THE GOLD AND SILVER MINES OF THE WEST.

By Prof. Rossiter W. Raymond, U. S. Commissioner of Mining Statistics.

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 made possible by the reports of a succession of muck operators and adventurers, chief of whom were James Wilson Marshall, a partner in the mill, who discovered the auriferous soil on the north fork of the American River, afterward named Columbia, in El Dorado county, in the spring of 1848. This discovery was made by James Wilson Marshall, a partner in the mill, who observed that the soil was washed down by the tail-race, a glittering fragment of a nugget of gold. Marshall failed to recognize the magnitude of his discovery, but his report was accompanied by a paragraph giving the mining results for the first six months of 1848. On June 23, 1848, the same paper announced the suspension of publication; and the editors and workmen, exhibiting their fellowship, went off to the diggings. Two years later, the population of California had increased from 15,000 to 100,000, and the gold-mining area extending along the west flank of the Sierra to Oregon, had been put under active exploitation.

The placer workings in the West, from the earliest operations of the Spaniards in New Mexico and perhaps in Arizona, may be said to date from the discovery of the Comstock lode in 1852. The Comstock lode is located in Nevada, on the banks of the Pen D'Oeille River, and in 1852, the placer workings were commenced. In 1853, a considerable immigration from Idaho followed the discovery of the Comstock lode, and in 1854, the development of the Comstock lode was inaugurated. In 1855, the Comstock lode was worked by drifting and blasting, and by the hydraulic process, usually with capital or machinery. The present chief sources of the gold product of the West are the Comstock lode in Nevada, the placer workings along the west flank of the Sierra to Oregon, and the silver districts of the western United States. The placer workings in the West, from the earliest operations of the Spaniards in New Mexico and perhaps in Arizona, may be said to date from the discovery of the Comstock lode in 1852. The Comstock lode is located in Nevada, on the banks of the Pen D'Oeille River, and in 1852, the placer workings were commenced. In 1853, a considerable immigration from Idaho followed the discovery of the Comstock lode, and in 1854, the development of the Comstock lode was inaugurated. In 1855, the Comstock lode was worked by drifting and blasting, and by the hydraulic process, usually with capital or machinery. The present chief sources of the gold product of the West are the Comstock lode in Nevada, the placer workings along the west flank of the Sierra to Oregon, and the silver districts of the western United States. The placer workings in the West, from the earliest operations of the Spaniards in New Mexico and perhaps in Arizona, may be said to date from the discovery of the Comstock lode in 1852. The Comstock lode is located in Nevada, on the banks of the Pen D'Oeille River, and in 1852, the placer workings were commenced. In 1853, a considerable immigration from Idaho followed the discovery of the Comstock lode, and in 1854, the development of the Comstock lode was inaugurated. In 1855, the Comstock lode was worked by drifting and blasting, and by the hydraulic process, usually with capital or machinery. The present chief sources of the gold product of the West are the Comstock lode in Nevada, the placer workings along the west flank of the Sierra to Oregon, and the silver districts of the western United States.

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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 spinal ridges, tin, and chronic iron.

The next belt is that of the Sierra Nevada and Oregon Cascades, which, upon their west slope, have two zones, a middle one of intrusive ores, and a middle line of volcanic rocks. These gold veins and the resultant placer deposits extend far into Alaska, characterized by the occurrence of gold in quartz, by a small amount of that metal which is contained in iron sulphides, and by occurring upon the upturned metamorphic strata of the Jurassic age. Lying to the east of this zone along the coast base of the Sierra, and stretching southward into Mexico, is a chain of silver mines consisting comparatively little base metals, and frequently included in volcanic rocks. Through the latter zone, 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 other rocks. Through New Mexico, Utah, and central Montana lies another zone of argentiferous galena lodes.

In 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, 1875, 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 occurrence of gold 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 have but a secondary action 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 named by rocks of various kinds, it will of course be impossible to paragraph them in a construction of a geologic history, unless 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 is it the case for the formation of fissures; but it must be freely confessed that in the case before us, the correction of half the Continental forma parallel mountain ranges offers good grounds for the explanation of various 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 may vary to some extent, as to the grangen, 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 groups exemplified by Mr. King. I am, in fact, strongly inclined to consider freedom from base metals for instance, a primary one in many cases, secondary phenomena, and not to be relied upon as characteristic for single veins even, to say nothing of whole groups, districts, and Continental zones.

Nevertheless, the formalizations 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 as much as in qualification of a possible such application on the part of the general public. The actual justification does exist though in a somewhat irregular way; and it is clearly refutable, 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.

The general trend (or, more accurately, the resulting from the same causes as produced it) appear the predominant longitudinal strata of the great outcrops of sedimentary rocks the longitudinal axis of greater arches; and, finally, the longitudinal veins of iron ore 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 Alleghanies, which the parallel mountain ranges, with secondary valleys of the same general age. Lying to the east of this zone, along the coast base of the Sierra, and stretching southward into Mexico, is a chain of silver mines consisting comparatively little base metals, and frequently included in volcanic rocks. Through the latter zone, 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 other rocks. Through New Mexico, Utah, and central Montana lies another zone of argentiferous galena lodes.

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The distribution of mineral deposits east of the Rocky Mountains follows somewhat different laws. Here we have but one longitudinal range—that of the Alleghanies, 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 designated a zone of longitudinal series of coal-fields. But between these mountain boundaries the geological formations of the country clusters, 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 mineral materials, in the country east of the Rocky Mountains, vary widely in age. The ores of gold, copper, and iron, in the pre-Silurian beds south of the South, the gneiss and dolomite beds of the South-west, and the copper ores of Lake Superior, in the lower Silurian rocks; the sulphuriferous iron ores of New York, and other States west of New York, in the Upper Silurian, and the siliceous beds of the same group; the blinums, salt, coal and iron ores of the Sub-carboniferous; the coal and metal of the Carboniferous; the coal, copper, and iron ores of the Tertiary; and 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 basins and the Pacific Slope. On this side the point of greater 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-Cretaceous, 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. Albright Hewitt, United States Commissioner to the Paris Exposition, in his admirable review of the iron and coal industry of the world. I cannot do better than quote his felicitous 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 exhaustion stony iron ore of every variety, and of the best quality. In seeking the normal channels of water communication, whether on the north, east, south, or west, the coal must cut this metaliferous rim; and in its turn, the iron ore may be carried back to the coal by use in conjunction with the carboniferous one, which are quite as abundant in the United States as they are in England, but hitherto have been left unnoticed, 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 eastern States in its length and course. Parallel with this in the great Eastern coal basin is a range of red sandstones and coals, stretching from the Ohio River to the Gulf of Mexico, and thence, returning by the plains which lie at the eastern base of the Rockies, with magnificent timber, available either for mining purposes or the manufacture of chemical iron, passing southwest, in Arkansas and Mississip, it 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, constitutes at Lake Superior deposits of ore which excite the wonder of all beholders; and remaining thence to the Atlantic slope, in the Adriatic Alps of New York; is a vast, undeveloped region, watered by rivers whose beds are 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 limonite 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 those the industry may extend, without limit, as far as the coast line 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."