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THE CALIFORNIAN DESERT BASIN.

THE Pacific States, being comparatively a new country, contain some large areas but little known, some even only partially explored, and about which very little has been published. Some portions of California are in this condition, especially the great Desert Basin, extending from the head of the Gulf of California northward, embracing the Colorado Desert, the Mohave Desert, and the Amargosa or Death Valley, all connected with one another, and forming a continuous basin, much of which is as low as or lower than the level of the ocean. Dreary and forbidding in character, difficult and dangerous to cross, destitute of water or vegetation except in small portions like the oases of the African deserts, burning under a tropical heat, swept by terrible sand-storms, and only inhabited by strange animals and reptiles, this great extent of country is considered worthless for human habitation, and, by its climatic influences, a curse to the inhabitable and fertile portions of the State, the dread of travelers, and the cause of most of the ills to which farming in California is subject. But the rest of the State is rapidly filling up. Tule-lands are being reclaimed at heavy expense. Railways are projected and building, which will cross the desert basin at several places; and it is a matter of interest to all to find out whether it is possible to do anything to redeem so immense an area from its dreary desolation and bring it into a condition to contribute something to the general good. The following notes, prepared from observations made by the writer during several expeditions into this territory within the past five years, though with no attempt at detailed scientific description, may be found of interest, and to give some new ideas of a region so little known or described. The portion treated of lies in San Diego County, and, for a better understanding of its peculiarities, a few preliminary words may be said in regard to that portion of the State.

The county of San Diego is one of

the largest in California, extending about 150 miles from east to west and 100 miles from north to south, and containing over 15,000 square miles. In shape it very nearly resembles the States of Massachusetts, Rhode Island, and Connecticut combined, and is somewhat larger than they are. This immense area can be divided into three portions, differing widely from each other in climate, soil, and productions, as well as in general appearance.

First, the western (extending from the Pacific Ocean back a distance varying from twenty to thirty miles) may be called the "Mesa Division," as it consists largely of sloping table-lands or *mesas*, rising gradually from a level to elevations of from 500 to 1,000 feet. It is generally destitute of trees, but covered with a variety of shrubs, plants, and grasses, many of them furnishing good grazing; and, being cut through by numerous streams running into the ocean, it has many valleys of fertile land, from 500 to 12,000 acres in area, with good soil and some timber along the water-courses. The climate of this region is similar to that of most of the Pacific Coast, though much less cool and damp than farther north. There are no great extremes of temperature, no snow, no ice, very little frost, little rain-fall, and a remarkable uniformity during the whole year.

The second division, which may be called the "Mountain Division," consists of parallel and transverse ranges of mountains, from 2,000 to 9,000 feet high, with deep valleys intersecting, some of them of considerable size. These valleys are always well watered, and most of them well supplied with timber; pine and cedar of large size and several varieties of oak growing on the ridges, and oak, sycamore, cotton-wood, willow, and some other trees, in the valleys. This division extends north and south the whole length of the county, varies in width from forty miles at the south end to nearly 100 miles at the north end, but is in reality divided there into two mountain regions, by the occurrence of the San Jacinto plains, an extensive and nearly level region, twenty to forty miles long and wide, and about 1,200 feet above the sea-level. The climate is hotter in summer and cooler in winter than near the coast; the rain-fall is much greater; snow and ice occur, and on the higher peaks remain for several months, it being not uncommon to see them late in May. During the summer the air is remarkably dry and invigorating, and on some of the pine-covered peaks and ridges almost perfectly free from dampness without being very hot.

From the eastern border of this region, at an average elevation of 5,000 feet above sea-level, there is an exceedingly rough, broken, and precipitous descent to the third or "Desert Division," which extends to the Colorado River, an average width of about seventy-five miles, including nearly one-half of the county. This region is one of the most singular in the world, as regards climate, soil, productions, elevation, and comparatively recent geological changes. Its first and most remarkable peculiarity is, that a large portion of this desert is below the level of the sea; the greatest depth, in the bed of Dry Lake, near its northern end, being about 250 feet. The earlier explorers doubted the accuracy of the measurements by the barometer, but recent railway surveys, with accurate instruments, have proved this remarkable fact. This depression gradually diminishes farther south, but a canal from the head of the Gulf of California, thirty or forty miles in length, would let the waters of the ocean in, and overflow an area probably twenty to thirty miles in width and sixty to eighty miles in length.

In the report of the survey for the Pacific Railroad, by Lieutenant R. S. Will-

lamson, of the United States Engineers, in November, 1853, he speaks of a tradition among the Cohuilla Indians, that at a period not very remote this basin was filled with water, and the Indians subsisted on fish and water-fowl caught in it. I heard the same story from an aged Indian of the vicinity, on a recent trip. The occurrence of a plainly marked beach or water-line on the rocks, as well as among the sand and bowlders—the incrustations coating the stones near this, of an appearance resembling coral, and similar to what may be seen near the bay of San Diego—the great quantities of shells which are strewed over the surface of the ground, some of them of fresh and some of salt water origin, and several other facts—all go to prove that at some late geological period this whole region was under water. And there is a good deal of evidence to show that this period was very recent. Besides the Indian traditions, which are usually very untrustworthy, there is plenty of proof that the country is now, and has been for some time, going through a very rapid drying-up process. Springs, that it is known flowed freely fifteen or twenty years ago, are dried up, or only furnish a little water; places where good grazing could be had only show now a little salt grass or bare white alkali ground; hundreds of iron-wood and other trees in some localities are dead or dying, with few young trees to replace them; the stumps and logs of palm-trees are numerous, and were evidently indigenous to the country and quite plenty; and the remains of frail Indian houses and fences are to be seen, where now is nothing but sand. At one point there is a singular pond, circular in shape, about fifty feet in diameter, with its bank some four feet above the surrounding plain. One of our party said when he visited it, fifteen years ago, it was fifty or sixty feet deep, the water clear and fresh, a large palm-tree leaning over it, and good grazing all about it. Now, it is not over eight or ten feet deep; the dead stump of the palm-tree alone remains; the water is alkaline and brackish, and nothing but salt grass grows around it. Yet, singularly enough, it contains fish, of what species I could not ascertain, but numerous, about two inches in length, and shaped like the "pumpkin-seed," so-called, of the Eastern States. No other fish exist, to my knowledge, within one hundred miles. It was probably formerly a natural artesian well; the diminished flow of the water has caused it to dry up, and the evaporation concentrated the mineral salts in solution.

Doctor Widney, in an able article in the OVERLAND MONTHLY for January, 1873, describes the manner in which this basin, which was no doubt part of the Gulf of California, became cut off from it, and gradually dried up; and there is every reason to believe that both his arguments and his conclusions in favor of restoring the ancient condition of things, and the advantages that would probably result therefrom, are correct. Lieutenant Williamson, also, in the railroad report above alluded to, discusses the same subject and arrives at the same conclusions; while a recent survey, by J. E. James, civil engineer, establishes the perfect feasibility of this project.

Few persons probably have attempted, as our party did, in March, 1875, to cross Dry Lake, at a place where it is about ten miles wide. Our attempt was a failure, and we were compelled to go back, after proceeding nearly three miles from shore; but we learned some interesting facts. The surface is a bed of dried mud (clay mixed with small shells), forming a crust about a foot and a half thick; below this is a thin crust of a crystallized white substance resembling salt or alum, but having neither taste nor smell; and under this exists an unknown depth of moist white clay, like soft putty, into which men and ani-

mals sink as soon as the crust is broken. The water this contains is saturated with salt, and round the eastern edge of Dry Lake are many springs and streams of clear cold salt water running into it.

The southern portion of the great desert is quite level, but the northern and north-eastern portions are broken by isolated peaks and ranges of mountains, which seem to be the continuation south-eastward of the San Bernardino mountains. They are composed of broken, abrupt, barren rocks, generally almost black from exposure to the weather, though sometimes red, or brown, or of a gray color. They always seem to terminate at the base as if at a shore-line, not only near the depressed basin, but when 1,500 or 2,000 feet higher; the mouths of the gorges and cañons by which they are cut being choked by enormous quantities of gravel, sand, and large bowlders, as though the torrents which brought them down had been met and checked by the breaking of an ocean swell. Lower down frequently occur long slopes covered with flat small fragments of rock, as regularly laid as a mosaic pavement, and almost as black as ink; then slopes of sand and gravel, and, at the bottom of the valley, sand-washes, as they are called, like the beds of ancient rivers, generally quite thickly covered with trees and bushes, varieties of cactus, and other desert growth. These valleys vary from a mile or two to ten miles wide, but all have the same general character: sand-washes, rising by gravelly or rocky slopes to the base of steep broken mountains, absolutely destitute of vegetation.

Some of these valleys are from twenty to fifty miles long, and one can travel in any direction without difficulty by keeping a little away from the foot of the mountains; the sand-washes and the gravel *mesas* being generally hard and compact. The valleys frequently look quite pretty, there being a park-like growth of timber of varieties peculiar to the desert. There are the iron-wood and mesquite (which resemble the acacias), and the *palo verde*, looking at a little distance like a green willow, but having no leaves at all, the small twigs terminating in sharp thorns. The iron-wood is very hard and heavy, about the color and grain of rose-wood. It will not split, and when dry is too hard to be cut with an axe, but can be broken off in slabs by blows with an axe or sledge-hammer, and would no doubt furnish material for very beautiful finishing-work, as it takes a high polish, and is of very handsome color and grain. It is also an excellent fuel, burning into clear hot coals, like mineral coal.

Every vegetable growth on the desert is covered with thorns: the trees, bushes, many varieties of cactus; even a sort of grass called *galleta* by the natives, and which furnishes a rather poor article of hay for stock, though wild animals seem fond of it. It grows around and over small hummocks of sand, is cut with a hoe, and looks as much like old brooms with a few seeds on them as anything else it can be compared to. The varieties of the cactus are numerous: among them the "Turk's-head," as large as a pumpkin; the "prickly-pear," or *puna*, with beautiful crimson flowers; the "*cholla*," with its terrible barbed thorns; the "lace cactus," looking as though it was covered with a lace veil; and many others. There are also the "*mescal*," which sends up a tall flower-stalk; the "Spanish bayonet," with a sheaf of delicate creamy blossoms; and a curious plant resembling a bundle of fish-poles diverging from a common root, growing twenty or thirty feet high, with small green leaves, no branches, but superb crimson flowers, that can be seen for a long distance. And with all this growth of vegetation there is no water to be seen. One may travel for days, may search all the cañons, may dig in

the sand, and finally perish of thirst, while all around are green trees, bright flowers, and plenty of vegetable growth. The trees and plants seem to absorb enough moisture during the rainy season to last them the rest of the year, and to be of such a structure as not to give it off again. It is maintained by some that the juice of the *mescal*, of the Turk's-head, and of other *cacti* can be used to quench thirst. Perhaps it might serve to moisten the mouth in extreme cases, but the experience of the writer, who has tried them all, is that it does more harm than good. The sap is acrid, and causes soreness, even blisters, on the mouth and tongue, and in a short time the thirst is more intense than before.

The air is perfectly dry, day and night; no moisture is perceptible in the morning, and one never catches cold by sleeping on damp ground or in a wet blanket. Yet this region is not entirely destitute of water. There are occasional springs, generally impregnated with alkali, or more or less brackish, but serving to supply the requirements of men and the wild animals of the country. Some of the desert mountains are stratified, and where the dip of the rock is toward the mountains natural cisterns occur, that fill with rain-water during the rainy season and last during most of the year. These can be found by persons acquainted with the peculiarities of the country, by observing the structure of the mountains, and by following the trails of wild animals as they lead up into the *arroyos* by which the mountains are very much cut up. In other places the presence of palm-trees is an almost certain indication of water below the surface, which can be reached by digging, sometimes only two or three feet, where the ground presents on the surface only a dry white sand; and such water is always good and sweet. Yet it is essentially a dry and desert region, and one dangerous to travel in without carrying several days' supply of water for men and animals. Scarcely a season passes without loss of life for want of water, one of the most terrible deaths known.

There are a good many animals indigenous to the country: deer, antelope, and mountain sheep of the big-horn variety, are comparatively numerous. Of the smaller animals there are the Californian hare or jack-rabbit, the common rabbit, the kangaroo-rat, two or three varieties of mice, numerous varieties of lizards (including one called the *iguana*, very good to eat and much prized by the Indians), the Arizonian quail (a different species from the Californian one), and many varieties of small birds, among which humming-birds are very numerous. Insects are also numerous: flies, moths, beetles, a small black bee, gnats, and ants. The distances from water to which these animals range appear to be about as follows: Small birds, one to two miles; rabbits, two to three; hares, four or five; deer and other large animals, ten to twelve; quails, two or three; bees, three or four; while other insects and lizards are everywhere; as are also the kangaroo-rats, which live in colonies, either in crevices in the rock or in holes excavated in the ground. It is very probable that water might be found by sinking wells in any of the sand-washes.

One very interesting animal, of which I have not been able to find any description or plates in the reports of surveys and explorations, is the desert tortoise, or land-terrapin. These animals are very numerous in the northern and eastern part of the desert, and are excellent eating. They are from twelve to fifteen inches long, the shell very much arched, the feet provided with long claws, and the hinder ones very much like those of an elephant. In crawling they raise the body two or three inches from the ground, and can travel quite fast for an animal of

their kind. Under the arch of the upper shell they carry a sack or pouch of water, and, as they live far from water supplies, no doubt they fill this during rains and subsist on it the rest of the time. The shell is covered with plates, that can be separated and used for ornamental purposes. They excavate holes under bushes and where a steep bank favors them, probably by aid of a pointed projection of the under shell resembling a shovel, and with their sharp claws. Into these holes they crawl backward, and can be found looking out, as if admiring the scenery. They appear to live on vegetable food, those that we killed containing the leaves of the grease-wood and other plants.

It is a curious study to examine the number and variety of tracks sometimes met with on the fine white sand. Deer and other large animals, coyotes, rats, rabbits, lizards, birds, beetles, and terrapins, leave evidence of their nocturnal rambles; and their habits, mode of travel, of eating, visiting one another, even their fights, and the way in which the *carnivora* capture their prey, can be studied in characters as plain as the hieroglyphics of ancient nations. And, indeed, hieroglyphics were not used exclusively in ancient times. On the rocks near many of the water reservoirs may be seen modern ones, cut or scratched by the Indians. Several of the figures are plain enough, such as the figure of a man, of a mountain sheep, of a serpent, of a tree; some mathematical figures and others are not so easily understood. Whether these were made simply for amusement, or as records, or for the sake of indicating where water could be found, I had no means of ascertaining.

The climate of this region is of a torrid and desert character. From April to November the thermometer ranges from 90° to 120° in the shade; while the heat of the sun, combined with the reflection from the bare sandy ground, is something terrific. Thunder-storms occur during the summer months, and rains from December to March, but the annual rain-fall is no doubt very small, and the evaporation very rapid. The sand-storms of the region are the dread of all travelers. Any wind, that elsewhere would scarcely be noticed, sets in motion the fine sand that in places is piled up in dunes or spread over considerable areas; and when the wind increases the air becomes filled with the driving sand. On so large an area of open country, subject to such extreme changes of temperature (for the nights are generally cool), wind-storms, of course, are frequent and often very severe; and anyone who has been exposed to an old-fashioned eastern snow-storm can imagine what it would be with sand substituted for snow. It fills the eyes, nose, and mouth, and does not melt as snow does; it cuts the skin so as frequently to bring blood; it sifts into everything—food, clothing, and baggage; and at last, when the storm becomes violent, all attempts at travel must be abandoned, and, seated on the ground with a coat or blanket wrapped round the head, so as to be able to breathe, the traveler must wait until the storm subsides.

Most of this great territory is utterly uninhabitable, though there are valuable mineral deposits, and some mines are being worked for gold, silver, and copper. Fine specimens of iron ore are found, and no doubt other valuable mines will be discovered and worked. There is plenty of timber for fuel, the iron-wood especially making a very hot fire and lasting a long time. Wells can be dug, or cisterns built for the accumulation of rain-water, to supply the needs of men and animals, perhaps enough for crushing and working ores. By a small expenditure of money and engineering skill, great changes could be produced, and a large part of this territory redeemed from its present worthless condition.

Doctor Widney, in the article before alluded to, has well treated this subject, and at the time of the publication of his paper much interest was manifested in it. A large area of the depressed basin could be covered with water from the Gulf of California; the evaporation from this would supply an additional rain-fall, and, by lowering the temperature of the surrounding country, diminish the general evaporation. The springs and streams that formerly nourished palm-trees and grass might be refilled; large areas of country put under cultivation, especially in the New River basin; by a system of irrigation from the Colorado River, crops of cotton, tropical fruits, and other valuable productions raised; and what is now a desert waste, dangerous and difficult to cross, might be made to support a large population. That it did support a considerable number of Indians, not long ago, is shown by various remains, among them fragments of pottery, which are scattered about in many places. Nor are these all the changes that might be brought about. The country west of the mountains, in San Diego, Los Angeles, and San Bernardino counties, which shows in a less degree the same signs of a gradual drying-up process, might be restored or improved. A greater rain-fall, fuller streams, the growth of timber, and crops and means of subsistence for a larger population than the country is now capable of sustaining, would be brought about, probably much sooner than is imagined; and the only drawback now affecting the whole of southern California, its liability to drought, might be mitigated or removed.

It is seldom possible for man to do so much to change the climatic conditions of a large area of country, as might be effected by an expenditure of money and labor so small as compared to the great enterprises of modern times. The New River basin in the southern part of the desert is rendered fertile by occasional overflows of the Colorado River, and in some places, where the Indians have been able to irrigate, the soil yields wonderfully, containing a large percentage of mineral salts. The amount of water carried by the Colorado River would not probably be sufficient to fill the depressed desert basin and compensate for the great evaporation; but if this were filled with sea-water, the Colorado would furnish means for irrigating the surrounding country, and so make it one of the richest agricultural regions in the world.

THE CROSSKEY BOYS.

IN TWO PARTS.—PART II.

AS yet the young wife felt herself to be almost an interloper, with Charlie Forsyth ruling the culinary department. Her domestic talents were thus hidden in a napkin; needle-work had been prohibited by her physician; she had not the happiness to be devoutly religious. She was simply an idle, inexperienced girl, who had mistaken childish preference for womanly love, left to her own undisciplined heart for guidance.

With firm loyalty to her husband, she never breathed in her long letters to her family a word that could betray her solitary and disappointing life. She wrote of the wondrous beauty of spring and the perfection of the climate; of her increasing botanical collection; of her