questionable authority,—in 1854, 1858, and 1870. Smoke and steam are said to have been frequently seen rising from the summit of St Helens. It is not easy to reconcile the statements which have been made in regard to the activity of Mount Hood. Eruptions of this mountain have been reported as having taken place; but the present writer in 1867 made inquiries of persons having it in full view, without being able to procure satisfactory evidence of any activity similar to that of Baker and St Helens, at least within the preceding twenty or thirty years. There is no evidence of any similar activity of Mount Rainier ; but, according to Stevens and Van Trump, who were the first to reach the summit of this mighty cone, jets of steam issue from the crater at the summit in sufficient quantity to keep a party warm.

VI. To the west of the Sierra Nevada and the Cascade range is another chain of mountains, which, although greatly inferior to these in some important respects, is still of very considerable interest—the Coast ranges of California and Oregon. They differ in being newer geologically, of less elevation, less extensively and regularly broken through by granitic axial masses, and less covered by volcanic overflows. The upheaval of the Sierra took place at the close of the Jurassic epoch, whereas that of the Coast ranges was the result of agencies operating during the later portion of the Tertiary, and continuing down to a very recent date—namely, into the post-Pliocene. The greater part of these ranges south of the Bay of San Francisco is of Miocene age, although even there extensive areas of Cretaceous rocks exist, and especially on the eastern side of this mountain belt, in the so-called Monte Diablo range. Farther north, beyond the bay, rocks of this age become more and more predominant, the areas of Tertiary being com­paratively narrow and unimportant. A remarkable feature of the geology of the Coast ranges is the extent to which these newer formations have been metamorphosed, so that by some observers these altered rocks have been described as belonging to the very oldest part of the geological series. The prevalence of serpentines and obscure serpentinoid rocks in great masses in these altered portions is also a fact of much geological interest. These altered rocks, and especially such of them as have been more or less silicified, are the home of the ore of quicksilver, mines of which metal have been opened and extensively worked at numerous points both south and north of the Bay of San Francisco. Chromic iron is also associated with these magnesian rocks, and at a few points is present in considerable quantity. Gold has been washed at numerous points in southern California, with some success. An important member of the Miocene series south of the Bay of San Francisco is the bituminous slate, which in places is several thousand feet in thickness, and often contains a large quantity of bituminous matter, which, at some localities, especially near Santa Barbara and Los Angeles, has oozed out upon the surface and given rise to areas of semi-liquid material, called “brea” by the Mexican Spanish, which has occasionally hardened and formed large deposits of asphalt. Many attempts have been made to bore into these bituminous rocks for petroleum, but these efforts have never been successful enough to furnish even the home market with a supply of oil suitable for illuminating purposes. Coal is found at numerous points in the Coast ranges, both in California and in Oregon, and of both Cretaceous and Miocene age. The most im­portant mines are those in Washington Territory, near Seattle ; and there is also a valuable and quite extensive coal-field on Van­couver Island, near Nanaimo, also in the Cretaceous. The most important and best-developed portion of the Coast ranges is that opposite or to the west of the valleys of the San Joaquin and Sacra­mento rivers. Both south and north of the extremities of these valleys the masses of the Coast and Sierra mountains coalesce, or be­come topographically so united that any distinction other than geo­logical is impossible. This uniting of the two ranges which takes place in northern California is continued through southern Oregon, where the topography is quite as complicated and difficult as in those parts of California where the two ranges come together. But in the last-named State the structure of the Coast ranges has been pretty well worked out by the California State Geological Survey, although the maps unfortunately remain unpublished, while in Oregon almost nothing has been done in this direction. Where best developed—in California—the Coast ranges have a length of fully 400 miles, and a breadth varying from 40 to 70 according to the varying position of the coast-line. The mass of mountains covering this area is made up of numerous subranges, some of which are very distinct and well-marked, while others are much less so. These all along the north-west and south-east trending portion of the coast, or from Point Conception (34° 15' N. lat.) to Cape Mendocino, run nearly in the same direction as that coast. Their altitude above the intervening valley, in the vicinity of the Bay of San Francisco, varies from a few hundred to 3000 or 4000 feet. Prominent points near that bay are Monte Diablo (3856 feet), Mount Hamilton (4440), Mount Helena (4343), and Mount Bache (3790). As we go north and south from the region of the Bay of San Francisco, we find the heights of the dominating peaks increasing. Mount Ballev, about 150 miles north of San Francisco, has an elevation of 6357 feet. About the same distance south of that city is San Carlos Peak (nearly 5000 feet). Portions of the range south of the Bay of San Francisco are of extremely recent date, as great masses of rock of Pliocene age, hundreds of feet in thickness, are seen to be turned up at a high angle. The ranges along that portion of the coast which has an east and west trend, on Santa Barbara Channel, have themselves the same trend, and are high and precipitous. Of these the Santa Inez is the most conspicuous, having along its crest points nearly or quite 4000 feet high. The Santa Monica, another east and west trending range, farther east and south, is remarkable as being made up of Miocene stratified rock, and having a central well-defined linear axial mass of intrusive granite, driven through it like a wedge, by which the range has been raised to a high angle near the eruptive rock, where it is extensively shattered and metamorphosed, and from which, in each direction transverse to the chain, it gradually and rapidly recovers its normal character and nearly horizontal position. Farther south along the coast the ranges are much broken, and central dominating points rise to very considerable elevations. The San Bernardino and San Jacinto Mountains are two of these elevated central masses, each rising to about 11,000 feet. The precise relations of these high masses to the Coast ranges and Sierra cannot as yet be stated. The region of the Coast ranges in California is one of very unequal attractiveness. Portions are rough and for­bidding, being covered by a dense thorny undergrowth, locally known as “chaparral”; other portions are in the highest degree fertile and picturesque, and have a remarkably mild and uniform climate. The slopes and hills near the coast, or open to the west winds, have a fairly sufficient rainfall. The interior ranges, especially the portions of them west of the San Joaquin valley, are very dry, and over large areas so much so as to be unfit for cultivation.

*Geology of the Mississippi Valley.*

The area enclosed between the Appalachians and the Cordilleras, extending to upwards of 1,500,000 square miles, the drainage basin of the Great Lakes and St Lawrence on the north and of the grand Missouri-Mississippi river-system on the south, cannot here be discussed in detail from the topographical point of view. The general features do not present the diversity seen in the regions already considered. All that can be done here is to indicate the salient points of the geology.

The belt of Tertiary and Cretaceous rocks already mentioned as forming the Atlantic slope extends, with very similar characters, curving broadly around the southern end of the Appalachians, and continuing along the Gulf and up the Mississippi valley, to about the junction of that river with the Ohio. About half of Alabama and Arkansas, all Mississippi and Louisiana, parts of Tennessee and Kentucky, and a very small corner of Missouri are underlain by these newer formations. Nearly the whole of Texas is similarly situated with respect to its geology. In the northern central por­tion of the last-mentioned State the marly and gypsiferous red sandstones of Triassic age cover a large area, bordered on the south­east by a little-known coal-field, of Carboniferous age, with a very small patch of Azoic or Archæan rocks at its southern termination, almost exactly in the centre of the State. Tracing the geological formations northward from Texas into New Mexico and along the eastern flank of the Rocky Mountains, we find the belt of Cretaceous and Tertiary covering a very large area, extending as far east from the mountains as the centre of Kansas, and covering nearly all Nebraska and Dakota, the north-western corner of Iowa, and the western half of Minnesota. The Triassic belt mentioned as occur­ring in Texas occupies a broad area in the Indian Territory and the southern central part of Kansas. It is also quite extensively ex­posed along the streams of New Mexico, forming the border of the Llano Estacado or Staked Plain. The Cretaceous and Tertiary rocks of the west have nowhere anything like the economical importance which they have in New Jersey; but from a palæonto- logical point of view they are of interest, and, especially in the lower Mississippi valley, have been studied with care and in con­siderable detail by the State geologists. Included within this border of more recent rocks, and comprising the whole of the North- Eastern Central group of States (see below), as well as the western portion of the North-Western Central, and smaller portions of the South-Eastern and South-Western Central groups, is a region under­lain almost exclusively by Palæozoic rocks, covered with post­Tertiary and recent detrital formations, the intermediate members of the geological series being entirely wanting. These Palæozoic strata include very extensive and complete representations of both the Lower and Upper Silurian series, and also of the Carboniferous, including both the upper and lower members of this division of the Palæozoic. As we leave the Alleghany escarpment in going west­ward we find the disturbances of the strata becoming less and less marked, what flexures there are being exceedingly broad, so that over large areas the rocks seem to lie in an almost undisturbed horizontal position. The geographical distribution of the areas underlain by the Coal-measures in this region is indicated below