was not widely known. Still less was its distribution northward suspected. The discovery of gold, January 19, 1848, at Sutter's sawmill, on the south fork of the American River, afterward famous as Coloma, in Eldorado county, was the beginning of the new epoch. This discovery was made by James Wilson Marshall, a partner in the mill, who observed in the *debris*, washed down by the tail-race, a glittering fragment of a mineral unknown to him. Suspecting it to be gold, he sought for further specimens, and obtained, in the course of a few days, several ounces of it. Tests subsequently made established its character; and the news spread with great rapidity, arousing an excitement throughout this country, and even in European countries, which has never been paralleled. March 15, 1848, a San Francisco newspaper contained a paragraph giving the tidings. In May, the same paper announced the suspension of publication; and the editors and workmen, imitating their fellow-citizens of every class, went off to the diggings. Two years later, the population of California had risen from 15,000 to 100,000, and the gold-bearing zone extending along the west flank of the Sierra to Oregon, had been put under active exploitation. The placers of the southern Counties of Oregon were opened in 1852; those of the John Day and Powder rivers in 1860. Gold was discovered in Idaho, on the banks of the Pen D'Oreille River, in 1852; but the active development of the Territory dates from the discovery of the Oro Fino mines in 1860, and the opening, two or three years later, of the rich Boise Basin. Montana was found to be auriferous in 1858 (possibly earlier), and in 1860 placer-mining was inaugurated. In 1862, a considerable immigration from Pike's Peak (then the general name for Colorado) set in. The gulches of Colorado began to be worked in 1859; and that Territory was rapidly settled, chiefly by immigrants from the East—in contrast to Nevada, Idaho, Oregon, and Arizona, the pioneer population of which was largely an overflow of the restless enterprise of California. In Arizona, gold is said to have been discovered in 1858 on the Gila River. In Nevada and Utah, no gold placers of importance have been found, though the metal is not entirely absent from the mountain ravines, and in some instances, particularly at the Comstock lode, in Nevada, it constitutes a considerable portion of the value of argentiferous ores.

The first form of gold-mining in these States and Territories was that of diggings. The miner loosened the auriferous soil with a pick, and shoveled it into a pan, from which, by skillful manipulation in water, the clay, sand and pebbles were removed, and the heavier particles of gold-dust left behind. The first improvement on the pan was the rocker; afterward the "tom" was introduced, from Georgia, and with it the sluice. In 1850 and 1851 the two latter devices began to be generally employed, in consequence of the greater convenience of water-supply afforded by the mining ditches. The first ditch of importance was made in 1850; and its success so stimulated imitation that, in the course of eight years, six thousand miles of mining canals had been constructed, at a cost of more than \$15,000,000, in California alone.

The development of the gold-mining industry was attended with much excitement, and many fluctuations. A phenomenon more frequent in early days than at present was that of the "stampedes" or sudden migrations of whole communities, on receipt of tidings of rich discoveries in new localities.

Perhaps the most remarkable of these was the so-called Fraser fever in 1858, when, in the course of four months, 18,000 men, nearly one-sixth of all the voters in California, went to Fraser River in British Columbia, expecting to find another virgin gold-field and to restore the "flush times" of 1849. The excitement reached its climax before any gold had been received from the new diggings in San Francisco, and was founded wholly upon rumors and reports of rich deposits on a bar of Fraser River, and upon the presumption that large and valuable placers would be found in the upper basin of that stream. The first discoveries were made in the spring; and the fever died out as suddenly as it had arisen, five-sixths of the adventurers returning before the end of the year.

At the present time the resources of the Pacific States and Territories are sufficiently well known to prevent these miscellaneous and excited migrations of population. It is not likely that new deposits will be discovered, offering large returns to individual labor without capital or machinery. The present chief sources of the gold product of the West are three: first, old and well-known placer-mining regions, where the ground continues to be worked with sluices and to pay a reasonable profit to miners, who usually operate in partnerships and companies (as do the Chinese); secondly, deep placers and cement deposits, which are worked by drifting and blasting, and by the hydraulic process, usually in the hands of powerful and wealthy joint-stock companies; and thirdly, quartz mines, operated by individuals or companies.

The following table, offered as an approximate estimate of the gold product of the United States since 1847, is the result of careful study of numerous treatises and partial statistics, in the light of much personal observation of the principal producing districts. Down to 1862 it follows the table compiled by J. Arthur Phillips, and published in his

"Gold and Silver." From 1862 to 1866 the production of California is calculated by deducting from the Express receipts of uncoined treasure at San Francisco from "the northern and southern mines," the receipts from Nevada, and adding 10 per cent to the remainder, to cover amounts shipped in private hands. From 1866 to 1873 inclusive the reports of the United States Mining Commissioner have been followed as a general authority; but as these do not separate the product of gold from that of silver, the division has been made by estimate, based on the known conditions and relations of the industry of different localities. Under the head of "Other States and Territories" is included the product of gold from Oregon, Washington, Idaho, Montana, Colorado, etc., and one-third the product of the Comstock lode in Nevada, that being the average proportion of gold by value in the Comstock bullion. The values are given in United States gold coin.

ESTIMATE OF GOLD PRODUCT OF THE UNITED STATES SINCE 1847.

Years.	California.	Other States and Territories.	Total.	Years.	California.	Other States and Territories.	Total.
1848	\$10,000,000		\$10,000,000	1862	\$34,700,000	\$ 4,500,000	\$39,200,000
1849	40,000,000		40,000,000	1863	30,000,000	10,000,000	40,000,000
1850	50,000,000		50,000,000	1864	26,600,000	19,500,000	46,100,000
1851	55,000,000		55,000,000	1865	28,500,000	24,725,000	53,225,000
1852	60,000,000		60,000,000	1866	25,500,000	28,000,000	53,500,000
1853	65,000,000		65,000,000	1867	25,000,000	26,725,000	51,725,000
1854	60,000,000		60,000,000	1868	22,000,000	26,000,000	48,000,000
1855	55,000,000		55,000,000	1869	22,500,000	27,000,000	49,500,000
1856	55,000,000		55,000,000	1870	25,000,000	25,000,000	50,000,000
1857	55,000,000		55,000,000	1871	20,000,000	23,500,000	43,500,000
1858	50,000,000		50,000,000	1872	19,000,000	17,000,000	36,000,000
1859	50,000,000		50,000,000	1873	18,000,000	17,000,000	36,000,000
1860	45,000,000	\$2,000,000	46,000,000				
1861	40,000,000	3,000,000	43,000,000	Total	\$986,800,000	\$252,950,000	\$1,239,750,000

Silver-mining in the West, apart from the early operations of the Spaniards in New Mexico and perhaps in Arizona, may be said to date from the discovery of the Comstock vein in 1859. This vein is in Nevada, on the east flank of the Sierra. According to some accounts, it was discovered as early as 1857, and the placer-diggings in the cañon below its outcrop were found as early as 1849 and worked by a small population from 1852. The gold contained a large proportion of silver, in some claims nearly one-half the value of it—a circumstance which was considered a misfortune by the miners, since it reduced the value per ounce of the gold-dust as currency from \$17 or \$18 to \$10 or \$12. In the vein itself the proportion of gold has usually been about one-third of the total value of the bullion. The revelation that the gray sulphuret of silver from the vein was a rich ore worth thousands of dollars per ton gave rise to perhaps the most intense excitement that has ever swept through the West, since the first discovery of gold. As usual in such cases, many older districts were suddenly depopulated and the mining industry was sadly demoralized. The State of Nevada was rapidly overrun by pioneers, and the silver districts of Esmeralda, Lander, and Humboldt counties, were explored and developed with an energy which proved in many cases premature. The Washoe excitement maintained for three years its predominance; but all the silver-mining enterprises of the State shared in the encouragement afforded by the first success of the mines of Virginia City. In 1863 the panic swept away some thousands of wild-cat speculations, and the Comstock mines themselves fell greatly in nominal value. A ruinous litigation, involving millions of dollars of expenditure, assisted this reaction. The discovery within the last three years of immense bodies of ore at the depth of more than 1500 feet below the surface in the Comstock lode, has brought the product of that vein to a figure not inferior to those of its best days. The silver-mining districts of Owyhee in Idaho, Unionville, Reese River, Belmont, Pioche, White Pine, and Eureka in Nevada, continue to be productive. The latter district and the silver districts of Utah and some of Montana and New Mexico, as well as that of Cerro Gordo in California, produce argentiferous galena and carbonate of lead, which are reduced by smelting in shaft furnaces. The Washoe ores and those of Pioche are treated by the so-called Washoe process, consisting of crushing in stamp-mills and subsequent amalgamation in pans. The ores of Reese River, Belmont, and Unionville in Nevada, and of Georgetown, Colorado, are treated by preliminary roasting with salt, and subsequent amalgamation. From Colorado and Utah considerable quantities of rich ore are shipped to American and foreign smelting works.

THE TOTAL PRODUCT OF SILVER IN THE UNITED STATES SINCE 1848 IS ESTIMATED AS FOLLOWS:

From 1848 to 1858 inclusive, \$50,000 per annum	\$550,000	1866	\$10,000,000
1859	100,000	1867	13,500,000
1860	150,000	1868	12,000,000
1861	2,000,000	1869	13,000,000
1862	4,500,000	1870	16,000,000
1863	8,500,000	1871	22,000,000
1864	11,000,000	1872	25,750,000
1865	11,250,000	1873	36,500,000
		Total	\$186,800,000

The mining districts of the Pacific Slope are generally ranged in parallel zones following the prevailing direction of mountain ranges. This generalization, first pointed out by Prof. Blake, has been more fully illustrated and connected with the geological history of the country by Mr. Clarence King, who says:

"The Pacific coast ranges upon the west carry quicksilver, tin, and chromic iron. The next belt is that of the Sierra Nevada and Oregon Cascades, which, upon their west slope, bear two zones, a foot-hill chain of copper mines, and a middle line of gold deposits. These gold veins and the resultant placer mines extend far into Alaska, characterized by the occurrence of gold in quartz, by a small amount of that metal which is entangled in iron sulphurets, and by occupying splits in the upturned metamorphic strata of the Jurassic age. Lying to the east of this zone, along the east base of the Sierras, and stretching southward into Mexico, is a chain of silver mines, containing comparatively little base metal, and frequently included in volcanic rocks. Through Middle Mexico, Arizona, Middle Nevada, and Central Idaho is another line of silver mines, mineralized with complicated association of the base metals, and more often occurring in older rocks. Through New Mexico, Utah, and Western Montana lies another zone of argentiferous galena lodes. To the east, again, the New Mexico, Colorado, Wyoming, and Montana gold belt is an extremely well-defined and continuous chain of deposits."

In my report as United States commissioner of mining statistics, rendered March, 1871, I remarked upon this subject as follows:

"These seven longitudinal zones or chains of mineral deposits must not, in my opinion, be held to constitute a complete classification. The belts of the Coast Range and the west slope of the Sierra are well-defined, both geologically and topographically; but it is not so easy to separate into distinct groups the occurrences of gold and silver east of the Sierra. For instance, the gold of Eastern Oregon, Idaho, and Western Montana, together with such occurrences in Nevada as those of the Silver Peak and New Pass districts, and numerous instances of sporadic occurrence of particular ores of silver or argentiferous base metals, cannot be brought within the classification above given. Either more zones must be recognized, or a greater mineralogical variety must be acknowledged in those already laid down. The latter alternative is, I think, the more reasonable. According to the principles set forth in a discussion of mineral deposits in my last report, it appears evident that the agencies which affect the general constitution of geological formations are far wider in their operation than those which cause the formation of fissures; and that the causes influencing the filling of fissures are still more local in their peculiarities than those which form the fissures themselves. Thus, of the area covered by rocks of a given epoch, more or less uniform in lithological character, only a small portion may have been exposed to conditions allowing deposits of useful minerals, even when such deposits are contemporaneous, as in the case of coal. Still more limited is the field for the formation of fissures; but it must be freely confessed that in the case before us, the corrugation of half the Continent into parallel mountain ranges offers good grounds for the expectation of vast longitudinal systems of fissures. When we come to consider the filling of these fissures, however, it is evident that the mineralogical character of the vein-material must vary, to some extent, as to the gangue, but to a still greater extent as to the nature of the ores. Even single mines, in the course of extensive exploitation, have produced ores differing as widely as do those of the different zones enumerated by Mr. King. I am, in fact, strongly inclined to consider freedom from base metals, for instance, a peculiarity due in many cases to secondary processes, and not to be relied upon as characteristic for single veins even, to say nothing of whole groups, districts, and Continental zones.

"Nevertheless, the generalizations of Prof. Blake and Mr. King on this subject are highly interesting and valuable. The criticism here made is not in opposition to their views so much as in qualification of a possible rash application on the part of the general public. The zonal parallelism does exist, though in a somewhat irregular way; and it is clearly referable, as these writers have shown, to the structural features of the country, the leading feature of which is the longitudinal trend of the mountain ranges.

"Subordinate to this trend (or, more strictly, resulting from the same causes as produced it) appear the predominant longitudinal strike of the great outcrops of sedimentary rocks, the longitudinal axes of granite outbursts, and, finally, the longitudinal vents of lava overflows and the arrangement of volcanoes in similar lines. It is evident that in crossing the country from east to west we traverse a series of different formations, while, by following routes parallel with the main mountain ranges, we travel upon the continuous outcrops of the same general age.

"The distribution of mineral deposits east of the Rocky Mountains follows somewhat different laws. Here we have but one longitudinal range—that of the Alleghenics, which is accompanied by a gold-bearing zone of irregular extent and value. In the Southern States the strata flanking this range present a remarkable variety of mineral deposits. On the eastern slope of the Rocky Mountains, again, occurs what may perhaps be denominated a zone or longitudinal series of coal-fields. But between these mountain boundaries the geological formations of the country cluster, as it were, around centers or basins. We have such a group in Michigan, another in the Middle States, and a third in the Southwest.

"The deposits of the different metals, ores, and useful minerals, in the country east of the Rocky Mountains, vary widely in age. The ores of gold, copper, and iron, in the pre-Silurian schists of the South; the galena and cobalt ores of the Southwest, and the copper

ores of Lake Superior, in the lower Silurian rocks; the argillaceous iron ores of New York, and other States west of New York, in the Upper Silurian, and the salines of the same group; the bitumen, salt, coal and iron ores of the Sub-carboniferous; the coal and iron of the Carboniferous; the coal, copper, and barytes of the Triassic; the lignites of the Cretaceous, and the fossil phosphates of the Tertiary period, are instances which may serve to show how great is this variety. It is not within the province of this report to discuss the mineral deposits of the Mississippi Basin, the Appalachian Chain, or the Atlantic Coast. I shall content myself with brief mention of two points. The first is the greater relative age of the metalliferous deposits as compared with those of the inland basin and the Pacific slope. On this side the period of greatest activity in such formations was over before it began in the West. The great gold and silver deposits beyond the Rocky Mountains appear to be post-Devonian, post-Jurassic, and even Tertiary in their origin. The vast volcanic activity which affected so wide an area in California, Oregon, Washington, Idaho, and Nevada, is not represented in the East.

"The other point is the peculiar relative position of our coal and iron deposits. This was eloquently described by Mr. Abram Hewitt, United States Commissioner to the Paris Exposition, in his admirable review of the iron and steel industry of the world. I cannot do better than quote his forcible words:

"The position of the Coal Measures of the United States suggests the idea of a gigantic bowl filled with treasure, the outer rim of which skirts along the Atlantic to the Gulf of Mexico, and thence, returning by the plains which lie at the eastern base of the Rocky Mountains, passes by the great lakes to the place of beginning, on the borders of Pennsylvania and New York. The rim of the basin is filled with exhaustless stores of iron ore of every variety, and of the best quality. In seeking the natural channels of water communication, whether on the north, east, south, or west, the coal must cut this metalliferous rim; and in its turn, the iron ore may be carried back to the coal, to be used in conjunction with the carboniferous ores, which are quite as abundant in the United States as they are in England, but hitherto have been left unwrought, in consequence of the cheaper rate of procuring the richer ores from the rim of the basin. Along the Atlantic slope, in the highland range, from the borders of the Hudson River to the State of Georgia, a distance of one thousand miles, is found the great magnetic range, traversing seven entire States in its length and course. Parallel with this, in the great limestone valley which lies along the margin of the coal-field, are the brown hematites, in such quantities at some points, especially in Virginia, Tennessee, and Alabama, as to fairly stagger the imagination. And finally, in the coal basin is a stratum of red fossiliferous ore, beginning in a comparatively thin seam in the State of New York, and terminating in the State of Alabama in a bed fifteen feet in thickness, over which the horseman may ride for more than one hundred miles. Beneath this bed, but still above water level, are to be found the coal-seams, exposed upon mountain sides, whose flanks are covered with magnificent timber, available either for mining purposes or the manufacture of charcoal iron, passing westward, in Arkansas and Missouri, is reached that wonderful range of red oxide of iron, which, in mountains rising hundreds of feet above the surface, or in beds beneath the soil, culminates at Lake Superior in deposits of ore which excite the wonder of all beholders; and returning thence to the Atlantic slope, in the Adirondacks of New York, is a vast, undeveloped region, watered by rivers whose beds are of iron, and traversed by mountains whose foundations are laid upon the same material. In and among the coal-beds themselves are found scattered deposits of hematite and fossiliferous ores, which by their proximity to the coal, have inaugurated the iron industry of our day. Upon these vast treasures the world may draw for its supply for centuries to come, and with these the inquirer may rest contented, without further question—for all the coal of the rest of the world might be deposited within this iron rim, and its square miles would not occupy one-quarter of the coal area of the United States."

"This vivid description rests upon a geographical rather than a geological grouping. But it is none the less intimately connected with the underlying geological facts. Its strongest application is, however, economical. If any material thing may stand as the type of force, it is coal, the deposits of which may well be called vast storehouses of power—the product of solar activity through uncounted years—laid up for the use of man; and iron, on the other hand, may symbolize the inert, dead matter, awaiting the touch of power to wake it into efficient life. These are prime elements in our universe of industry. Take them away and our present civilization is annihilated. Put them together in the hand of an intelligent and mighty nation, and that nation could recall the world from the chaos of barbarism. But they need each other; and it is in the wonderful combination of both, as well as the exhaustless abundance of each, that America finds sure promise of enduring power.

"Thus East and West bear witness of our great inheritance of natural wealth. Every period of geological change has been laid under contribution to endow with rich legacies some portion of our land. Our territory epitomizes the processes of all time, and their useful results to man. Divided, yet in a stronger sense united, by mountain chains and mighty rivers, our diversified mineral resources may figuratively represent, as I firmly believe they will literally help to secure and maintain, our characteristic national life—a vast community of communities, incapable alike of dissolution and of centralization; one, by mutual needs and affections, as the Continent is one; many, by multiform industries and forms of life, as the members of the Continent are many."