

Report of explorations for that portion of a railroad route : near the thirty-second parallel of north latitude, lying between Dona Ana, on the Rio Grande, and Pimas Villages, on the Gila / by John G. Parke.

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EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.

WAR DEPARTMENT.

Vol. II

REPORT

OF

EXPLORATIONS FOR THAT PORTION OF A RAILROAD ROUTE,

NEAR THE

THIRTY-SECOND PARALLEL OF NORTH LATITUDE,

LYING BETWEEN

DONA ANA, ON THE RIO GRANDE,

AND

PIMAS VILLAGES, ON THE GILA.

BY

LIEUT. JOHN G. PARKE,

CORPS TOPOGRAPHICAL ENGINEERS.

1854

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Washington
1855?



REPORT.

Instructions from the Secretary of War —Organization of party.—Route from San Diego to Pimas villages.—Pimas and Maricopas Villages, and Indians.—El Picacho mountain.—First appearance of cotton-wood after leaving the Gila.—Tucson; its inhabitants and their occupation.—Meteorite found in cañon of Santa Rita mountains.—Its analysis by Prof. Charles U. Shepard.—Attentions received from commanding officers at Tucson.—Country between the Tucson and San Pedro rivers.—San Pedro valley.—Dos Cabezas.—Playa de los Pimas.—Trails of Caballados.—Visits from Indians.—Characteristics of the valleys.—Cook's trail.—Ojo de Vaca.—Rio Mimbres.—Startling intelligence from Fort Webster.—Mesilla valley.—Mesilla.—Explanation of map.—Profile of country.—Timber.—Building-stone.—Water.—Barometrical measurements with reduced approximate altitudes.—Appendix.

WASHINGTON, D. C., *August 22, 1854.*

SIR: I have the honor to submit the following report of the operations of the party intrusted to my charge, for the examination and survey of railroad route to the Pacific, in obedience to the following instructions:

“WAR DEPARTMENT,
“*Washington, November 18, 1853.*

“SIR: The President of Mexico has given to this government authority to make surveys within the Mexican territory, in connection with examinations of railroad routes to the Pacific, and you are selected to make such a survey, in accordance with the instructions below, provided a suitable party can, as is believed, be organized with the means which will be placed at your disposal.

“For this purpose a draft on the assistant treasurer at San Francisco for five thousand dollars is herewith enclosed to you, and orders have been given to Lieutenant Williamson to supply you with all the funds he can spare, and all the animals, equipments, &c., which may be disposable for the object, on the disbanding of his party.

“A similar order has been given to Lieutenant Whipple, though it is hardly expected that aid from him will be necessary should these instructions reach you before the party of Lieutenant Williamson is disbanded. If, however, Lieutenant Williamson should have sold his animals and equipments, you may find Lieutenant Whipple's assistance essential to your success. It is to be distinctly understood that neither of those officers is to deprive himself of anything necessary to the prompt completion of his report. The organization and outfit of your party are to be completed on the most economical scale that can be prudently adopted.

“The necessary orders have been given for the detail of an escort, and supplies for the same.

“You will confer with Lieutenant Williamson upon everything relating to the organization and outfit of your party, and to your plans for the prosecution of the work.

“You will use the utmost despatch in commencing and prosecuting the duty assigned to you, and observe the following instructions in regard to it:

“Referring to a sketch from the office of the Mexican boundary survey, hereto annexed, you will commence the barometric levellings on the Gila, a little above ‘Pimas village,’ at a place marked ‘Dry creek;’ follow the line by ‘Tucson,’ thence by blue line marked ‘Nugent's wagon trail,’ to angle in red dotted line marked ‘Brackish pools,’ east of Salt lake.

“It may be that a shorter and better line exists from the point of departure on the Gila to the point on the San Pedro where blue line, or Nugent's wagon trail, strikes it. The mountains in that cut-off are described to be generally parallel to the river San Pedro, and the belief exists that a good route can be found through them on the line indicated.

“From the point marked ‘Brackish pools,’ just east of Salt lake, as far east as the first stream marked ‘Sienega,’ along the dotted red line, a survey and line of barometric levellings has been carried by the Mexican boundary survey. But it would be well to make the survey continuously along the red and blue line eastwardly until it strikes Cook’s wagon trail, and thence by the shortest distance and most practicable route to the valley of the Rio Bravo, to some point between ‘Doña Ana’ and ‘Frontera,’ eight miles north of El Paso.

“A more eligible and direct route from the region of the said Salt lake to the point indicated on the Rio Bravo may be found. If information or observation on the ground shall so suggest, you will not confine yourself to the wagon trail described, but depart from the line indicated at any convenient point.

“Bear in mind these wagon trails are faint, and not as broad or well marked as the great emigrant trail known as Cook’s route, which, having been sufficiently explored, will not receive your attention. The levels have been carried continuously by Major Emory along the valley of the Gila, and it might facilitate the operations not to unpack the barometer until the party shall have reached the point of departure from the Gila.

“As the whole country between the Gila and the Rio Bravo embraced in the parallels of latitude 32° and 34° has been well covered with astronomical observations, it will probably not be necessary for you to impede your progress in checking the run of your work by elaborate astronomical observations. A sextant and chronometer, by which you can obtain your latitudes, will, it is believed, prove sufficient to check your work.

“The profile of the region traversed, showing the gradients which a road passing over it must encounter, is the information most wanted. It is therefore recommended that you take the barometric height at every point on the line to be surveyed which may be important in the elucidation of this subject.

“On reaching the Rio Bravo, it may add little to the expense of your party to bring it all the way in to the settlements on the Red river. If so, you will take some new route from Doña Ana, passing through the northern part of Texas, and make a barometric levelling of the same.

“Very respectfully, your obedient servant,

“JEFFERSON DAVIS,
“*Secretary of War.*”

“Lieut. J. G. PARKE,

“*Corps of Topographical Engineers, San Diego, California.*”

These instructions, with passport accompanying them, were received in San Diego, California, December 20, 1853,* on my return from an examination of the Jacum Pass, made under orders from Lieut. Williamson, corps topographical engineers. After receipting to Lieut. Williamson for so much of his property, including instruments, as was serviceable and necessary, I commenced the organization and equipment of a party, but found it imperative on me to repair to San Francisco for the purpose of securing the services of an assistant, and procuring funds and additional instruments; in all of which I succeeded, with the exception of obtaining a mountain barometer, there not being a single one available in that section of the country. Having returned to San Diego and completed the outfit of the party, which numbered in all fifty-six souls, we took our departure from the quartermaster’s depot on the afternoon of January 24, 1854. The party was organized as follows: Mr. Henry Custer, assistant and topographer; Dr. A. L. Heermann, physician and naturalist; Lieut. George Stoneman, first dragoons, commanding escort of twenty-eight men, and also undertook the duties of quartermaster and commissary of the expedition, in the discharge of which were employed eighteen men; five additional men assisted in carrying barometers and tripods.

From San Diego we followed the emigrant route known as the Southern, via Warner’s rancho, in the coast range, across the Colorado desert, to Fort Yuma, at the junction of the Gila and

* See “A,” in the Appendix.

Colorado rivers, and thence up the Gila to the Pimas villages. To Fort Yuma the road is good, and presents no obstacle to rapid transportation with wagons excepting a steep ascent in the mountains and occasional sands on the desert.

Up the Gila our route lay upon the left bank of the river, with the exception of a short distance, where we were forced to cross to its right bank, the river having, in the last few years, changed its bed, and now washes the base of the mesas, which it was impracticable to pass without much labor.

The road is not confined entirely to the river-bottom, because of the close proximity of the river to the mesas, which often forced it to cross over terminating spurs that jut out from the south, thus cutting off many deep bends of this sinuous river.

The travelling upon the mesas was hard and firm, whilst that in the bottom was generally heavy. We moved under favorable circumstances, there having been quite a fall of rain since the last party passed, which not only laid the dust, but hardened the surface of the roadway.

While on the Gila the great scarcity of grass and other forage was a constant source of anxiety, and caused much night travelling. The few patches of grass near the watering-places were cropped close by the herds of stock driven to the California market, and the mezquite-bean, upon which the emigrant almost solely depends for the existence of his animals, was now out of season; but by dint of great care and attention on the part of Lieut. Stoneman, taking advantage of every bunch of cane growing at the water's edge, and the sparse tufts of a dry bunch-grass found on the mesas at a distance from the roadside, we succeeded in reaching the first of the Pimas and Maricopas villages, with all our animals, on the 13th of February, having just crossed a jornada of thirty-eight miles, and camped by a rain-water pool, surrounded by a large area of dry bunch and salt grass, three hundred and ninety miles from San Diego. To rest our animals and give them an opportunity to feed, we remained in camp a day, and on the following day moved through the villages, camping near the point where the emigrant trail, turning southward, leaves the river-bottom. We had numerous visits from the Pimas and Maricopas. Their chiefs and old men were all eloquent in professions of friendship for the Americans, and were equally desirous that we should read the certificates of good offices rendered various parties while passing through their country.

In order the more fully to describe the country traversed, with a view of facilitating the solution of the question of practicability of constructing a railroad through it, I will first transcribe the journal of our operations, setting forth the general features of the country, which may possibly be of service to any whose duties should hereafter require, or interest dictate to visit this region, and then subjoin a memoir showing the gradients to be overcome along the route travelled, as illustrated by the accompanying map and profile.

While in San Francisco I had the good fortune to meet Mr. Nugent, and am much indebted to him for a copy of his notes made during a trip across this country; and as his trail, as plotted upon a sketch sent me, so ill accords with his notes, (in one instance crossing inaccurately what I deem an impracticable ridge,) it is proper for me to remark that where I departed from the line indicated in my instructions, I pursued that which, on examination, presented the fairest prospects for, and least obstacles to, the construction of a practicable profile, bearing in mind its directness.

February 16, 1854.—On turning from the river we have to encounter a long stretch of about seventy miles where the finding of water is very uncertain, it being dependent upon the rains and seasons. As is found by experience to be most advantageous on setting out upon these jornadas, we started from camp, on the left bank of the Gila, about six miles above the Pimas, at 1 p. m., and after travelling 3.5 miles in the river-bottom, took a course tangent to the eastern base of the ridge on our right, and skirting a mezquite growth, interspersed with small patches of bunch-grass, extending southeastward from the Gila. As we progressed the road became hard and firm, leading over a gradually ascending plain of a red gravelly surface, destitute of all vegetation excepting the grease-wood and occasional mezquite. In the distance

on the right were low lost mountains, and on the left a low ridge, increasing in altitude towards the south. Camped at 11½ p. m., upon the hard clay surface of the drain for this vast area, without water or grass, having made twenty-three miles.

February 17.—Started at sunrise, continuing on our general course south 35° east. In front are two gaps, separated by a peculiarly castellated mountain, El Picacho, rising abruptly from the plain, through the eastern one of which passes our road. During the morning a few scattering bunches of grass were seen on either side of the road, affording a happy relief to the painful monotony of this almost desert. The road, still hard and firm, continues up the smooth drain with an apparently uniform ascent to the eastern gap, which we reached at 1 p. m., and fortunately found some pools of rain-water, surrounded by quite a dense growth of mezquite. This gap is not a notch or depression in the crest of a continuous ridge, but an extension of the plain narrowed down by bare, rugged peaks of almost solid rock, rising abruptly from the plain. Leaving the gap at 5 p. m., we continued over the same character of country until 10 p. m., camping by the road-side without grass or water—distance twenty-eight miles.

February 18.—A smart shower aroused the camp at an early hour this morning. The teams were soon harnessed, and we were again on the road at daylight. On the clearing away of the clouds, we found ourselves travelling directly for a gap separating a low ridge on the west from one probably two thousand five hundred feet high at its terminus, and extending eastward until lost below the horizon. The summits of this ridge are whitened with this morning's fall of snow, which was confined to those high altitudes. El Picacho looms up, with its well-defined and angular profile, a most prominent landmark.

At half-past 9 we struck the sandy bed of a stream leading from the gap, and bearing towards the Gila in a northwesterly course. Crossing the bed, we turned the point of a low ridge on the right of the gap—made up of huge, shapeless masses of trachytic rock, with a few scattering argillaceous nodules—and found, a short distance beyond, another pool of rain-water; but there not being a sufficiency of grass, and finding that it increased in quantity and improved in quality as we advanced, we pushed on still further, following the valley of the dry stream, and camped about noon by a water-hole with abundance of grass and wood. We have here not only the bunch-grass, but also the grama, which, although dry, possesses a great deal of nourishment. The cotton-wood makes its appearance—the first we have seen since leaving the Gila.

From the river to the entrance of this gap there extends a plain of gradual and apparently uniform ascent towards the south, with a surface free from washes and deep drains, but studded with isolated peaks and ridges, (lost mountains,) which, seen from a distance, have the appearance of continuity, and impress the traveller with the idea of being in the centre of a vast basin surrounded by chains of mountains. The soil of this plain changes from a dry, ashen loam at the Gila, through a reddish argillaceous sand, to a gravel as we approached the ridges and peaks; and yields a growth of stunted artemisia and larrea, with mezquite in the low portions, and cereus giganteus, midst other varieties of the cactus, upon the uplands. Scattered patches of grass were found by the roadside. These mountains are of peculiar form and shape. Their serrated crests and faces, often vertical and cliff-like, surmounting the slopes of the debris, give the whole, particularly when aided by mirage, a semblance to the crumbling towers of a fallen castle. The rock is volcanic, vesicular, and of a reddish color, which throws over the ridges of the distant landscape quite a purplish tint, forming a pleasing contrast with the glare and reflection from the parched plain. Within this gap we find the deep sand-bed of a dry stream, whose banks and terraces increase in altitude as we ascend; being at camp from fifteen to twenty feet high, and extending back to the mountains on either side.

February 19.—Remained in camp to-day, and took repeated readings of the barometers.

February 20.—Got under way at sunrise. Seven miles of good road, through the mezquite growth adjacent to the stream-bed, brought us to Tucson. In order to allay any fears and correct all misapprehensions on the part of the inhabitants with reference to our movements and probable connexion with the lawless expedition then on foot for the seizure of this country, we

halted the party outside the limits of the town.* Lieutenant Stoneman and myself rode in, and, on inquiring of the guard, found the comandante of the presidio, Captain Hilarion Garcia, and also the inspector of the troops of the State of Sonora, Captain Bernabé Gomez; to whom we made ourselves known, and, stating the object of the visit, presented them our passport. The party then moved through the town, and encamped about two and a half miles beyond on the bank of a clear running brook, with abundance of grass and wood.

February 21.—Remained in camp.—Rest and a good feeding of corn, which we fortunately can obtain, will be of great service to our animals, some of them already beginning to fail. Tucson (properly Tucson) is a one-storied flat-roofed adobe town of about six hundred inhabitants, whose sole pursuit is agriculture; the much dreaded Apaches having interfered greatly with their pastoral occupation. They raise chiefly corn and wheat, cultivating about three hundred acres of rich soil by irrigation from a stream which has its source near the mission of San Javier del Bac, 8.5 miles to the south; and although it flows past our camp with a depth of one foot, and width of six feet, its waters nevertheless disappear a short distance below the town, either consumed by irrigation or absorbed by the sands. At sunrise the temperature of this stream was 62°, while that of the air was 32°. Timber is scarce in this locality, that used in building, a species of pine, being found in cañons and narrow gorges of the distant mountains; while the cotton-wood, willow, and mezquite, of the immediate vicinity, is barely sufficient for fences and fires. From the summit of a conical hill about half a mile to the west of Tucson, a very extended prospect is presented. On our back trail El Picacho stands near the horizon's verge, with its fine proportions distinctly visible. To the north and northeast is Sierra Santa Catarina, high, rugged, and with numerous spurs, extending eastward to the San Pedro. South of east is the gap through which we pass, bounded on the south by Sierra Santa Rita, which extends around to the south point. In this direction lies the valley of San Javier del Bac. To the southwest and west are a series of "lost mountains." This conical hill is covered with angular fragments of scoriæ, varying in size from that of an egg to a cubic yard, more or less vesicular and compact. Descending the hill, an amygdaloidal volcanic earth is found overlying a mass of metamorphic limestone, much contorted. At the base is found a coarse-grained granite, and apparently a conglomerate of all the above ingredients, decomposed where exposed, giving the whole a whitewashed appearance. The commandant showed us two specimens of a meteorite found in a cañon in Santa Rita mountain, about twenty-five or thirty miles to the south of Tucson. They are both used as anvils, and were lying, one in the presidio or garrison, and the other in front of the alcalde's house. That in the garrison is of a very peculiar form, being annular and somewhat like a signet ring of large dimensions, its exterior diameter being about three and a half feet, and interior about two, and weighs near 1,200 pounds. The other piece weighs about 1,000 pounds, and has an elongated prismatic form, serving well the purposes of an anvil, it being partially buried, and standing nearly two feet above the surface of the ground. By permission of the authorities our blacksmith undertook to cut off some specimens for us, in which he almost entirely failed, the metal being so tough and hard; still, by dint of two hours' hard work and the use of a cold chisel of the best temper, and a most weighty sledge, we procured a few small chippings, sufficient for the purposes of analysis. The fracture is crystalline, resembling that of cast-iron. It yields to the hammer, and has a clear ring not unlike bell-metal.

NOTE.—Having submitted a specimen of the above meteorite to Professor Charles U. Shepard, I received from him the following, bearing date July 31, 1854, in relation to its analysis: "I have already so far submitted a portion of it to examination as to become fully satisfied of its meteoric character. It contains nickel, phosphorus, and magnesia, in addition to the iron. Sulphur is not thus far evinced, though probably present. I should add silver also to the list of ingredients. Its specific gravity is 6.66, which is rather below the average; but, most unexpectedly, I find that its entire mass is finely amygdaloidal, with an earthy white mineral

See "B," in the Appendix.

analogous to a meteoric mineral that I described as forming the chief part of the Bishopville (S. C.) meteoric stone. It is this feature that makes your iron entirely peculiar. To see this trait, you have only to polish a little surface, and etch with hydrochloric acid, when the surface becomes speckled over with the white earthy mineral, imparting to it a porphyritic character; but to see this *well*, will require the aid of a microscope.

“Large quantities of the white mineral remain undissolved after the solution of the main mass in the acid; and floating among the residuum may be seen also a dark gray flocculent matter, which I took to be the meteoric mineral I have named Dyslytite. Much of the white earthy mineral is thus seen to be in grains, perfectly rounded; some of which are transparent and resemble hyalite; other portions of them are milk-white and nearly opaque. These last are soft, and precisely resemble chladnite.”

February 22.—Again got under way, starting about noon; but, instead of taking the emigrant route viâ the mission of San Javier del Bac to the Cienega de los Pimas, thereby making a great détour, travelling first south, and then due east, we took a course direct for the gap, there intervening apparently a smooth and uniformly ascending plain; camped without water, but an abundance of grass. The officers of the garrison, and Inspector General Gomez, accompanied us to the camp; thus adding another to the list of polite attentions and serviceable offices rendered us by these gentlemen, for which we are under many obligations.

February 23.—Soon after leaving camp this morning, we were compelled to diverge from our course, owing to the thick growth of cactus, and were finally compelled to cut a road through it. Reaching the emigrant road, we turned almost due east, and travelled over an undulating country, the swells increasing as we neared the entrance of the gap, where we encountered a cañon debouching from this pass and opening out into a broad drain or valley to the northwest. Entering this cañon we commenced its ascent, travelling through deep and heavy sand, alternating with contracted meadow patches, hemmed in by walls, approaching verticality, of irregular, shapeless masses of rock, generally of a metamorphic character; limestone, granite, copper-green, and a pudding-stone, all being found without any marked characteristics or apparent order of superposition. Camped at the first water, with grass and wood, having made 18.4 miles.

February 24.—Made an examination of the country adjacent to the camp, and found that this cañon is the main drain of the gap or depression, and that the slopes on either side are rough and broken up by deep ravines and washes. Our teams started at nine and a half, and were soon forced to the hills by the narrowing of the cañon, rendering it impassable for wagons without much labor bestowed on removing the obstacles. Avoiding this cañon by a rough and rugged road, we again entered the valley, and thus continued through long, smooth meadows, and over rough and steep pitches (fortunately not high) for nine miles, when we ascended the table-land on our left and commenced the approach to the divide, following a set of wagon-trails. On the table-land had a good road over a red gravelly soil of decomposed igneous rock, yielding a rich growth of grama grass, which, although not in season, is nevertheless very nutritious, being perfectly cured hay, standing as it grew. Camped near the divide between the waters of the Tuzcon and those of the San Pedro, without water and but little wood, having made 13.5 miles.

February 25.—Last night was cold and squally, a rain setting in immediately after dark. Started early and soon made the summit of the divide, whence we had a view of the San Pedro valley—a dry, parched-looking plain, bounded on the east by a low, bare ridge, beyond which loomed up in the blue distance the Dos Cabezas, the most striking and prominent landmark in this region. The trail bearing too much to the south, we left it, and turning eastward descended to the San Pedro, where we camped. From the summit there is a gradual slope to the valley proper, or bottom, which we entered by an abrupt descent of about sixty feet. This bottom is bounded on both sides by an irregular zigzag step, much indented by deep washes, and is at this point about three miles wide. It is covered with a growth of grass, now dry and

crisp. The stream is about eighteen inches deep and twelve feet wide, and flows with a rapid current, at about twelve feet below the surface of its banks, which are nearly vertical, and of a treacherous miry soil, rendering it extremely difficult to approach the water, now muddy and forbidding. The banks are devoid of timber, or any sign indicating the course or even the existence of a stream, to an observer but a short distance removed. Made eleven miles.

February 26.—Started down the stream about two miles to the ford, Lieutenant Stoneman having despatched a fatigue party to improve it; but in spite of this and the great exertion of Lieutenant S., we had no little trouble in effecting a crossing. There being no trail leading eastward from the river, the party again encamped, while I started to examine the several gaps in the ridge on our front. Leaving the river-bottom, we followed up a lateral valley; but finding it narrowing as we advanced, becoming a tortuous dry sand-bed or arroyo, bounded by steep slopes, we took to the table-land; and after a few miles of rough riding reached the gap immediately to the east of our camp, and found it not only impracticable for our wagons, but presenting no advantages for our profile beyond the mere direction. We then skirted the western base of this ridge southerly, and found a cañon leading directly through it, with walls of rounded masses of granite, which formed in many places, also, quite a step-like bottom. Passing through this cañon, we continued on the east slope, southward, and found that the ridge terminated, leaving a very inviting and apparently feasible pass between it and the terminus of an overlapping ridge from the south. In this pass we found comparatively fresh wagon-trails. Returned by following these trails to the river, and thence down to camp, arriving at midnight with our mules broken down.

February 27.—Lieutenant Stoneman and myself examined the fourth gap on the north of those examined yesterday, through which I am now satisfied that Mr. Nugent must have passed. We found the approaches difficult and hazardous to attempt with loaded wagons, according well with Mr. Nugent's notes: "a succession of steep hills and rocky ravines."

From the river bottom to the base of this ridge extends a foot-slope, appearing as if once smooth and of uniform ascent, but now cut up into a perfect labyrinth of washes and gullies, ramifying and branching into a multitude of arms as we ascend. Returning to camp, I determined to take the gap through which we passed last night. Packing up, we followed the river until striking the wagon trails, then turned eastward up a large sandy ravine, and camped at sundown without water, but a sufficiency of grass. Made fourteen miles.

February 28.—Left the ravine near the mountains, the road leading over a smooth, rolling, prairie-like surface through the pass, the summit of which we reached at 11 o'clock. Before us lay an extended plain, in the middle of which is the Salt lake, Playa de los Pimas, and beyond this the Chiricahui ridge, with its lofty Dos Cabezas; to the north the massive Mount Graham, with an apparently continuous ridge extending northwestward till lost below the horizon. Between this ridge and that over which we have just passed there is a wide opening towards the mouth of the San Pedro, apparently a continuation of the plain Playa de los Pimas. To the north of the Chiricahui ridge is a wide gap between it and Mount Graham; and immediately to the south of the Dos Cabezas is a third gap, Puerto del Dado, which is very inviting, and, lying directly on our course, I determined to travel through it.

From the summit we had a perfectly smooth road over a reddish soil, covered with grass, and devoid of trees with the exception of a few scattering palmettos down to the Playa, which, at present, is a hard, smooth, and apparently level area of about fifteen miles in length by nearly ten in width, without a particle of vegetation, it being the perfection of sterility. These playas, in my opinion, have no outlet, and are so nearly level that the rain and drain waters are spread over a large surface; and there being but little absorption and very rapid evaporation, it is left smooth and baked. In some places it is much cracked, and covered by a nitrous efflorescence, which gives rise to the ordinary name for all like places—"Salt lake." On the Playa we crossed two very large trails leading from south to north, doubtless those of

Caballados, once the property of the Mexican *ranchero*, and now furnishing rations for the ruthless *Cayoteros*.

We commenced the ascent of the slope beyond, and camped at sunset without water, having made 25.5 miles. During the day parties were out hunting water, but returned unsuccessful; one party completely turning the southern end of the *playa*, where water is indicated upon the sketch, and another going in search of the "brackish pools" on its eastern margin.

March 1.—Got off at 1 a. m.; took a straight course for the point of the mountains, expecting to find water, in accordance with the statement of our guide, in a *cañon* to the right of the *Dos Cabezas*. Here again disappointment met us, and left us now the only alternative to reach the spring in the *Puerto del Dado*, for which we immediately set out, having at the same time parties penetrating the *cañadas* and valleys on our left, with, however, but faint hopes of finding that which our animals stood so much in need of. During the night we passed over a perfectly smooth but gradually ascending grassy plain; but while skirting the bases of the foot-slopes from the *Dos Cabezas*, it became, as we advanced, somewhat undulating, our trail crossing valleys and their divides. At 1 p. m. we reached the summit of the pass, beyond which we encountered really a rough country. Still continuing on our course, we crossed a great number of valleys and *cañadas* near their sources, having much difficulty with our wagons upon the steep descents and ascents. Finding the much desired water, we encamped in a small triangular valley with an abundance of grass and wood, about 2.3 miles from the summit. While crossing the divide a few Apaches made their appearance, showing themselves only to the rear of the train. Two or three of our men approached them, and were saluted with cries of "muchos amigos."

After a short parley they were satisfied of our peaceable disposition, and followed us into camp. Made to-day twenty-three miles—in all, without water, fifty-five miles.

March 2.—Remained in camp to-day; took hourly observations of the barometer. The weather was cold and disagreeable, with raw and high winds coming down from the summits to the southeast of us. Our animals are now doing well, having an abundance of fine grama grass, and, by husbanding, a sufficiency of water. The spring is situated near the head of a lateral *cañada*, about five hundred yards from camp. The water is cool and good-tasted, but unfortunately the supply is limited, the small basin being emptied last evening before our mules were satisfied. Happily there is another in a valley near by, which was shown us by the Indians. Judging from the number and depth of trails in this vicinity, these springs are much frequented by the Apaches. Around camp there grows an evergreen oak, generally dwarfish, and of but little service other than for fire-wood. At and near the summit of the pass large masses of granite and volcanic rocks are found, outcropping and heaped up into lofty peaks on either side. During the day many Indians visited our camp, some to beg and others to sell mules. They are about to move their camp, the water giving out on the other side of the summit, according well with our experience.

March 3.—Again took up our line of march, the road leading down the dry bed of a *cañada*, in places narrow and tortuous. Opening out on the plain of the valley of *Sauz*, there lies in our front, about twenty-four miles distant, a low range of mountains, bare, rugged, and peaked, extending from the *Gila* southward. On our left a continuation of the ridge from the *Dos Cabezas* northward, while on our right the view was intercepted by this same ridge extending 11.5 miles eastward. From the mouth of the *cañada* our trail passes close to the base of this ridge, crossing at right-angles the slopes and valleys making from it.

Reaching the extremity of the ridge, or rather the point of its turning to the south, our road makes directly for a sharp peak crossing the valley, diagonally passing over a uniform slope down to the stream, which we reached just at dark, having made twenty-five miles.

In this vicinity there are neither trees nor bushes to indicate the course of the stream. There is no main bed or channel, the water ramifying through small narrow ditches, or spreading

itself over the surface of the bottom, rendering it marshy and miry. Grass is scarce and salty. The chief growth upon the plain is larrea, agave, and artemisia.

While on the road an Apache family passed us, all mounted. The head of the party informed us there were but two passes through the ridge in front. Towards one we are now bearing, and through the other, which lies to the north, passed the boundary surveying party.

March 4.—Crossed the stream, but not without much trouble. The mules mired badly—so much so that they were unhitched, and the wagons passed over by hand. Followed up the stream a short distance, and again encamped. In order to ascertain the practicability of the passes, two parties were sent out, to each of which I gave a description of the cañon through which Mr. Nugent passed, taken from his notes. Lieutenant Stoneman kindly assisted me, and examined the gap towards which we were travelling yesterday. He found wagon trails leading through it, and the general features of the cañon corresponding with Mr. Nugent's notes, but no spring, as he stated, "under a large cedar tree." Here again were we disappointed. Surely we are crossing this country in its driest season. Towards evening the parties returned, reporting no trails nor passes between this one and that referred to above.

This morning was intensely cold; quite a skimming of ice even upon the running water. The northern slopes of the peaks of Chiricahui are whitened with snow.

March 5.—Expecting another long stretch without water, the kegs and canteens were filled and mules all watered. A few miles brought us again into our old trail leading up the foot-slope of the ridge, and towards the same gap we were travelling upon two days since. By a gradual and uniform ascent we reached the mouth of the cañon which leads directly through the ridge, and heading close to the plain on the eastern side.

Near the entrance of this gap lies an outcrop of metamorphic, secondary limestone, underlying huge masses of granite, heaped up throughout the cañon in most beautiful confusion. From the stream to this ridge extends a slope displaying a rich growth of grama-grass in patches. From the crest of this ridge had a view quite analogous to that obtained from those already crossed, but somewhat tamer; an immense plain, or rather valley, extending north and south, and bounded by a low ridge on the east, the Gila mountains on the north, and detached mountains on the south, having the appearance of continuity. The ridge on the east gives out towards the north, leaving a continuous plain extending around its northern end. Our course bears, for a depression in the low hills, to the north of a rounded conical peak, and leads us, as before, diagonally across the valley, the bottom being dry, and covered with a dwarfish growth of mezquite, sage, and bunch-grass.

The characteristics of these valleys are their great similarity one with another, and the perfect uniformity in the individual features. The foot-slopes are gentle and smooth up to within a short distance from the ridges, where they assume gradually a greater degree of inclination; and, of a consequence, are rough and indented by drains, the frequency and depths of which depending, in a great measure, upon the altitudes of the parent mountains.

The soil of these slopes is made up of the detritus of the rocks in place in the ridges. Near their bases the surface is strewn with angular fragments, which become ground up and disintegrated the further they are removed from the original rocks, until they are reduced to an impalpable ashen soil, as is generally the case in the bottoms. When near the divide of the low hills, we found on the right of the road, in the bed of a dry gully, a hole made by some of our predecessors, containing about a bucket-full of water. After a little digging, the supply was found to be constant, but at the same time very small. We, however, encamped, having made 21.6 miles. This spring is indicated upon the sketch; but I scarcely think it is permanent, the surrounding features giving it more the appearance of a blind drain of the surface-water collected in the immediate vicinity. Lieutenant Stoneman had it deepened about two or three feet, and then managed, by great care and attention, to give each team-mule a bucketful—an operation requiring at least three hours. Some of the men were up at intervals during

the night, each watching his turn to give his riding-animal another sip. We found near camp a greenish rock, with a slightly malachitic coating, closely resembling an ore of copper.

March 6.—Had during the night high winds, accompanied by a slight shower. Soon after leaving camp we had spread before us another plain of similar character to those before encountered. The road was firm, over a surface strewn with fragments of a compact chocolate-colored igneous rock, with small whitish crystals imbedded. On the right was a large mass of much weather-worn metamorphic scoriæ. In the bottom crossed another playa, (lake of the sketch,) the surface of which was apparently as level as a floor, and so dry and hard that the wagons scarcely made an impression. A joking teamster remarked, "Here is your country for a railroad."

While ascending the slope beyond the playa, we struck into a plain wagon road, crossing from the northwest, made by the boundary surveying party. Following this road we turned the point of the ridge, having, however, two or three knolls on our right. We passed over an uneven country, the drains and ravines all making southward, in which direction is apparently a prairie extending from the playa around the terminus of this ridge to the eastward. Our plain road divided up into a number of trails, leading off into various directions; and finally losing all traces of them, we took a course eastward, expecting soon to reach the emigrant road, (Cook's wagon trail.) Having made 27.9 miles, we camped without water, being again unsuccessful in finding an indicated spring. Grass in abundance, but a scarcity of wood. Throughout the day the wind was high and weather squally.

March 7.—Continued on the course of last evening about a mile, and struck Cook's trail at the very point where Nugent departed from it; the surrounding topography according with the sketches; and, in addition, there were visible faint traces of an old wagon trail. This road is here broad and well beaten, being through this region the only route travelled by the southern emigration to California. From this point there extends eastward a prairie, unobstructed by a continuous ridge, over which I should, in accordance with my instructions, take a direct course to the Rio Bravo. But, as this would involve the necessity of another ninety miles' march without water, and there being no doubt about the practicability of a railroad over it, I have determined to follow for the present the emigrant road into Mesilla, deeming the other an undertaking too hazardous with our animals in their present condition, completely fagged and leg-weary, the results of a succession of long stretches without water which we have encountered since leaving the Pimas, and over which we were obliged to travel with rapidity by night as well as day.

Following the road a short distance, we struck the arroyo or valley coming down from the Ojo de Inez; but, not finding here any water, we pushed on to the Ojo de Vaca, passing over a gently undulating prairie, the slopes and drains of which run southward. Camped, having made 12.6 miles, with fine grass, slightly brackish water, and no wood—the roots of the dwarf mezquite serving all the purposes of cooking. This spring is situated in a slight depression in the prairie, with rounded knobs or knolls on the north, and an insulated rock-capped excrescence on the south. The water, flowing but a few yards, forms quite a marsh, surrounded by rushes and cane; the drain or valley making from it, like those we have encountered since leaving the point of ridge east of the playa, (lake,) spreading out into the broad prairie.

March 8.—Sent this morning two men to Fort Webster, near the copper mines, and about fifteen miles north of the crossing of the Mimbres, to report our arrival in this vicinity, and invite the officers of the garrison to visit us at our camp on the Mimbres, where we expect to remain during to-morrow. From these gentlemen I expect to gain much additional information respecting the section of country lying south of the boundary line, parallel $32^{\circ} 22'$ and extending to the Rio Bravo.

Allowed our mules to graze until 10, when we started for the Rio Mimbres, having a most excellent road over a swelling grassy prairie, crossing at right-angles, as a general thing, the line of greatest declivity. Approaching the Rio Mimbres from the west, one unac-

quainted with its locality is completely deceived, finding himself, when apparently ascending the slope from the Picacho de los Mimbres, very unexpectedly on the summit of a low divide, at the bottom of which lies a meandering line of cotton-woods and willows, indicating the river's course. Although these trees are now destitute of foliage and have a very wintry aspect, the trunks and bare branches nevertheless afford a very pleasing relief. Camped a short distance above the crossing, the grass having been burned in that vicinity. The stream is now about six feet wide, and one foot deep. The water is clear and cold, and flows over a pebbly bottom, with a rapid current; and, like most of the streams throughout this country, although dignified by the title of rio, (river,) its waters disappear soon after leaving the mountains, sinking into the sands a short distance below the road.

Shortly after Lieutenant Stoneman and I had turned in, the men sent to Fort Webster returned, bringing strange and somewhat startling intelligence. Instead of finding a flourishing post, garrisoned by three companies, as was expected, they found not a soul, and the post in ruins, most of the buildings burned to the ground, and the remaining ones sacked—all a perfect wreck; and from the facts of the embers still smoking, and the great number and freshness of the Indian tracks, the depredation has been committed within the last few days. Not an Indian was to be seen, although frequent fires were seen while coming down the river. We must be more cautious and circumspect in our movements hereafter. To be in such close proximity to Indians and not see any of them, indicates clearly that all is not right. Soon after the establishment of this post, these Indians located themselves in its immediate vicinity and commenced cultivating. This whole affair is wrapped in uncertainty, which will not be cleared up until we arrive at Fort Fillmore.

March 9.—Remained in camp to-day, being a fine opportunity for our animals to graze and rest, both of which they stand much in need of, having performed trying and severe duties.

March 10.—Passed a cold night, the thermometer being at sunrise 20°. The Apaches did not disturb us. Left camp at half-past 6 o'clock, and, crossing the stream, we followed the road, which is equal to a turnpike, on a course tangent to the southern end of the Picacho de los Mimbres. On nearing this mountain, we found that, instead of turning it, the road, after passing over two or three ravines, crosses a low spur by a steep ascent, but gradual descent, to Cook's spring, at its base, where we camped, having made nineteen miles. This spring is a hole, or rather a pond, of sulphureous water, which disappears a short distance from its source. There are no trees, not even bushes, to indicate the existence of this spring. Wood is very scarce, "bois de vache" being called into requisition.

Around the terminus of this ridge extends a plain, the continuation of that which absorbs the waters of the Mimbres. How this plain is connected or disconnected with the Rio Bravo bottom, remains to be seen.

March 11.—Having now before us a long stretch, by report sixty miles to the river, without water, we did not leave camp until noon, thus affording our animals an opportunity to graze and take a long draught prior to entering upon this jornada.

From the spring our road lay across a plain, sloping southward, in which direction the view was unbroken by mountain ridges or peaks. So smooth was it, that we had frequent examples of the delusive mirage. Crossing this plain, we ascended a divide, from the crest of which we had spread before us another plain of similar character, but sloping, singularly enough, to the north. Beyond this is a system of mesas, encrusted with a black, volcanic rock, the surface of which is nearly horizontal. In many places this whole crust has been removed, leaving rounded and gently swelling hills. By easy descent we reached the divide beyond, and camped at eight in the evening, having fine grass, but no water nor wood. Distance twenty-three miles.

From Cook's spring there appears to be a break in the ridge of hills to the east, south of the wagon road, and directly opposite the opening between the southern end of the spurs from Picacho de los Mimbres and the Sierra Florida. Should this plain extend to the river, a great advantage will be gained over the route at present travelled.

March 12.—Got off by early dawn, and encountered the same description of country as that of yesterday. Broad, smooth valleys, separated by low ridges, the ascents and descents of which were easy and gentle, except where we came in contact with the volcanic covering of the mesas. As we neared the river our road became rough, encountering, while descending from the mesas, gullies and drains with steep slopes, and a long, dry, sandy ravine, leading down to the bottom of the Rio Bravo del Norte. We camped at sundown on the bank of the river, at the mouth of this ravine, and near the parallel of $32^{\circ} 22'$, the boundary between the United States and Mexico, as settled by the commissioners empowered by the treaty of Guadalupe Hidalgo.

We are now in the well-known Mesilla valley, a small portion of the Rio Bravo bottom lying between the river and the low table-land (Mesilla) on the west; Doña Ana is in sight on the opposite side of the river. Made twenty-seven miles, the entire distance from Cook's spring being fifty miles.

March 13.—Followed down the river, and soon got into the fields, the wagon road passing directly through them, there being no other obstacles than the numerous and ramifying acequias, (irrigating ditches,) many of which had been bridged.

The town of Mesilla is, although new, a very thriving and busy place, and has a rapidly-increasing population. Passing through the town, we crossed the river and encamped in a grove of cotton-woods in view of Fort Fillmore. Although the route just passed over from Cook's spring to the river is practicable for the construction of a railroad, and at the same time being satisfied that the gaps or breaks bearing southeast from the spring present another equally so; still, wishing to compare the two, I determined to retrace our steps in order to make a profile of the latter. Accordingly, on the 17th of March I started with an escort, commanded by Lieut. R. Ransom, 1st dragoons; having obtained from the post fresh animals, both riding and pack, for which, and other assistance, I am much indebted to Major E. Backus, commanding, and to Lieut. J. C. McFerran, acting assistant quartermaster.

Retracing our steps, we camped at the last water, the point where the road leaves the river.

March 18.—Showery during the night. Packed up, and soon after leaving camp the showers of last night turned into a settled rain, rendering the travelling anything but comfortable. We, however, pushed on till half-past 3, when luckily finding two or three cedar bushes in a ravine on the right of the road, (wood being an exceedingly scarce commodity,) we deemed it advisable to make camp. Succeeding in making a fire, we huddled around it, alternately steaming our knees and backs until 9 o'clock, when we turned in with a fair prospect of getting, if possible, more thoroughly soaked, there being no cessation in the rain; and we started without a single tent, the only shelter or protection being one India-rubber poncho.

March 19.—All hands contributed towards the making up of a very sorry picture; even the horses and mules looked most forlorn.

It remained cloudy and threatening during the morning, but at noon the sun made his appearance—a very welcome visitor. We halted to dry our blankets and packs. At sundown we reached the spring.

March 20.—Started southward, skirting the bases of the spurs making from the Picacho de los Mimbres. Continued on this course seven and a half miles, reaching a point in the gap between the Picacho and the Sierra Florida, from which I could see westward, over an almost perfectly level plain, the conical hills to the south of the Ojo de Vaca, while towards the east lay a continuation of the same character of country. Started eastward, bearing towards the middle of a gap between the mesas, over which the wagon road passes, and the low hills to the south. Took several barometric readings; camped at sundown, encountering thus far no obstacle whatever to the construction of a very easy grade. In fact, it was difficult in many places to detect a slope; and if any, the direction. Camped in the open prairie with fine grass, but without wood and water; distance 18.5 miles.

March 21.—Wishing to reach the river before night, we started at 2 a. m., and after con-

tinuous travelling reached the river-bottom at noon. After halting a couple of hours, we moved on to our camp at the post; distance thirty-five miles.

The map has been constructed simply from bearings taken by a prismatic compass, and distances along the route measured by a viameter. Before entering upon the field of the survey, my chronometer most unfortunately met with an accident, rendering it unserviceable. For the latitude and longitude of the point of departure on the Gila, of Tucson, and of the point of striking the Rio Grande, I am indebted to Major W. H. Emory, topographical engineers, in charge of Mexican boundary survey.

The red full line is the line of survey over which the wagons passed. The red dotted is the line of survey made by returning from camp on Rio Bravo, having a small party with pack-mules. The full blue line indicates where, and how, obstacles encountered upon the full red may be avoided, as shown in the profile and notes; and although it does not indicate a line actually passed over and surveyed, it nevertheless is located from observations made while on the field. The blue dotted is suggestive, and indicates where still further improvements may *probably* be made, depending upon other explorations and detailed surveys. By referring to the map it will be seen that the dry bed of stream passing Tucson has, after leaving the point of the hill at camp No. 12, station 2, a slope and direction towards the northwest, which, according to information obtained at Tucson, it retains until reaching the Rio Gila, opening out into its bottom at a point about twenty-five miles below camp No. 10. In that case a saving of distance will be had, and a continuous grade obtained from the Gila to Tucson.

In the Puerto del Dado it may be found practicable and advantageous, after a minute survey, to pursue the blue dotted line, crossing the ridge of a low spar, and thus obtain a less curved trace; and in case the cutting and embankments upon either of the lines in the Puerto require too much work, the whole ridge may be turned on the north, the maximum elevation to be overcome being not more than 4,862 feet, the approximate altitude of camp Castro, in the foot-hills of Mount Graham, furnished me by Major W. H. Emory, topographical engineers; but this detour will be made greatly at the expense of distances. From the plain of the Playa de los Pimas a gap was seen extending towards the mouth of the San Pedro, apparently a continuation of the plain.

Should a practicable descent be found in this direction to the San Pedro, and thence to the Rio Gila, this route will possess decided advantages when taking into consideration the questions of water and distance.

After turning the Chiricahui mountains, a more direct route eastward may be had, depending upon the practicability of the gaps in the ridge to the east of the Valle de Sauz.

From camp No. 24, station 4, an open plain extends in the direction of blue dotted line, presenting, as far as could be observed, no other obstacle than the lack of water, to the running of an almost direct route tangent to the northern end of Sierra de Florida.

When reaching the Rio Bravo I found that to pursue the survey through northern Texas, as was suggested in my instructions, would involve the necessity of incurring a debt equal to the amount of appropriation allowed me; and as Captain Pope, of topographical engineers, had started about one month previous on this line, I deemed it advisable to close my work, discharge such of my party as could be dispensed with, and start to this city by the most direct and expeditious route via San Antonio and Indianola, Texas.

PROFILE.

No. 1, the lower, is the profile of line passed over by the wagons during the survey, indicated upon the map by a full red line, and is constructed from altitudes measured by Green's cistern barometer 387 and 392, and distances measured by a viameter attached to a wheel of the instrument wagon, by assuming the altitude of the starting point on the Rio Gila as zero, and referring the altitudes of the several points along the line to it. It therefore gives approximately

the relative elevations of not only the camps, the main summits or divides encountered and valleys crossed, but also the various intermediate accidents or changes in the surface passed over, the barometer being put up and reading taken at every apparent deviation from the uniform slope.

No. 2, the upper, is constructed with reference to the sea-level, and shows the average grades with which the several sections of the route may be passed. The dotted lines being those attainable by deviating from the red line at points indicated, and following the blue, thereby the grades are improved and the line shortened; but at the same time the question of water is thrown out of consideration.

Commencing at the Rio Gila, we have from camp No. 10 a smooth, plain country extending as far as camp No. 15, station 1, presenting a stretch of ninety-seven miles of easy grades, requiring but little work, the maximum grade being fifty feet per mile from camp No. 14, station 1, to camp No. 15, station 1, a distance of nineteen miles.

At camp No. 15, station 1, we entered a cañon leading from the Cienega de los Pimas, in the gap, by descending abruptly from the plain on its left bank to its dry sandy bottom. By a side-cutting this cañon can be entered with a grade of nineteen feet. Reaching camp No. 16, the summit of the divide between the Cienega and the Rio San Pedro can be attained without trouble; but it is impracticable to continue on this line (the red) to the river. This difficulty can be overcome by deviating at camp No. 16, station 3, and following blue line through camp No. 17, station 1, and camp No. 17, station 3, and skirting along the bases of the hills bounding the valley to a point near camp No. 19, station 1, where, crossing the river, the ascent of the dry ravine leading from the range beyond is commenced. Through the cañon above camp No. 16, there will be required rock-cutting at points where, it becoming narrow and tortuous, rocky projections are presented as obstacles to either a right line or gently curving trace. The walls of this cañon being, however, in no instance over eighty feet, and seldom over fifty feet high, and at many points, where it widens out to a valley, they are replaced by low, rounded hills, no insurmountable obstacle to an average grade of thirty-eight feet per mile is encountered as far as the summit, camp No. 17, station 1. From this point, by pursuing the line indicated, the bottom of the San Pedro may be reached by a grade not exceeding sixty-one feet per mile, and will require but light cutting, the slopes of the foot-hills being of a loose clay. The river can be bridged by a single short span, the water-way being about twenty-five feet wide.

Between the San Pedro and the Playa de los Pimas a low ridge intervenes, the approach to which is by a dry arroyo or drain leading from a gap in its crest, bounded by rounded hills and occasional walls, varying from twenty to fifty feet in height, made up of a semi-hardened conglomerate mass of debris of granitic and volcanic rocks. In the gap there lies a rolling prairie-like country, extending in an unbroken plain down to the playa. This divide can be crossed with an average ascending grade of sixty-two feet, and a descending one not exceeding fifty-four feet.

From the Playa de los Pimas the line crosses the Chiricahui range, passing through the Puerto del Dado. By the line travelled, the ascent to the summit of this pass lay over a smooth plain until reaching the foot-slopes of the mountains, when it became undulating, crossing valleys and their divides; whereas by curving to the southward these foot-slopes will be avoided, and a continuously ascending slope is found, giving, after making a sixty-foot cutting at the summit, a grade less than forty-six feet per mile, that obtained by following the direct red and blue lines. Leaving the summit and following the red line, we find that in the distance 4.7 miles to camp No. 22, station 1, a descent of seven hundred feet is made; and that thence to camp No. 22, station 4, distant seven miles, there is an additional descent of one hundred and eighty-one feet. The line in this descent crosses lateral ravines making from the summits on the right until reaching a point a few yards below camp No. 22, where it enters the main drain, and follows down its bed to the opening on the plain at camp No. 22, station 1. It thence passes to station 4, along the base of the ridge projecting eastward from the Puerto.

Starting from the summit with the above cutting, and hugging the ridge with a curving trace, as indicated by the blue line, station 4, or the level of that station, can be reached by a grade not exceeding seventy feet per mile. This will require, in addition to the rock-cutting at the summit, heavy side-cutting and embankment. At and near the summit large masses of granite are out-cropping, while below camp No. 22 the walls of the cañon are made up of a much tilted and contorted stratification of a slaty sandstone and limestone.

From this station 4, our route lay over a smooth plain, descending apparently uniformly to the stream at the bottom of the Valle de Sauz. Upon this plain a continuous grade of about thirty feet per mile can be constructed with but little labor, the ground being already, as it were, graded. The stream is no obstacle. But from it, at camp No. 23, to the summit of the gap in the ridge beyond, there is an ascent of seven hundred and seventy-one feet, requiring, after making a sixty-foot cutting at the summit, a continuous grade of about ninety feet to overcome it, following either of the lines indicated; but as the approach to the entrance of this gap is over an unbroken slope, this grade can be reduced by ascending the slope diagonally, thus increasing the distance.

The gap is wide and open, with the exception of about a hundred yards at the summit, where it narrows down to a cañon, with granite wall.

No difficulty is found in crossing the valley, which is made up of smooth slopes lying between camp No. 24, station 4, and camp No. 25, station 1. The maximum grade is but sixty-eight feet per mile, the natural slope ascending to camp No. 25, station 1.

Beyond this point lies another bottom, bounded by a low spur, giving out and sinking into the plain towards the south.

For considerations of water we continued eastward, hugging and skirting the extremities of the spurs of this ridge until reaching Cook's trail, which we followed to the Ojo de Vaca, and then pursued the trail to the Rio Bravo. By observations made on the ground, it was found perfectly practicable to construct a line of grades answering the purposes of a railway communication along or near the route travelled, the maximum grades being encountered in ascending the summit of camp No. 25, station 7, and at the Rio Mimbres; in the first case, 78.7 feet, and in the second 89 feet, allowing sixty feet for cutting and the same for embankment, and even these grades can be greatly reduced by a slight deviation to the south at these points. But, since the several spurs, valleys, and slopes crossed make southward and amalgamate, forming a continuous plain unobstructed by rough ridges, the line or route to the river can be improved, not only in its grades, but also be shortened by diverging at camp No. 25, station 3, and pursuing a general direction, as indicated by the blue line, to its junction with the red dotted, and thence following it to the river; the profile of this latter having been determined barometrically.

Profile No. 2 gives, in the dotted line, the average grade attainable by following the course above indicated, the maximum being about fifty feet, that required in making the ascent from the point of divergence to "A" on the horizontal curve, passing through camp No. 25, station 6, and thence ascending to B, the approximate altitude of which is five thousand one hundred and seventy-seven feet, after assuming that the fall of the ravine from camp No. 26, station 2, to the point "B," is at least ten feet per mile. But little work will be required throughout this stretch, deep cutting being avoided by gently curving the trace.

From Cook's spring, camp No. 29, to the river, the profile of wagon route shows no great altitudes to be overcome, the chief obstacles being the abrupt ascent at camp No. 29, stations 3 and 4, crossing the ridge at camp No. 30, stations 1, 2, and 3, and descending to the river-bottom from camp No. 30, station 8. At these points heavy grades are necessary, but the difficulties can be entirely avoided by pursuing, instead of the red full line, the red dotted line; the profile of which is given in No. 2, connecting with the dotted or profile of blue line from C. This indicates a smooth, prairie-like surface, according well with the observations made on the ground, that it was difficult to tell, in many places, the direction of slope. This smooth sur-

face, or mesa, has an average altitude above the river-bottom of three to six hundred feet, and is connected with it by an irregular step of a loose, light soil, extending to a point opposite, and a short distance below Fort Fillmore, where, in place of the deep-washed, loamy slope, is found an outcrop of a black, igneous rock, with a foot-slope of its angular debris. To descend to the river-bottom will require a diagonal trace, hugging the mesa slope, until a distance is made sufficient to overcome the difference in altitude; the direction of this depending upon location of route to the eastward, whether leaving the valley at the pass near Doña Ana, or on the south at El Paso.

The supply of timber along the route is very limited. Cotton-wood, the only growth of size sufficient to answer the purposes of sills, is found in but four localities; on the Gila, at Tucson, on the Mimbres, and Rio Bravo. Water being so essential to the very existence of this tree, it only grows on the banks of streams, and disappears with the sinking of the waters, as is the case at Tucson and Rio Mimbres. At Tucson I was informed that a variety of the pine is found in the cañadas of Sierra de Santa Catarina to the east and northeast of the town. In the mountains, about fifteen or twenty miles north of the crossing of the Mimbres, the pine also exists. But the plains are entirely destitute of trees of any description, and the mountains have a general appearance of sterility and ruggedness, yielding in the concealed nooks and valleys a meagre growth of cedar and dwarfish evergreen oak.

The rocks are generally of a metamorphic character, but there is found at many points along the line stone answering well the purposes of construction. Granite appears in the Cienega de los Pimas, in the ridge to the east of the San Pedro, outcropping in the Puerto del Dado, and overlying masses of secondary limestone in the ridge east of the Valle de Sauz. Sandstone and limestone are both found in the Puerto del Dado. Near the Rio Bravo both limestone and gypsum are found, the veins or seams of the anhydrous variety of the latter being exposed in the clayey walls of the ravine leading down to the river.

There is a great scarcity of water along the line, there being but nine localities where the supply could be said to be permanent. These are: 1st, at Tucson—a clear running stream, but disappearing a few hundred yards below the town; 2d, in the Cienega de los Pimas—fine springs, but the water soon sinks into the sand, as is the case at camp No. 16; 3d, the Rio San Pedro, a turbid stream, winding its way to the Gila; 4th, a spring near camp No. 22, in the Puerto del Dado—the water cold and very palatable, but the supply very limited, our animals having entirely exhausted the basin before they had a sufficiency; 5th, in the bottom of the Valle de Sauz—a stream of clear but slightly brackish water, spreading out into a marsh and extending towards the Gila in a succession of pools; 6th, a hole near camp No. 25, where, although the water rose in the bottom, still every other feature would indicate that a blind drain of mere surface-water had been tapped; 7th, the Ojo de Vaca—a spring of slightly sulphureous water, rising in the open plain and forming a marsh, beyond the limits of which there is no appearance or indication of the existence of water; 8th, Rio Mimbres—a rippling mountain stream of clear cold water at the crossing, being the more beautiful from the contrast with the state of things a few miles below, where the water is absorbed by the parched plain, the trees disappear, and there is nothing left but the dry, gaping bed; 9th, Cook's spring—is of similar character to the Ojo de Vaca, and bears more of a resemblance to a pond-hole than to a spring.

In addition to the above constant waters, there are holes or depressions on the plains intervening, which are filled by the rains of the wet season, and thus often afford relief to the anxious and solicitous traveller. These holes are lined with a clay allowing but little absorption; but, being generally shallow and broad-surfaced, evaporation soon empties them of that necessary which one requires, but has to be deprived of in order fully to appreciate it.

At Tucson the rainy season commences in April, and continues for three or four months; so that the emigrant who passes this point during the summer months finds himself in this country in the most favorable season with water abundant and grass green and nourishing, whereas we were there, and *en route*, about the end of the dry season, as our experience proved, meeting

a different state of things; so that one's views and opinions of this country depend entirely upon the season during which he visits it.

Whether water can be obtained on these plains by digging within reasonable limits, is a question purely problematical, to be solved in every case by experiment, owing to the geological structure of the country. This experiment I consider worthy of attention, not only on account of its great and all-important bearing upon the question of locating a line for railroad over this country, where are intervals of fifty and seventy miles between permanent waters, but also, if successful, on account of the relief rendered the various parties crossing during the dry season, whose sole and great anxiety now is, when entering upon these jornadas, to get their animals through to the next water.

Before closing this report, I take great pleasure in expressing my thanks for the many kind offices and valuable assistance rendered throughout the trip by Lieutenant George Stoneman, 1st dragoons, and commanding escort, an officer full of expedients and experience, the results of eight years' campaigning; also to Dr. A. L. Heermann, physician and naturalist, and to Mr. Henry Custer, assistant; both of whom displayed a proficiency in their professions only equalled by the zeal bestowed upon the discharge of their respective duties.

I have the honor to be, very respectfully, your obedient servant,

JNO. G. PARKE,

Lieutenant Corps Topographical Engineers.

Hon. JEFFERSON DAVIS,
Secretary of War.

TABLE OF BAROMETRICAL MEASUREMENTS, WITH THE REDUCED APPROXIMATE ALTITUDES.

First column of heights.—Those entered in this column were obtained by referring the principal camps to each other, and the intermediate stations to the nearest well-determined camp. The barometric reading was first reduced to 32°. After which, a correction was applied, on account of hourly variation, taken from the following table, prepared by L. Blodget, Esq., of the Smithsonian Institution, after a careful and close investigation of hourly observations made during the survey of the Mexican boundary; and that of Lieutenant Whipple, topographical engineers, in corresponding longitudes and neighboring latitudes.

6 a. m.....	— .010
7 a. m.....	— .040
8 a. m.....	— .045
9 a. m.....	— .050
10 a. m.....	— .057
11 a. m.....	— .070
12 m.....	— .032
1 p. m.....	+ .009
2 p. m.....	+ .030
3 p. m.....	+ .040
4 p. m.....	+ .050
5 p. m.....	+ .045
6 p. m.....	+ .035
7 p. m.....	+ .025
8 p. m.....	+ .010
9 p. m.....	+ .005

Second column of heights—Contains the elevations obtained by referring each observation to the sea-level; barometer assumed to be 30.050; thermometer, 64°. The barometer was corrected for temperature and horary variation, as in column 1st.

These reductions were made by D. G. Major, Esq., under the direction of Mr. Blodget, who furnished the tables and formulæ, and, at my request, the following communication referring to their application:

“SMITHSONIAN INSTITUTION, *July 16, 1854.*”

“DEAR SIR: At your request, I make the following note of the direction given to the reduction of the barometric observations made on your line of survey from the Pimas villages, on the Gila river, to El Paso. They were reduced in part by the aid of new constants and new modes of correction, which require some explanation.

“Determinations of elevation by the barometer are subject to error from two causes not considered in the formulæ and tables usually employed, or those providing for this determination, though simultaneous observation on a vertical line.

“The survey of an extended surface-line necessarily involves liability to those errors, and it cannot be accurately made by the principles applicable to vertical and simultaneous comparisons alone.

“The sources of error are, first, variable constants of atmospheric pressure, both in the changes for the day and among the months; and, second, non-periodic changes, or variations without regularity or definite recurrence.

“To avoid the first error, or that arising from horary variations of pressure, a scale of correction for the observations made at each hour has been applied, reducing each reading to a mean position for the day. This scale is a new one, of larger range of variation than that applicable in the eastern United States and in Europe; and it was determined from hourly observations made by the survey under Lieutenant Whipple, corrected and confirmed by reference to the results of hourly observations by the boundary survey, which were made accessible for this purpose by Major Emory and Mr. Chandler. The scale is given in connexion with the computation and results.

“To correct the work for non-periodic variations of pressure, the principal camps are referred to each other consecutively, and each to a principal camp; correcting the determination by the mean of these results. Each camp is also referred directly to the sea-level, assuming a mean pressure at sea-level in those latitudes of 30.050 inches, with the barometer corrected to the reading at freezing-point, and the air temperature at 64°. These results agree very nearly with those obtained by the first and preferable mode.

“The intermediate stations and minor camps are first referred to the nearest principal camp; and the line formed by successive differences from such point of departure is corrected, if found not to agree with the single difference determined from camp to camp by a proportional correction of the intermediate elevations. The result of elevations are still liable to error, from a measure of non-periodic variation that cannot be determined, but they are the best possible in this description of survey, without simultaneous observations at stations very near each other.

“The correction for monthly variation of pressure would be very small at the date of this survey.

“It is proper to say that the greatest error probable in the determination of the absolute elevation of any camp by those methods cannot exceed one hundred feet, and the error of any grade would be wholly unimportant.

“Respectfully, yours,

“L. BLODGET.

“Lieutenant PARKE,

“*In charge of Survey of Line from Gila river to El Paso.*”

TABLE OF BAROMETRICAL OBSERVATIONS.

Barometrical Observations and approximate Altitudes of camps and stations along the line from the Pimas villages, on the Rio Gila, to Mesilla, on the Rio Bravo.

Station.	Date.	Hour.	Number of barometer.	Height of column.	Attached thermometer.	Detached thermometer.	App. altitude, No. 1.	App. altitude, No. 2.	Distance from the preceding station.	Distance from camp to camp.	Remarks.	
Camp 10, on the Gila.	Feb. 15	Sunset	387	28.770	47.5	Clear.	
		Sunset	392	28.780	48	50	Do.	
	Feb. 16	Sunrise	387	28.637	25	Do.	
		Sunrise	392	28.613	28	25	Do.	
		8.....	387	28.702	62	Do.	
		8.....	392	28.710	61	47	Do.	
		9.....	387	28.730	69	Do.	
		9.....	392	28.732	72	56	Do.	
		10.....	387	28.738	72.2	Do.	
		10.....	392	28.734	75.5	61	Do.	
		11.....	387	28.732	79.5	Do.	
11.....	392	28.730	82	62.5	.....	.....	.....	.....	Do.	
1.....	Feb. 16	.....	387	28.600	77	1457.9	1364.7	.....	.....	Do.
2.....	Feb. 16	Sunset	387	28.475	68	1650.7	1503.2	2.7	.....	Do.	
Camp 11.....	Feb. 17	Sunrise	387	28.340	38	Do.	
		Sunrise	392	28.350	38	40	1668.4	1660.7	12.40	23.10	Cloudy from zenith to horizon in the west; southerly breeze.	
1..... 2..... 3.....	Feb. 17	9.30.....	387	28.375	58	56	1712.2	1722	7	Cloudy; strong west wind.	
		11.30.....	387	28.278	70	65	1835.1	1861.3	5.50	.....	
		2.30.....	387	28.176	80	73	.....	.....	.....	.....
		2.30.....	392	28.196	84	73	.....	.....	.....	.....
		3.....	387	28.152	72	69	.....	.....	.....	.....
		3.....	392	28.160	73	69	.....	.....	.....	.....
		3.30.....	387	28.140	70	66	.....	.....	.....	.....
		3.30.....	392	28.150	71	66	.....	.....	.....	.....
		4.....	387	28.138	67	65	.....	.....	.....	.....
		4.....	392	28.145	68	65	1869.3	1891.5	2.30	.....	
		4.....	Feb. 17	Sunset	392	28.120	64	1886.4	1908.4	1.40		.....	Strong south wind; clear in the west; showery for half an hour from 4 a. m.
Camp 12.....	Feb. 18	Sunrise	392	28.070	47	46	1971.8	1963.1	10.9	27.10	Heavy clouds; wind south.	
		Sunrise	392	28.025	47	45	2010.2	1998	2.5	Heavy clouds to the east; clearing in the west.	
3.....	Feb. 18	8.50.....	392	28.032	55	52	2064	2037.7	5.45	Sun breaking through the clouds.	
4.....	Feb. 18	11.30.....	392	27.950	65	60	2161.5	2169.1	5.82	Cloudy.	
Camp 13.....	Feb. 18	Sunset	27.900	44	44	2078.4	2090	3.06	19.50	Showery; heavy clouds in the east; wind west.	
		27.984	38	39	Clear in eastern horizon; from zenith to the west overcast; thin clouds.	
		Sunrise	387	27.980	38	39	Fleecy clouds.	
		8.....	392	28.040	62	50	
		8.....	387	28.030	61	50	
		9.....	392	28.050	61	55	
		9.....	387	28.035	59	55	
		10.....	392	28.046	62.5	65	Clouds disappearing.
		10.....	387	28.055	73.5	65	
		10.....	28.05
		11.....	392	28.032	62.5	58	Cum. clouds; north breeze
11.....	387	28.030	60.5	.....	.....	.....	.....	.....	.....	.....
12.....	392	27.97	69	68	.....	.....	.....	.....	.....	Cum. clouds.
12.....	387	27.99	75	68	.....	.....	.....	.....	.....	.....
1.....	392	27.955	66	60	.....	.....	.....	.....	.....	Cum. clouds; northerly breeze.
1.....	.....	27.960	65	60	.....	.....	.....	.....	.....	.....
2.....	392	27.940	76.5	68	.....	.....	.....	.....	.....	Cum. clouds; northwest breeze.
2.....	.....	27.960	74	68	.....	.....	.....	.....	.....	.....
4.....	392	27.915	70	60	.....	.....	.....	.....	.....	Clouds.
4.....	387	27.918	68	60	.....	.....	.....	.....	.....	.....
5.....	392	27.905	66	59	.....	.....	.....	.....	.....	A few clouds in easterly horizon; north wind.
5.....	387	27.900	64	59	.....	.....	.....	.....	.....	.....
Sunset	392	27.860	49	52	.....	.....	.....	.....	.....	.....
6.....	387	27.855	49	52	.....	.....	.....	.....	.....	.....
Camp 14.....	Feb. 20	Sunrise	392	27.825	37	38	2078.4	2090	3.06	19.50	Perfectly clear and calm.	
		Sunrise	387	27.825	37	38	Clear and calm.	
.....	Feb. 20	12.....	392	27.780	67	60	Clear and southwesterly breeze.	
12.....	.....	27.770	67.5	60	.....	.....	.....	.....	.....	.....
1.....	392	27.773	74	63	.....	.....	.....	.....	.....	Do.
1.....	387	27.753	67	63	.....	.....	.....	.....	.....	.....
2.....	392	27.760	75	64	.....	.....	.....	.....	.....	Do.
2.....	387	27.740	73	64	.....	.....	.....	.....	.....	.....
3.....	392	27.750	64.5	60	.....	.....	.....	.....	.....	Do.
3.....	387	27.740	70	60	.....	.....	.....	.....	.....	.....
4.....	392	27.760	73.5	56	.....	.....	.....	.....	.....	Do.
4.....	387	27.740	67	56	.....	.....	.....	.....	.....	.....
5.....	392	27.750	59	54	.....	.....	.....	.....	.....	Do.
5.....	387	27.730	64.5	54	.....	.....	.....	.....	.....	.....
Sunset	392	27.730	51	52	.....	.....	.....	.....	.....	.....
Sunset	387	27.720	51	52	.....	.....	.....	.....	.....	.....
Camp 14.....	Feb. 21	Sunrise	392	27.730	31	32	Clear, calm, and cold.	
		Sunrise	387	27.720	30	32	Do.	
		Sunrise	392	27.772	48	36	Do.	
		Sunrise	387	27.772	46	36	Do.	

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TABLE OF BAROMETRICAL OBSERVATIONS.

Barometrical Observations and approximate Altitudes, &c.—Continued.

Station.	Date.	Hour.	Number of barometer.	Height of column.	Attached thermometer.	Detached thermometer.	App. altitude, No. 1.	App. altitude, No. 2.	Distance from the preceding station.	Distance from camp to camp.	Remarks.	
Camp 14.....	Feb. 21	11.....	392	27.800	75	69	.....	.....	.....	.....	Light easterly breeze.
		11.....	387	27.800	76	69	.....	.....	.....	.....	Light northerly breeze.
		1.....	392	27.732	73	72	.....	.....	.....	.....	.....
		3.....	387	27.740	80	72	.....	.....	.....	.....	.....
		4.....	387	27.745	74	68	.....	.....	.....	.....	.....
		4.....	387	27.734	71	68	.....	.....	.....	.....	.....
		Sunset	392	27.730	59	60	.....	.....	.....	.....	.....
1.....	Feb. 22	2.....	392	27.725	90	84	2349.8	2432.1	4.35	.....	Strong westerly breeze; few clouds on horizon.
Camp 15.....	Feb. 22	.....	.....	.....	.....	.....	.....	.....	.....	.....	Clear and calm.
		1.....	392	26.820	81	75	3273.2	3333.6	15.10	.....	Thin clouds in the east; fresh breeze.
Camp 16.....	Feb. 23	2.....	392	26.925	86	78	3146.1	3229.3	0.34	.....	Strong west wind; thin clouds.
		Sunset	392	26.785	66	64	.....	.....	.....	.....	West wind; thin clouds to the northwest.
Camp 16.....	Feb. 24	Sunrise.....	392	26.615	34	32	.....	.....	.....	.....	West wind; clouds cum.
		8.30.....	392	26.660	46	46	.....	.....	.....	.....	West wind; strong indication for rain.
		9.30.....	392	26.680	52	47	3335.6	3348.8	2.62	18.06	.....
1.....	Feb. 24	10.30.....	392	26.660	58	52	3442.8	3456.7	0.85	.....	West wind; clouds cum.
		2.....	392	26.565	55	52	3650	3661.7	7.70	.....	Strong west wind.
		3.....	392	26.282	65	56	3751.6	3778.6	1.84	.....	Do.
Camp 17.....	Feb. 24	Sunset.....	392	25.760	45	46	.....	.....	.....	.....	Do.
		Sunrise.....	392	25.825	29	30	4222.7	4197.9	4.93	15.3	.....
1, off the road.....	Feb. 25	9.....	392	26.080	60	51	4027.5	4055	.....	.....	Clear and calm.
		10.15.....	392	26.055	65	55	4070.9	4132.4	5.91	.....	Do.
		11.30.....	392	26.496	69	59	3633.1	3670	2.39	.....	Do.
Camp 18, near San Pedro river.	Feb. 25	3.....	392	26.660	79	68	.....	.....	.....	.....	Do.
		4.....	392	26.635	74	64	.....	.....	.....	.....	Clear; west wind.
		5.....	392	26.605	62	60	.....	.....	.....	.....	West wind; feathery cl'ds in west.
		Sunset.....	392	26.609	55	52	.....	.....	.....	.....	Do.
		Sunrise.....	392	26.495	11	12	3413.3	3419.3	2.74	11.04	.....
1.....	Feb. 26	8.....	392	26.585	42	35	.....	.....	.....	.....	South breeze, and clear.
		9.....	392	26.628	61	41	.....	.....	.....	.....	Clear.
		9.15.....	387	26.600	60	43	.....	.....	.....	.....	Do.
		9.30 a.m.....	387	26.620	54	45	.....	.....	.....	.....	Do.
		11.30.....	387	26.700	75	68	3492.9	3458	1.97	.....	Clear.
Camp 19.....	Feb. 27	4.15.....	387	26.430	86	79	3435.3	3501.6	0.63	.....	Do.
		Sunset.....	387	26.185	63	63	3645.3	3753.4	10.16	.....	Do.
Camp 20.....	Feb. 28	.....	.....	.....	.....	.....	.....	.....	.....	.....	Do.
		1.....	387	26.000	29	30	4026.7	3964.6	0.9	14	.....
		2.....	387	25.860	66	61	4294.9	4347.4	3.46	.....	Clear and calm.
Camp 20.....	Feb. 28	3.....	387	25.720	69	64	4435.9	4531.1	2.40	.....	Clear; breeze south.
		4.....	387	25.580	71	72	4506.7	4707.9	2.70	.....	Clear; strong southwest breeze.
		5.....	387	25.655	76	72	4565.4	4561.4	5.14	.....	Clear; strong southwest breeze.
		6.....	387	25.900	78	70	4149.0	4268.4	5.73	.....	Do.
		7.....	387	25.910	72	68	4127.9	4236.7	2.19	.....	Do.
		.....	.....	.....	.....	.....	.....	.....	.....	.....	Do.
		.....	.....	.....	.....	.....	.....	.....	.....	.....	Do.
Camp 21.....	Mar. 1	9.15.....	387	25.310	51	46	4829.3	4842.8	13.53	.....	Strong southwest wind; squally.
		12.45.....	387	25.050	54	49	5066.6	5096.1	7.25	.....	Do.
Camp 22.....	Mar. 1	1.10.....	387	24.935	58	51	5183.1	5228.6	0.50	.....	Do.
		4.15.....	387	25.235	54	48	.....	.....	.....	.....	2.33
Camp 22.....	Mar. 2	9.....	387	25.425	48	40	.....	.....	.....	.....	Strong southwest wind; clouds in the east.
		10.....	387	25.425	54	42	.....	.....	.....	.....	North wind; clear.
		11.....	387	25.410	53	42	.....	.....	.....	.....	Do.
		11.....	392	25.418	54	42	.....	.....	.....	.....	Do.
		12.....	387	25.385	50	44	.....	.....	.....	.....	.....
		North wind; clear; light clouds in the west.
		12.....	392	25.395	48	44	.....	.....	.....	.....	.....
		1.....	387	25.350	44	46	.....	.....	.....	.....	.....
		1.....	392	25.355	44	46	.....	.....	.....	.....	.....
		2.....	387	25.335	64	52	.....	.....	.....	.....	.....
		2.....	392	25.340	64	52	.....	.....	.....	.....	.....
		3.....	387	25.325	60	52	.....	.....	.....	.....	.....
Camp 22.....	Mar. 3	3.....	392	25.322	60	52	.....	.....	.....	.....	Northwest wind; sky overcast.
		4.....	387	25.285	52	52	.....	.....	.....	.....	Do.
Camp 22.....	Mar. 3	4.....	392	25.280	52	52	.....	.....	.....	.....	Northwest wind; clouds in N.W.; clear in zenith.
		5.....	387	25.276	49	48	.....	.....	.....	.....	.....
		Northwest wind; clouds in northwest; clear; clouds disappeared.
		5.....	392	25.275	49	48	.....	.....	.....	.....	.....
		5.45.....	387	25.270	44	45	.....	.....	.....	.....	.....
		5.45.....	392	25.270	44	45	.....	.....	.....	.....	.....
		Do.
	
	
	
	
	
1.....	Mar. 3	Sunrise.....	387	25.260	24	28	4745.6	4751.9	2.33	23.58	Clear and calm.	
2.....	Mar. 3	7.45 a.m.....	387	25.585	30	30	4482.3	4408.6	2.33	.....	Do.
		8.45.....	387	25.720	62	50	4415.1	4439	0.95	.....	Do.
3.....	Mar. 3	10.....	387	25.810	63	53	4398.6	4389	2.35	.....	Clear; light west wind.
		11.30.....	387	25.825	62	52	4300.7	4340	3.77	Do.	
4.....	Mar. 3	3.30.....	387	26.190	77	67	3844.7	3943	5	Do.	

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TABLE OF BAROMETRICAL OBSERVATIONS.

Barometrical Observations and approximate Altitudes, &c.—Continued.

Station.	Date.	Hour.	Number of barometer.	Height of column.	Attached thermometer.	Detached thermometer.	App. altitude, No. 1.	App. altitude, No. 2.	Distance from the preceding station.	Distance from camp to camp.	Remarks.
Camp 23.....	Mar. 4	Sunrise.....	387	26.210	19	20	.....	.....	.....	.....	Clear; northwest breeze.
		7.10.....	387	26.245	33	28	3815	3698.4	8	22.40	Clear; light south breeze.
Camp 24.....	Mar. 4	2 p. m.....	387	26.160	84	75	.....	.....	.....	.....	Do.
		3.....	387	26.162	87	78	.....	.....	.....	.....	Do.
		4.....	387	26.155	87	78	.....	.....	.....	.....	Feathery clouds; light southwest breeze.
		5.20.....	387	26.132	81	75	.....	.....	.....	.....	Do.
	Mar. 5	5.55, or sunset.....	387	26.100	63	63	.....	.....	.....	.....	Do.
		Sunrise.....	387	26.045	43	48	.....	.....	.....	.....	Southeast breeze; sky overcast.
1.....	Mar. 5	6.50.....	387	26.055	39	39	3967.2	4029.4	2.9	2.9	Do.
		7.45.....	387	25.945	58	56	.....	.....	.....	.....	South breeze; sky overcast.
2.....	Mar. 5	7.50.....	387	25.950	58	56	4180.1	4204.2	1.85	.....	Do.
8.50.....		387	25.750	69	63	4434.2	4486.7	1.90	.....	Strong southwest breeze; sky overcast.	
3.....	Mar. 5	9.20.....	387	25.588	65	61	4602.2	4646.3	0.70	.....	Strong southwest breeze; clearing.
4.....		9.30 a. m.....	387	25.614	68	65	4586.3	4646.1	0.35	.....	Strong southwest breeze.
5.....	Mar. 5	10.35.....	387	25.748	72	68	.....	.....	.....	.....	Do.
10.40.....		387	25.748	74	69	4457.9	4542.5	2.10	.....	Do.	
6.....	Mar. 5	11.10.....	387	25.865	79	75	4354	4455.9	1	.....	Light southwest breeze; clearing.
7.....		12.30.....	387	25.900	83	73	4269.5	4359.6	3.20	.....	Hazy and thin clouds in the horizon.
8.....	Mar. 5	1.50.....	387	25.850	88	82	4281.9	4404.9	.....	.....	Light northwest breeze; clear in the horizon.
		2.05.....	387	25.845	82	75	4281.9	4404.9	2.55	.....	.....
9.....	Mar. 5	4.....	387	25.635	77	72	4522.5	4622	3.50	.....	Southwest breeze; clear in the northern horizon.
		4.30.....	387	25.500	75	69	4619.8	4697.1	1	.....	Do.
Camp 25.....	Mar. 5	5.20.....	387	25.470	69	70	.....	.....	.....	.....	Strong southwest wind.
		4.45.....	387	25.460	63	63	.....	.....	.....	.....	Clearing.
1.....	Mar. 6	6, or sunset.....	387	25.455	61	61	4644.6	4701	0.95	19.15	.....
		6.40.....	387	25.464	55	55	4697.4	4685.8	0.95	.....	.....
2.....	Mar. 6	8.15.....	387	25.685	64	58	4491.4	4517.1	3.25	.....	Heavy cum. clouds in southeast; light southwest wind.
		9.24.....	387	25.850	69	63	.....	.....	.....	.....	Fresh south wind.
3.....	Mar. 6	9.25.....	387	25.855	71	63	4330.5	4380.5	2.35	.....	Do.
		10.20.....	387	25.820	70	65	4374.4	4434.6	2.05	.....	Do.
4.....	Mar. 6	11.30.....	387	25.618	70	65	4705.2	4644.6	1.80	.....	Fresh south wind; cloudy and a few drops of rain.
6.....		1.10.....	387	25.256	75	70	.....	.....	.....	.....	Fresh south wind.
7.....	Mar. 6	1.25.....	387	25.258	75	71	4928.3	5011.9	3.50	.....	High southwesterly wind.
		3.10.....	387	24.790	68	68	5407.5	5476.1	3.25	.....	Do.
Camp 26.....								6.55	23.70	Do.	
1.....	Mar. 7	7.....	387	24.910	46	39	.....	.....	.....	.....	Clear and calm.
		7.15.....	387	24.915	46	39	5245.6	5215.9	1.54	.....	Do.
2.....	Mar. 7	7.45.....	387	24.955	50	46	5220.6	5220.7	1.39	.....	Thin clouds; fresh west breeze.
		9.05.....	387	24.850	59	52	.....	.....	.....	.....	Do.
4.....	Mar. 7	9.10.....	387	24.855	57	51	5361	5394.4	1.20	.....	Scattering cum.
		10.40.....	387	25.050	61	56	5150.4	5212.8	4	.....	Do.
Camp 27, Ojo de Vaca.	Mar. 7	11.....	387	25.055	60	55	.....	.....	.....	.....	Southwest wind; scattering cum. in west.
		5.....	387	24.890	64	60	.....	.....	3.10	11.20	Light southwest wind.
	Mar. 8	Sunrise.....	387	24.878	52	52	.....	.....	.....	.....	Heavy clouds in east horizon.
		Sunrise.....	387	24.838	35	35	.....	.....	.....	.....	Light west breeze.
		7.....	387	24.855	45	42	.....	.....	.....	.....	Do.
		8.30.....	387	24.905	60	51	.....	.....	.....	.....	Do.
		9.....	387	24.908	61	52	.....	.....	.....	.....	Do.
		9.30.....	387	24.902	60	53	.....	.....	.....	.....	Breeze freshening.
1.....	Mar. 8	10.....	387	24.900	63	54	5288.3	5312.3	3.10	11.20	Clear in zenith.
		10.40.....	387	24.865	66	55	5408.2	5335.8	0.60	.....	Clear in zenith; west breeze.
2.....	Mar. 8	11.50.....	387	24.955	69	60	5298.5	5351.2	3.45	.....	Cum. coming from southwest; west breeze.
		2.15.....	387	25.045	68	64	.....	.....	.....	.....	Clouds scattering.
3.....	Mar. 8	2.30.....	387	25.040	66	61	5100.8	5168.6	6.43	.....	Clouds in the horizon to southwest; clear in the zenith.
		4.....	387	24.925	67	60	5209.9	5268.6	6.12	.....	Clear, except in south and southwest; west wind.
Camp 28, Rio Mimbres.	Mar. 8	5.30.....	387	24.930	55	54	.....	.....	0.39	17	Do.
		Sunset.....	387	24.924	50	50	.....	.....	.....	.....	Clear; fresh northwest wind.
	Mar. 9	8.15.....	387	25.075	51	49	.....	.....	.....	.....	High west wind.
		10.....	387	25.115	63	56	.....	.....	.....	.....	High west wind; a single cloud in southeast horizon.
1.....		11.....	387	25.122	63	56	.....	.....	.....	.....	Do.
		12.....	387	25.135	66	59	High west wind; few clouds in south and southeast.
		1.....	387	25.142	68	60

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TABLE OF BAROMETRICAL OBSERVATIONS.

Barometrical Observations and approximate Altitudes, &c.—Continued.

Station.	Date.	Hour.	Number of barometer.	Height of column.	Attached thermometer.	Detached thermometer.	App. altitude, No. 1.	App. altitude, No. 2.	Distance from the preceding station.	Distance from camp to camp.	Remarks.
Camp 28, Rio Mimbres.	Mar. 9	2.....	387	25.142	68	60					
		3.....	387	25.160	69	61					
		4.....	387	25.170	69	61					
		5.....	387	25.175	60	59					
		6.5, or sunset	387	25.168	49	50	5048.4	5082.4			
1, crossing river.	Mar. 10	6.30, or sunrise.	387	25.370	31	26	4729.8	4602	0.29		Clear and calm.
		2.....	387	25.115	56	49	5092.7	5085.6	7.16		Clear and fresh east wind.
3.....	Mar. 10	10.10.....	387	25.350	57	52	4784.6	4802.2	2		Do.
4.....	Mar. 10	11.50.....	387	25.575	64	58	4579.9	4628.2	2		Light east wind.
5.....	Mar. 10	12.30.....	387	25.390	73	62	4732.2	4843.7	2		Do.
6.....	Mar. 10	1.10.....	387	25.325	76	69	4942.6	5045.7	2.30		Do.
7.....	Mar. 10	1.35.....	387	25.390	76	64	4747.2	4827.1	1.30		Do.
Camp 29, Cook's Spring.	Mar. 10	3.....	387	25.385	71	60			0.35	17.60	Clear and light east breeze.
		6, or sunset... 11 a. m.....	387	25.352	54	53					
1.....	Mar. 11	11.30.....	387	25.312	75	64					Thin. strat. in northeast; light south breeze.
		12.50.....	387	25.420	78	71	4862.8	4883.2	0.35	17.60	Do.
2.....	Mar. 11	3.....	387	25.560	84	76					Thin strat. in the horizon; light southwest breeze.
		3.15.....	387	25.555	83	75	4597.6	4692.5	6.26		Do.
3.....	Mar. 11	4.30.....	387	25.410	83	76	4754.8	4853.1	3.25		Do.
4.....	Mar. 11	4.45.....	387	25.272	80	75	4901.5	4995.3	0.33		Thin strat. in the east and north.
5.....	Mar. 11	6.15, or sunset	387	25.370	62	58					Calm; clouds accumulating in south and east.
		6.30 p. m....	387	25.364	54	54	4751.1	4754.6	4.69		Do.
6, three hundred yards west of camp 30.	Mar. 12	6 a. m.....	387	25.095	44	45	5066.4	5009.7	4.83		Cloudy; calm; rain indications.
Camp 30.	Mar. 12	7.....	387	25.225	49	49	4968.3	4931.4	3.33	22.89	Do.
		7.30.....	387	25.110	55	55	5113.8	5107.6	1.21		Light southwest breeze.
3.....	Mar. 12	7.45.....	387	25.255	55	54	4955.3	4943.9	0.61		Cloudy and calm.
4.....	Mar. 12	8.....	387	25.320	56	55	4888.5	4881.8	0.70		Do.
5.....	Mar. 12	8.45.....	387	25.420	60	58	4744.1	4800.5	2.49		Cloudy and very light west breeze.
6.....	Mar. 12	10.05.....	387	25.230	61	59	4904.3	5024.6	3.39		Cloudy and very light southwest breeze.
7.....	Mar. 12	12.20.....	387	25.475	64	62	4710	4719.3	6.49		Clouds thickening; fresh south breeze.
8.....	Mar. 12	1.20.....	387	25.210	63	62	4960.9	4989.9	2.44		Clouds thickening; high and fresh.
9.....	Mar. 12	3.....	387	25.640	70	66	4479.5	4525.4	3.90		Do.
Camp 31, on Rio Bravo.	Mar. 12	5.....	387	25.880	71	66					High southwest wind; clear in the west; clouds in the east.
		6.10, or sunset	387	25.878	60	61	4229.3	4243.7	3.04	27.67	Very blustering; clear in the west; clouds in the east.
Camp 32, near Fort Fillmore.	Mar. 13	2.....	387	26.200	75	75					Cloudy and calm.
		Sunset.....	387	26.26	58	58					Do.
Camp 35.....	Mar. 19	Sunset.....	387	26.110	73	74					Clouds.
		Sunset.....	392	26.140	73	74	3937.8	3976	12.28	12.28	Westerly breeze; cum. scattering.
1.....	Mar. 20	Sunset.....	387	25.200	60	59					Westerly breeze; few scat. cum.
		6.15, or sunrise.	387	25.175	31	32	4959.5	4908.8			Clear and calm.
2.....	Mar. 20	9.45.....	387	25.760	70	69	4458.9	4405	7.60		Clear; light southwest breeze.
3.....	Mar. 20	12.45.....	387	25.825	73	72					Scattering cum.; strong south-southwest breeze.
		1.30.....	387	25.828	77	80					Do.
Camp 36.....	Mar. 20	2.....	387	25.820	78	82	4326.2	4418.1	5.75		Do.
		6.....	387	25.685	63	62			1		Do.
1.....	Mar. 21	Sunset.....	387	25.660	62	60	4440	4453.5	10.75	24.10	Clear and calm.
		6.10, or sunrise.	387	25.665	34	33			12.50		Do.
2.....	Mar. 21	6.30.....	387	25.665	40	36	4386	4259.4			Do.
3.....	Mar. 21	8.....	387	25.672	60	57	4520.1	4515.7	4.35		Do.
4.....	Mar. 21	11.55.....	387	25.940	80	72	4265.2	4328.6	11.50		Southwest breeze; clouds coming up.
Frontera.....	Mar. 24	1.....	387	26.925	81	79					Southwest breeze; clouds.
		12.30.....	387	26.214	80	79	3895.7	3988.1	3		Do.
			387	26.230	76	76	3927	3993.3			Do.

APPENDIX.

A.

CAMP NEAR MISSION SAN DIEGO,
December 20, 1853.

SIR: I have the honor to acknowledge the receipt of instructions from the War Department, November 18, 1853, detailing me for the prosecution of a survey "in connection with examination of railroad routes to the Pacific," through Northern Mexico and Texas, together with the passport, and a copy of the instructions relative to the organization of an escort. They arrived at a most opportune moment; Lieut. Williamson about completing his field-work, and Lieut. Stoneman encamped at this place with his escort. Of Lieut. Whipple's movements or whereabouts we have heard nothing definite; and I will, therefore, proceed to organize and equip my party, without counting upon any assistance from the latter officer, receipting to Lieut. Williamson for such instruments and property as I shall need, and at the same time can be spared by him.

But, to complete my outfit, it is absolutely necessary that I should go to San Francisco, mainly to procure barometers. This trip I shall make with all possible despatch.

In my instructions no mention is made of either an assistant or a physician.

Deeming both of these essential to the rapid prosecution of the work and well-being of the expedition, I will secure their services, in case they can be obtained at such salaries as will not cause my expenditures to exceed the amount of appropriation allowed me.

Very respectfully, your obedient servant,

JNO. G. PARKE,
Bvt. 2d Lieut., Corps Top. Engineers.

Hon. JEFFERSON DAVIS,
Secretary of War.

B.

WAR DEPARTMENT,
Washington, December 9, 1853.

SIR: On the eighteenth ultimo, instructions were addressed to you at San Diego, from this department, to make preparations for, and take charge of a survey for a railroad route from a point on the Gila, near the Pimas villages, to the Rio Grande, partly passing through Mexican territory, for which authority had been obtained from the Mexican government. Since those instructions were despatched, intelligence has been received here of a hostile expedition against the Mexican province of Sonora having sailed from California; and it is apprehended that this lawless conduct on the part of our misguided citizens may excite a feeling among the Mexican people which would render it unsafe for your party, with its military escort, to make its appearance among them, especially as it is not known whether the Mexican government has advised its officers or people along the line of your route that the survey is made by permission.

4 c

Although the examination of the route in question is a matter of much importance, and earnestly desired by the department, it is unwilling to incur any serious risk of a collision between your party and the Mexicans. You are, therefore, directed to consider well all the circumstances before proceeding to carry into effect the instructions above referred to; and unless you are fully satisfied that you can perform the exploration without any serious interruption, you will relinquish the undertaking for the present. With this general direction, the matter must be left to your discretion, with the injunction to let no undue confidence lead you to overlook or underrate the possible danger before you; and as you will, when these instructions reach you, be in possession of information later, by from thirty to sixty days, than that which has reached this city, it is to be hoped that it may be of such a character as will enable you to form a correct and safe conclusion as to the course to be pursued.

Very respectfully, your obedient servant,

JEFFERSON DAVIS,
Secretary of War.

Lieut. JOHN G. PARKE,
Corps Topographical Engineers.

P. S.—Accompanying your instructions was sent a passport from the State Department, which it was intended to have countersigned by the Mexican minister. His absence, however, prevented it. Herewith you will find a duplicate with the countersign of General Almonte.

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EXPLORATIONS AND SURVEYS FOR A RAILROAD ROUTE FROM THE MISSISSIPPI RIVER TO THE PACIFIC OCEAN.
WAR DEPARTMENT.

ROUTE NEAR THE THIRTY-SECOND PARALLEL OF NORTH LATITUDE.

EXTRACT

FROM

REPORT OF A MILITARY RECONNAISSANCE,

MADE IN 1846 AND 1847,

BY

LIEUT. COL. W. H. EMORY.

1d

SIR: For the purpose of giving completeness to the railroad reports of the route near the thirty-second parallel, the following extract is made from the report by Lieut. Col. Emory, of his reconnaissance in 1846 and 1847, from Fort Leavenworth, Missouri, to San Diego, California.

The extract is from that portion of the report describing the route from the junction of the San Pedro with the Gila, to the junction of the latter with the Colorado of the West.

This connects Lieutenant Parke's survey (from Doña Ana to the Pimos villages) with Lieutenant Williamson's surveys in the southern part of the State of California.

Very respectfully, your obedient servant,

A. A. HUMPHREYS,
Captain Topographical Engineers.

Hon. JEFFERSON DAVIS,
Secretary of War.

EXTRACT FROM LT. COL. EMORY'S REPORT.

From the junction of the San Pedro with the Gila, to the junction of the Gila with the Colorado of the West.

Junction of the San Pedro and Gila rivers.—Formation along the Gila.—Stormy night.—Visits from Indians.—Game.—Minerals.—Willows.—Formation of rocks.—Plants.—Atmosphere.—Soil.—Remains of Indian settlements.—Hieroglyphics.—Pimos Indians.—Tradition.—Manner of cultivating land.—Dress.—Traffic.—Character of the Pimos Indians; their advancement in civilization.—Depredations of Apache Indians.—Maricopas Indians; their character, &c.—Maricopas women.—Mirage.—Scarcity of grass and water.—Loss of mules.—Remains of Indian works.—Hieroglyphics.—Game.—Mexican camp; capture of the party with their horses.—Navigation of the Colorado and Gila rivers.—Remains of a Spanish church.—Settlers.—Capture of a Mexican with the mail from California; interesting news.—Lassoing horses.—General sketch of the country from the Arkansas to the Colorado.—Mexican peonage.—Apaches and Navajoes.—Colorado river.

About two miles from our camp the San Pedro joins the Gila, just as the latter leaps from the mouth of the cañon. The place of meeting is a bottom three miles wide, seeming a continuation of that of the Gila. It is principally of deep dust and sand, overgrown with cottonwood, mezquite, chamiza, willow, and the black willow. In places there are long sweeps of large paving-pebbles, filled up with drift-wood, giving the appearance of having been overflowed by an impetuous torrent. The hills on both sides of the river, still high, but now farther off, and covered to the top with soil producing the mezquite and pitahaya, as the day advanced, began to draw in closer, and before it closed had again contracted the valley to a space little more than sufficient for the river to pass; and at halt, after making seventeen miles, we found ourselves encompassed by hills much diminished in height, but not in abruptness. The road, except the deep dust which occasionally gave way and lowered a mule to his knee, was good—that is, there were no hills to scale. The river was crossed and recrossed four times. At twelve and fourteen miles there were good patches of grama, burned quite yellow, but for most of the way, and at our camp, there was little or no grass, and our mules were turned loose to pick what they could of rushes and willow along the margin of the stream.

Wherever the formation was exposed along the river, it was a conglomerate of sandstone, lime, and pebbles, with deep caverns.

Nearly opposite our camp of this date, and about one-third the distance up the hill, there crop out ore of copper and iron, easily worked, the carbonate of lime and calcareous spar. A continuation of the vein of ore was found on the side where we encamped, and a large knoll strewed with what the Spaniards call "*guia*," the English of which is "guide to gold."

The night has set in dark and stormy; the wind blows in gusts from the southwest, and the rain, falling in good earnest, mingled with the rustling noise of the Gila, which has now become swift and impetuous, produces on us, who have so long been accustomed to a tranquil atmosphere, quite the impress of a tempest. We have been so long without rain as to cease to expect, or make provision against it; and the consequence is, the greatest difficulty in getting the men to provide coverings for the destructible portion of our rations.

Three Indians hailed us just before making camp, and after much parley were brought in. They feasted heartily, and promised to bring in mules. At first they denied having any; but after their appetites were satisfied their hearts opened, and they sent the youngest of their party to their town, which was at the head of the dry creek of our camp of the night before last. The fellow went on his way, as directed, till he met the howitzers, which so filled him with surprise and consternation that he forgot his mission and followed the guns to camp in mute wonder. These people are of the Piñon Lano (piñon wood) tribe, and we had been told by the Pinoleros (pinole eaters) that the chief of this band had mules.

Flights of geese and myriads of the blue quail were seen, and a flock of turkeys, from which we got one.

The river-bed at the junction of the San Pedro was seamed with tracks of deer and turkeys; some signs of beaver, and one trail of wild hogs.

Our camp was on a flat, sandy plain, of small extent, at the mouth of a dry creek with deep washed banks, giving the appearance of containing, at times, a rapid and powerful stream, although no water was visible in the bed. At the junction, a clear, pure stream flowed from under the sand. From the many indications of gold and copper ore at this place, I have named it Mineral creek; and, I doubt not, a few years will see flat-boats descending the river from this point to its mouth, freighted with its precious ores.

There was a great deal of pottery about our camp, and just above us were the supposed remains of a large Indian settlement, differing very slightly from those already described.

November 8.—The whole day's journey was through a cañon, and the river was crossed twelve or fifteen times. The sand was deep, and occasionally the trail much obstructed by pebbles of paving-stone. The willow grew so densely in many places as to stop our progress, and oblige us to look for spots less thickly overgrown, through which we could break.

The precipices on each side were steep; the rock was mostly granite and a compact sandy limestone, with occasional seams of basalt and trap; and towards the end of the day, calcareous sandstone, and a conglomerate of sandstone, feldspar, fragments of basalt, pebbles, &c. The stratification was very confused and irregular, sometimes perfectly vertical, but mostly dipping to the southwest, at an angle of 30°. Vast boulders of pure quartz at times obstructed our way, and the river in places was paved with those of less magnitude.

About two miles from camp our course was traversed by a seam of yellowish-colored igneous rock, shooting up into irregular spires and turrets, one or two thousand feet in height. It ran at right angles to the river, and extended to the north and to the south, in a chain of mountains as far as the eye could reach. One of these towers was capped with a substance, many hundred feet thick, disposed in horizontal strata of different colors, from deep red to light yellow. Partially disintegrated, and lying at the foot of the chain of spires, was a yellowish calcareous sandstone, altered by fire, in large amorphous masses.

For a better description of this landscape, see the sketch by Mr. Stanly.

To the west, about a mile below us, and running parallel to the first, is another similar seam, cut through by the Gila, at a great butte, shaped like a house. The top of this butte appears to have once formed the table-land, and is still covered with vegetation. Through both these barriers the river has been conducted by some other means than attrition. Where it passes the first, it presents the appearance of a vast wall torn down by blows of a trip-hammer. Under to-day's date, in Appendix No. 2, will be found many interesting plants, but the principal growth was, as usual, pitahaya, acacia, prosopis, Fremontia and obione canescens.

The latitude of this camp, which is within a mile of the spot where we take a final leave of the mountains, is, by the mean of the observations on north and south stars, Polaris and beta Aquarii, 33° 05' 40"; and the height of the river at this point above the sea, as indicated by the barometer, 1,751 feet.

At night, for the first time since leaving Pawnee fork, I was interrupted for a moment in my observations by moisture collecting on the glass of my horizon shade, showing a degree of

humidity in the atmosphere not before existing. In the States there is scarcely a night when the moisture will not collect on the glass exposed to the air, sufficient in two or three minutes to prevent the perfect transmission of light.

November 9.—The effect of last night's dampness was felt in the morning, for, although the thermometer was only 37°, the cold was more sensible than in the dry regions at 25°.

We started in advance of the command to explore the lower belt of mountains by which we were encompassed. The first thing we noticed in the gorge was a promontory of pitch-stone, against which the river impinged with fearful force, for it was now descending at a rapid rate. Mounting to the top of the rock, on a beautiful table, we found sunk six or eight perfectly symmetrical and well-turned holes, about ten inches deep and six or eight wide at top; near one, in a remote place, was a pitch-stone, well turned and fashioned like a pestle. These could be nothing else than the corn-mills of long extinct races. Above this bed of pitch-stone a butte of calcareous sandstone shot up to a great height, in the seams of which were imbedded beautiful crystals of quartz. Turning the sharp angle of the promontory, we discovered a high perpendicular cliff of calcareous spar and baked argillaceous rock, against which the river also abutted, seamed so as to represent distinctly the flames of a volcano. A sketch was made of it, and is presented with these notes. On the side of the river opposite the igneous rocks, the butte rose in perpendicular and confused masses.

This chain continued, not parallel, as I supposed, to the first described barrier, but circled round to the east, and united with it. It also united on the north side, forming a basin three or four miles in diameter, in which we encamped last night. Except a few tufts of *larrea Mexicana*, these hills were bare of vegetation. Away off to the south, and bordering on the banks of the river, covering the surface of the ground for one or two feet, was an incrustation of black cellular lava or basalt, like that seen about the Raton. Nothing more was wanted to give the idea of an immense extinct volcano. Through the centre of the crater the Gila now pursues its rapid course.

The Gila at this point, released from its mountain barrier, flows off quietly at the rate of three miles an hour into a wide plain, which extends south almost as far as the eye can reach. Upon this plain mezquite, chamiza, the green acacia, prosopis, artemisia, obione canescens, and pitahaya, were the only vegetation. In one spot only we found a few bunches of grass. More than four-fifths of the plain was destitute of vegetation; the soil, a light-brown, loose, sandy earth, I supposed contained something deleterious to vegetation.*

We made our noon halt at the grass patch. At this place were the remains of an immense Indian settlement; pottery was everywhere to be found, but the remains of the foundations of the houses were imbedded in dust. The outlines of the acequias, by which the soil was irrigated, were sometimes quite distinct.

The soil was moist, and wherever the foot pressed the ground the salts of the earth effloresced, and gave it the appearance of being covered with frost. In this way the numberless tracks of horses and other animals, which had at times traversed the plains, were indelible, and could be traced for great distances by the eye, in long white seams.

We found fresh trails of horses, which might be those of General Castro, or of the Indians. When leaving California, Castro's determination, as we learn from Carson, was to go to Sonora, beat up recruits and return. Our route might easily be reached, for we are now marching along a road everywhere accessible, and within three days' march of the settlements of Sonora and the fort at Tucson, said to be regularly garrisoned by Mexican soldiers.

We passed the deserted lodges of Indians, and, at one place, remote from the lodges, we saw thirteen poles set up in a sort of incantation formula—twelve on the circumference of a circle

* A specimen of this soil was submitted to Professor Fraser, who says: "It is a light-brown, loose, sandy earth, containing scarcely anything soluble in water, the solution giving only faint indications of common salt and carbonite of lime. A very small portion of iron pyrites is also contained in it, but I imagine its want of fertility may more properly be attributed to its deficiency in organic matters."

twenty feet in diameter, and one in the centre. Radii were drawn on the ground from the centre pole to those in the periphery of the circle. It was the figuring of some medicine man of the Apaches or Pimos, we could not tell which, for it was on neutral ground, about the dividing line of the possessions claimed by each.

After leaving the mountains all seemed for a moment to consider the difficulties of our journey at an end. The mules went off at a frolicsome pace, those which were loose contending with each other for precedence in the trail. The howitzers, which had nearly every part of their running gear broken and replaced, were, perhaps, the only things that were benefited by the change from the mountains to the plains. These were under the charge of Lieutenant Davidson, whose post has been no sinecure. In overcoming one set of difficulties we were now to encounter another. In leaving the mountains we were informed that we bade adieu to grass, and our mules must henceforth subsist on willow, cotton-wood, and the long green ephedra.

November 10.—The valley on the southern side of the Gila still grows wider. Away off in that direction the peaks of the Sonora mountains just peep above the horizon. On the north side of the river, and a few miles from it, runs a low chain of serrated hills. Near our encampment a corresponding range draws in from the southeast, giving the river a bend to the north. At the base of this chain is a long meadow, reaching for many miles south, in which the Pimos graze their cattle; and along the whole day's march were remains of zequias, pottery, and other evidences of a once densely populated country. About the time of the noon halt, a large pile, which seemed the work of human hands, was seen to the left. It was the remains of a three-story mud house, sixty feet square, pierced for doors and windows. The walls were four feet thick, and formed by layers of mud two feet thick. Stanly made an elaborate sketch of every part; for it was, no doubt, built by the same race that had once so thickly peopled this territory, and left behind the ruins.

We made a long and careful search for some specimens of household furniture or implement of art, but nothing was found except the corn-grinder, always met with among the ruins and on the plains. The marine shell, cut into various ornaments, was also found here, which showed that these people either came from the seacoast or trafficked there. No traces of hewn timber were discovered; on the contrary, the sleepers of the ground-floor were round and unhewn. They were burnt out of their seats in the wall to the depth of six inches. The whole interior of the house had been burnt out, and the walls much defaced. What was left bore marks of having been glazed, and on the wall in the north room of the second story were traced the following hieroglyphics: [Lost.]

Where we encamped, eight or nine miles from the Pimos village, we met a Maricopa Indian looking for his cattle. The frank, confident manner in which he approached us was in strange contrast with that of the suspicious Apache. Soon six or eight of the Pimos came in at full speed. Their object was to ascertain who we were, and what we wanted. They told us the fresh trail we saw up the river was that of their people, sent to watch the movements of their enemies, the Apaches. Being young, they became much alarmed on seeing us, and returned to the town, giving the alarm that a large body of Apaches were approaching.

Their joy was unaffected at seeing we were Americans, and not Apaches. The chief of the guard at once despatched news to his chief of the result of his reconnaissance. The town was nine miles distant, yet in three hours our camp was filled with Pimos, loaded with corn, beans, honey, and zandias (water-melons.) A brisk trade was at once opened. This was my observing night; but the crowd of Indians was great, and the passing and repassing at full speed so continuous, that I got an indifferent set of observations.

The camp of my party was pitched on the side nearest the town, and we saw the first of these people and their mode of approach. It was perfectly frank and unsuspecting. Many would leave their packs in our camp and be absent for hours, theft seeming to be unknown among them. With the mounted guard, which first visited us, was a man on foot, and he appeared to keep pace with the fleetest horse. He was a little out of breath when he reached

us; but soon recovering, told us he was interpreter to Juan Antonio Llunas, chief of the Pimos. We were taking some refreshments at the time, and invited him to taste of them. The effect was electric; it made his bright, intelligent eye flash, and loosened his tongue. I asked him, among other things, the origin of the ruins of which we had seen so many. He said, all he knew was a tradition amongst them, "that in by-gone days a woman of surpassing beauty resided in a green spot in the mountains near the place where we were encamped. All the men admired and paid court to her. She received the tributes of their devotion—grain, skins, &c., but gave no love or other favor in return. Her virtue and her determination to remain unmarried were equally firm. There came a drought which threatened the world with famine. In their distress people applied to her, and she gave corn from her stock, and the supply seemed to be endless. Her goodness was unbounded. One day as she was lying asleep with her body exposed, a drop of rain fell on her stomach, which produced conception. A son was the issue, who was the founder of a new race, which built all these houses."

I told the interpreter repeatedly he must go and report to the general; but his answer was, "Let me wait till I blow a little." The attraction was the *aguardiente*. At length he was prevailed on to go to head-quarters, leaving at our camp his bows and arrows and other matters, saying he would return and pass the night with us.

November 11.—Leaving the column, a few of us struck to the north side of the river, guided by my loquacious friend, the interpreter, to visit the ruins of another Casa Montezuma. In the course of the ride I asked him if he believed the fable he had related to me last night, which assigned an origin to these buildings. "No," said he, "but most of the Pimos do. We know, in truth, nothing of their origin. It is all enveloped in mystery."

The casa was in complete ruins, one pile of broken pottery and foundation-stone of the black basalt making a mound about ten feet above the ground. The outline of the ground-plan was distinct enough.

We found the description of pottery the same as ever, and among the ruins the same sea-shell, one worked into ornaments; also a large bead, an inch and a quarter in length, of bluish marble, exquisitely turned.

We secured to-day our long-sought bird, the inhabitant of the mezquite, indigo-blue plumage, with top-knot and long tail; its wings, when spread, showing a white ellipse.

Turning from the ruins towards the Pimos village, we urged our guide to go fast, as we wished to see as much of his people as the day would permit. He was on foot, but led at a pace which kept our mules in a trot.

We came in at the back of the settlement of the Pimos Indians, and found our troops encamped in a cornfield, from which the grain had been gathered. We were at once impressed with the beauty, order, and disposition of the arrangements for irrigating and draining the land. Corn, wheat, and cotton are the crops of this peaceful and intelligent race of people. All the crops have been gathered in, and the stubbles show they have been luxuriant. The cotton has been picked and stacked for drying on the tops of sheds. The fields are subdivided by ridges of earth into rectangles of about 200 × 100 feet, for the convenience of irrigating. The fences are of sticks, wattled with willow and mezquite, and, in this particular, set an example of economy in agriculture worthy to be followed by the Mexicans, who never use fences at all. The houses of the people are mere sheds, thatched with willow and corn-stalks.

With the exception of the chief, Antonio Llunas, who was clad in cast-off Mexican toggery, the dress of the men consisted of a cotton serape of domestic manufacture, and a breech-cloth. Their hair was very long and clubbed up. The women wore nothing but the serape pinned about the loins, after the fashion of Persico's Indian woman on the east side of the Capitol, though not quite so low.

The camp was soon filled with men, women, and children, each with a basket of corn, frijolés, or meal, for traffic. Many had jars of the molasses expressed from the fruit of the pitahaya. Beads, red cloth, white domestic, and blankets, were the articles demanded

in exchange. Major Swords, who had charge of the trading duty, pitched a temporary awning under which to conduct the business, which had scarcely commenced before this place formed a perfect menagerie, into which crowded, with eager eyes, Pimos, Maricopas, Mexicans, French, Dutch, English, and Americans. As I passed on to take a peep at the scene, naked arms, hands, and legs protruded from the awning. Inside there was no room for bodies, but many heads had clustered into a very small space, filled with different tongues and nations. The trade went merrily on, and the conclusion of each bargain was announced by a grunt and a joke, sometimes at the expense of the quartermaster, but oftener at that of the Pimos.

November 12.—We procured a sufficiency of corn, wheat, and beans from the Pimos, but only two or three bullocks, and neither horses nor mules. They have but few cattle, which are used in tillage, and apparently all steers, procured from the Mexicans. Their horses and mules were not plenty, and those they possessed were prized extravagantly high. One dashing young fellow, with ivory teeth and flowing hair, was seen coming into our camp at full speed, on a wild, unruly horse, that flew from side to side as he approached, alarmed at the novel apparition of our people. The Maricopa—for he was of that tribe—was without saddle or stirrups, and balanced himself to the right and left with such ease and grace as to appear part of his horse. He succeeded in bringing his fiery nag into the heart of the camp. He was immediately offered a very advantageous trade by some young officer. He stretched himself on his horse's neck, caressed it tenderly, at the same time shutting his eyes, meaning thereby that no offer could tempt him to part with his charger.

The general gave a letter to Governor Llanas, stating that he was a good man, and directing all United States troops that might pass in his rear to respect his excellency, his people, and their property. Several broken-down mules were left with him to recruit, for the benefit of Cook's battalion as it should pass along.

To us it was a rare sight to be thrown into the midst of a large nation of what are termed wild Indians, surpassing many of the Christian nations in agriculture, little behind them in the useful arts, and immeasurably before them in honesty and virtue. During the whole of yesterday our camp was full of men women, and children, who sauntered amongst our packs unwatched, and not a single instance of theft was reported.

I rode leisurely in the rear, through the thatched huts of the Pimos. Each abode consists of a dome-shaped wicker-work, about six feet high, and from twenty to fifty feet in diameter, thatched with straw or corn-stalks. In front is usually a large arbor, on top of which is piled the cotton in the pod for drying.

In the houses were stowed watermelons, pumpkins, beans, corn, and wheat, the last three articles generally in large baskets; sometimes the corn was in baskets covered with earth, and placed on the tops of the domes. A few chickens and dogs were seen, but no other domestic animals except horses, mules, and oxen. Their implements of husbandry were the axe, (of steel,) wooden hoes, shovels, and harrows. The soil is so easily pulverized as to make the plough unnecessary.

Several acquaintances, formed in our camp yesterday, were recognised, and they received me cordially, made signs to dismount, and when I did so, offered watermelons and pinole. Pinole is the heart of Indian corn, baked, ground up, and mixed with sugar. When dissolved in water, it affords a delicious beverage; it quenches thirst, and is very nutritious. Their molasses, put up in large jars hermetically sealed, of which they had quantities, is expressed from the fruit of the pitahaya.

A woman was seated on the ground under the shade of one of the cotton sheds. Her left leg was tucked under her seat, and her foot turned sole upwards; between her big toe and the next was a spindle about eighteen inches long, with a single fly of four or six inches. Ever and anon she gave it a twist in a dexterous manner, and at its end was drawn a coarse cotton thread. This was their spinning jenny. Led on by this primitive display, I asked for their loom by pointing to the thread and then to the blanket girded about the woman's loins. A fellow

stretched in the dust, sunning himself, rose up leisurely and untied a bundle which I had supposed to be a bow and arrow. This little package, with four stakes in the ground, was the loom. He stretched his cloth and commenced the process of weaving.

We travelled fifteen and a half miles and encamped on the dividing ground between the Pimos and Maricopas. For the whole distance we passed through cultivated grounds, over a luxuriantly rich soil. The plain appeared to extend in every direction fifteen or twenty miles, except in one place about five miles before reaching camp, where a low chain of hills comes in from the southeast, and terminates some miles from the river. The bed of the Gila, opposite the village, is said to be dry, the whole water being drawn off by the acequias of the Pimos for irrigation; but the ditches are larger than is necessary for this purpose, and the water which is not used returns to the bed of the river with little apparent diminution in its volume.

Looking from our camp north, 30° west, you see a great plain, with mountains rising in the distance on each side. This prospect had induced some travellers to venture from here in a direct line to Monterey, in California, but there is neither grass nor water on that passage, and thirst and distress overcame, undoubtedly, those who attempted it.

In almost an opposite direction north, 50° east, there is a gap in the mountains, through which the Salt river flows to meet the Gila, making with it an acute angle at a point ten or fifteen miles distant from our camp, bearing northwest. A little north of east, another gap, twenty or thirty miles distant, shows where the Rio San Francisco flows into the Salt river. From the best information I can collect, the San Francisco comes in from the north; its valley is narrow and much cañoned; good grass abounds all the way. Le Vonoceur, one of my party, came down that river in 1844 with a trapping party of forty-eight men. He states that they were much annoyed the whole way by the Apache Indians, a great many of whom reside on that river. Every night they were fired upon, and an attempt made to stampede their mules. Many of their traps were stolen, and one of their party, an old man, who had been in the mountains forty-five years, was killed by the Indians in this expedition.

Near the junction of the Gila and Salt rivers there is a chain of low serrated hills coming in from both sides, contracting the valley considerably. Around the south spur the Gila turns, making its course in a more southerly direction. To the east, except where the spurs already mentioned protrude, the plain extends as far as the eye can reach. A great deal of the land is cultivated, but there is still a vast portion within the level of the Gila that is yet to be put under tillage. The population of the Pimos and Maricopas together is estimated variously at from three to ten thousand. The first is evidently too low.

This peaceful and industrious race are in possession of a beautiful and fertile basin. Living remote from the civilized world, they are seldom visited by whites, and then only by those in distress, to whom they generously furnish horses and food. Aguardiente (brandy) is known among their chief men only, and the abuse of this, and the vices which it entails, are yet unknown.

They are without other religion than a belief in one great and overruling spirit.

Their peaceful disposition is not the result of incapacity for war, for they are at all times enabled to meet and vanquish the Apaches in battle, and when we passed they had just returned from an expedition in the Apache country to revenge some thefts and other outrages, with eleven scalps and thirteen prisoners. The prisoners are sold as slaves to the Mexicans.

The Maricopas occupy that part of the basin lying between camp 97 and the mouth of the Salt river, and all that has been said of the Pimos is applicable to them. They live in cordial amity, and their habits, agriculture, religion, and manufactures, are the same. In stature they are taller; their noses are more aquiline, and they have a much readier manner of speaking and acting. I noticed that most of the interpreters of the Pimos were of this tribe, and also the men we met with in the spy-guard. Though fewer in number, they appear to be superior in intelligence and personal appearance.

Don José Messio is their governor, and, like the governor of the Pimos, holds his office by

the appointment of the Mexican governor of California. The people have no choice in the selection. Both of these Indians are respectable-looking old men, and seem to be really worthy of the trust reposed in them.

We had not been long in camp before a dense column of dust down the river announced the approach of the Maricopas, some on foot, but most of them on horseback. They came into camp at full speed, unarmed, and in the most confident manner, bringing watermelons, meal, pinole, and salt for trade. The salt is taken from the plains; wherever there are bottoms which have no natural drainage, the salt effloresces, and is skimmed from the surface of the earth. It was brought to us both in the crystallized form and in the form when first collected, mixed with earth.

My camp was selected on the side towards the village, and the constant galloping of horses rendered it difficult for me to take satisfactory observations, which I was desirous of doing, as it is an important station. When I placed my horizon on the ground, I found that the galloping of a horse five hundred yards off affected the mercury, and prevented a perfectly reflected image of the stars, and it was vain to hope for these restless Maricopas to keep quiet. News got about of my dealings with the stars, and my camp was crowded the whole time.

The latitude of this camp, by such observations as the Maricopas would allow me to make, was $33^{\circ} 09' 28''$.

November 13 and 14.—With the morning came the Maricopas women, dressed like the Pimos. They are somewhat taller, and one peculiarity struck me forcibly—that while the men had aquiline noses, those of the women were *retroussés*. Finding the trade in meal had ceased, they collected in squads about the different fires, and made the air ring with their jokes and merry peals of laughter. Mr. Bestor's spectacles were a great source of merriment. Some of them formed the idea, that with their aid he could see through their cotton blankets. They would shrink and hide behind each other at his approach. At length I placed the spectacles on the nose of an old woman, who became acquainted with their use, and explained it to the others.

We were notified that a long journey was to be made without finding water, (to cut off an elbow in the river,) and the demand for gourds was much greater than the supply. One large gourd cost me four strings of glass beads, which was thought a high price. The interpreter who guided us to the Casa Montezuma, on the north side of the Gila, said that on the Salt river, about one and a half day's journey, there was one of those buildings standing, complete in all respects except the floors and roof. He said it was very large, with beautiful glazed walls; that the footsteps of the men employed in building the house could yet be seen in the adobe, and that the impression was that of a naked foot. Whenever a rain comes, the Indians resort to these old houses to look for trinkets of shells and a peculiar green stone, which I think is nothing more than *verde antique*.

At 12 o'clock, after giving our horses a last watering, we started off in a southwestern direction to turn the southern foot of the range of hills pointing to the Salt river. Five miles brought us into a grove of the pitahaya, which had yielded a plentiful supply of fruit to the Indians. Our way was over a plain of granitic sand, ascending gradually and almost imperceptibly. After leaving the pitahaya, there was no growth except the *larrea Mexicana*, and occasionally, at long intervals, an *acacia* or *inga*.

We travelled till long after dark, and dropped down in a dust-hole near two large, green-barked *acacias*. There was not a sprig of grass or a drop of water, and during the whole night the mules kept up a piteous cry for both.

There was nothing but the offensive *larrea*, which even mules will not touch when so hungry as to eat with avidity the dry twigs of all other shrubs and trees. As soon as the moon rose, at 3 a. m., the bugle sounded to horse, and we were up and pursuing our way. A little after sunrise we had passed the summit, and were descending towards the Gila. This summit was formed by a range of granite hills running southeast, and standing in pinnacles.

As the sun mounted, the mirage, only seen once before since leaving the plains of the Arkansas, now began to distort the distant mountains, which everywhere bounded the horizon, into many fantastic shapes. The morning was sharp and bracing, and I was excessively hungry, having given my breakfast, consisting of two biscuits, to my still more hungry mule. I was describing to Mr. Warner how much more pleasant it would be to be jogging into Washington after a fox hunt, with the prospect of a hot breakfast, when up rose to our astonished view, on the north side of the Gila, a perfect representation of the Capitol, with dome, wings, and portico, all complete. It remained for full twenty minutes with its proportions and outline perfect, when it dwindled down into a distant butte.

We went on briskly to the Gila, whose course, marked by the green cotton-wood, could be easily traced. It looked much nearer than it really was. We reached it after making forty miles from our camp of yesterday.

Our poor brutes were so hungry they would drink no water, but fell to work on the young willows and cane. After letting them bite a few minutes we moved down the river five miles farther, to a large and luxuriant patch of paspalum grass, shaded by the acacia and prosopis.

My eyes becoming sore with dust, I took a large object for my southern star to-night, the planet Saturn. Sixteen circum-meridian altitudes of Saturn, and nine altitudes of Polaris, give the latitude of the camp $35^{\circ} 59' 22''$.

November 15.—In the morning the general found the mules so much worsted by the forty-five miles' journey without food or water, that he determined to remain for the day. Most of the mules belonging to my party have travelled 1,800 miles, almost continuously. Two or three times they have all appeared on the eve of death; but a mule's vitality recuperates when life seems to be almost extinct, so I am in hopes the day's rest will revive them sufficiently to enable them to undertake what will be the most distressing part of the journey. From information collected from the Indians and others, it appears that we shall meet with no more grass from this spot to the settlements, estimated to be three hundred miles distant.

This has been a gloomy day in the dragoon camp. The jornada cost them six or eight mules, and those which have survived give little promise of future service. The howitzers make severe draughts on them. Yesterday, within five miles of the river, Lieutenant Davidson was obliged to hitch his private mules to them. An order has been given to-day to dismount one-half the command and reserve the animals for packing.

From all accounts there is no difficulty in following the route of the river from camp 97 to this place, and the journey is but a trifle longer; I would, therefore, recommend parties in our rear to get a Coco Maricopa guide and keep the river.

Our trail crossed the remains of an old acequia, and the plains were covered with broken pottery. About us there are signs of modern Indian tenements, and the acequia may possibly have been the work of their hands. We know the Maricopas have moved gradually from the gulf of California to their present location, in juxtaposition with the Pimos. They were found so late as the year 1826 at the mouth of the Gila; and Dr. Anderson, who passed from Sonora to California in 1828, found them, as near as we could reckon from his notes, about the place we are now encamped in. The shells found to-day were, in my opinion, evidently brought by the Maricopas from the sea. They differ from those we found among the ruins.

Observed for time to-night and obtained the rates of my chronometers; that of chronometer No. 783, 12s. per day, showing a very satisfactory consistency in rate since leaving the mountains.

November 16.—The valley on the south side continues wide, and shows continuously the marks of former cultivation. On the north side the hills run close to the river.

After making ten miles we came to a dry creek, coming from a plain reaching far to the south, and then we mounted the table-lands to avoid a bend in the river, made by a low chain of black hills coming in from the southeast. The table-land was strewed with fragments of

black basalt, interspersed with agate, chalcedony, vitrified quartz, and carbonate of lime. About the summit was a mound of granite boulders, blackened by augite, and covered with unknown characters, the work of human hands. These have been copied. On the ground near by were also traces of some of the figures, showing some of the hieroglyphics, at least, to have been the work of modern Indians. Others were of undoubted antiquity, and the signs and symbols intended, doubtless, to commemorate some great event. One stone bore on it what might be taken, with a little stretch of the imagination, to be a mastodon, a horse, a dog, and a man. Their heads are turned to the east, and this may commemorate the passage of the Aborigines of the Gila on their way south.

Many of the modern symbols are in imitation of the antique, and doubtless the medicine men of the present day resort to this mound to invoke their unseen spirits, and work the miracles which enable them to hold their sway amongst their credulous race. There are many more weird and mysterious-looking places than this to be found along the banks of the Gila, and the first attraction to the modern Indian was, without doubt, the strange characters he saw inscribed.

Some of the boulders appear to have been written and re-written upon so often, it was impossible to get a distinct outline of any of the characters.

We descended into the broad valley of the Gila, skirted on the south side by the table-land, black with basalt pebbles, resting on a stratum of the carbonate of lime, upon which the river impinged at every flood and widened its valley.

The hills on the north side were of red and gray rocks, probably granite, irregular in form, varying from five hundred to one thousand feet. Finding no grass, we loosened our mules among the willows and cane.

November 17.—The route to-day was over a country much the same as that described yesterday. Wherever we mounted to the table-lands to cut off a bend in the river, we found them dreary beyond description, covered with blocks of basalt, with a few intervals of dwarf growth of *larrea*. Now and then a single acacia raised its solitary form and displayed its verdure in the black expanse. We crossed the dry beds of two creeks with sandy bottoms. Under the crust of basalt are usually sandstone and a conglomerate of pebbles, sandstone, and lime. This last is easily undermined by the river, and the basalt or lava then caves in.

The bottoms of the river are wide, rich, and thickly overgrown with willow and a tall aromatic weed, and alive with flights of white brant, (wing tipped with black,) geese, and ducks, with many signs of deer and beaver.

At night I heard the song of the sailors calling the depth of the water, and presently Williams, Lieutenant Warner's servant, who had been missing all day, came out of the river with the hind quarters of a large buck, perfectly intoxicated with his unexpected success. Twelve miles back he let his mule loose, went in pursuit of deer, and killed a buck. After lugging the whole of it for two miles, he lightened his load by leaving one-half.

We encamped down in one of the deserted beds of the Gila, where the ground was cracked and drawn into blisters. The night was cold, the thermometer at 6 a. m. 20°. Latitude of the camp 32° 55' 52".

November 18.—High wind from the northwest all day, showing that there was still a barrier of snow-clad mountains between ourselves and Monterey, which we must turn or scale.

Carson pointed to a flat rock covered with fir, and told that he had slaughtered a fat mule there. The names of several Americans were inscribed on the same rock.

After travelling some ten or twelve miles through the valley, we mounted to the table-land, and at 12½ o'clock stopped to graze our horses at a little patch of dried spear-grass. Leaving this, the ground, as far as the eye could reach, was strewn with the black, shining, well-rounded pebbles. The *larrea* even was scarcely seen, and dreariness seemed to mantle the earth. The arroyo by which we descended to the river was cut from a bed of reddish pebbles twenty or

thirty feet deep, and as we neared the river they were soldered together into a conglomerate, of which lime was the cement.

We saw to-day on the rocks other rude carvings of the Indians, but their modern date was apparent.

To-day there was a dead calm, about meridian intensely hot, and the dust rose in volumes as our party advanced.

We found the river spread over a greater surface—about one hundred yards wide—and flowing gently along over a sandy bottom, the banks fringed with cane, willow, and myrtle.

Last night I took an involuntary plunge into it, for my mule sunk in a quicksand while I was searching for a place to cross my party. To-night I took a swim, but found the waters disagreeably cold.

The chain of broken hills still continued on the north side, and, when near our camp of this date, circled in an amphitheatre, with its arch to the north. The basaltic columns, rising into the shape of spires, domes, and towers, gave it the appearance, as we approached, of a vast city on the hills. The distance of the crown of this amphitheatre, determined by angulation, is — miles, and Francisco informs me that against its north base the Colorado strikes. So at this point, which is about six miles below our camp of this date, the Gila and Colorado must be near together. The hills and mountains appeared entirely destitute of vegetation, and on the plains could be seen, only at long intervals, a few stunted tufts of *larrea Mexicana* and wild wormwood, *artemisia cana*.

November 19.—The table-lands were the same as those described yesterday, but the valley widens gradually, and for most of the way is six or eight miles wide, and the soil excellent. Some remains of former settlements in broken pottery, corn-grinders, &c., but much fewer in number than above. Nine miles from camp a spur of mountains of an altered silicious sandstone came in from the southeast, sharp as the edge of a case-knife, and shooting into pinnacles. At their base we passed for half a mile over the sharp edges of a red, altered sandstone, dipping southwest about 80° , indeed nearly vertical.

On this spur was killed a mountain sheep, one of a large flock, from which we named it Goat's spur. We encamped on an island where the valley is contracted by sand buttes into what had been very recently the bed of the river. It was overgrown with willow, cane, Gila grass, flag-grass, &c. The pools in the old bed of the river were full of ducks, and all night the swan, brant, and geese, were passing; but they were as shy as if they had received their tuition on the Chesapeake bay, where they are continually chased by sportsmen. The whole island was tremulous with the motion of the mules grazing, and my observations were, therefore, not very satisfactory.

Eleven circum-meridian altitudes of Procyon, and twelve altitudes of Polaris, give the latitude of the camp $32^\circ 43' 38''$.

November 20.—The table-lands were of sand, and the bottom of the river constantly received deposits from them, which changed its bed frequently, as might be seen from the different growths of cotton-wood marking the old land. Our road, about five miles from last night's camp, was traversed by a spur of coarse-grained granite, underlaid by old red sandstone, dipping some eighty degrees to the south and west. The direction of the spur was nearly parallel to those before noted, northwest and southeast, which is the direction of the axis of the maximum elevation of most of the mountains traversing the course of the Gila.

Our camp was pitched on a little patch of grass two miles from the river; night came on before the horses reached it, and they were without water for twenty-four hours; there was a pond near the camp, but so salt that the horses could not drink it.

At noon the thermometer was 74° , at 6 p. m. 52° , and at 6 o'clock the next morning 19° , which has been about the average range of temperature for the last two weeks.

November 21.—To-day we marched only eight and a half miles, and halted for a patch of

grama, which was an agreeable and beneficial change to our mules, which had been living on cane and willow for some days past.

The plains are now almost entirely of sand, and composed of sandy and calcareous loam with iron pyrites and common salt, covered sparsely with chamiza, *larrea Mexicana*, and a shrubby species of sage, (*Salvia*.)

I observed at night for latitude and time, and there being two occultations of Jupiter's satellites, I was tempted to observe them with our inferior telescope, which only gave us another proof of its uselessness for the purpose.

November 22.—Mr. Warner and I started before the advance sounded, and climbed the sharp spur of a continuous comb of mountains coming from the southeast, to try if we could see the Colorado of the west. The mountains rose abruptly from the plains, as they mostly do in this region, resembling in appearance large dykes terminating at top in a sharp ridge which a man could, at any part, straddle. They were of hard granite, pepper-and-salt colored, traversed by seams of white quartz. This spur gives the river Gila quite a bend to the north, and from that point to its mouth, which we reached at night, the river is straight in its general direction; but its course is crooked and dotted with sand-bars, by incursions from the sand-hills which now flank both its sides. The sand is brought down by the winds from the valley of the Colorado. Its volume seemed, I think, a little diminished, probably absorbed by the sand.

The day was warm, the dust oppressive, and the march, twenty-two miles, very long for our jaded and ill-fed brutes. The general's horse gave out, and he was obliged to mount his mule.

Most of the men were on foot, and a small party, composed chiefly of the general and staff, were a long way ahead of the straggling column, when, as we approached the end of our day's journey, every man was straightened in his saddle by our suddenly falling on a camp which, from the trail, we estimated at 1,000 men, who must have left that morning. Speculation was rife, but we all soon settled down to the opinion that it was General Castro and his troops; that he had succeeded in recruiting an army in Sonora, and was now on his return to California. Carson expressed the belief that he must be only ten miles below, at the crossing. Our force consisted only of one hundred and ten men. The general decided we were too few to be attacked, and must be the aggressive party; and if Castro's camp could be found, that he would attack it the moment night set in, and beat them before it was light enough to discover our force.

The position of our camp was decided, as usual, with reference to the grass. The lives of our animals were nearly as important as our own. It was pitched to-day in a little hollow encircled by a chain of sand-hills, overgrown with mezquite.

The sergeant of the general's guard was behind, his mule having broken down; and when he came in, reported having seen two Indians about five miles back. For a short time we supposed this immense trail was a band of Indians returning from a successful marauding expedition in Sonora or California; but this conjecture was soon dispelled by the appearance of a mounted Mexican on a sand butte overlooking our camp, who, after taking a deliberate survey, disappeared. The camp was arranged immediately for defence, and a cordon of sentinels stationed on the sand-hills.

The two howitzers did not arrive till nine o'clock, and the officer in charge, Lieutenant Hammond, reported that he had seen large fires to the right, apparently five miles distant, on the opposite side of the Gila.

The general said it was necessary for him to know who occupied the camp, its force, character, and destination. He ordered me to take my party and fifteen dragoons, for the purpose of reconnoitring. After beating about in the mezquite for some time, we struck a slough of the Gila, where grew some tall willows. Up one of these I sent a dragoon, who saw no fire, but whose ears were gladdened by the neighing of horses. He slipped down the tree much faster than he climbed it, quite enchanted with the hope of exchanging his weary mule for a charger. Instead of reporting what he had seen, he exclaimed, "Yes, sir, there are enough for us all." "Did you see the fires?" "No! but they are all on horses; I heard them neighing, and

they cover much ground." He pointed in the direction, and after proceeding a short distance we all heard distinctly the noise of the horses, indicating a large number.

Silence was enjoined, and we proceeded stealthily along for some time, when a bright fire blazed before us. I halted the guard, and with two dragoons, Londeau and Martinez, proceeded unobserved until within a few feet of the fire. Before it stood an armed Mexican. I sent Londeau and Martinez with orders to assume the occupation of trappers, and ascertain who, and what, the man guarded. The conference was short; other Mexicans advanced, and I sent in man for man. It was not Castro, as we expected, but a party of Mexicans with five hundred horses from California, on their way to Sonora for the benefit of Castro.

I took the four principal men to the general, and left a guard to watch the camp and see that no attempt was made to escape. The men were examined separately, and each gave a different account of the ownership and destination of the horses.

The chief of the party, a tall, venerable-looking man, represented himself to be a poor employé of several rich men engaged in supplying the Sonora market with horses. We subsequently learned that he was no less a personage than José Maria Leguna, a colonel in the Mexican service.

November 23.—We did not move camp to-day, in order to make a refit from last night's capture, and give our mules an opportunity to pick what little grass they could before taking the desert of ninety miles, which lies on the other side of the Colorado, and between us and water.

Warner, Stanly, and myself saddled up to visit the junction of the Gila and Colorado, which we found due north from our camp, and about a mile and a half distant. The day was stormy, the wind blowing fiercely from the north. We mounted a butte of feldspathic granite, and, looking 25° east of north, the course of the Colorado was tracked by clouds of flying sand. The Gila comes into it nearly at right-angles, and the point of junction, strangely chosen, is the hard butte through which, with their united forces, they cut a cañon and then flow off due magnetic west, in a direction the resultant due to the relative strength of the rivers.

The walls of the cañon are vertical, and about fifty feet high and one thousand feet long. Almost before entering the cañon, in descending the Gila, its sea-green waters are lost in the chrome-colored hue of the Colorado. For a distance of three or four miles below the junction the river is perfectly straight, and about six hundred feet wide; and up at least to this point, there is little doubt that the Colorado is always navigable for steamboats. Above, the Colorado is full of shifting sand-bars, but is, no doubt, to a great extent susceptible of navigation.

The Gila, at certain stages, might be navigated up to the Pimos village, and possibly with small flat-boats at all stages of water.

Near the junction, on the north side, are the remains of an old Spanish church, built near the beginning of the seventeenth century, by the renowned missionary, Father Kino. The mission was eventually sacked by the Indians, and the inhabitants all murdered or driven off. It will probably yet be the seat of a city of wealth and importance, most of the mineral and fur regions of a vast extent of country being drained by the two rivers. The stone butte, through which they have cut their passage, is not more than a mile in length. The Gila once flowed to the south, and the Colorado to the north of this butte, and the point of junction was below. What freak of nature united their efforts in forcing the butte is difficult to say. During freshets, it is probable the rivers now discharge their surplus waters through these old channels. Francisco informs me that the Colorado, seven days' travel up from the butte, continues pretty much as we saw it.

There a cañon is reached, impassable for horses or canoes. The country between is settled by the Coyotaros, or wolf-eaters, *cochinears*, (dirty fellows;) Los Tontears, or fools; and the Garroteros, or club Indians. These cultivate melons, beans, and maize.

On our return we met a Mexican, well mounted and muffled in his blanket. I asked him

where he was going; he said to hunt horses. As he passed, I observed in each of his holsters the neck of a bottle, and on his croup a fresh-made sack, with other evidences of a preparation for a journey. Much against his taste, I invited him to follow me to camp; several times he begged me to let him go for a moment—that he would soon return. His anxiety to be released increased my determination not to comply with his request. I took him to General Kearney, and explained to him the suspicious circumstances under which I had taken him, and that his capture would prove of some importance. He was immediately searched, and in his wallet was found the mail from California, which was of course opened.

Among the letters was one addressed to General José Castro, at Alta, one to Antonio Castro, and others to men of note in Sonora. All suspected of relating to public affairs were read, and we ascertained from them that a counter revolution had taken place in California; that the Americans were expelled from Santa Barbara, Puebla de los Angeles, and other places; and that Robideaux, the brother of our interpreter, who had been appointed alcalde by the Americans, was a prisoner in jail. They all spoke exultingly of having thrown off “the detestable Anglo-Yankee yoke,” and congratulated themselves that the tri-color once more floated in California.

Captain Flores was named as the general and governor *pro tem.*, and the enthusiasm of the people described as overflowing in the cause of emancipation from the Yankee yoke. One letter gave a minute and detailed account of a victory stated to have been obtained over the Americans. It stated that 450 men landed at San Pedro, and were met, defeated, and driven back to the fort at San Pedro. This last was attributed by us to Mexican braggadocio, as it is usual with them to represent their defeats as victories; but that there was a disturbance of a serious kind in the province we could not doubt, from the uniformity of the accounts on that head. We also learned that the horses captured were in part for General Castro. Nothing more was wanting to legitimize our capture, and Captain Moore was directed to remount his men.

The letters contained precise information, but being dated so far back as the 15th October, left us in great doubt as to the real state of affairs in California; and the Mexicans played their parts so dexterously, it was not in our power to exact the truth from them. One of the party, who had received some little favor from Carson in California, was well plied with brandy, but all that could be extorted from him was the advice that we should not think of going to the Puebla with our small force—counsel that our friend soon learned we had not the slightest intention of following.

The position of our camp, about one mile and a half south of the junction of the Colorado and Gila rivers, determined by 12 circum-meridian altitudes of Sirius, 6 of Saturn, and 12 altitudes of Polaris, is latitude $32^{\circ} 42' 09''$.

The clouds, together with my military duties, interfered with taking a more elaborate set of lunar distances. An inspection of the individual observations for latitude will show that the latitude of the camp may be relied on, but I regret it was not in my power to measure the exact distance of my camp from the mouth of the Gila.

At night, passing my arm over the surface of the fur robe in which I was enveloped, electric sparks were discharged in such quantities as to make a very luminous appearance, and a noise like the rattle of a snake.

November 24.—We visited the camp of our Mexican friends, whom the general determined to release, and found there was a woman with the party in the agonies of childbirth. She was at once furnished from our stores with all the comforts we possessed. This poor creature had been dragged along, in her delicate situation, over a fearful desert.

The captured horses were all wild, and but little adapted for immediate service, but there was rare sport in catching them, and we saw, for the first time, the lazo thrown with inimitable skill. It is a saying in Chihuahua that “a Californian can throw the lazo as well with his foot as a Mexican can with his hand,” and the scene before us gave us an idea of its truth. There was a wild stallion, of great beauty, which defied the fleetest horse and the most expert rider.

At length a boy of fourteen, a Californian, whose graceful riding was the constant subject of admiration, piqued by repeated failures, mounted a fresh horse, and, followed by an Indian, launched fiercely at the stallion. His lariat darted from his hand with the force and precision of a rifle-ball, and rested on the neck of the fugitive. The Indian at the same moment made a successful throw; but the stallion was too stout for both, and dashed off at full speed, with both ropes flying in the air like wings. The perfect representation of Pegasus, he took a sweep, and, followed by his pursuers, came thundering down the dry bed of the river. The lazos were now trailing on the ground, and the gallant young Spaniard, taking advantage of the circumstance, stooped from his flying horse and caught one in his hand. It was the work of a moment to make it fast to the pommel of his saddle, and by a short turn of his own horse he threw the stallion a complete somerset, and the game was secure.

We travelled over a sandy plain a few miles, and descended into the wide bed of the Colorado, overgrown thickly with mezquite, willow, and cotton-wood. After making about ten miles, we encamped abreast of the ford, on a plateau covered with young willows, of which our horses were to lay in a sufficient supply to last them over the desert. Since writing the above we have found a good patch of grass, and our people have been ordered to cut a ration for each mule to carry along.

The night was excessively cold and damp, and in the morning our blankets were covered with a little dew. For the first time the bugle calls were distinctly reverberated, showing the atmospheric change as we approach the coast and descend into the neighborhood of the sea-level. In New Mexico, even when surrounded by hills and perpendicular walls, the report of fire-arms and the sound of the bugle were unattended with any distinct echo. The reports were sharp and unpleasant—not rounded, as here, by the reverberation.

The country from the Arkansas to this point, more than twelve hundred miles, in its adaptation to agriculture, has peculiarities which must forever stamp themselves upon the population who inhabit it. All of North Mexico, embracing New Mexico, Chihuahua, Sonora, and the Californias, as far north as the Sacramento, is, as far as the best information goes, the same in the physical character of its surface, and differs but little in climate or products.

In no part of this vast tract can the rains from Heaven be relied upon, to any extent, for the cultivation of the soil. The earth is destitute of trees, and in great part also of any vegetation whatever.

A few feeble streams flow in different directions from the great mountains which in many places traverse this region. These streams are separated, sometimes by plains, and sometimes by mountains, without water and without vegetation, and which may be called deserts, so far as they perform any useful part in the sustenance of animal life. The cultivation of the earth is therefore confined to those narrow strips of land which are within the level of the waters of the streams, and wherever practised in a community with any success, or to any extent, involves a degree of subordination and absolute obedience to a chief repugnant to the habits of our people.

The chief, who directs the time and the quantity of the precious irrigating water, must be implicitly obeyed by the whole community. A departure from his orders, by the waste of water or unjust distribution of it, or neglect to make the proper embankments, may endanger the means of subsistence of many people. He must, therefore, be armed with power to punish promptly and immediately.

The profits of labor are too inadequate for the existence of negro slavery. Slavery, as practised by the Mexicans—under the form of peonage, which enables the master to get the services of the adult while in the prime of life, without the obligation of rearing him in infancy, supporting him in old age, or maintaining his family—affords no data for estimating the profits of slave labor as it exists in the United States.

No one who has ever visited this country, and who is acquainted with the character and value of slave labor in the United States, would ever think of bringing his own slaves here with any

view to profit; much less would he purchase slaves for such a purpose. Their labor here, if they could be retained as slaves, among peons nearly of their own color, would never repay the cost of transportation, much less the additional purchase money.

I made many inquiries as to the character of the vast region of country embraced in the triangle formed by the Colorado of the west, the Del Norte, and the Gila; and the information collected will, at some future time, be thrown into notes for the benefit of future explorers, but are not given in this work, as I profess to write only of what I saw.

From all that I learn, the country does not differ materially in its physical character from New Mexico, except, perhaps, being less denuded of soil and vegetation. The sources of the Salinas, the San Francisco, Azul, San Carlos, and Prieto, tributaries of the Gila, take their rise in it. About their headwaters, and occasionally along their courses, are presented sections of land capable of irrigation.

The whole extent, except on the margin of streams, is said to be destitute of forest trees. The Apaches, a very numerous race, and the Navajoes, are the chief occupants; but there are many minor bands, who, unlike the Apaches and Navajoes, are not nomadic, but have fixed habitations. Among the most remarkable of these are the Soones, most of whom are said to be Albinos. The latter cultivate the soil, and live in peace with their more numerous and savage neighbors.

Departing from the ford of the Colorado in the direction of Sonora, there is a fearful desert to encounter. Altar, a small town, with a Mexican garrison, is the nearest settlement.

All accounts concur in representing the journey as one of extreme hardship, and even peril. The distance is not exactly known, but it is variously represented to be from four to seven days' journey. Persons bound for Sonora from California, who do not mind a circuitous route, should ascend the Gila as far as the Pimos village, and thence penetrate the province by way of Tucson.

November 25.—At the ford the Colorado is 1,500 feet wide, and flows at the rate of a mile and a half per hour. Its greatest depth in the channel, at the ford where we crossed, is four feet. The banks are low, not more than four feet high, and, judging from indications, sometimes, though not frequently, overflowed. Its general appearance at this point is much like that of the Arkansas, with its turbid waters and many shifting sand islands.

The ford is entered at the lower extremity of the plateau upon which we encamped, and leads down the river, crossing three sand islands, which we sketched; but as they are constantly shifting, the sketch will perhaps afford no guide to the traveller, and may even lead him into error. It is therefore not furnished. The ford is narrow and circuitous, and a few feet to the right or left sets a horse afloat. This happened to my own horse.

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