shelter except what was to be found under cover of the absinthe bushes, which grew in many thick patches, one or two, and sometimes three feet high.

August 1st.—The hunters went ahead this morning, as buffalo appeared tolerably abundant, and I was desirous to secure a small stock of provisions; we moved about seven miles up the valley, and encamped one mile below Rock Independence. This is an isolated granite rock, about six hundred and fifty yards long, and forty in height. Except in a depression of the summit, where a little soil supports a scanty growth of shrubs, with a solitary dwarf pine, it is entirely bare. Everywhere within six or eight feet of the ground, where the surface is sufficiently smooth, and in some places sixty or eighty feet above, the rock is inscribed with the names of travellers. Many a name famous in the history of this country, and some well known to science, are to be found mixed among those of the traders and of travellers for pleasure and curiosity, and of missionaries among the savages. Some of these have been washed away by the rain, but the greater number are still very legible. The position of this rock is in longitude 107° 26′, latitude 42° 29′ 36″. We remained at our camp of August 1st until noon of the next day, occupied in drying meat. By observation, the longitude of the place is 107° 25′ 23″, latitude 42° 29′ 56″.

August 2d.—Five miles above Rock Independence we came to a place called the Devil's Gate, where the Sweet Water cuts through the point of a granite ridge. The length of the passage is about three hundred yards, and the width thirty-five yards. The walls of rock are vertical, and about four hundred feet in height; and the stream in the gate is almost entirely choked up by masses which have fallen from above. In the wall, on the right bank, is a dike of trap-rock, cutting through a fine-grained gray granite. Near the point of this ridge crop out some strata of the valley formation, consisting of a grayish micaceous sandstone, and fine-grained conglomerate, and marl. We encamped eight miles above the Devil's Gate, of which a view is given in the accompanying plate. There was no timber of any kind on the river, but good fires were made of drift-wood, aided by the *bois de vache*.

We had to-night no shelter from the rain, which commenced, with squalls of wind about sunset. The country here is exceedingly picturesque. On either side of the valley, which is four or five miles broad, the mountains rise to the height of twelve and fifteen hundred or two thousand feet. On the south side, the range appears to be timbered, and to-night is luminous with fires—probably the work of the Indians, who have just passed through the valley. On the north, broken and granite masses rise abruptly from the greensward of the river, terminating in a line of

broken summits. Except in the crevices of the rock, and here and there on a ledge or bench of the mountain, where a few hardy pines have clustered together, these are perfectly bare and destitute of vegetation.

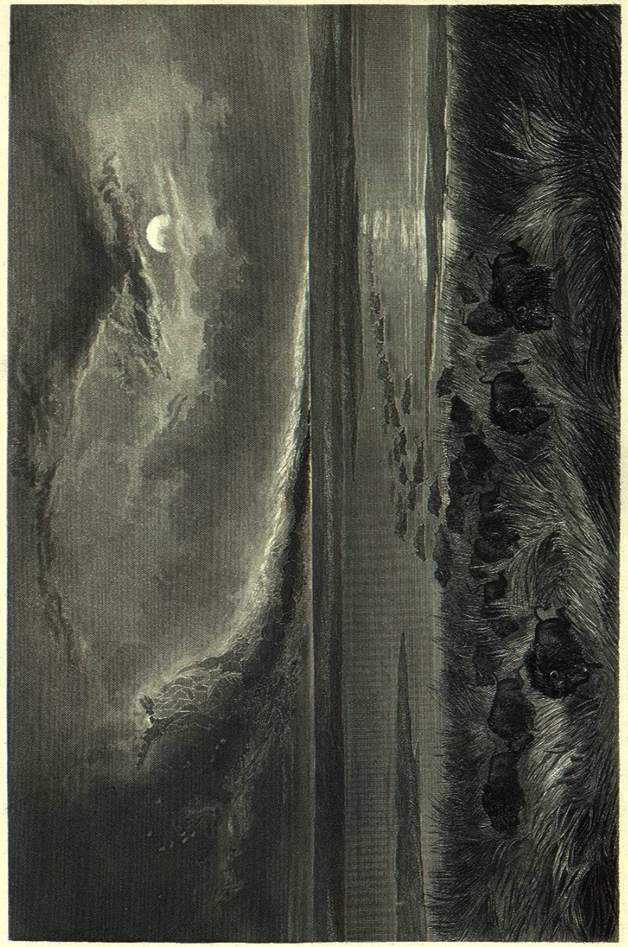
Among these masses, where there are sometimes isolated hills and ridges, green valleys open in upon the river, which sweeps the base of these mountains for thirty-six miles. Everywhere its deep verdure and profusion of beautiful flowers is in pleasing contrast with the sterile grandeur of the rock and the barrenness of the sandy plain, which, from the right bank of the river, sweeps up to the mountain range that forms its southern boundary. The great evaporation on the sandy soil of this elevated plain, and the saline efflorescences which whiten the ground, and shine like lakes reflecting the sun, make a soil wholly unfit for cultivation.

August 3d.—We were early on the road the next morning, travelling along the upland part of the valley, which is overgrown with artemisia. Scattered about on the plain are occasional small isolated hills. One of these, which I examined, about fifty feet high, consisted of white clay and marl, in nearly horizontal strata. Several bands of buffalo made their appearance to-day, with herds of antelope; and a grizzly bear—the only one we encountered during the journey—was seen scrambling up among the rocks. As we passed over a slight rise near the river, we caught the first view of the Wind River Mountains, appearing, at this distance of about seventy miles, to be a low and dark mountainous ridge. The view dissipated in a moment the pictures which had been created in our minds, by many descriptions of travellers, who have compared these mountains to the Alps in Switzerland, and speak of the glittering peaks which rise in icy majesty amidst the eternal glaciers nine or ten thousand feet into the region of eternal snows. The nakedness of the river was relieved by groves of willows, where we encamped at night, after a march of twenty-six miles; and numerous bright-colored flowers had made the river bottom look gay as a garden. We found here a horse, which had been abandoned by the Indians because his hoofs had been so much worn that he was unable to travel; and, during the night, a dog came into the camp.

August 4th.—Our camp was at the foot of the granite mountains, which we climbed this morning to take some barometrical heights; and here among the rocks was seen the first magpie. On our return, we saw one at the mouth of the Platte River. We left here one of our horses, which was unable to proceed farther. A few miles from the encampment we left the river, which makes a bend to the south, and, traversing an undulating country, consisting of a grayish micaceous sandstone and fine-grained conglomerates, struck it again, and encamped, after a journey of twenty-five miles. Astronomical observations placed us in latitude 42° 32′ 30″, and longitude 108° 30′ 13″.

August 5th.—The morning was dark, with a driving rain, and disagreeably cold. We continued our route as usual; but the weather became so bad that we were glad to avail ourselves of the shelter offered by a small island, about ten miles above our last encampment, which was covered with a dense growth of willows. There was fine grass for our animals, and the timber afforded us comfortable protection and good fires. In the afternoon the sun broke through the clouds for a short time, and the barometer at 5 P.M. was at 23.713, the thermometer 60°, with the wind strong from the northwest. We availed ourselves of the fine weather to make excursions in the neighborhood. The river, at this place, is bordered by hills of the valley formation. They are of moderate height; one of the highest peaks on the right bank being, according to the barometer, one hundred and eighty feet above the river. On the left bank they are higher. They consist of a fine white clayey sandstone, a white calcareous sandstone, and coarse sandstone or pudding-stone.

August 6th.—It continued steadily raining all the day; but, notwithstanding, we left our encampment in the afternoon. Our animals had been much refreshed by their repose, and an abundance of rich, soft grass, which had been much improved by the rains. In about three miles we reached the entrance of a cañon, where the Sweet Water issues upon the more open valley we had passed over. Immediately at the entrance, and superimposed directly upon the granite, are strata of compact, calcareous sandstone and chert, alternating with fine white and reddish-white, and fine gray and red sandstones. These strata dip to the eastward at an angle of about eighteen degrees, and form the western limit of the sand and limestone formations on the line of our route. Here we entered among the primitive rocks. The usual road passes to the right of this place; but we wound, or rather scrambled, our way up the narrow valley for several hours. Wildness and disorder were the character of this scenery. The river had been swollen by the late rains, and came rushing through with an impetuous current, three or four feet deep, and generally twenty yards broad. The valley was sometimes the breadth of the stream, and sometimes opened into little green meadows, sixty yards wide, with open groves of aspen. The stream was bordered throughout with aspen, beech, and willow; and tall pines grew on the sides and summits of the crags. On both sides the granite rocks rose precipitously to the height of three hundred and five hundred feet, terminating in jagged and broken-pointed peaks; and fragments of fallen rock lay piled up at the foot of the precipices. Gneiss, mica slate, and a white granite, were among the varieties I noticed. Here were many old traces of beaver on the stream; remnants of dams, near which were lying trees which they had cut down, one and two feet in diameter. The hills entirely shut up the river at the end of



BUFFALO ESCAPING FROM PRAIRIE-FIRES

about five miles, and we turned up a ravine that led to a high prairie, which seemed to be the general level of the country. Hence, to the summit of the ridge, there is a regular and very gradual rise. Blocks of granite were piled up at the heads of the ravines, and small bare knolls of mica slate and milky quartz protruded at frequent intervals on the prairie, which was whitened in occasional spots with small salt lakes, where the water had evaporated, and left the bed covered with a shining incrustation of salt. The evening was very cold, a northwest wind driving a fine rain in our faces; and at nightfall we descended to a little stream, on which we encamped, about two miles from the Sweet Water. Here had recently been a very large camp of Snake and Crow Indians; and some large poles lying about afforded the means of pitching a tent, and making other places of shelter. Our fires to-night were made principally of the dry branches of the artemisia, which covered the slopes. It burns quickly, with a clear oily flame, and makes a hot fire. The hills here are composed of hard, compact mica slate, with veins of quartz.

August 7th.—We left our encampment with the rising sun. As we rose from the bed of the creek, the *snow* line of the mountains stretched grandly before us, the white peaks glittering in the sun. They had been hidden in the dark weather of the last few days, and it had been *snowing* on them, while it *rained* in the plains. We crossed a ridge, and again struck the Sweet Water—here a beautiful, swift stream, with a more open valley, timbered with beech and cotton-wood. It now began to lose itself in the many small forks which make its head; and we continued up the main stream until near noon, when we left it a few miles, to make our noon halt on a small creek among the hills, from which the stream issues by a small opening. Within was a beautiful grassy spot, covered with an open grove of large beech-trees, among which I found several plants that I had not previously seen.

The afternoon was cloudy, with squalls of rain; but the weather became fine at sunset, when we again encamped on the Sweet Water, within a few miles of the South Pass. The country over which we have passed to-day consists principally of the compact mica slate, which crops out on all the ridges, making the uplands very rocky and slaty. In the escarpments which border the creeks, it is seen alternating with a light-colored granite, at an inclination of 45°; the beds varying in thickness from two or three feet to six or eight hundred. At a distance, the granite frequently has the appearance of irregular lumps of clay, hardened by exposure. A variety of *asters* may now be numbered among the characteristic plants, and the artemisia continues in full glory; but *cacti* have become rare, and mosses begin to dispute the hills with them. The evening was damp and unpleasant; the thermometer, at 10 o'clock, being at 36°, and the grass

wet with a heavy dew. Our astronomical observations placed this encampment in longitude 109° 21′ 32″, and latitude 42° 27′ 15″.

Early in the morning we resumed our journey, the weather still cloudy, with occasional rain. Our general course was west, as I had determined to cross the dividing ridge by a bridle-path over the broken country more immediately at the foot of the mountains, and return by the wagon road, two and a half miles to the south of the point where the trail crosses.

About six miles from our encampment brought us to the summit. The ascent had been so gradual that, with all the intimate knowledge possessed by Carson, who had made this country his home for seventeen years, we were obliged to watch very closely to find the place at which we had reached the culminating point. This was between two low hills, rising on either hand fifty or sixty feet. When I looked back at them, from the foot of the immediate slope on the western plain, their summits appeared to be about one hundred and twenty feet above. From the impression on my mind at this time, and subsequently on our return, I should compare the elevation which we surmounted immediately at the pass, to the ascent of the Capitol Hill from the Avenue, at Washington. It is difficult for me to fix positively the breadth of this pass. From the broken ground where it commences, at the foot of the Wind River chain, the view to the southeast is over a champaign country, broken, at the distance of nineteen miles, by the Table Rock; which, with the other isolated hills in its vicinity, seems to stand on a comparative plain. This I judged to be its termination, the ridge recovering its rugged character with the Table Rock. It will be seen that it in no manner resembles the places to which the term is commonly applied—nothing of the gorge-like character and winding ascents of the Alleghany passes in America; nothing of the Great St. Bernard and Simplon Passes in Europe. Approaching it from the mouth of the Sweet Water, a sandy plain, one hundred and twenty miles long, conducts, by a gradual and regular ascent, to the summit, about seven thousand feet above the sea; and the traveller, without being reminded of any change by toilsome ascents, suddenly finds himself on the waters which flow to the Pacific Ocean. By the route we had travelled, the distance from Fort Laramie is three hundred and twenty miles, or nine hundred and fifty from the mouth of the Kansas.

Continuing our march, we reached, in eight miles from the pass, the Little Sandy, one of the tributaries of the Colorado, or Green River of the Gulf of California. The weather had grown fine during the morning, and we remained here the rest of the day, to dry our baggage and take some astronomical observations. The stream was about forty feet wide, and two or three deep, with clear water and a full swift current, over a sandy

bed. It was timbered with a growth of low, bushy and dense willows, among which were little verdant spots, which gave our animals fine grass, and where I found a number of interesting plants. Among the neighboring hills I noticed fragments of granite containing magnetic iron. Longitude of the camp was 109° 37′ 59″, and latitude 42° 27′ 34.″

August 9th.—We made our noon halt to-day on Big Sandy, another tributary of Green River. The face of the country traversed was of a brown sand of granite materials, the *detritus* of the neighboring mountains. Strata of the milky quartz cropped out, and blocks of granite were scattered about containing magnetic iron. On Sandy Creek the formation was of parti-colored sand, exhibited in escarpments fifty to eighty feet high. In the afternoon we had a severe storm of hail, and encamped at sunset on the first New Fork. Within the space of a few miles, the Wind Mountains supply a number of tributaries to Green River, which are all called the New Forks. Near our camp were two remarkable isolated hills, one of them sufficiently large to merit the name of mountain. They are called the Two Buttes, and will serve to identify the place of our encampment, which the observations of the evening placed in longitude 109° 58′ 11″, and latitude 42° 42′ 46″. On the right bank of the stream, opposite to the large hill, the strata which are displayed consist of decomposing granite, which supplies the brown sand of which the face of the country is composed to a considerable depth.

August 10th.—The air at sunrise is clear and pure, and the morning extremely cold, but beautiful. A lofty snow-peak of the mountain is glittering in the first rays of the sun, which has not yet reached us. The long mountain wall to the east, rising two thousand feet abruptly from the plain, behind which we see the peaks, is still dark, and cuts clear against the glowing sky. A fog, just risen from the river, lies along the base of the mountain. A little before sunrise the thermometer was at 35°, and at sunrise 33°. Water froze last night, and fires are very comfortable. The scenery becomes hourly more interesting and grand, and the view here is truly magnificent; but, indeed, it needs something to repay the long prairie journey of a thousand miles. The sun has just shot above the wall, and makes a magical change. The whole valley is glowing and bright, and all the mountain peaks are gleaming like silver. Though these snow-mountains are not the Alps, they have their own character of grandeur and magnificence, and will doubtless find pens and pencils to do them justice. In the scene before us, we feel how much wood improves a view. The pines on the mountain seemed to give it much additional beauty. I was agreeably disappointed in the character of the streams on this side of the ridge. Instead of the creeks which description had led me to expect, I find bold broad streams, with three or four feet water and a

rapid current. The fork on which we are encamped is upward of a hundred feet wide, timbered with groves or thickets of the low willow.

We were now approaching the loftiest part of the Wind River chain; and I left the valley a few miles from our encampment, intending to penetrate the mountains as far as possible with the whole party. We were soon involved in very broken ground, among long ridges covered with fragments of granite. Winding our way up a long ravine, we came unexpectedly in view of a most beautiful lake, set like a gem in the mountains. The sheet of water lay transversely across the direction we had been pursuing; and, descending the steep, rocky ridge, where it was necessary to lead our horses, we followed its banks to the southern extremity. Here a view of the utmost magnificence and grandeur burst upon our eyes. With nothing between us and their feet to lessen the effect of the whole height, a grand bed of snow-capped mountains rose before us, pile upon pile, glowing in the bright light of an August day. Immediately below them lay the lake, between two ridges, covered with dark pines which swept down from the main chain to the spot where we stood. Here, where the lake glittered in the open sunlight, its banks of yellow sand and the light foliage of aspengroves contrasted well with the gloomy pines. "Never before," said Preuss, "in this country or in Europe, have I seen such magnificent, grand rocks."

I was so much pleased with the beauty of the place that I determined to make the main camp here, where our animals would find good pasturage, and explore the mountains with a small party of men. Proceeding a little farther, we came suddenly upon the outlet of the lake, where it found its way through a narrow passage between low hills. Dark pines, which overhung the stream, and masses of rock, where the water foamed along, gave it much romantic beauty. Where we crossed, which was immediately at the outlet, it is two hundred and fifty feet wide, and so deep that with difficulty we were able to ford it. Its bed was an accumulation of rocks, boulders, and broad slabs, and large angular fragments, among which the animals fell repeatedly.

The current was very swift, and the water cold and of a crystal purity. In crossing this stream, I met with a great misfortune in having my barometer broken. It was the only one. A great part of the interest of the journey for me was in the exploration of these mountains, of which so much had been said that was doubtful and contradictory; and now their snowy peaks rose majestically before me, and the only means of giving them authentically to science, the object of my anxious solicitude by night and day, was destroyed. We had brought this barometer in safety a thousand miles, and broke it almost among the snow of the mountains. The loss was felt by the whole camp—all had seen my anxiety, and aided me

in preserving it. The height of these mountains, considered by the hunters and traders the highest in the whole range, had been a theme of constant discussion among them; and all had looked forward with pleasure to the moment when the instrument, which they believed to be true as the sun, should stand upon the summits and decide their disputes. Their grief was only inferior to my own.

This lake is about three miles long, and of very irregular width, and apparently great depth, and is the head-water of the third New Fork, a tributary to Green River, the Colorado of the West. On the map and in the narrative I have called it Mountain Lake. I encamped on the north side, about three hundred and fifty yards from the outlet. This was the most western point at which I obtained astronomical observations, by which this place, called Bernier's encampment, is made in 110° 08′ 03″ west longitude from Greenwich, and latitude 42° 49′ 49″. The mountain peaks, as laid down, were fixed by bearings from this and other astronomical points. We had no other compass than the small ones used in sketching the country; but from an azimuth, in which one of them was used, the variation of the compass is 18° east. The correction made in our field-work by the astronomical observations indicates that this is a very correct observation.

As soon as the camp was formed, I set about endeavoring to repair my barometer. As I have already said, this was a standard cistern-barometer of Troughton's construction. The glass cistern had been broken about midway; but as the instrument had been kept in a proper position, no air had found its way into the tube, the end of which had always remained covered. I had with me a number of vials of tolerably thick glass, some of which were of the same diameter as the cistern, and I spent the day in slowly working on these, endeavoring to cut them of the requisite length; but, as my instrument was a very rough file, I invariably broke them. A groove was cut in one of the trees, where the barometer was placed during the night, to be out of the way of any possible danger, and in the morning I commenced again. Among the powder-horns in the camp I found one which was very transparent, so that its contents could be almost as plainly seen as through glass. This I boiled and stretched on a piece of wood to the requisite diameter, and scraped it very thin in order to increase to the utmost its transparency. I then secured it firmly in its place on the instrument, with strong glue made from a buffalo, and filled it with mercury properly heated. A piece of skin which had covered one of the vials furnished a good pocket, which was well secured with strong thread and glue, and then the brass cover was screwed to its place. The instrument was left some time to dry; and when I reversed it, a few hours after, I had the satisfaction to find it in perfect order, its indications being about the same as on the other side of the lake before it had been broken. Our suc-