REPORT

OF AN

EXPLORATION OF PARTS

OF

WYOMING, IDAHO, AND MONTANA,

IN

AUGUST AND SEPTEMBER, 1882,

MADE BY

LIEUT. GEN. P. H. SHERIDAN,

Commanding the Military Division of the Missouri,

WITH THE

ITINERARY OF COL. JAS. F. GREGORY, AND A GEOLOGICAL AND BOTANICAL REPORT BY SURGEON W. H. FORWOOD.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1882.

REPORT

OF AN

EXPLORATION OF PARTS

OF

WYOMING, IDAHO, AND MONTANA,

IN

AUGUST AND SEPTEMBER, 1882,

MADE BY

LIEUT. GEN. P. H. SHERIDAN,

Commanding the Military Division of the Missouri,

WITH THE

ITINERARY OF COL. JAS. F. GREGORY, AND A GEOLOGICAL AND BOTANICAL REPORT BY SURGEON W. H. FORWOOD.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1882.

5969——1

LETTER OF TRANSMITTAL.

HEADQUARTERS MILITARY
DIVISION OF THE MISSOURI,
Chicago, Ill., November 23, 1882.

GENERAL: I have the honor to forward herewith my report of an exploration made in my command during the month of August, 1882, accompanied by the itinerary of Col. James F. Gregory and a geological and botanical report by Surgeon W. H. Forwood.

Very respectfully, your obedient servant,

P. H. SHERIDAN,
Lieutenant-General, Commanding.

The ADJUTANT-GENERAL OF THE ARMY,
Washington, D. C.

[First endorsement.]

ADJUTANT-GENERAL'S OFFICE,
Washington, November 28, 1882.

Respectfully submitted to the Secretary of War.

R. C. DRUM,
Adjutant-General.

REPORT.

HEADQUARTERS MILITARY
DIVISION OF THE MISSOURI,
Chicago, Ill., November 1, 1882.

GENERAL: I have the honor to submit, for the information of the General of the Army, the following report of an exploration made by me of parts of the Territories of Wyoming, Idaho, and Montana, during August and part of the month of September, of the present year.

On August 1, I started from my headquarters, at Chicago, accompanied by General Delos B. Sacket, Inspector-General, U. S. A., Lieut. Cols. M. V. Sheridan and James F. Gregory, of my staff, Capt. W. P. Clark, U. S. A., General Anson Stager, General William E. Strong, Mr. John McCullough, Mr. W. R. Bishop, of New York, and Mr. C. D. Rhodes, of Chicago, and proceeded via the Chicago, Rock Island and Pacific and the Union Pacific Railways, to the crossing of Green River, in Wyoming. At this point we left the railroad on the morning of August 4, and proceeded by spring wagons to Atlantic City, not far from the old and abandoned post of Fort Stambaugh, on the summit of the Wind River Mountains, camping at Atlantic City the night of the same day.

The route, after leaving Green River railroad station, was up the valley of the Green River, and thence across to the Big Sandy. This country is very broken and sparsely covered with grass, although in many of the valleys there was good grass and numerous herds of cattle. After leaving the Big Sandy, the country improved gradually, as we approached the Wind River Mountains.

Leaving Atlantic City on the morning of the following day, August 5, we crossed the summit of the mountains and passed into a country luxuriantly covered with bunch grass. Proceeding down through the mountains, the Red Cañon, we entered the valleys of the Little Popoagie and Big Popoagie Rivers and passing through Lander City, arrived at Fort Washakie that afternoon, August 5.

The valleys of the Little Popoagie and Big Popoagie seemed to be taken up by thrifty farmers who, by the aid of irrigation, were cultivating fine crops of wheat, oats, and corn; both are well sheltered, with Lander City as the headquarters of all the cattle interest lying east and west of Wind River, including the Gray Bull and Stinking Water country, as well as the Lower Wind River Valley, all of which is most excellent grazing country, occupied by thousands of fat cattle.

Fort Washakie is on the Little Wind River, about 2 miles distant from the Shoshone Agency. The valley of Wind River at this point is very broad and fertile, and is the best location for the Indians I have ever seen. The reservation of the Shoshones is large, furnishing an abundance of good land and fine grazing.

At Fort Washakie we found our escort and camp equipage, which had been sent there in advance, our camp pitched and everything ready to receive us. August 6 was passed in camp at Fort Washakie, making preparations for marching the following morning.

About 2 miles from Fort Washakie, and near our camp, there is a large mineral spring about 400 feet in diameter and 16 feet in depth. The volume of water which flows up from the center is about 16 feet in diameter, and runs from the spring in a large stream, emptying into the Little Wind River near by. It is a medicinal spring, said to possess very fine curative properties. Its temperature is 108° Fahrenheit, falling somewhat on cool nights. I have no correct analysis of the water, but it contains chlorides, a little iron, and some sulphur. There are no deposits from the water, such as are usually found in all hot springs of Colorado and New Mexico, so that there is no danger in freely drinking it for medicinal purposes. The bottom of the spring is soft white sand, exceedingly agreeable in bathing, but strangers have to be very careful to remain in the water for only a short time, until they grow accustomed to its temperature.

On August 7, at 6.15 a. m., the command marched from camp near Fort Washakie, across to the south fork of Wind River via Sage Creek, encamping on the main Wind River, just below the mouth of Dry or Bear Creek—distance traveled, 17 miles. Shortly after crossing the south fork of Wind River, the country became elevated rolling land, as far as the crossing of Sage Creek, an insignificant stream of indifferent water, and affording, in the way of grass and wood, no inducements for camping; so that, although it had been the intention to make our camp at this place, it presented such an unfavorable and sage-brushy aspect, that the march was continued until the banks of the main Wind River were reached. The country passed over from Sage Creek is broken, but interspersed with grassy plains and hills, the monotony being relieved by occasional glimpses of herds of cattle belonging to Indian families or their white friends. We were still on the Shoshone Reservation.

On August 8, at 6.15 a. m., we resumed the march up the south bank of Wind River, passing Crow Heart Butte on our right, a high mountain of bad-land formation, but an excellent land-mark for many hundreds of miles. We found a pleasant camp on a small, swift-running stream, called Spring Creek, a tributary of Wind River. The country traveled over, except the immediate valley of the Wind River, was of the bad-land formation, and offered no inducements for agriculture and little for grazing purposes. It is high, broken, and rolling. Spring Creek and Wind River abound in fine white-bellied dark-spotted trout,

distinguished from trout east of the Mississippi by the dark spots on the sides, instead of the red. Distance marched, 16 miles; altitude of camp, 5,800 feet.

August 9, at 6.15 a. m., we resumed our march up the south bank of Wind River, crossed Dinwiddie Creek, and encamped on the west bank, just above the crossing. The ford was deep, the water swift, and so turbid that trout could not be caught, although the stream is famous for its great abundance of them. The country traveled over was the valley of Wind River, with but a small amount of grass in the main valley and its tributaries. On either side are high, interesting mountains, on the slopes of which we frequently saw herds of antelope and a few deer. Distance marched, 12 miles; altitude of camp, 6,100 feet.

On August 10, we broke camp at 6.15 a. m., and continued our march up the south side of Wind River, crossing the stream from south to north and again from north to south, until we finally encamped on Jake's Creek, near the headquarters of Torrey's cattle ranch, where grass was abundant and shelter for cattle during winter good. Dense groves of willow, cottonwood, pine, and cedar, grow here, making good browsing and shelter for the fine herd of cattle belonging to Captain Torrey. We did not meet him and were sorry, for we knew him well, as he was, until a few months ago, a captain in the Thirteenth Infantry, to which regiment I had the honor to belong during the latter part of 1861 and early part of 1862. His herd of cattle bids fair to make him very wealthy. Distance marched, 17 miles; altitude of camp on Jake's Creek, 6,800 feet.

On August 11, we marched up Wind River, crossing to the north side shortly after starting, and continuing until we encamped in a large meadow of many miles in extent, at what is known as Clark's ranch, at the upper forks of Wind River. Distance marched, 15 miles; altitude, 7,400 feet. This camp was beautiful in its surroundings of high, picturesque mountains and the grassy plains down the main Wind River and up the north and south forks of that stream. The currents in the branches of the main stream were swift, and the trout abundant and large. Our Indian scouts, our guide Jackson, and Mr. Clark, the proprietor of this elevated ranch, contend that the south fork here is the main Wind River, although the mountain openings, but not the stream itself, would indicate that the main river belonged to the north branch. The south fork reaches over to the headwaters of the Gros Ventre, the north fork up to the headwaters of Buffalo Fork of Snake River. The view was superb. The camp was named Camp Bishop, after our agreeable companion and friend, H. R. Bishop, of New York. The country passed over, on this day's march, was about as described for the day preceding.

On August 12, the march was resumed up the south fork of Wind River, over a broken country carpeted with good grass, until we reached a point 4 or 5 miles from camp, when the Indian guides crossed the stream to the south bank and commenced the ascent of the Continental Divide.

The ascent was on a very easy grade, almost good enough for a fair wagon road, if the timber at places were cut out of the trail. In making the march to the summit, we passed through open glades and beautiful parks along the side of the mountain range, some of them several miles in length and all covered with splendid bunch and gama grasses and wild flowers. On the summit level were a series of open grassy parks and here and there small lakes. We encamped in a pretty place near the summit, having marched 15 miles. Altitude, 9,200 feet. This pass was unknown to white men, and seemed to have been used in the past only by Indians. It is much better than the Union Pass, to the south of it, or than the pass to the north of it, traversed by Captain Kellogg's command last year. It was named Lincoln Pass, after the Hon. Robert T. Lincoln, Secretary of War, whose expedition this really was, but the non-adjournment of Congress and official duties prevented him, at the last moment, from being at its head.

Next morning, August 13, we resumed our march at the usual hour across the summit, and commenced the descent through open glades, but by and by we encountered more timber, sideling places, and occasionally short, steep pitches. The descent was not so favorable a grade for a wagon road as the ascent, but it was by no means bad, and a small amount of money would suffice to make a good wagon-road through Lincoln Pass. It is by far the best pass I have ever seen over the Continental Divide. About one o'clock, after a long march, we found ourselves in the valley of the Gros Ventre River, just below the forks, and in an open bottom on the edge of a beautiful, clear river, filled with two and three pound trout. We here went into camp, naming it Camp Benkard, in honor of Mr. Benkard, president of the Long Island Trout Club. Distance marched, 18 miles; altitude, 7,650 feet. The hills bordering the valley of the Gros Ventre are covered with bunch and other nutritious grasses. There is a trail over from this valley, via headwaters of Green River, to the new railroad from Granger Station, Wyo., to Portland, Oreg., on which trail wagons have passed.

On August 14, the march was resumed at the usual hour and continued down the valley of the Gros Ventre, crossing the west fork and its beautiful valley, and also the main river, just below, until the eastern edge of the valley of Snake River was soon after reached, where camp was pitched on the Gros Ventre River, and named Camp Stager, after General Anson Stager, so well known at the War Office in Washington during the war of the rebellion, and since that time as vice-president and superintendent of the Western Union Telegraph Company. Distance marched, 19 miles; altitude of camp, 7,000 feet. The country passed over on this day's march was mostly in the foot hills along the valley of the Gros Ventre, and was covered with good grass and beautiful wild flowers. Just before going into camp we crossed a little divide, from the summit of which the broad extensive valley of Snake River, with the Teton Range of mountains as its background,

was suddenly revealed to our sight. The view was the grandest and most impressive I have ever seen.

The valley of Snake River has a north and south direction, and is, at Camp Stager, about twenty miles broad, the Teton Range rising up from the level of the valley on the western edge. The Gros Ventre River, on the bank of which our camp was located, was filled with handsome trout from one to three pounds in weight. Game was very abundant on the line of march; elk, antelope, bear, and deer were the trophies of the hunters this evening. I had to forbid the killing of antelope, at the head of the column, as it would have been a cruelty to kill more than the command could consume.

On August 15, we left Camp Stager, and turned to the north, up the valley of Snake River, keeping near the foot hills on the eastern side and parallel to the river. The valley over to the Teton Range of mountains—to which we traveled parallel—is, I should think, 15 miles broad. To the south, and just north of the cañon of Snake River, two grassy buttes rise up from the level of the valley, and are called the Gros Ventre Buttes. We encamped on the east bank of Snake River, just above the mouth of Buffalo River. Distance marched, 21 miles; altitude of camp, 6,900 feet. The camp was beautiful in the extreme. That portion of the valley of Snake River passed over during this day's march is mostly a level, grassy plain, with occasional clear mountain streams coming in from the east and emptying into Snake River. It is a lovely valley, with excellent soil, covered with luxuriant bunch and gama grasses. Altitude of the valley, 6,000 feet. Should there be no drawbacks from heavy snows in winter and cattle and horse flies in summer, it can, by civilization, be made a paradise. There is little, if anything, known of it, but it is recorded on the maps as Jackson's Hole. The altitude and the appearance of the soil and grasses did not indicate severe winters. At Camp Stager we met two or three miners, who had just come into the country, and, on Buffalo River, one miner of a party of three or four who came in last spring, but these parties knew but little of this valley. They knew nothing of the winter climate, but spoke of the annoyance to their animals from the large horse and cattle fly so well known in the Indian Territory south of the Arkansas. Our camp was named Camp McCullough, in honor of Mr. John McCullough, our exceedingly interesting companion, so well known and highly appreciated. During the day's march herds of antelope occasionally ran across our path, but the number permitted to be killed was limited to our wants. Large fine trout were taken from Snake River, in front of our tents, during the afternoon.

On August 16, at the usual hour, we resumed our march up Snake River and along Jackson's Lake, where we took to the foot hills to avoid marshy places, coming again to the lake at its upper end. The lake is about 6 miles wide and 15 miles long, very deep, and lies immediately at the foot of the Teton Range and directly under the Teton Peak

named Mount Moran, after our distinguished countryman and artist. The lake was covered with wild geese, swan, brant, and ducks. We did not encamp on the lake, but continued our march up the valley of Snake River, through grassy meadows, until we had made 19 miles, where we selected a beautiful spot for camp, which was named Camp Rhodes, after our companion and friend, C. D. Rhodes. Just after going into camp one of the miners who had followed us from Buffalo River came in. He had missed us the previous night while we were encamped near Buffalo River, as he and his three companions were out working on their ditch to bring water to their claim. He had a large pack of bear and other skins, and wanted to exchange them for coffee, sugar, and tobacco. I asked him if he would not sell them for money, but he promptly said that money was of no value in Jackson's Hole. He wanted "tobacco and grub." He and his partners had had no sugar or coffee, and but little tobacco and flour, since about the 15th of May. I think they had been living on wild meat, with a little tobacco to chew, for several months. We bought his skins, as we could not trade food for them, and with the money he purchased what he desired from the savings of the company of soldiers who formed our escort. They had but little tobacco to sell, as they wanted the weed themselves; this was a great disappointment to him, and I believe he would have given up the sugar, coffee, and flour to get more tobacco. He was from Massachusetts, but had been out in the wilds for fifteen or twenty years, was in strong, vigorous health, and expected to make his fortune on Buffalo River. He was anxious to get back to his camp to complete his ditch, so as to get two or three weeks' run in the sluice-boxes before the winter came on. This party expected to make enough in two weeks' run from their ditch to carry them over the winter. The gravel wash on Buffalo River graded all the way up to 240 colors to the pan. Snake River Valley, or Jackson's Hole, is about 50 miles in length and about 15 miles broad, Jackson's Lake being well up toward its northern end. It is difficult to get into the valley in the spring on account of the swollen condition of the streams, but a very little money would make a good, practicable road to it. The soil is good, grass luxuriant, and gold and silver may turn out to be of mining value. If so, the cattle-man, miner, farmer, and artist will some day redeem it from its present solitude.

August 17, continued our march up the left bank of Snake River through the foot hills, and, as in the latter part of the day before, through open glades and considerable fallen timber, at places, until our direction led across the main river, about 3½ miles below the mouth of Lewis' or Lake Fork. Our Sheep-Eating guides, who formerly lived in this country, here became somewhat confused about our direction, advising us to keep up the valley of Snake River until we reached the Yellowstone Lake; but as Lewis' Lake and Shoshone Lake were a part of our programme, we considered it best to encamp on the north bank of Snake

River and wait here one day for examination of our direction to the front. This delay was made more agreeable by our having a camp of great beauty on the edge of the river, with a splendid range of grass for our animals and plenty of good trout-fishing at the doors of our tents. The camp was named Camp Strong, after our knightly and distinguished guest and sportsman, General William E. Strong, of the staff of General McPherson during the war. Distance marched, 8 miles; altitude of camp, 7,050 feet.

August 18 was spent here. Meantime Mr. Thomas Moore, chief packer of the Division of the Missouri, and Campbell, my old scout during the war, with the Sheep Eating-Indian guides, had laid our trail to Lewis' Lake. To the east of this camp and south of the Yellowstone Lake is Mount Hancock, while to the southwest and south the grand Teton Range is still in view.

August 19 we resumed the march through dense timber, occasionally relieved by open parks, until we reached the lower falls of Lewis' or Lake Fork of Snake River. The trail was made by pioneers in advance, who had to chop a great deal to make a practicable passage for the command. At the lower falls of Lewis' or Lake Fork of Snake River we met a party of railroad engineers looking out a railroad route south from the National Park, which was then distant from us only two days' march. We bade them good-bye and resumed our march, crossing the Lake Fork above the falls, and after encountering a pretty rough trail from fallen timber, we encamped on the banks of Lewis' Lake, a beautiful body of water, four or five miles in diameter and very deep. Although south of the National Divide the country commenced to show symptoms of the great geyser condition, by escaping steam from craters and numerous boiling springs, Mr. Moore, Campbell, the Indian guides and pioneers, still kept ahead of us in the direction of Shoshone Lake, and did a good deal of hard work in cutting and looking out a trail for the next day. Our march was 22 miles; altitude of camp, 7,875 feet.

August 20 we resumed the march at 6.15 a. m., and followed Moore's trail. This, unfortunately, though my own fault, led too close to Shoshone Lake, and ran into a pocket of fallen timber, which gave very hard work to the men, and finally had to be abandoned. Making more to the north, in a few miles we struck the large open trail from the Upper Geyser Basin to the Yellowstone Lake. This trail we followed until it led us down to Shoshone Lake, and, after feasting our eyes on this beautiful lake, which was so deep that the color of the water was as blue as indigo, we turned from it and crossed the Continental Divide, going over to the head-waters of Fire Hole River and down it to the Upper Geyser Basin, pitching our camp only 200 yards from Old Faithful, who, as if to welcome us, was making one of its best efforts just as we were passing by. Distance marched, 26 miles; altitude of camp, 7,600 feet. We had with us five Sheep-Eating Indians as guides,

and, strange to say, although these Indians had lived for years and years about Mounts Sheridan and Hancock and the high mountains southeast of the Yellowstone Lake, they knew nothing about the Geyser Basin, and they exhibited more astonishment and wonder than any of us. The Sheep-Eaters were a band of the Snake or Shoshone Indians, probably renegades, and in years gone by had taken refuge in inaccessible places among the high mountains above mentioned to protect themselves from their own people and from other straggling bands of Indians who made war upon them. They lived on sheep, which were to be found very high up, and, having no guns, killed them with arrows and by "surrounds." They were then very poor and dressed in skins, but in latter years commenced to hold some little intercourse with Washakie's band of Shoshones and traded skins for a few guns and a small amount of ammunition; finally, when the Geyser Basins were discovered, and the whites commenced to render their habitations, high up as they were, insecure, they were persuaded by the old chief, Washakie, to abandon their mountain homes and come into the reservation at Fort Washakie, on Wind River. They were greatly excited in getting back to their old country, but had, from superstition, perhaps, never visited the Geyser Basin and knew nothing about it.

August 21 we remained at the Upper Geyser Basin. From our camp we could tell, by the little indicators near the craters of all the geysers, when their action was to take place, and had sufficient time to go to the immediate vicinity of the craters to get the best effect. Old Faithful never fails to perform his duties every sixty minutes, the action continuing seven minutes each time. Although the others have longer periods and are somewhat irregular in their respective intervals of time, they do not vary sufficiently to cause much disappointment to persons in waiting. We saw Old Faithful repeatedly, the Bee-hive, the Grand, the Giant, the Splendid, the Grotto, the Giantess, and many others—on one occasion nearly all in action at the same time.

On August 22 we resumed the march down the Fire Hole River, through the Middle Basin, by what is known in the park as the Sheridan Geyser. This geyser had just made one of its grand exhibitions, but we were too late for the best effects. After years of rest, it resumed its activity only last year by throwing up a column of water over 400 feet in height and 70 feet in diameter. We continued our march through the Middle Basin to the Lower Basin, via the Paint Pots, then over to and up the east branch of the Fire Hole, and over the divide, in the direction of the cañon of the Yellowstone, encamping, after a long march, on the headwaters of Alum Creek, where an abundant supply of hard and firm brook trout was caught. Distance marched, 27 miles; altitude, 8,050 feet.

August 23 we marched at 6.15 a. m., and shortly after 12 m. pitched

our camp just over the Lower Falls of the Yellowstone. Distance marched, 15 miles; altitude of camp, 7,300 feet.

Next day, August 24, we resumed our march down the cañon of the Yellowstone River, which exhibited at every curve of the narrow trail a cañon with almost precipitous banks, the natural water-wash of millions of years. After climbing on the mountain sides for many hours during the day, we at last reached Baronett's bridge over the Yellowstone River and went into camp on a small plateau just below the bridge. Distance marched, 23 miles; altitude of camp, 6,400 feet.

The next morning, August 25, after parting with our dear companion, Mr. John McCullough, who had won all our hearts, we resumed our march up the east fork of the Yellowstone. Mr. McCullough was obliged to leave us here in order to meet engagements made before our departure. We bade him good-bye, starting him off in a spring-wagon for Fort Ellis, just as the sun commenced to light up the sky over the eastern horizon. Our direction was up the east fork until we reached the mouth of Soda Butte Creek, thence up that creek until we found a beautiful place for our camp, distant from Cook City about 11 miles. Distance marched, 25 miles; altitude of camp, 7,500 feet. The country passed over in this day's march I think may fairly be considered the best grass and the best wintering country inside of the National Park. There are rich bottom-lands surrounded by bald, grassy mountains, dotted with groves of timber, principally of the different varieties of the pine family and the quaking aspen.

August 26, resumed the march, passing through Cook City, a mining town on the divide between the waters of the east fork of the Yellowstone River and Clark's Fork. Many of the mines here are considered valuable. There are about one hundred houses in the city, with fair prospects of as many more in a few months, indicated by the quantities of freshly-hewn logs lying about and the number of town lots for sale. After stopping only a short time to make some inquiries of the courteous inhabitants, we continued on our way. Just as we reached the summit of the divide, where the waters of Soda Butte Creek and Clark's Fork take their respective water-sheds, we met a hunter, Mr. Geer, who considered himself so familiar with the Bear Tooth Range of Mountains that I was induced to abandon the old Clark's Fork trail and make an effort to cross that range, thus saving about three days in our journey to Billings' Station, on the Northern Pacific Railroad. After meeting him and employing him as a guide, somewhat against the judgment of older guides, we passed down the mountain with much difficulty, on account of the burning forests, the fire extending across our line of march. The journey this day was through high mountain peaks covered on top with perpetual snow. We encamped at the base of Index Peak and Pilot Knob, on the banks of Clark's Fork of the Yellowstone. This camp was named Camp Clark, after Capt. W. P. Clark, Second Cavalry, our Indian interpreter. Distance marched, 31 miles; altitude of camp, 7,100 feet.

In the evening, just before dinner, the hunters who had gone off the day before on our left flank, over in the direction of Hell Roaring Creek, returned with buffalo, elk, deer, and antelope. They saw a herd of about one hundred and forty buffalo and killed four.

On the morning of August 27, under the direction of our new guide, we crossed to the north side of Clark's Fork and began the ascent of the Bear Tooth Range. This was long, but gradual, and quite feasible for a wagon-road, so far as grade is concerned. The only difficulties which presented themselves during the day were bodies of densely-growing timber at one or two places. However, we got through these without much delay, and about twelve o'clock encamped immediately under a very prominent land-mark, called on the map Red Butte. The camp was beautiful, and was named Camp Gregory, after Colonel Gregory, of my staff. The country traveled over was open and grassy, bunch and gama grasses predominating. Distance marched, 13 miles; altitude of camp, 9,400 feet. From our camp this day we were high enough to obtain a complete view of the whole Rocky Mountain Range for several hundred miles, with its snow-capped peaks and massive beds of snow, drifted in places to a depth of 40 or 50 feet in the craters and summit ravines. Several lakes, large and small, were in plain view beneath us on the lower levels.

Next day, August 28, we resumed our march at 6.15 a. m., passing along the border of one of these summit lakes, very deep, and a mile and a half or two miles in diameter. The edge of the lake, having a small margin of mud, was very much tracked up by grizzly bear, elk, and deer. We continued eastward, still ascending, and crossed numerous beds of perpetual snow, solid enough to permit our horses and pack train to traverse them without breaking through. At about 11 a. m. we reached the summit level of our trail. We were here far above the timber line, and although our pathway was covered with spring flowers, the grasses were coarse and unnutritious. The view to the eastward gave us the high, snow-clad range of the Big Horn Mountains, with Pryor's Mountain Range lying intermediate. The view from this high altitude was grand, extending in every direction to the limit of vision from good field-glasses. We had now reached the headwaters of the Little and the Big Rocky, streams that enter into the main fork of Clark's River, well down toward its mouth. Our progress was down a natural divide between Little and Big Rocky, until we arrived at the edge of the cañon, whence there was an abrupt descent to the plain below, distant from us about nine miles. At first I thought of sending the escort ahead to break and remove obstructions from the trail, but soon discovered that the men would consume too much time in trying to make too good a trail; that it was best to take the advance down the mountain and let the escort follow. We all got down safely; one mule only fell from the trail and caught in the top of a tree growing up from a point below. Unharmed, and with his pack on, we cut him out

of the tree on the side of the mountain, without further accident reaching our camp in the valley of the Little Rocky at the base of the range. We had to walk most of the distance down the declivity, but our riding horses and pack train came down the mountain without inconvenience or accident, excepting the one mule which fell off the trail, as before described. Notwithstanding that mishap, I am satisfied that a well-packed mule can go either up or down where a horse can be led. Distance marched, 25 miles; altitude of camp, 5,890 feet. This camp was named Camp Wheelan, after Capt. J. N. Wheelan, Second Cavalry, commanding our escort. Considering that it was the latter part of August, the fact that the country traveled over most of the day was covered here and there with deep snow, coarse grasses, and early spring flowers, indicated high altitudes and difficulty in crossing on this trail until late in the summer season. In passing a beautiful little mountain lake with beds of snow near it, the head of the column came suddenly upon a drove of about two hundred elk, and, as the hunters had all gone out on the flanks of the column, not a gun was at hand. Although this large drove of magnificent animals turned around when they discovered us, and for a moment ran toward the head of the column, no one was ready but Geer, the guide, who, after some delay in getting his gun out of its case, got a shot which killed a fine doe. The men of the escort farther in the rear opened quite a fusillade, but the game was too far off. The hunters came in that evening with only one elk, although if they had been at the head of the column they could have had as many as we might have desired to kill. After a march of 25 miles we had crossed the Bear Tooth Mountain Range and encamped on Little Rocky, whose valley was not especially large or prepossessing, but the clear mountain stream contained thousands of brook trout. Our trail over the Bear Tooth Range was unmarked, and where trails were followed, they were made by elk, bear, and deer. We had no time to pick our steps, but one who will do so will be able, in my opinion, to get a good practicable trail for packing. By this trail the distance from the mouth of Clark's Fork to Cook City will be three days shorter than by the old Clark's Fork trail, and I believe that it can be made, if it is not now, a better trail than the other.

On August 29, we resumed the march at 6.15 a. m., and I wish to say here, that in mentioning that we started at 6.15, which was the latest moment at which we started upon any morning during our journey, I mean that the whole command was ready and the mules packed at that time each morning. In this day's march I gave way to the guides. I should have gone by the most direct line in our general course to the Big Rocky, and then taken the valley of that stream to Clark's Fork, but made the mistake of going directly east instead, expecting to strike the Clark's Fork about where the old Bridger Road crosses that stream. The direction taken carried us at first over a good grassy country, but it eventually led us into the bad-lands, so that we struck

Clark's Fork at least 10 miles above the Bridger Crossing and encamped there, after a march which I considered one of the most fatiguing of the entire trip. Distance traveled, 21 miles: altitude, 3,850 feet.

On the morning of August 30, we crossed Clark's Fork a little above our camp, proceeded down the valley, crossed the river again to the west bank at the Bridger Ford, and continued our march until we crossed the Big Rocky. The valley of Clark's Fork opened out until, at places, it was 5 or 6 miles broad, the soil good, and bunch and gama grasses fine. We met, during the day, many of the Crow Indians, painted, and mounted on tough little ponies. Near our camp was a small village containing a number of women and children who were out gathering berries and wild plums.

On August 31, at 6.15 a. m., continued our march down the prolongation of the beautiful valley through which we marched yesterday. It opened out to the width of about 8 miles, as we approached the Yellowstone River, which we crossed by a very good ford just about the mouth of Clark's Fork. We then continued down the north bank of the Yellowstone River, to Billings' Station on the Northern Pacific Railroad, arriving there about one o'clock p. m. The bottom lands of Clark's Fork, passed over this day, were especially noted for fine grasses and good agricultural soil. At one point I saw one or two good fields of wheat, with fine vegetables at the same place. These were the only signs of cultivation in this valuable valley; they belonged to a white man who had married a Crow Indian woman. The Crow Reservation begins near the 110th meridian and extends eastward along the south side of the Yellowstone, nearly to the mouth of the Rosebud, embracing the valleys of Clark's Fork, Pryor's River, and those of the Big and Little Horn Rivers. These are all valleys with good agricultural soil and abundant grasses. Irrigation is necessary for the best cultivation. The formation of the valleys and the large rivers running through them render irrigation easily attainable if desired. The high, rolling country separating these valleys is covered with bunch and gama grasses. The section and reservation mentioned is subjected to what is known in that country as the chinook-winds. They are soft, warm winds, which melt the snow quickly, giving a warmer temperature and good grazing in the winter. In this Crow Reservation there are six millions of acres of valuable land on which nothing is now grown. It is used by the Crows only to gather a few berries and for grazing their small amount of stock. The Crow Nation numbers 3,470 souls. They cannot keep this body of good land much longer for such purposes, and I would recommend that the government give 80 acres to the head of each family, buy the balance from the Indians, paying them, say, half a dollar per acre, if thought proper, then purchase government bonds with this money, and each year use for their support, through the Commissioner of Indian Affairs and their agent, the interest upon the bonds, without touching the principal. This interest would be very much more than is

now appropriated yearly, and the Indians, by these means, would have a perpetual fund, the principal of which should never be touched, except by acts of Congress. In fact, if all Indians and their reservations were treated in this way a better system of government for the Indians could be obtained. It would also be a good bargain for the government, as the purchased land could be sold to actual settlers for an advance, and be occupied by people paying taxes, to say nothing of the opening up of the country. The Indian would be satisfied, as he would then receive a fair compensation, to him, for what we acknowledge belongs to him. No appropriation would then have to be made by Congress each year for the Indians; there would be less chance to squander what would be justly due them from the interest on their bonds, and from the principal in bonds, held by the Government; they would have the security of never coming to want.

The geysers in the National Park presented nearly the same conditions as in the previous year, but there seemed to be greater action on the part of some of them, Old Faithful, the Beehive, and the Grand showing a marked increase in their efforts. The Sheridan has been very violent, wearing out the crater until the diameter has enlarged from 70 feet to about 125 feet. Quite a large section of the crater next to the Fire Hole River has been torn out, and at each eruption an immense volume of water is emptied into that river. The bed of the river contains many large blocks of stone, thrown out by the violent action which has taken place. On arriving at the railroad I regretted exceedingly to learn that the National Park had been rented out to private parties. The place is worthy of being a National Park, the geyser phenomena and the Yellowstone Cañon having no parallel in any nation. The improvements in the park should be national, the control of it in the hands of an officer of the government, and small appropriations be made and expended each year for the improvement of roads and trails. It has been now placed in the hands of private parties for money making purposes, from which claims and conditions will arise that may be hard for the government and the courts to shake off. The game in the park is being killed off rapidly, especially in the winter. I have been credibly informed that, since its discovery, as many as four thousand elk were killed by skin hunters in one winter, and that even last winter, in and around the edges of the park, there were as many as two thousand of these grand animals killed, to say nothing of the mountain sheep, antelope, deer, and other game slaughtered in great numbers. I would like to see the government extend this park to the east as far as a north and south line through Cedar Mountain; this would be due east about 40 miles, at the same time placing the southern boundary of the park at the 44th parallel of latitude, which would be due south 10 miles. This would increase the area of the park by 3,344 square miles, and would make a preserve for the large game of the West, now so rapidly decreasing. This extension would not be taking anything away

from the people, as the territory thus annexed to the park can never be settled upon. It is rough, mountain country, with an altitude too high for cultivation or winter grazing for cattle. The game is now being driven toward the park, and if we keep out the skin hunters the game will naturally drift to where it can find protection. This year I noticed that buffalo were on the edge of the park, and the elk, deer, antelope, and big-horn sheep, from the Big Horn Mountains, are all drifting to the section of country which would be included in the National Park if it were extended as I recommend. I respectfully make an appeal to all sportsmen of this country, and to the different sportsmen's clubs, to assist in getting Congress to make the extension I describe, thus securing a refuge for our wild game. If authorized to do so, I will engage to keep out skin hunters and all other hunters, by use of troops from Fort Washakie on the south, Custer on the east, and Ellis on the north, and, if necessary, I can keep sufficient troops in the park to accomplish this object, and give a place of refuge and safety for our noble game. If any of the game which will naturally drift to this place of safety break out again let it be killed, but let its life be made safe while in the National Park; it will then soon learn to stay where it will be unmolested.

I inclose herewith a journal of the march, by Lieut. Col. J. F. Gregory, aid-de-camp, and a report upon the geology and botany of the country explored, by Maj. W. H. Forwood, surgeon, U. S. A.

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

P. H. SHERIDAN,
Lieutenant-General-Commanding.

Brig. Gen. R. C. DRUM,
Adjutant-General United States Army, Washington, D. C.

REPORT OF LIEUT. COL. JAMES F. GREGORY.

HEADQUARTERS MILITARY
DIVISION OF THE MISSOURI,
Chicago, Ill., October 19, 1882.

GENERAL: I have the honor to submit the accompanying journal of the trip made by me pursuant to your instructions in July last from the Union Pacific Railroad at Rawlins to Fort Washakie, and of the trip made by yourself and party from Fort Washakie along the valleys of the Wind, Gros Ventre, and Snake Rivers, through the Yellowstone National Park, across the Clark's Fork divide of the Rocky Mountains, over the Bear Tooth range of mountains, and down the valley of Clark's Fork of the Yellowstone to the terminus of the Northern Pacific Railroad, 12 miles west of Billings, Mont.

A map of Yellowstone National Park, Big Horn Mountains, and adjacent territory, with our trail camps, &c., marked upon it, is inclosed herewith.

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

JAMES F. GREGORY,
Lieutenant-Colonel and Aid-de-Camp.

Lieut. Gen. P. H. SHERIDAN, *U. S. A.*

JOURNAL.

Pursuant to instructions given me by the Lieutenant-General, I left Chicago on the 10th of July last, with two men and the camp equipage, supplies, &c., intended for the use of the general's party from the time of their arrival at Washakie.

I arrived at Rawlins about midnight on the 12th and left there on the afternoon of the 13th. My transportation consisted of a four-mule spring wagon, four army wagons, four saddle mules, and two horses, under charge of Mr. George Fisher, wagon-master. One sergeant and four privates of the Fourth Infantry composed my escort. We traveled by the road, over which supplies are hauled by the contractors from Rawlins to Fort Washakie, and by which the Indian goods are also transported to the agency there.

We arrived at Fort Washakie on the 19th of July, having made six camps *en route*, viz, Springs, Lost Soldier Creek, Crook's Gap, Sweet-

water Station, on the Sweetwater River, Beaver Creek, and Little Popoagie River. From the latter camp we traveled by way of Lander City, thereby making our route longer by six miles than if we had gone directly across by the traveled road from the Little Popoagie to the post.

The distance from Rawlins to Washakie I measured with an odometer fastened to the near front wheel of my spring wagon. By way of Lander City it is 141 miles, or 135 miles by the straight road. The road is a good one, with no very steep grades except one leading down into the valley of Beaver Creek, which could readily be made easier by going a little further around to the westward. There is also a wide sand plain between Bell Springs and Lost Soldier Creek, a distance of 26 miles, without water, except by losing about five miles of distance by going off the road that distance to Bull Springs. Mr. Rankin, the transportation contractor at Rawlins, informed me that this unpleasant feature of the road was next year to be remedied by leaving the sand plain to the right and making a new and shorter road from Bell Springs through the hills to Willow Creek and thence to Crook's Gap.

There is very little wood along the entire route, and not an abundance of either grass or water until the Sweetwater River is reached, though enough of the latter at the camping places for a small command. For the station on the Sweetwater wood is hauled from the hills to the south, a distance of about twenty miles. The grass along the Sweetwater had been pretty well eaten off by herds of cattle which were being slowly driven to the plains along the lower river.

Although I have never been over the road from Green River station, on the Union Pacific Railroad, to Washakie, I infer from what I have heard of it that the Rawlins road is a much better and easier one, and it is 12 miles shorter.

We saw many herds of antelope *en route*, and killed several. Sage chickens were abundant, and the young were about one-third grown; just the right size for the table.

Below, in tabular form, is a list of the camping places, with distances between them as determined by means of the odometer:

	Distance.	Total distance.	Remarks.
	Miles.	*Miles.*	
Rawlins Springs	12.3	12.3	No wood; fair grass; water good but not plentiful.
Bell Springs	2.7	15.0	Some wood; fair grass; good water five miles to left of road.
Bull Springs	13.0	28.0	
Lost Soldier Creek	12.9	40.9	Little wood; fair grass; good water.
Crook's Gap	19.5	60.4	Little wood; good grass; good water.
Bridge, Sweetwater River	20.3	80.7	Brushwood; good grass; good water.
Bridge, Beaver Creek	15.6	96.3	No wood; tall, coarse grass; good water.
Twin Creek	9.8	106.1	No wood; good grass; good water.
Little Popoagie River	12.3	118.4	No wood; fair grass; good water.
Popoagie River			Little wood; fair grass; good water.
Lander City	8.0	126.4	
Fort Washakie	14.7	141.1	

On reaching Washakie, July 19, I went into camp on the right bank of the Little Wind River, about a half mile above the post. Capt. J. N. Wheelan, with his company, G, Second Cavalry, and Mr. Thomas Moore, chief packer, Department of the Platte, with three trains of pack mules (which were about five miles distant, grazing in the foot-hills of the Wind River Mountains), I found here awaiting the General's arrival, and they reported to me for instructions.

General Sheridan and his party were unexpectedly delayed in starting from Chicago, and did not arrive at Fort Washakie until the afternoon of the 5th of August. They had come in spring wagons, with relays, from Green River station to Fort Washakie, 147 miles, in a little over two and a half days, not traveling nights.

The intervening time between the date of my arrival at the post and August 5 was, most of it, profitably occupied in reorganizing our camp outfits to make good pack loads, and in completing packages which had not been properly arranged before starting. I am indebted to Maj. V. K. Hart, Fifth Cavalry, who was in command at Fort Washakie, for much politeness and aid in having done at his post all that I desired.

The packers of the mule trains were almost all new men, who were not well versed in the difficult art of packing, and Mr. Moore occupied much of the time in drilling them; and I had camp moved twice; once to a little island in the Little Wind River near the post, and a second time to the famous Hot Spring, two and an eighth miles below the post. In each of these moves everything was packed as it was expected to be on the march. In the second move both the cavalry command and the packers' camps moved with me. During most of my stay at Washakie the weather was intensely hot during the day, over 100° on one or two days, but delightfully cool in the early evening and at nights.

August 5, Saturday.—General Sheridan and party arrived in camp at the Hot Spring in the afternoon, coming by the cut-off road, past the agency, and not by the post.

The party now together is as follows: Lieut. Gen. P. H. Sheridan, U. S. A.; Brig. Gen. D. B. Sackett, U. S. A.; Lieut. Col. M. V. Sheridan, U. S. A.; Lieut. Col. J. F. Gregory, U. S. A.; Capt. W. P. Clark, U. S. A.; General Anson Stager, Chicago; General W. E. Strong, Chicago; Mr. H. D. Bishop, New York; Mr. John McCullough, and Mr. Charles D. Rhodes, Chicago. Four servants accompany the party.

The *personnel* at the cavalry headquarters is as follows: Capt. J. N. Wheelan, Second Cavalry; Lieutenant Griffith, Second Cavalry; Surg. W. H. Forwood, U. S. A., and Mr. George Booth, New York. The strength of Captain Wheelan's command is 55 enlisted men, Company G, Second Cavalry, 1 hospital steward, 1 citizen blacksmith, 1 scout, and 1 servant. Mr. Moore's command consists of three pack trains of 47 mules each, with 1 head-packer and 11 packers for each train.

We have also one hunter, Shoshone Dick, five Shoshone Indian scouts, and one squaw.

RECAPITULATION.

Officers	13
Civilians	8
Enlisted men	56
Packers	37
Blacksmith	1
Scouts	2
Hunter	1
Indians	6
Servants	5
Total	129
Horses	83
Mules	157
Bell horses	3
Indian horses	18
Total	261

August 6, *Sunday.*—Remained in camp. During the day several members of our party employed their leisure in visiting the post and in examining the wonderful petroleum spring (Tar Spring it should be called), which is nearly opposite our camp and about a half mile north of the Little Wind River. In the evening we were visited by some of the officers of the garrison and by many Arapahoe Indians, including Black Coal, head chief, and Sharp Nose, second chief. Washakie, chief of the Shoshones, whose tepees are about 5 miles up the river, was coming to visit the General at our camp, but met him at the trader's store in the morning. He is a noble-looking old savage, but walks and stands erect, and wears his long, gray hair flowing down over his shoulders. Washakie and his sons cultivate by irrigation two considerable patches of ground on the Little Wind River. The labor, however, is mostly done by proxy, their squaws acting in the latter capacity.

August 7, *Monday.*—Broke camp at 6.15 a. m., crossed the Little Wind River at Fort Washakie, and marched nearly north over a rolling, barren country to the Wind River. The latter part of the march was tiresome to those of the party who had not been on horseback for a long time, and the more so because the weather was very hot and the country dry and dusty. It had been the General's intention to camp on Sage Creek, 10 miles out, but when we arrived there we found only a sage brush bottom, warm water, and little grass, so he concluded to go to the Wind River, where we found a pleasant camp, with plenty of those prime necessities for an outfit like ours—wood, water, and grass. The river was so swollen and roily from recent heavy rains in the mountains that there was no fishing. Temperature at 3 p. m., 83°; distance marched, 17 miles.

August 8, *Tuesday.*—Broke camp at 6.15 a. m. and marched up the left bank of the Wind River past Crow Heart Butte, a notable landmark of

the country, and went into camp in a pleasant meadow beside a small, swiftly-flowing stream of pure, cold water called Spring Creek. General Strong shot some doves in the afternoon, and numerous trout were caught. Altitude of camp by aneroid barometer, 5,800 feet; temperature at 3 p. m., 86°; distance marched, 16 miles.

August 9, *Wednesday.*—Broke camp at 6.15 a. m. and marched up the valley to Dinwiddie Creek, which we forded below the falls, going into camp on its west bank a short distance above the ford. The water was a little more than belly-deep on the horses at the ford, and the current was very rapid. Men were stationed in the stream below the ford to keep the animals from going down stream, and the trains were crossed without accident. We had been informed that this stream was the most bountifully stocked with trout of any of the tributaries of the Wind River, and had anticipated much sport when we should arrive here. It was, however, so greatly swollen by rains and so roily that no trout were caught. Our camp was very dusty and the afternoon very hot. We, however, had a pleasant retreat under some large trees, close to the edge of the creek, which here was a foaming torrent. The thermometer at noon marked 88°; altitude, 6,100 feet; distance marched, 12 miles.

August 10, *Thursday.*—Broke camp at 6.15 a. m. Forded the Wind River to the north bank, 4 four miles from camp, and shortly after the North Fork of Wind River. Recrossed the Wind River, and went into a very pleasant camp on the east bank of Jake's Creek. The country passed over has been generally very dry and dusty, but here all is moist and green. In the afternoon several of the party rode over to Torrey's Lake, and were quite successful in taking some very fine trout; General Sheridan caught one weighing 2 pounds and 10 ounces. Togwotee, one of our Shoshone guides, after whom Captain Jones named the Togwotee Pass, killed a mountain sheep in the afternoon. We saw during the day several herds of cattle, which are the property of Captain Torrey, formerly of the Thirteenth Infantry, after whom the beautiful lakes in which we fished, and the stream which is their outlet, are named. Thermometer at 2 p. m., 84°; altitude, 6,800 feet; distance marched, 17 miles.

August 11, *Friday.*—Broke camp at 6.15 a. m., crossed Wind River to north bank shortly after leaving camp, and marched over a rough and broken country until we again forded the river about 2 miles before reaching our camp at the forks of Wind River. At the ford we found awaiting us the wagons which had been sent out from Fort Washakie with forage for our horses. From the ford to our camp is a level stretch of ground which near the forks is kept as a hay meadow by a settler. We crossed the West Fork, and camped in a lovely meadow between the forks, with groves of poplar around us and between us and the streams. General Sheridan has named our camp Camp Bishop, in honor of Mr. H. R. Bishop, of New York, who, an enthusiastic sportsman and veteran

hunter, is one of his honored guests. The empty forage wagons return to Fort Washakie to-morrow, as this point is the farthest on our journey which can be reached by wagons. During the day several antelopes and one black-tail deer were killed, and a large number of trout caught. Temperature at 4 p. m., 81°; altitude, 7,400 feet; distance marched, 15 miles.

August 12, *Saturday.*—Broke camp at 6.15 a. m. Following the valley of the West Fork of Wind River about 4½ miles, we then crossed and left it. Thence, ascending the Wind River Mountains, our trail lay through parks, glades, and forests, and over bare mountain sides until we reached a summit, beyond which the streams seemed to flow to the westward. There we went into camp near a small rivulet, tributary, as we afterwards discovered, to Warm Spring Creek—the latter a tributary to Wind River. During the afternoon General Strong amused the members of the party by shooting with his rifle at a mark, with a cigar box lid for a front sight. The day's march was an exceedingly pleasant one, and the temperature, owing to the increased altitude, very comfortable. At 2 p. m. the thermometer marked 67°; altitude of camp, 9,200 feet. At 3 miles before arriving in camp we crossed a ridge of which the altitude was 9,550 feet. Distance marched, 15 miles.

August 13, *Sunday.*—General Sheridan has named this pass of the mountains Lincoln Pass, in honor of the honorable the Secretary of War, Mr. Robert T. Lincoln, for whose benefit and pleasure the journey we are on was projected by the General. Mr. Lincoln had hoped and expected to be with us, but at the last moment announced that unforeseen official duties would prevent his leaving Washington. To the north of us is Togwotee Pass, and another unnamed pass, through which came Colonel Kellogg to the eastward last year. To the south is Union Pass, the pass of Captain Raynolds and his party coming eastward in 1860, but, so far as is known, a few trappers are the only persons of the white race who have gone through the break in the mountains hereafter to be known as Lincoln Pass.

Breaking camp at the usual hour, 6.15 a. m., we arrived at the summit in less than a half mile's distance. Its altitude, according to my barometer, is 9,400 feet. From the pass our course was a little west of south until we reached the valley of the Gros Ventre River. The trail was very steep and rough, winding at times around mountain sides where the misstep of a horse was likely to plunge himself and his rider to the bottom of a gorge hundreds of feet below. About 10 or 11 miles from camp we were opposite the mouth of the little stream, along whose deep cañon lies the trail over Union Pass, and soon after crossed the trail which leads from Green River to the recently discovered mines on the Gros Ventre and Snake Rivers. Early in the morning General Strong, Mr. McCullough, and Captain Clark, with Tosar, one of the Shoshone scouts, went off hunting and returned at night with the saddle of an enormous elk, which they had killed. Numerous large bands

of antelope were seen by all of us during the day, and several were killed. A bear was also killed by one of the packers on the trail over which the rest of the command had just passed. The Gros Ventre River is full of gamy trout of all sizes up to two pounds. Enough were caught to-day to satisfy the appetites of the entire command. Our camp was on the south bank of the Gros Ventre, in a place which old tepee poles and sweat-house willows mark as a common camping-ground for Indians. The camp is named by General Sheridan Camp Benkard. Temperature at 4 p. m., 70°; altitude, 7,650 feet; distance marched, 18 miles.

August 14, *Monday.*—Broke camp at 6.15 a. m., and marched down the valley of the Gros Ventre, crossing that stream to the north side about 11 miles from camp. Thence the trail lay away from the river, through cañons and over the mountains, making considerable elevations, although the grades are not very steep. About 16 miles from camp we arrived on the crest of a high ridge, where we had a splendid view of the extended plain which lies between the Gros Ventre and Snake Rivers and the majestic Grand Tetons. The altitude of the ridge was 7,300 feet. Thence, descending abruptly, we arrived on a broad plateau above the cañon of the Gros Ventre, and went into camp on the bluff above the right bank of the stream. To-day, Mr. Moore, in about two hours' fishing, caught seventy-six magnificent trout. Numerous others were caught, but no one else approached his string. From our camp was also had a fine view of the Grand Tetons, the most splendid, in an artistic sense, of any group of mountains on this continent. We were, however, too tired to thoroughly enjoy it or the possibilities of fine catches in fishing the Gros Ventre, and early retired to rest. The Gros Ventre is called by the Shoshone Indians Red Paint River, probably because they obtain near its course the red ochre with which they delight to decorate themselves. Several antelopes were killed to-day by General Strong and Captain Clark. Our camp to-night General Sheridan has named Camp Stager, in honor of our genial friend, General Anson Stager, of Chicago. Temperature at 6 p. m., 68°; altitude, 7,000 feet; distance marched, 19 miles.

August 15, *Tuesday.*—The night past was unusually warm, with a strong wind blowing, so that our canvas kept flapping to the utter destruction of sleep. At 5 a. m. the thermometer stood at 54°. At 6.15 a. m. we broke camp, and leaving the Gros Ventre marched northward along the valley and the foot-hills above Snake River. During the day numerous herds of antelopes were seen and some black-tail deer. Three antelopes were killed. We witnessed a curious encounter between a buck antelope and one of Shoshone Dick's bear-dogs. These two dogs are natural bob-tails and crossed-breeds of Newfoundland and St. Bernard. They have been trained by Dick to attack bears and to hold them at bay until he can secure the game. On this occasion the oldest dog held the antelope at bay for fully fifteen minutes, until a soldier got near enough to shoot and kill him. We went into camp on the east

bank of the Snake River, about a mile up stream from the mouth of Buffalo Fork. The fishing in the Snake River is excellent. Large numbers of fine trout were caught, and one caught by the Indian boy, who is only about eleven years old, weighed 3½ pounds, the largest we have seen. Doctor Forwood reports to-day about thirty cases of mild cholera morbus among the men, caused doubtless by a too liberal diet, composed almost exclusively of fish. This camp is named by General Sheridan Camp McCullough, in honor of our fellow-traveler, Mr. John McCullough. Temperature at 3 p. m., 88°; altitude, 6,900 feet; distance marched, 21 miles.

August 16, *Wednesday.*—Last night was another warm night, and our camp-fire was more for picturesqueness than for comfort. This morning at 5 a. m. the thermometer marked 48°. Broke camp at 6.15 a. m., and marched over ridges, through much fallen timber, and through swamps. The trail was a very crooked one for the first 10 miles. After a march of about 12 miles, we arrived at the head of Jackson's Lake, where we stopped to rest and to enjoy the magnificent spectacle of the beautiful lake, clear and blue, and alive with swans and other wild fowl, and having the Grand Tetons, snow-clad and majestic, looming up in the background. The mountains come close down to the lake on its west bank, whilst on the east bank is a wide bottom, luxuriant with grass, which has at places a width of three or four miles. Leaving the head of Jackson's Lake we reached in 7 more miles a small creek, which empties into the Snake River, and went into camp at its head. The Snake River here is difficult to approach, because of swamp-land and dense timber. We had quite a severe shower after arriving in camp, the first we have had since leaving Fort Washakie. In the afternoon a man named Preble came into camp, having followed us from Buffalo Fork with some bear skins, loaded on a pack horse, which he desired to barter for some grub, as money was of no use here. It seems that he and his partner came from Eagle Rock, Idaho, last spring to Buffalo Fork, where they are engaged in placer mining with very hopeful prospects. He says they get as much as 250 colors to a pan, and make, on days when they can work, from $10 to $40 per day. They are building a flume and sluice-way, which they hope to have in operation in about three weeks. This camp is named Camp Rhodes, in honor of Capt. Charles D. Rhodes, of Chicago, one of the most enthusiastic sportsmen of our party. Temperature at 5 p. m., 70°; altitude, 6,950 feet; distance marched, 19 miles.

August 17, *Thursday.*—Broke camp at 6.15 a. m., and marched up the valley on the east side of the river. The trail was very crooked, and much of it lay through burned and fallen timber. Forded Snake River 8 miles from camp, and followed on the trail about a mile, but returned and went into camp in a fine grove of trees, between a splendid meadow and the Snake River. Our tents are pitched alongside the river in the open grove with the Teton range in full view. It is altogether a very

delightful camp, and is named Camp Strong, in honor of General William E. Strong, of Chicago. Here we are to remain in camp one day in order to give the hunters of the party a chance to test their skill. A lightning stroke kindled a fire in the woods on the other side of the river last night. Moore and Campbell went ahead on the trail, after we got into camp, to reconnoiter it and cut it out as much as may be necessary to permit our pack trains to pass. They report a bad trail from here to the Lower Falls of Lewis' or Lake Fork, with much burned and fallen timber. Altitude of camp, 7,050 feet; distance marched, 8 miles.

August 18, *Friday.*—Remained in camp. We had thought when we went into camp here that the small stream which empties into the river just above our camp was the Lewis or Lake Fork, but as the general became doubtful about it, I went up the river, taking Shoshone Dick with me, and discovered that the mouth of Lewis' Fork is a good 4 miles up the river from camp. Opposite the mouth of Lewis' Fork, on the south bank of the river, are two groups of geysers, or rather hot springs, which present abundant evidence of having been geysers, and now pour their tribute of hot water into the Snake River. From the top of a mountain, about 800 or 1,000 feet above the river, I could plainly see the break of the Lewis Fork through the dense timber for 10 or 12 miles of distance, and also the line of the Heart River trail to Yellowstone Lake. The hunters returned to camp from their trip to the Teton range in search of large game shortly after noon, having seen nothing. General and Colonel Sheridan also went out hunting at 5 a. m. to-day, but returned with similar result. We were greatly surprised that Jackson's Hole, which is so rich in pasturage, wood, and water, was not already occupied by cattle-men, who, since the cessation of Indian difficulties have so rapidly spread over nearly all of our great Northwest. Preble, the man who visited us in camp the day before yesterday, says it is because of the presence, in vast numbers, and the virulence, of the deer, dog, and other flies during the early part of the season, and that horses and cattle cannot live during a part of June and July, unless shielded by buildings from their attacks. He himself the past summer had to build a barn for his horses, although he has as yet no house for himself. This, if it be true, may account for the absence of game just now, although the fly season is over. Trout were caught in great abundance to day, and General Sackett, whilst sitting and walking on the river bank in front of camp, caught this evening fifteen or sixteen suckers.

August 19, *Saturday.*—This morning the water in our buckets was frozen hard, and the grass solidly covered with heavy white frost. The trail to-day lay, most of the time, through dense standing, fallen, and burned timber. We crossed Lewis' or Lake Fork to the east about 16 miles from camp. Above the lower falls we passed out of the worst of the timber, but had to go over a good deal of swampy ground along the bottom of the river. Many of our pack-mules mired, but were gotten out without damage to themselves or their packs. We went into

camp in a lovely open park at the north end of Lewis Lake, the only spot on its shore line which is not densely timbered. On the opposite shore of the lake, about southwest from camp, we saw in the evening a small geyser in eruption. Captain Rhodes and Captain Clark went out hunting over towards Mount Sheridan with Tosar and a couple of soldiers, and returned in the evening with one young elk. The wind was very strong from the southwest this afternoon, raising the surface of the little lake into foamy billows and precluding all attempts at fishing. Plenty of good wood, water, and grass. Temperature at 4 p. m., 74°; altitude, 7,875 feet; distance marched, 22 miles.

August 20, *Sunday.*—Broke camp at Lewis' Lake at 6.12 a. m; thence marched northwardly well up on the mountains through dense timber, much of it fallen and burned. Passed around Shoshone Lake, and striking the trail leading from Yellowstone Lake to the Upper Geyser Basin about 12 miles from camp, reached the camping-place of visitors to Shoshone Lake, near the head of the lake, at 10 a. m. There we rested a half hour and then followed the trail across the Continental Divide and down the cañon of the Fire Hole River to the Upper Geyser Basin, where we went into camp near Old Faithful, on the identical spot where the general and his party camped last year. Here Jack Baronett met us and is to accompany us from here to the Northern Pacific Railroad. Temperature at 5 p. m., 60°; altitude, 7,600 feet; distance marched, 26 miles.

August 21, *Monday.*—Remained in camp near Old Faithful. The day was passed in revisiting the wonderful and gorgeous natural fountains, the existence of which were unknown only a few years ago, but now are known and read about and wondered about by the intelligent people of all countries. The vandalism which I commented on in my report of last year has since been continuing until the whole top of the crater of the most wonderful of all the geysers, Old Faithful, has been broken down almost out of all recognition. We met here a party of tourists who came into the park from the Utah and Northern Railroad. They are Mr. and Mrs. Wallace, Mr. and Mrs. McMasters, Mr. Brown, and Miss White, the latter from Walla Walla, Oreg., and the others from Salt Lake City. Temperature at 7 a. m., 40°; at 5 p. m., 65°.

August 22, *Tuesday.*—Broke camp at 6.10 a. m. and marched down the road along the Firehole River to the lower Geyser Basin. We stopped at the Middle Geyser Basin, or Hell's Half Acre, as it is now usually called, to see the grand Sheridan Geyser. This geyser, which has only recently (within two or three years) become an active one, has produced great changes in the appearance of the ground around it for the space of an acre or so since last year. Then its appearance was that of a large and almost circular hot spring, situated on a bluff near and about 25 or 30 feet above the river bank. Now it is an immense cavern, the depths of which are concealed by a constant outpour of steam, and it has worn out a wide and deep gulch, which is its outlet

into the river. We were not fortunate enough to see one of its eruptions, except at a distance of more than a mile. It is said to be very variable both as to the intervals of time between eruptions and the volumes of boiling water and earthy matter ejected. The height of the column of water is said to vary from 30 or 40 to 300 or 350 feet, and its volume of water to raise the water of the river 14 inches above its natural level; also making the river so hot that animals cannot ford it below and near the outlet for a half hour after the great eruption is over. We stopped a few moments at the Lower Basin to see the Fountain Geyser, the Paint Pots, and the other wonders there, and then continued the march along the road to Alum Creek, where we went into camp on a pretty timbered knoll, about a mile to the right of the road, with plenty of wood, water, and grass. During the afternoon Captain Rhodes and Captain Clark caught forty-five trout from Alum Creek, which here does not seem to be at all impregnated with the salt from which it derives its name. Just before reaching Alum Creek we met Captain Gibson with his company of the Seventh Cavalry, who are escorting Mr. Killarno, of the United States Coast Survey. The latter gentleman, for the Interior Department, is checking, with the zenith telescope, the survey made a year ago last summer of the boundary line between Wyoming and Montana. Captain Gibson and the officers of his command and Mr. Killarno paid their respects to the General at our camp in the evening. Temperature at 5 a. m., 30°; at 5 p. m., 78°; altitude, 8,050 feet; distance marched to road crossing of Alum Creek, 26 miles; to camp, 27 miles.

August 23, *Wednesday.*—Broke camp at 6.10 a. m. and followed the road to Sulphur Mountain, where we stopped a few moments, and thence followed the road and trail to the Lower Falls of the Yellowstone, where we went into camp on our camp ground of last year, about a half mile from Cascade Creek, and near the top of the cañon. Some of the party went down the trail to the top of the falls, some to the Upper Falls, and some went fishing, but had no success. During the evening we had a "brave" camp fire, and the party of ladies and gentlemen whom we met at the Upper Geyser Basin, and who are camped near us here, came over to our camp fire. Mr. McCullough entertained them and us by recitations and anecdotes. We had also several songs, and altogether a very enjoyable evening. Mr. Fort, ex-member of Congress from Illinois, his son, and Mr. Ellsworth, of Dayton, Ohio, came into camp this evening. They had come into the park by way of Bozeman and the Mammoth Hot Springs. General Sheridan has invited them to go with us as far as Baronett's Bridge, whence he will send them to the Mammoth Springs, where they can obtain transportation to Bozeman. This morning Paul La Rose, hunter, Shoshone Dick, and the Indians who have been our guides, were discharged, as on leaving the park we go into the Crow country, which they know nothing about. Henceforward Jack Baronett and Campbell will be our scouts and guides. Dick and

his party branched off from our trail soon after leaving camp, intending to ford the Yellowstone near the Mud Geyser, and then to follow the Stinking Water trail through the mountains, returning to Fort Washakie by the road from where the Stinking Water River debouches from the mountains to Washakie. Temperature at 7 p. m., 68°; altitude, 7,300 feet; distance marched, 15 miles.

August 24, *Thursday.*—Broke camp at 6.10 a. m. and followed the new trail (Norris's) between the Lower Falls and Baronett's Bridge. It lies for some miles along the crest of the Yellowstone Cañon, and then over the eastern shoulder of Mount Washburn. It is not so good as the old trail west of Mount Washburn, over which we traveled last year. After crossing the Washburn ridge it is almost continually down hills, and very steep hills at that, for 12 long miles. About 5 miles south of Tower Creek we met Captain Hughes, of General Terry's staff, and Lieutenant Coale, Second Cavalry, with an outfit of pack mules. They came into the park from Fort Ellis, and are escorting General Armstrong of the Indian school at Hampton, Va., through the park. We stopped a few moments to see the beautiful falls of Tower Creek, and then marched on to Baronett's Bridge, where we arrived shortly after one o'clock. General Strong, Captain Clark, Captain Rhodes, and Mr. Bishop started out, under Baronett's guidance, with some pack mules, to do some hunting about the headwaters of Slough and Hell Roaring Creeks. They expect to rejoin us at our camp of to-morrow night, but go prepared to remain out two nights if they find it desirable or necessary. Mr. McCullough is to leave us in the morning and go by ambulance to Fort Ellis, and thence by stage to Billings, on the Northern Pacific Railroad. He does this in order to reach Saint Paul before the 4th proximo, as he has an engagement there on that date. We are all sorry to lose such a genial companion and affectionate friend, and feel the separation the more keenly because of the tender and kindly parting address which he made to us at lunch. We camped about a half mile below the bridge with plenty of water and wood, but not very much grass. Temperature at 3 p. m., 82°; at 8 p. m. 70°; altitude, 6,400 feet; distance marched, 23 miles.

August 25, *Friday.*—Mr. McCullough, Mr. Fort and son, and Mr. Ellsworth left us just before breaking camp this morning. Broke camp at 6.15 a. m., crossed Baronett's Bridge, and traveled upon the road to Cook City. Went into camp near the cabin by which was our first camp on Soda Butte Creek last year. The country is dry and dusty, but the grass is yet in very fine condition. The hunters have not returned. Temperature at 5 a. m., 48°; at 6 p. m., 72°; altitude, 7,500 feet; distance marched, 25 miles.

August 26, *Saturday.*—Broke camp at 6 a. m. Between camp and Cook City we met Captain Fowler, Second Cavalry, who, with a detachment of his company, is making an exploration through the mountains. He had come from Fort Custer by the Clark's Fork trail. Cook City

has grown very much since we were there last summer, and now has nearly two hundred inhabitants, and looks like a thriving mining town. Before crossing the divide between Soda Butte Creek and Clark's Fork we met a Mr. Geer, who owns a ranch on the Yellowstone near the mouth of Clark's Fork. He says he came from his ranch to Cook City by way of Little Rocky Creek and through the Bear Tooth range of mountains, and that the trail is no place worse than the trail from this divide down to Clark's Fork. He offers to guide us to the Yellowstone by his route, and says we can get through by doing a little timber cutting. The General has his proposition under consideration. We found a forest fire had been for some days burning across the trail. Fortunately the wind was blowing from the northeast, and though we passed over the fire track amongst burning logs and hot ashes, we were only compelled to diverge from the trail occasional short distances. We went into camp on Clark's Fork, on the spot where we camped last year. General Sheridan has named it Camp Clark, in honor of Captain Clark, Second Cavalry, who is with us, and who, as Lieutenant Clark, had a skirmish here with Bannock Indians in 1878. The hunters returned to camp at 5 p. m., having had a long and weary journey, as after their hunting was over they had to follow us from where they struck our trail, 48 very long miles. However, they were consoled by their success, as Mr. Bishop and Mr. Rhodes each killed a mountain buffalo, the former a very large bull, and General Strong a black-tailed deer. There are no trout in the north fork of Clark's Fork above its cañon, or in the streams tributary to it. Temperature at 5.30 a. m., 38°; at 6 p. m., 66°; altitude of divide, 8,250 feet; altitude of camp, 7,100 feet; distance marched, 21 miles.

August 27, *Sunday.*—Broke camp at 6.15 a. m. The General concluded to take Geer for a guide and try to go over the Bear Tooth range, hitherto regarded as impossible. We were all glad to make the attempt instead of following our old trail of last year, the Clarke's Fork trail. We crossed the north fork of Clarke's Fork soon after leaving camp, and climbed the mountains to the north of it in a general direction nearly due east from Index Peak. We climbed nearly all the morning, with but few and short descents. Soon after leaving camp we came in sight of Clay Mountain, which was a landmark for Geer to keep sight of, as our proper direction was just to the right of it. This mountain is the most prominent peak in the Bear Tooth range, which is visible for several miles along the Clarke's Fork trail. We passed many lovely little lakes and crossed several pure water mountain streams. The air was bracing, the weather delightful, and even the work of climbing under such circumstances was a pleasure. We had to make occasional halts to give time for the pioneers to cut a trail through thick fringes of timber. Everywhere we saw so many old elk tracks that it seemed as if this had been their favorite abode; but we saw no game or any very fresh signs. Our camp was pitched on the south side of

Clay Mountain, beside a rapidly flowing little stream, which runs down the mountains in a northeastwardly direction. Our tents are on a little plateau above the creek, amongst a sparse grove of pine trees, some of which are 2 to 3 feet in diameter of trunk, though their height is insignificant. With plenty of delicious water, wood and grass, and grand mountain views it is altogether the pleasantest camp we have had, and General Sheridan has complimented me by naming it Camp Gregory. Colonel Sheridan and General Strong, with Geer for guide, went out hunting, but saw no game or indeed any fresh signs. Dr. Forwood, Lieutenants Griffith and Campbell climbed Clay Mountain, which from our side appears to be a very sharp peak. It is, however, easily accessible from the west and north sides. Campbell carried my barometer with him, and it marked on the peak 12,650 feet. The camp-fire at night was a very enjoyable feature of our night's stay. Temperature at 5 p. m., 52°; altitude, 9,400 feet; distance marched, 13 miles.

August 28, *Monday.*—Broke camp at 6.10 a. m. It was cold last night, and this morning there were films of ice on the still places along the creek. For 6 miles or so our general course was a little north of east; after that turning more to the north. We passed over mountains and through valleys and alongside of pretty mountain lakes. About 7 miles from camp an immense herd of elk, estimated at about two hundred, crossed our path in front of the column, and not more than 250 yards distant. They appeared confused and ran in several directions, but soon disappeared around a point of a mountain to our right. The hunters of the party were all out, away from the column in search of game, and saw this same band, but at a distance of a half mile or so. Geer and a soldier fired each a shot or two, but failed to kill. At about 14 miles from camp we halted for a time on the divide west of Bennett's Creek, which takes its rise here. The altitude was 10,000 feet, and about a mile further on it was 10,500 feet, the highest point reached on the trail. At about 18 miles from camp we reached the head of the cañon of Little Rocky Creek, down which we clambered. The descent was very abrupt, and along the steep sides of the cañon, which was covered with loose stones, making a very precarious foothold for both men and animals, it was very difficult work to clamber down and lead one's horse besides, and as I look back upon it, it appears to me almost miraculous that our large train came down without accident. The altitude at the top of the cañon was 9,400 feet; at the first plateau, about 2 miles down, it was 1,600 feet less; and at camp, about 7 miles from the top of the cañon, 3,600 feet less than at the top. At less than 10,000 feet of altitude we found in many places deep drifts of perpetual snow, and passed over the surface of one field of it. The valleys, especially that of Bennett's Creek, were soft and miry. Last winter was here as everywhere in the Northwest a very open one with little snowfall, so that we made the passage of the Bear Tooth range under unusually favorable circumstances, and I very much doubt if a practicable trail can be made across where

we went, which could possibly be used for more than two months of the year in ordinary seasons. Our camp was pitched beside the Little Rocky Creek just below the cañon, where there was plenty of water and grass, but a scarcity of wood. The camp is named Camp Wheelan, in honor of Capt. J. N. Wheelan, Second Cavalry, who commands our escort. The hunters arrived in camp soon after the command. Captains Rhodes and Clark were the successful ones, and brought in a fine elk, which they had killed. Temperature at 6.30 p. m., 60°; at 7 p. m., 53°; altitude, 5,800 feet; distance marched, 25 miles.

August 29, *Tuesday.*—Broke camp at 6.12 a. m. and marched for about 8 miles over rolling and stony ground, and about 10 miles through bad lands, when we arrived on the Clarke's Fork bottom. Our camp was in a grove of cottonwood trees, on the west bank of Clarke's Fork. The general course all day was nearly northeast. General Strong killed a white-tailed deer, and Mr. Moore caught 76 trout. Temperature at 8 p. m., 54°; altitude, 3,850 feet; distance marched, 21 miles.

August 30, *Wednesday.*—Temperature at 5 a. m., 32°. Broke camp at 6.15 a. m. Forded Clarke's Fork about a half mile above camp, and back again to the west bank about 4 miles down stream. Marched down the valley, all the time in sight of the river, over bottom lands as splendid as any there are in Montana, and were they not on the Crow Indian Reservation they would soon be occupied by settlers. We crossed Rocky Fork, but had to cross back again to the south bank to get a good camp near the water. On the west bank a little above us is quite a large camp of Crow Indians, several of whom met us 7 or 8 miles out, and came with the column into camp. A number of them also visited us in the evening. Colonel Sheridan met with a painful and possibly serious accident just upon leaving camp this morning. Before fording the river the first time his horse got into a quicksand, and the colonel in trying to get away from him was in some manner thrown violently against the hard bank of the river, dislocating his arm at the shoulder. Doctor Forwood was fortunately close at hand, and attended to him at once. He however suffered terrible anguish during the long hard march of the day, and was about exhausted when we reached camp. Unfortunately for him this was our longest march of the trip, and the day was very hot. The night of our arrival in camp on the Little Rocky the general dispatched Campbell to Billings with instructions to return as far as here and await our arrival. He joined us about 15 miles out on the trail, and reported that Mr. Bishop's cars would be at Billings to-night; that he had forded the Yellowstone just above the mouth of Clarke's Fork and found it a good ford, with a gravel bottom; that Mr. McCullough arrived at Billings yesterday, and upon hearing that we were to arrive soon enough to get him to Saint Paul by the 2d of September had concluded to wait for us. All of this was good news, and put us in good spirits for to-

morrow's march. Temperature at 5 p. m., 74°; altitude, 3,500 feet; distance marched, 31 miles.

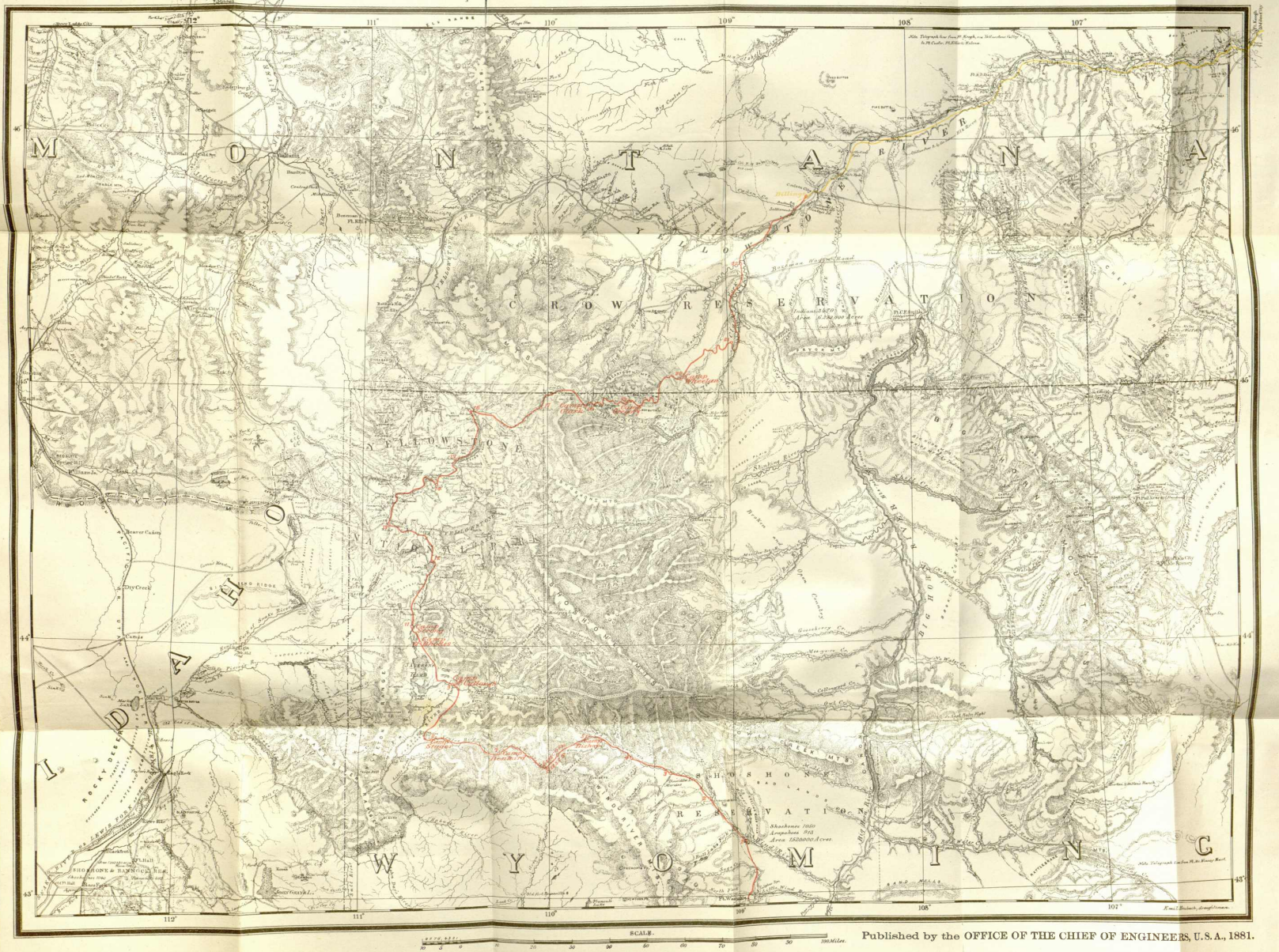
August 31, *Thursday.*—Broke camp on Rocky Fork at 6.18 a. m. Forded the Yellowstone above the mouth of Clark's Fork by an excellent ford. The Yellowstone is ordinarily a dangerous and treacherous stream, but the water is very low now, and our train came over without accident. After the guide, General Stager led the column in making the ford. The Yellowstone is the northern boundary of the Crow Reservation, and as soon as we had crossed it there were visible many ranch buildings both up and down the stream. The Clarke's Fork bottom, as it is miscalled, because it is on the opposite side of the Yellowstone from Clarke's Fork, is a very rich bottom, and is, I believe, already all taken up by settlers. The town of Billings is located on the eastern edge of it. Four miles down the river from the ford we came to the construction parties of the Northern Pacific Railroad, and the superintendent of construction kindly offered to send the general and his party to Billings, 12 miles, in a caboose. His invitation was accepted, and Captain Wheelan was left to bring the rest of the command to the town. The change from horseback to a railway car was very acceptable to Colonel Sheridan, who has suffered intensely all day, and only got a little sleep last night under the influence of soporifics. We were soon in Billings, which is 3 miles west of the older town of Coulson, and found Mr. Bishop's cars awaiting us. Mr. McCullough was on the watch for us, and apparently was as much rejoiced to rejoin the party as we were to have him. The command arrived about two and a half hours after we did, and our baggage and camp equipage was quickly transferred to the baggage car. The charge of the pack trains was transferred to Captain Wheelan, with orders to proceed to Fort Custer. He went into camp with his command on the south side of the Yellowstone, nearly opposite Coulson City. Distance marched by the command, 28 miles.

September 3, *Sunday.*—We left Billings by special train at 8 p. m. August 31, and reached Fargo, Dak., in time, on the morning of the 2d, to have our cars attached to the regular east-bound train. We arrived at Saint Paul on the evening of the 2d and in Chicago this afternoon. The journey by rail was an exceedingly pleasant one, as Mr. Bishop had his cars provided with every comfort and luxury that it seems possible to devise for the enjoyment of even travelers who ride in special private cars. Colonel Sheridan has rapidly improved since we left the horseback mode of travel, and Dr. Forwood says his arm will be soon "as good as ever."

Thus ends a trip which was an event of importance in the lives of all of us, covering a period of five weeks from the time of leaving Chicago to the return there. No accident or misfortune occurred to mar the pleasure of the journey, except Colonel Sheridan's mishap, which has proved not to be serious. We made twenty-two camps, and marched

YELLOWSTONE NATIONAL PARK, BIG HORN MOUNTAINS
AND ADJACENT TERRITORY.

Prepared in Office of CHIEF ENGINEER, Mil. Div. Mo. 1881.



Published by the OFFICE OF THE CHIEF OF ENGINEERS, U.S.A., 1881.

AUTHORITIES.

Yellowstone and Missouri Rivers, 1859-60	Capt. W. F. Raynolds, U. S. Eng'rs.
	1st. Lieut. H. E. Maynadier, 10th. Inf.
	Dr. F. V. Hayden, U. S. Geologist.
Sources of the Snake River, 1872	Capt. W. A. Jones, U. S. Eng'rs.
North-western Wyoming, 1873	2d. Lieut. C. W. Larned, 7th Cav.
Col. Stanley's Yellowstone Expedition, 1873	Capt. Wm. Ludlow, U. S. Eng'rs.
From Carroll to the Yellowstone National Park, 1875	Capt. W. S. Stanton, U. S. Eng'rs.
From Carroll to the Yellowstone National Park, 1875-77	Capt. W. S. Stanton, U. S. Eng'rs.
Rec. of Routes in the Dep't of the Platte, 1877	Lieuts. Carpenter and Schuyler, U. S. A.
Sketch of Principal Peaks, etc. in the Big Horn Mts., 1877	Lieut. Gen. P. H. Sheridan and Col. D. B. Sacket.
Route through the Big Horn Mts., 1877, by Lieut. Gen. P. H. Sheridan and Col. D. B. Sacket.	
Montana Territory, 3d Edition, 1878	Lieut. Edward Maguire, U. S. Eng'rs.
Montana Territory, 1878	Dr. F. V. Hayden, U. S. Geologist.
Drainage Map of part of Wyoming and Idaho, 1879	U. S. General Land Office.
Montana Territory, 1879	

Idaho Territory, 1879	U. S. General Land Office.
Yellowstone National Park, 1879	P. W. Norris, Supt's.
Mil'y Reservation of Fort Custer and National Cemetery, 1879	Lieut. Edward Maguire, U. S. Eng'rs.
Survey of Northern Boundary line of Wyoming, 1880	R. J. Reeves, C. E. U. S. G. Land Office.
	U. S. General Land Office.
Yellowstone River, 1880	Chief Engineer, U. P. R. R.
Utah and Northern R. R. 1880	L. S. Kelly.
Sketch of country between Yellowstone and Stinking River, 1880	A. R. Keller, U. S. Ind. Ag't.
Sketch of country in the vicinity of Crow Agency, 1880	Capt. W. P. Clark, 2d Cav.
Big Horn Mountain Expedition, 1880	Lieut. Hunter Liggett, 5th Inf.
Additions to Map of Montana, (Lieutenant Maguire's) 1880	Capt. G. Russell, 3d Cav.
Map of route of escort to survey of Northern Boundary of Wyo., 1880	Maj. J. W. Mason, 3d Cav.
Map of Scouting expedition, from Fort Washakie, Wyo., 1880	

every day but two after leaving Fort Washakie until reaching the Northern Pacific Railroad. The total distance covered by ambulance from Green River to Fort Washakie, and thence to Billings on horseback, was 592 miles. At nearly all times after the first two days out from Washakie we had plenty of large or small game in camp for our mess table, including elk, black and white tailed deer, antelope, buffalo, bear, mountain-sheep, ducks, and grouse, and trout in abundance.

The weather was pleasant during the entire trip, and our outfit complete. We had all varieties of climate and scenery that belong to the prairies and mountains of our northwestern country, and we all return home delighted with our experience, reinvigorated, healthy, and ready for another of the same sort.

The exploration has proved the practicability of the route into the National Park from the forks of Wind River by way of Lincoln Pass, the valleys of the Gros Ventre and Snake Rivers and of Lewis' or Lake Fork of the Snake River.

The crossing of the Bear Tooth range has hitherto been deemed an impossibility, and many have tried but failed to get through, notably the escort to the boundary surveyors a year ago last summer and Captain Clark in 1878, both of whom were seeking to reach, by a shorter route than the Clarke's Fork trail, the Crow Agency, which is on the Rosebud River, just north of the Bear Tooth range. Indians are always accredited with intimate knowledge of all the country over which they can by any possibility range; but Captain Clark informs me that he sought in vain to find a Crow Indian who had ever been across the Bear Tooth, or had ever heard of any one else who had. They united in saying that it was not possible for a horse to get through. Our trail, however, can scarcely be called a practicable way of approach to the park from the north, as most of the year it will be impassable by reason of snow.

REPORT OF SURGEON W. H. FORWOOD, U. S. A.

FORT OMAHA, NEBR.,
September 17, 1882.

SIR: I have the honor to submit the following report of my observations and collections of specimens illustrative of the general features, natural history, and resources of the regions explored during the expedition of Lieutenant General Sheridan through Northwestern Wyoming. Without any pretensions to a purely scientific discussion of the subjects embraced in this report, I have endeavored to seize upon the chief points of practical interest observed along our route, and will present them with as few technicalities as possible in such form as may best contribute to a general knowledge of the places visited. The long ride of 450 miles in twenty-four days, over new trails in a portion of the country comparatively but little known, necessarily precluded a thorough examination of all its many interesting details, and hence the results are less complete than its importance demands.

The excellent health of the command and the fortunate escape from accident along the march made the demands upon me as medical officer very light and obviates the necessity for any further report on this point.

The expedition started August 7, from Fort Washakie, Wyo., proceeded up Wind River beyond the mouth of De Noir Creek, and thence over the Continental Divide in a southwesterly direction to the Gros Ventre Valley; down this into the basin of Snake River at the foot of the Tetons; up Snake River and Lewis's Fork to the National Park, and out by way of Baronett's bridge and Soda Butte Creek to the head of Clark's Fork and Index Peak, and then by an easterly course across the Bear Tooth Mountains, descending to the plains at a point near the cañon of Little Rock Creek, and so down Clark's Fork and the Yellowstone to the terminus of the Northern Pacific Railroad, at Billings, Mont. The route through these several regions will be taken up and considered in chronological order.

THE WIND RIVER VALLEY.

Descending into the valley from the heights at South Pass, our course was through Red Cañon and the flourishing settlement at Lander, over to the Big Spring near Washakie, where we remained one day to prepare for the final start with saddle-horses and pack animals. The scenery from the plains around Washakie is very picturesque. The valley is inclosed on all sides, excepting at the southeast, by mountains

of the Owl Creek, Shoshone, and Wind River ranges, 8,000 to 12,000 feet in height. Long foot-hills project at intervals, reaching far out into plain, and between these the mountain-side is cleft by deep cañons, with nearly vertical walls, in which fine sections of the underlying rocky strata are exposed in many places. The bluffs are often steep and broken by erosion into remarkable shapes, and when they consist of the so-called "red-beds," as they do in places where the bright-colored marls, clays, and sandstones of the Jurassic and Triassic series come to the surface, the effect is most striking. Red, white, purple, yellow, and other colored strata, arranged in sharply-defined layers, are to be seen, eroded into enormous cones and spires, compounded of multitudes of smaller ones, grading off in perfect symmetry at successive heights for miles, banded everywhere with the conspicuous ribbon-like stripes and with scarcely a vestige of plant life. Over nearly the whole area to the northward, from the base of the Owl Creek range through a succession of high benches, bad lands, and shifting sand hills, without water, trees, or grass, there is a picture of grand desolation which offers but little to attract the botanist or to encourage the future agriculturist. The southwest side, on the contrary, is well watered by tributaries of Wind River and the numerous branches of Little Wind River and the two Popo Agies. The streams, skirted with a few trees and shrubs, flow through rich, alluvial bottoms, here and there expanding into picturesque little lakes. Vegetation is everywhere abundant. Above 6,000 feet the long, green slopes are decorated with spruce, pine, and poplars, massed in dense forests or grouped around beautiful open parks, up to where the snow glistens under an August sun among the somber, naked rocks at the summit.

This difference in character between the two sides of the valley is due, in a great measure, to difference in elevation of the ranges. On the Wind River Mountains, rising 10,000 to 12,000 feet above the level of the sea, the snow remains throughout the year, melting gradually and supplying innumerable springs and rivulets which distribute their waters down the slopes and form the creeks and rivers below, while in the Owl Creek range, but 8,000 or 9,000 feet high, it melts early, and with a meager amount of rainfall, the vegetation is left to perish in the hottest part of summer. On the side where a system of natural irrigation is thus maintained the surface is protected by the conservative action of plants, and, on the other, the erosive forces go on, unrestrained to effect the most gigantic results.

As we proceed on our march over the divide and up Wind River the region becomes more uneven and extremely diversified in outline, embracing many novel and interesting features, which give it a character quite peculiar, though not altogether prepossessing. The Wind River Valley is the site of an ancient lake basin, and for a distance of from 5 to 15 miles on each side of the river below the mouth of North Fork the surface is composed of a thick layer of Tertiary sediments, which

cover all the lower plains, form the divides, and extend up to the foot-hills. These beds consist of loose, fine-grained, whitish sandstones, clays, and gravel, the *débris* of older rocks. They have been gathered from the surrounding heights, and deposited in horizontal layers, extending continuously over the whole bed of the lake. The results of erosion which has taken place since that time are to be seen here on a grand scale. Cañons and wide valleys have been cut out, and whole areas removed, leaving isolated buttes, pyramids, and mounds of various shapes, like ancient ruins scattered over the plain. Crow Heart Butte, a weird and gloomy-looking pile of disintegrating rock, several hundred feet in height, is a remnant of these lake deposits which serves to mark the depth of their original thickness, while the surfaces planed down around it indicate the enormous amount that has been worn off by erosion and swept away.

In passing from the valley toward the mountains the underlying rocks come to the surface in the following order of succession:

Cretaceous beds, gray or brownish sandstones and clays, with seams of lignite and iron concretions.

Jurassic limestones and various colored calcareous and arenaceous marls, with vast quantities of gypsum.

Triassic red sandstones.

Carboniferous beds, mainly limestones.

Potsdam, loose bedded brownish sandstone.

Gneisses with seams of feldspar and quartz and dark, slaty schists, gold and silver bearing.

Granite, gray and reddish, to black quartzites and granites.

The latter form the nucleus of the mountain ranges against which the outlying beds recline at gradually decreasing angles from the Potsdam sandstone to the Cretaceous series without much indication of unconformability. This arrangement is shown in the accompanying diagram (Fig. 1) of a section through South Pass and Red Cañon to the mouth of Wind River, points at which the several layers are particularly well exposed by the erosion which has followed the uplift of the mountains, and will serve to illustrate the general facts in the geology of the whole region. It is probable that between the carboniferous and metamorphic rocks there are, in places, detached portions of other members of the Silurian series, but these are not apparent at the point of section.

The feldspathic gneisses and slaty schists above mentioned, are the gold and silver bearing rocks at South Pass, and, as they extend along the whole range into the mountains beyond, they are no doubt the source of gold in the river drift, which we shall find on the western side of the divide. The South Pass mines are in the same stagnant condition as when visited by Captain Jones ten years ago, and the description then given will apply now. The gold is found in quartz veins in a free state, easily worked. The silver is distributed between the plates of mica slate in beautiful frosted scales. The Jurassic and

Fig 1.

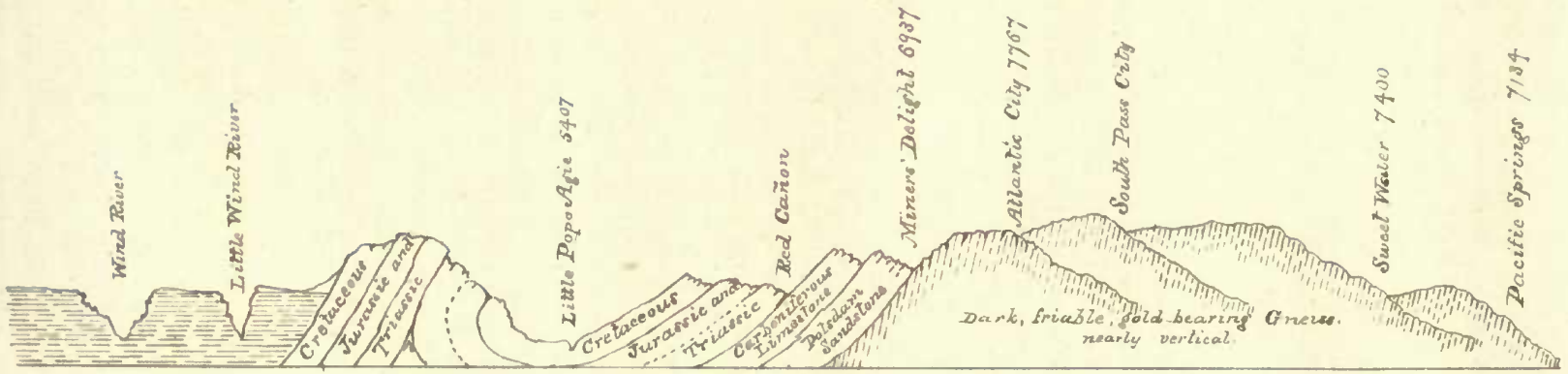


Diagram of Section through South Pass and Red Cañon, from Pacific Springs to the mouth of Wind River, about 60 miles

Triassic beds furnish unlimited quantities of lime, gypsum, and building stone, and their brick-red sandstones and other colored layers give a singular appearance to the landscape, especially remarkable to one coming from east of the Mississippi, where the series of rocky strata ends with the Carboniferous and these red beds do not appear.

At Red Cañon and other places there are bluffs, 300 feet in height, of dark red rock, which form conspicuous objects at various points over the plain, particularly striking when viewed from the eastern spurs of the Wind River Mountains. The lignite of the Cretaceous, though common enough, is not yet appreciated, owing to its somewhat inferior quality and the abundance of wood.

A prominent feature of this region, and one which is destined to be of great importance in the future, is the Hot Spring, a few miles below Fort Washakie, described by Dr. Heitzmann (Jones's Rep., 1873, p. 294). It is situated on the river terrace in an open plain about a mile from Little Wind River. The saucer-shaped basin is 250 to 315 feet in diameter, and from the center the clear water rises at a temperature of 105° to 110° Fah., accompanied by a free escape of carbonic acid gas. The smooth bottom, covered with white deposit from the water, slopes gradually outward to a depth of 10 feet or more. Our camp being near this wonderful pool we had ample opportunity to indulge in the luxury of its baths. Its benefits as a therapeutic agent in the cure of disease and as an invigorating, healthful resort for the unafflicted have been fairly tested by the troops at the neighboring garrison, and with the best results.

The productiveness of the Wind River Valley is dependent upon natural and artificial irrigation, without which it would be uninhabitable. The rainfall is limited by peculiar conditions. In order to enter this region rain-clouds must either pass over a range of high mountains, where their moisture is precipitated, or over dry plains, where it is absorbed. Light showers, therefore, from the edge of mountain storms are, as a rule, all that is to be expected. Irrigation, by means of ditches, is, however, practical over all the river bottoms. The surface is everywhere rich in plant food, and needs only water to make it productive. We found fine wheat, oats, barley, and garden vegetables growing on a surface of brick-red earth, the *débris* of Triassic sandstone fallen down from the bluffs. The general elevation is high, averaging 5,600 feet on the line of march between Red Cañon and Crow Heart Butte, but this is counterbalanced in a measure by a sheltered situation and favorable southern exposure, so that the winters are mild and the summers sufficiently long for most crops. The principal danger in this and similar mountain valleys is the sudden occurrence of frost from cold-descending currents of air, in late spring and early fall, which may happen in a single night and be followed by fine weather for weeks. All the creek and river bottoms on the south side of Wind River up to Bull Lake Fork will, eventually, be irrigated and farmed, but beyond that point

the surface is so heaped up into moraines and hummocks and covered with bowlder drift by glacier action as to be fit only for grazing purposes. Even the unpromising region on the north from Crow Heart Butte to the Big Horn, which would be at once rejected by the inexperienced as a hopeless desert, is a good winter range for cattle when there is snow to supply them with water. The cañons and ravines contain many nutritive plants which, though small and inconspicuous, seeming more dead than alive, are eagerly sought after by stock, and possess far more fattening qualities than the finer looking grasses of the mountains. It cannot be occupied in summer for want of water.

Below 6,000 feet the trees and shrubs are confined to the margins of streams, and consist of bitter cottonwood, box-elder, willow, red osier, dogwood (*Cornus stolonifera*), birch (*Betula occidentalis*), and plum bushes. The following berries were collected at Murphy's ranche on the Little Popoagie, August 5: *Amelanchier Canadensis*, *Ribes cereum*, *Shepherdia Canadensis*, and *Elæagnus argentea*. Over the open plains the common sage (*Artimesia tridentala*) is everywhere very abundant, along with greasewood or chico (*Sarcobatus vermiculatus*) and the so-called white sage (*Eurotia lanata*), the grama and buffalo grass, and perhaps one or two other kinds, which, together, give assurance of a dry climate, a light fall of snow in winter, and with a supply of water include all the indications to be sought in a typical cattle range. Most of the thirty-nine species of grasses collected are to be found at one place or another within the limits of the valley. A very curious and showy little plant, *Lewisii redivivus*, well worth cultivation in our gardens, is common on the dry hillsides, much prized by the Indians for its edible root, which they collect in the spring when the leaves first put out. The rare and handsome *Astragalus ventorum*, found but once before, was collected on the banks of Wind River. Among the species found along the route, more or less characteristic of the region between Washakie and De Noir Creek, are the following: *Hedysarum Mackensii*, *Œnothera pinnatifida*, *Œ. cæspitosa*, *Œ. triloba*, *Ferula multifida*, a new variety of *Aplopappus uniflorus*, *Aster Fremontii*, and a new variety of *Erigiron cæspitosus* (to be named later). The beautiful golden-yellow *Mentzelia lævicaulis*, *M. pumila*, and also a white species, are often very ornamental along barren sand ridges, where there is little else to attract attention. As we proceed up the valley the species multiply with the increased elevation, and the flora of the plains passes gradually into that of the mountain region ahead of us.

FROM WIND RIVER TO THE GROS VENTRE.

From the point of departure on Wind River over the Continental Divide to the Gros Ventre Valley the country is for the most part densely wooded, and but few exposures of the underlying strata come to the surface. The singular looking striped buttes, eroded into fantastic shapes, which have been so marked a feature along our last two days' march,

disappear under a surface of drift and rich alluvial deposit, and are seen no more until we reach the Gros Ventre Valley. The nucleus of the divide is composed of a dark cellular trachyte, over which we rode for half a mile through the timber. This is the first igneous rock thus far noticed in the Wind River Mountains, which are, in this respect, in striking contrast with the rugged mass of volcanic ranges that extend for a hundred miles to the northward. A loose, friable, gray sandstone, met with in places on the surface, is suggestive of Tertiary beds, which appear in great thickness at the first break on the tributaries of the Gros Ventre, and probably cover the slopes on both sides nearly up to the top of the dividing ridge. Specimens of mica in fine large plates are found at Union Peak, a short distance south of this point.

The flora of this region offers a far greater variety and attractiveness than in the Wind River Valley, and here becomes the chief feature of interest. Starting out from our camp at the foot of the divide we pass at once into green meadows and up the slopes through thick shrubbery and forests of spruce and pine, where the dull monotony of the plains, with their sage brush and bad-lands, is soon forgotten in the cool, refreshing mountain air, among beautiful flowers and crystal streams. The shady woods are everywhere carpeted with *Berberis aquifolium*, *Arctostaphylos Uva-ursi*, *Linnæa borealis*, and various mosses, but the ferns are conspicuous for their absence. In all this Rocky Mountain region they are among the rarest of plants. But a single species was collected on our trip, found at the Yellowstone Falls. There is no lack of dark, moist places and crevices of rocks, but they are seldom found even where the conditions seem most favorable for them. The surface is rich with the accumulated vegetable *débris* of centuries, and abundantly supplied with water from melting snows. The extreme variation between deep shady cañons, swampy meadows, and dry hill-sides offers a wide scope for variety of plant forms, but notwithstanding this the number of species is comparatively few and far less than appearance at first sight would indicate. Ascending to the higher plateaus we find little parks opening out in the timber where a characteristic subalpine flora is displayed in full force. Different species of *Townsendia*, *Erigiron*, *Hellenium Hoopsii*, *Polemonium cæruleum*, *Viola canina*, a new dwarf variety of *Veronica Americana*, *Pedicularis Grœnlandica*, and *P. procera*, *Eriogonum umbellatum*, *Calochortus Nuttallii* and *Zygadenus elegans*. Among the more showy and attractive kinds a beautiful columbine, with white, buff, and sometimes pale blue flowers (*Aquilegia cærulea*), regarded as one of the finest Rocky Mountain plants and already largely cultivated, was conspicuous in partially shaded places at 9,000 feet and upwards. Several species of *Delphinium*, with particularly deep blue flowers, two or three scarlet *Castilleias*, *Lupinus argenteus*, *Pentstamon glaber*, and *P. strictus*, *Mimulus Lewisii*, *Mertensia Siberica*, a variety of *Phlox longifolia*, pure white and lying in thick masses over the ground, and many others with pretty faces and hard

names fill the air with their delicate perfume and contrast their brilliant colors with the dark green foliage of this romantic region.

Medicinal plants are represented by handsome species of aconite valerian, arnica, and gentian. Among the latter a new species, No. 172 in the list, was found here, which Prof. Asa Gray, of Harvard University, has seen proper to name after the collector.

The Continental Divide was crossed by a new and easy route, to be known hereafter as the Lincoln Pass, where we camped in a beautiful mountain park. The top of the ridge presents the appearance of being cut down into a wide depression with an open undulating surface, the western end of which overlooks the region beyond. The mountain spurs slope up gradually on either side of the park, covered with a heavy body of timber, and a clear stream flows through the center, fed by numerous springs and brooks that issue from the adjoining hills. Although in the middle of August, the snows had but recently melted and the flowers and grasses had all the freshness of May. The *Ranunculus*, *Trollins*, and *Caltha* were just coming in bloom down where the snow had lingered longest, while higher up, at the edge of the timber, there were spaces covered with *Myosotos sylvatica* and *Townsendias* and *Erigirons*, and farther out on the southern slope the surface was brilliant with the golden yellow *Arnica angustifolia*. The Douglas spruce, *Pinus contorta* and *Pinus flexilis*, splendid specimens of evergreen trees, were of all sizes, from the young seedling up to mature age, scattered singly and grouped in clusters or massed into dark forests in a way that made the confusion of chance seem like the height of decorative art. These and a few *Pinus ponderosas* and here and there a grove of *Populus tremuloides*, with their silver white trunks contrasting with the foliage of the pines, comprise the whole list of trees which, in the combination of their various sizes and habits, give the impression of a much greater variety.

On an elevated plateau, in the center of the pass, traces of an old Indian encampment were found, with stone arrow heads, chippings and unfinished pieces strewn around, relics, apparently, of the Sheepeater band, who once inhabited this region, but belonging to a time so far back in the forgotten past that our old Indian guide, a descendant of that tribe, could give no satisfactory account of them.

In passing from the eastern to the western water-shed no marked change is to be noticed in the character of the flora. A slight difference may be traced, but, with few exceptions, the species, so far as the route of the expedition extended, are common to both.

THE GROS VENTRE VALLEY.

The Gros Ventre River, from its upper tributaries to within 12 miles of its mouth, where it enters the Snake River basin, is hemmed in by mountains, leaving only very narrow valleys, interrupted by cliffs, which frequently descend, on one side or the other, quite to its banks. The stream abounds with trout, and is a favorite locality for elk, deer, and

other game. There are facilities for grazing stock to a limited extent in summer, but its chief point of interest lies in the fact that it offers a convenient trail from the Green River and Wind River regions toward the Teton Pass and the National Park through an otherwise most rugged and difficult country.

In tracing the geological features between the Continental Divide and the Snake River basin beyond we find the whole region along its upper tributaries covered with lignite beds of enormous thickness, composed of whitish, fine grained, friable sandstone, sand, clay, and gravel, dipping at variable angles from 10° to 40° to the eastward and from underneath these the Cretaceous, Jurassic, Triassic, and Carboniferous make their appearance in succession as we pass down stream to the cañon. The bluffs rise abruptly into foot-hills and mountains on each side 1,200 to 1,500 feet above the bed of the stream, and the different layers enumerated appear at prominent points along the way, conspicuous among which are the brick red sandstones.

The Gros Ventre Valley is evidently subjected to strong prevailing winds from the west. All the hills and slopes having a western exposure are thrown into a series of drifts or wave-like markings by the action of winds, and the surfaces thus exposed are comparatively bare of vegetation. The trees are confined almost exclusively to situations sheltered from that direction. Many plants, enumerated at Lincoln Pass, are also found there in favorable places, but the bleak slopes are covered only with a meager growth of stunted grass and weeds. Little breaks in the foot-hills are often brilliant with *Gilia aggregata* in sandy soil, along with *Lonicera involucrata* and a purple variety of *Pentstamon confertus*. *Veronica alpina*, *Gentiana amarella*, *Crepis elegans*, *Antennaria Carpathica*, *Solidago multiradiata*, *and Heracleum lanatum*, are other common and characteristic species which suddenly change as the river passes out into the level and more fertile plains beyond the cañon.

SNAKE RIVER BASIN.

The region along Snake River, from where the Little Gros Ventre enters it to the mouth of Lewis's Fork, at the boundaries of the park, is one of the most interesting and remarkable on our route, and one, which for grand mountain scenery and picturesque landscape beauty is probably surpassed by but few in the world. As we descend the Gros Ventre River to the top of a high ridge near the cañon, the mountains, which all along have shut out our view to the northward, abruptly end, and the broad expanse of Snake River Basin, with the Grand Teton range rising 7,000 feet nearly vertical out of the plain, suddenly opens out before us. It is scarcely possible to view the scene which there presents itself, without feelings of rapture and awe. Embracing, as it does, nearly every element that can contribute to heighten our impressions of grandeur, with no sign of human beings to relieve the solitude which reigns supreme, and with every feature that could add a charm to the

beauties of primitive nature, we seem transported to the threshold of some fairy land, secluded and guarded against intrusion by the lofty mountains that inclose it on every side.

Entering the valley at this point our course turned sharply to the north, and proceeded under the shadow of the Tetons over grassy meadows and through scattering pines to the mouth of Buffalo Fork, and thence along the eastern shore of Jackson's Lake and up to the crossing of Snake River, just outside the boundaries of the park. This region, some 50 miles in length, is one vast game park, with forests and lakes and meadows and streams in the greatest profusion, and well supplied with elk, deer, antelope, trout, and water fowl. It varies from one to fifteen miles mide, expanding in places and again contracting and curving in graceful irregularity around the projecting spurs and isolated buttes which give a charming variety to its outline.

The lignite beds, so largely developed along the Gros Ventre, if they ever existed in the Snake River Basin, have been swept away, and the surface over wide areas is nearly level and covered with a rich carpet of grasses and flowers, over which numbers of deer and antelope were feeding. The underlying rock seems to consist of a white, friable, almost chalky limestone, largely soluble in acid. An exposure twenty feet thick of this material in the banks of a stream east of the Upper Gros Ventre Butte has a peculiar tuberculated, irregularly beded appearance, very suggestive of hot-spring deposit, similar to that found on Gardiner's River farther north. Innumerable hot springs occur along the streams above Jackson's Lake. Twenty of these, on an unnamed creek, just beyond our last camp on Snake River, gave temperatures of 105° to 135° Fahrenheit. The creek banks, in this instance, although quite high, were warm and spongy for some distance on either side and covered with a singularly luxuriant growth of vegetation, but too "shaky" to bear much weight. A few still feebly acting geysers and the extinct and disintegrating remains of many others indicate the former existence of a geyser basin in this part of the valley. The Carboniferous limestone which was seen emerging from under the Gros Ventre at the cañon, forms the face of the mountain lower down the stream and makes its appearance in both the Lower and Upper Gros Ventre Buttes, out in the valley, where in the latter it is underlaid by conglomerate limestone and quartzitic sandstone probably of Quebec and Potsdam age. The same layers appear in the cañons along the eastern side of the Tetons, over which the Jurassic, Triassic, Cretaceous, and Tertiary come successively into view as we proceed northward, until the whole is covered by the great lava beds from beyond. The Teton Range has a nearly north and south trend along the western boundary of the basin. The chief mass of the mountains is composed of dark gray-looking gneisses and gneissic granite thrust up through the broken and eroded fragments of the overlying series. They are buried at the base in dark forests of spruce and pine, which thin out at

about 10,000 feet, and above this the bare rock rises, in five principal peaks, 3,800 feet higher, covered along the cliffs and cañons with perpetual snow. On the eastern side of the valley there are but few exposures of the strata, the hills being covered with grass and timber, and, as far south as Jackson's Lake, the higher summits are capped with igneous rock, which increases to beds of great thickness beyond that point.

Gold exists in the river drift along the Gros Ventre, Snake River, and other streams in considerable quantities, and several attempts at placer mining have been made from time to time, but without much success owing to the difficulties which beset such an undertaking in a region so remote and inaccessible. When roads are opened and settlements find a footing there, placer mining will at once become an industry of importance and profit. The fact that gold is found amongst the sand and gravel, brought down by so many streams which head in the mountains to the east of Jackson's Lake, points to those ranges as a probable locality of rich mines yet to be discovered.

As there are no settlements in this region, which has seldom been visited except by a few prospectors and trappers, it becomes an interesting question as to what its capabilities are for pastoral or agricultural purposes. In the absence of any statistics regarding the climate or seasons we can only judge of these from circumstances and appearances as observed by us in the middle of summer. It would be strange indeed if a country so favored by nature in all its appointments, so romantically beautiful, sustaining a rich and varied flora and abounding in animal life, should long remain uninhabited by man. With a southern exposure throughout its length, sheltered on all sides, and under the lea of the Tetons, it must have a climate mild in proportion to its elevation. The flora indicates a climate intermediate between that of the plains and that of the subalpine regions. The vegetation was well advanced August 15, and the luxuriant growth of grasses, sedges, and weeds everywhere gave assurance of a deep rich soil. It must be added, however, that where grasses and flowers flourish so abundantly there is a large amount of moisture, and this, in high altitudes, invariably represents a large amount of snow in winter. The grease wood and white sage, indicative of dry air and little snow, are rarely found there. The following examples, more or less conspicuous for their handsome flowers, may be selected to illustrate the flora of the lower plains; *Aconitum Columbianum*, *Sphæralcea rivularis*, *Parnassia fimbriata*, *Epilobium spicatum*, *E. latifolium*, *Carum Gairdneri*, *Chrysopsis villosa*, *Aster integrifolius*, *Antennaria dioica*, *Bahia integrifolia*, *Campanula rotundifolia*, *Glaux maritima*, *Spiranthes Romanzoffiana*.

The numerous streams coming out of the hills to the east and crossing the valley at right angles afford the means of irrigating every part of it. At the southern end of Jackson's Lake the Snake River has been shoved abruptly to the eastward by descending moraines from the Te-

tons, which have dammed up its ancient channel along the base of the mountains and carried it out into the middle of the valley.

The shores of the lake, including its large islands, are covered with spruce, pine, and poplar, with the associated undergrowth, and from this point northward, the timber increases rapidly until the whole surface is occupied with a dense forest. The species are the same as those common to this whole region, excepting that the heavy yellow pine (*Pinus ponderosa*) is more rare, and two other handsome species become quite frequent, *Picea Engelmanni* and *Abies subalpina*. These two are found together throughout the Park and Bear Tooth Range in rich, moist soil, between 7,000 and 9,000 feet. The latter has been confounded, in reports from this region, under two or three other names, as *Abies grandis*, *A. amabilis*, &c., but it is the only Abies found in the Rocky Mountains north of the latitude of Pike's Peak. The habits of this and *Picea Engelmanni* are so identical that the two are always found together, preferring the outskirts of the timber and open places along with Douglass, spruce and *Pinus flexilis*, while *Pinus contorta* forms the main body of the thick forest, to the exclusion of almost all other large trees. The margins of lakes and streams are skirted with the usual growth of willows, western birch, spotted alder, and the red osier dogwood, and up the sides of the mountains we often encounter thick masses of *Ceanothus velutina*, *Symphoricarpus occidentalis*, and *Rubus Nutkanus*. In moist, shady places along the mountains north of Jackson's Lake *Arctostaphylos Uva-ursi*, *Berberis aquifolium*, *Linnæa borealis*, *Bryanthus empetriformis*, and *Vaccinum Myrtillus* L. var., *microphyllum*, Hook., are common. The latter is a diminutive species of evergreen whortleberry, 5 to 10 inches high, found everywhere in the timber, from 8,000 to 10,000 feet. It is said that the Indians are fond of the tea made from dried leaves and stems of this plant, and we had ample opportunity to enjoy the delicious flavor of its little coral-red berries. *Rubus strigosus*, *Fragaria Virginiana*, *Ribes floridum*, *Ribes lacustre*, and *Ribes cereum* were ripe and abundant along the cañons to the east of our last camp on Snake River. From this point our course was up Lewis's Fork and along the shores of Lewis's and Shoshone lakes, through a densely wooded country covered with fallen logs, to the Upper Geyser Basin.

IN THE PARK.

The remarkable character of the region included within the National Park and the infinite variety of natural wonders and objects of interest to be found there, have attracted the attention of scientists, journalists, and artists, who have given such accurate pen and pencil pictures of it that the tourist, merely taking a hasty look, finds but little left to tell. It was intended, among other things on this trip, to collect some data bearing on the question as to whether the number and activity of the Yellowstone geysers was *decreasing* or not. A large number of re-

liable observations were made at different points, from the Hot Springs on Gardiner's River to the Shoshone basin, by Frank H. Bradley, Dr. Peale, and others in 1871 and 1872, and it was proposed to repeat these at the same points, for comparison, after the lapse of ten years, but as opportunity failed this interesting task must be postponed or bequeathed to others. Some facts were noted, however, which would seem to indicate that the geysers are not dying out by a progress sufficiently rapid to produce any marked difference in that short space of time. The very careful observations of Dr. Peale in 1872 on the frequency, height, duration, &c., of the principal geysers in the upper basin, show no perceptible diminution of their power, as compared with the performances of these geysers at our visits in 1881 and 1882. The Castle, Bee-Hive, Old Faithful, Saw-Mill, and Turban Geysers appear to perform just as they did ten years ago. The Grotto Geyser may have increased a little in frequency and diminished in duration, and the Grand and Giantess have changed somewhat in character and for the better, as will be seen by the following notes.

Grand Geyser.—Dr. Peale records the following observations in 1872:

August 18.—One continuous eruption, lasting 15 minutes.

August 19.—One continuous eruption, lasting 37 minutes.

August 20.—A succession of three eruptions, with intervals as follows: First eruption, 3 minutes; interval, 6 minutes. Second eruption, 4 minutes; interval, 10 minutes. Third eruption, 9 minutes. Total time, 32.

Messrs. Dana and Grinnell (Ludow's report) observed, August, 1875, a succession of *five* eruptions, with short intervals.

August 25, 1881.—There was a succession of *seven* eruptions, with short intervals, 1 to 3 minutes; total time estimated, 30 to 40 minutes; and on the same day, two hours later, the same performance was repeated.

August 26.—A succession of seven eruptions, as before; not repeated that day.

August 19, 1882.—(Reported by eye-witnesses.) Geyser played at 2 p. m., and again an hour later, giving a fine display of seven eruptions each time.

August 20.—A succession of seven eruptions, with intervals substantially same as last year, but not repeated.

August 21.—Same as yesterday.

It appears, then, that in 1872, the geyser often discharged at a single eruption, with occasional successions of as many as three. In 1875 there were a succession of five eruptions, and in 1881 and 1882 there were never less than seven observed, and these were not unfrequently repeated an hour or two later.

Giantess Geyser.—In 1872, as recorded by Dr. Peale (Hayden's report, p. 149), there were three eruptions of about 17 minutes each, at intervals of three-quarters of an hour.

In 1875, as observed by Dana and Grinnell, the performance was as follows: After some preliminary efforts, during which a large amount of water was thrown out, there was an interval of two hours, when a similar disturbance took place, and two hours later the geyser played to a great height for about an hour, after which there was a violent escape of steam for an hour or more longer.

In 1882, as observed by Mr. John Baronett, the geyser began August 6, 8 p. m., and played 20 feet or more for about 15 minutes; then followed an interval of about the same time; then it played 20 to 50 feet, with occasional sprays up to 150 feet for three-quarters of an hour, followed by an interval of about the same time. Continued to play with intermissions in same way up to midnight, and was still playing in morning and up to 12 m. August 7, when it ceased, and the crater was empty to a great depth.

August 13, 5.30 p. m., it began with a rumbling noise and shot up "higher than Old Faithful," and then varied between 20 and 150 feet for three-quarters of an hour, and an intermission of about the same time followed. Thus the eruptions and suspensions, about three-quarters of an hour each, continued throughout the 13th, 14th, and up to 9 o'clock on the morning of the 15th, when it ceased and the crater was empty as before.

A new geyser of the first class appeared about three years ago, in place of some hot springs, a short distance west of the Giant, called the Splendid, and well deserves the title. It has three jets, two directed obliquely inward and one vertical in the center, and plays to a height of 50 to 75 feet once in about two and one-half hours.

The Sheridan Geyser is another new one, situated on the Fire Hole River, about half way between the upper and lower basins, and is the largest in the park. It was one of a group of hot springs designated by Dr. Peale as the "Half-way Springs," in 1872 (see Hayden's Report, 1872, p. 147). It began to play at irregular intervals, and, finally, within the last year, settled down to a constant period of about two hours. It was impossible at our hasty visit to obtain measurements or even correct estimates of the dimensions of the crater, owing to the dense clouds of steam that constantly envelope it from sight, but while in eruption the column appeared to be about 200 feet in diameter and rose to a great height, accompanied by vibrations of the surrounding surface and the throwing out of rocks, which cover the ground and the bed of the river for a hundred yards on all sides. Its character as an eruptive geyser was first pointed out by the distinguished mountaineer, Mr. John Baronett, who named it in honor of General Sheridan in 1881.

There are numberless hot springs in the Park, possessing the proper requisites for active geysers, some of which are in process of development toward that point, while others have passed beyond it and returned to a state of rest, perhaps to be renewed again, so that for

every one that is diminishing in splendor or becoming extinct a new one is preparing to take its place. The gradual manner in which all these changes take place, and the enormous amount of geyserite accumulated around the craters of different geysers give some idea of the countless ages that must constitute the life period of each. Old Faithful Geyser, for example, appears to have built up no less than five cones, the remains of which are to be seen grouped about it in different stages of disintegration, the most recent of which is still 15 feet in height, while its present mound is 12 feet above the surrounding surface, and measures 145 by 215 feet at the base, all formed by deposit from the water, and yet the amount accumulated in a single year is but the merest film. It is probable, therefore, that whatever may eventually be the fate of these rare and wonderful objects of interest, the time is still remote when they will have become extinct or even materially diminished in splendor.

The now generally accepted theory of geyser action was first announced by Professor Bunsen, after a careful study of the Iceland geysers, and it may be interesting in this connection to refer briefly to the principles upon which it is based, in order to see whether they fulfill all the conditions presented by the geysers here in the Yellowstone Basin.

It will be remembered that, while water boils at a temperature of 212° Fahrenheit, under the ordinary weight of one atmosphere, a greater degree of heat is required to form steam when the water is subjected to pressure, as, for example, at the bottom of a long vertical tube, where the whole column from above presses upon the water below. The amount of heat required to form steam at the bottom of such a tube would be greater than at the top, and the difference would be in proportion to the pressure exerted by the superincumbent column. Now, when water is heated under pressure in this way it has the property of *expanding into steam when the pressure is removed*, and if it be strongly heated under heavy pressure, as at the bottom of a geyser tube, and the pressure be suddenly and largely relieved as by throwing out a considerable portion of the water, a large amount of *steam will form with sudden and explosive violence.* This, it is thought by Bunsen, is the *vis a tergo* at the bottom of all eruptive geysers. And now for the mechanism by which, in the laboratory of nature, these few simple principles are applied to bring about the wonderful results which we have seen.

The geyser must have a tube of reasonable length and width, extending more or less vertically into the earth; a supply of water from the surrounding surface, as wells are supplied, for example, heat sufficient in amount and applied to the tube at a reasonable depth below the surface. The variation of these conditions and the modifications of them, which will be explained farther on, is all that is necessary to give variety to the character of the geyser, and when they are exceeded its activity fails.

The heat.—One of the first things that arrests our attention in entering

the region of the National Park is the vast amount of igneous rock that has been poured out in the form of molten lava over the surface in all directions. The whole upper mass of the mountains to the east of the Yellowstone is composed of this material, thousands of feet in thickness. The river cuts its way through cañons of it, and it extends to the westward for hundreds of miles. These lava beds are known to be of comparatively modern date, because they are found resting on Tertiary strata, which shows that they were ejected after the deposition of all the underlying series. It is not unreasonable to suppose, therefore, that at this point the great fissures in the earth's crust through which this lava escaped may still contain molten matter at no great depth below the surface, and that the heat from this is transmitted upwards through the rocks sufficiently near to be reached by the percolating waters from above.

The water.—It is one of the indispensable conditions to the existence of an active geyser that the water shall contain silica in solution, and this to the exclusion of more than a very limited amount of lime, soda, potash, or magnesia, as the tube is to be prepared by silicious deposit. Analyses of water and deposit from active geysers, wherever these have been found, invariably show that the solid ingredient is silica with but a trace of other minerals, and in order to dissolve silica the water must be slightly alkaline in addition to the heat. The necessity for these nice conditions may explain the great rarity of geysers; hot springs in which they are not demanded are common enough.

The formation of the tube.—The waters from the surface having found their way down through the strata to the heated rocks below and having received the requisite amount of alkali and silica, the process of building a suitable tube through the deposition of silicia from the water begins and may continue for years or centuries, during which time the future geyser is merely a hot spring. The tube may be irregular, crooked, or branching, but it must be sealed up sufficiently at its lower ramifications to give effect to the expansive power of the steam upon the column of water to be raised. If too long, the resistance of the column would be greater than the force of steam could overcome, and, when too short, the difference between the boiling points at top and bottom will not be sufficient to form much steam when the pressure is relieved. If the tube is too wide, circulation of the water up and down will equalize the temperature, allow the steam to escape gradually, and spoil the eruption. The boiling point at the place where the heat is applied must be considerably higher than that at the outlet, and this condition must be maintained in order that a large amount of steam may form there at the moment when the crisis comes, and the greater this difference, within certain limits, the more ejective force the geyser will have. If the outlet be proportionately wide the jet will be lower, and *vice versa*, but when by silicious deposit it becomes too contracted, the geyser may cease to be eruptive, or force a new one.

The eruption.—In the geyser basin with an elevation of 7,000 to 8,000 feet, the theoretical boiling point of water is 198° to 199° Fahrenheit, but at the bottom of a long geyser tube it would be much higher, and this difference represents the amount of heat available for the sudden generation of steam at the moment when the pressure of water is relieved. In the simplest form of eruption the bubbles of steam at the point of contact with the greatest heat displace a portion of the water in the tube and at once set the geyser in action, but when the weight of water is greater, the steam goes on forming at the bottom until its tension is sufficient to overcome the resistance offered by the column and an equilibrium is established. This may be maintained for a longer or shorter period, owing to the inflow of cold water or the gradual escape of steam, but if the heat be sufficient and the column not too high, a portion of the water will at length be expelled and the crisis ensue as before. In either case the operation is similar. The water having risen to the top of the bowl or crater and boiling more or less at the surface, large volumes of steam begin to rush up by which a considerable quantity of it is displaced and caused to overflow. The weight of water being thus diminished and the formation of steam at the bottom consequently increased, this is quickly followed by still larger volumes and more water is thrown out, and now the whole column, mingled with steam, is lifted several feet into the air and continues rising by successive throes to its full height. The eruption may be continuous until the water is exhausted and subside as it rose followed by more or less escape of steam, or it may be suspended for a short interval and renewed again. It will be readily seen that variation in the character of the tube as to shape, length, direction, &c., would give rise to variations in the character of the geyser, and changes gradually taking place in the tube would also account for changes in its performances. Variations in the quantity, manner, and location of the water supply or of the application of heat would have a similar effect, and the limit to which all these may be modified is wide enough perhaps to cover every peculiarity noticed amongst the geysers of the Yellowstone Basin. The suspensions sometimes occurring during an eruption are, it seems to me, to be accounted for by the lowering temperature produced by the action itself. As the water escapes from the crater it is quickly cooled by the enormous expansion of steam and consequent absorption of heat which takes place, so that the falling spray is quite cold, and as soon as a momentary relaxation in the steam tension is thus brought about, it is furthered by the cool water falling back into the orifice of the crater, filling it up. Whether a mere co-incident or not, further observation must determine, but it was noticed that those geysers having craters which offer great facility for the return of the water often gave a succession of ejections at short intervals, as in the case of the Giantess and Grand, while those to which the water did not return invariably had but one continuous discharge. The Fan Geyser, for example, throws

its water obliquely across the creek, and the Bee-Hive has a long cone-shaped orifice, and the stream is so thin and thrown so high that it falls in spray or floats off in the form of vapor, and these geysers are among the most regular in the basin and always discharge at one eruption. Old Faithful, the Castle, Giant, and other smaller ones, are of the same kind. There are some peculiarities difficult as yet to understand, as, for example, the repetition occasionally of the whole series of eruptions of the Grand one hour or two after the first. Many more details are wanting as to the habits and changes of each geyser before correct conclusions can be formed of their true nature; but the few hints here thrown out may serve to give direction to future observation, and the greater the number of facts accumulated the better we shall be able eventually to understand them.

COOK CITY MINING-CAMP.

Leaving the Park by way of Baronett's Bridge, we followed up the valley of Soda Butte Creek, past Soda Butte, an isolated mound of sulphurous and calcareous material, the site of a former hot spring similar to those found on the Gardiner River. This has usually been referred to as an extinct geyser; but the character of the ingredients forming the cone is inconsistent with such a theory, since analysis has shown that the deposit from all active geysers is composed mainly of silica. The valley is about one-fourth of a mile wide, and the surface, rising in elevation, becomes uneven from extensive land-slides and masses of conglomerate rolled down the heights until, just at the boundary of the Park, we find ourselves in a narrow gorge between nearly vertical walls of igneous rock 1,200 to 2,000 feet in height, the northeast gateway, opening from the Yellowstone Basin into the vast arena of volcanic mountains to the eastward. The lofty walls on either side are formed of a porphyritic trachyte or trachytic breccia, consisting of different kinds of igneous rock in irregular pieces of various size conglomerated together and bedded in nearly horizontal layers, under which is a greenish conglomeratic limestone made up of small flattened pebble-like masses, capable, when pure, of a high polish, and makes a handsome marble. On exposed surfaces it weathers in pits and holes and disintegrates into a dull gray or whitish friable mass, in which its conglomerate character is scarcely traceable. From this point to the head of Soda Butte Creek the way is bordered by mountains of volcanic rock 2,000 to 3,000 feet high, eroded at their summits into the most remarkable turreted and castellated shapes, and resting at the base on a horizontal ledge of limestone. In a little grassy park-like expansion of the valley, 3 miles below the head of the creek, is Cook City, a mining camp of about thirty or forty cabins and one hundred and fifty inhabitants. It is a regularly incorporated town, with a post-office and a weekly mail, 127 miles by wagon-road from Bozeman, Mont. The so-called mines are located within a radius of 3½ or 4 miles from the camp. The following memo-

randa, furnished me by Mr. A. J. Malin, deputy recorder for Gallatin County, Montana, will give a very fair exhibit of their present status, and may be of interest to those desiring information on the subject.

There are in all about 180 claims located and recorded, the more important of which are as follows:

On Republican Mountain, immediately south of the camp:

Great Republic mine.—Silver, tunnel 15 by 8 by 6 feet, in limestone; yield, 80 to 1,500 ounces silver to ton of galena ore. Four tons of this ore were packed out on mules, and sold on a basis of 350 ounces of silver to the ton. Mine now sold for $50,000.

Houston, extension of same; shaft 22 by 6 by 4 feet.

Greely, extension of same; tunnel, 25 feet.

On Streeter Mountain, immediately north of camp:

New World, silver mine; 4 feet vein of galena in limestone, dipping at high angle; average, 60 ounces of silver to ton of ore; shaft, few feet. (The description of this will serve for nine others under various names in same group on same ledge.)

On Henderson's Mountain, 2 miles north of camp:

Lake Superior, silver and gold; shaft, 25 feet, in vein of mica schist, with cubes of iron pyrites; yield, $50 gold and 8 ounces silver to ton.

Home Stake, same; shaft 20 feet.

Little Blue, same; shaft, 25 feet; vein extends north and south at high angle.

War Eagle, similar, and also very rich vein of galena; shaft, about 60 feet. (The tellurium reported from this mine proves, on examination, to be lead.)

On Crown Butte, head of Soda Butte Creek, 2½ miles north of camp:

Black Warrior, silver and gold; shaft, 60 feet, in vein of galena ore, 6 feet thick; average, $100 to the ton; $50,000 offered and refused for half interest. (Several others prospected in same group.)

Time was afforded to make a personal inspection of but one of these prospect holes, that of the Great Republic. It is situated in a limestone ledge on the mountain side 450 feet above the creek. A good road leads up to a point where preparation is being made to shoot the ore down. The limestone of undetermined thickness lies horizontally, and at the point where the tunnel begins shows a blackened, burnt appearance, which is the indication of ore. The first stroke of the pick brings the silver-bearing galena to light, and from that point to the end of the tunnel, 15 by 8 by 6 feet, directly into the bank, the walls on all sides consist of a sort of modified limestone and galena, mixed in nearly equal proportions. Nothing could be finer than the prospect there presented, so far as it goes; but what is beyond, above, below, or on either side, is unknown. The body of ore shows no sign of thinning out, but there is nothing to indicate its direction or extent.

A few hundred feet further along the ledge there is a shaft 22 feet, and still farther a tunnel of 25 feet, which show the same dark-looking

modified limestone, with more or less galena. This would seem to indicate that the ore follows the limestone horizontally in beds of various dimensions instead of being in proper vertical seams. The croppings which guide the prospector are not found in lines running at right angles with the strata, as in the case of regular fissure veins, but appear at points along the ledge itself, and when found there appears, so far as yet prospected, an irregular expansion of the mass in different directions. It is probable that the ore occupies various horizons throughout the limestone beds, and as specimens from the Henderson Mountain mines are found in mica schist and gneissic slate, with pyrites of iron, it must extend down into the underlying metamorphic rocks, where it is associated with free gold.

But one mine was reported sold; the others are owned and held by the prospectors, many of whom spend their winters in the Gallatin Valley, earning money to enable them to remain at their claims in the summer, waiting for something to turn up.

There is undoubtedly a vast amount of very fine silver ore in this region, and more is coming to light every day in the discovery of new prospects, but the proper value of any particular claim is, under the present circumstances, a matter of the utmost uncertainty. There is a movement on foot to start a smelter at the camp for working the ore, and this is the crucible in which the value of these claims should be tested. There is no scarcity of good ore, and when the mines are developed to a reasonable degeee in this way there will be no lack of capital to take hold of them.

OVER THE BEAR-TOOTH RANGE.

From Cook City the trail leads over a granite ridge forming the divide between Soda Butte Creek and the upper tributaries of Clark's Fork. The pass is low and thickly covered with the usual growth of spruce pine and poplar already enumerated, and the ground is strewn with allen timber.

Ascending the heights opposite Index Peak, a grand view of the valley of Clark's Fork and the surrounding mountains is presented, including some of the most remarkable scenery to be found on the continent. The Clark's Fork, with its hundreds of tributaries arising in as many small lakes formed by melting snows from the ranges on either side, rushes down steep grades, through narrow wooded valleys, and deep cañons to the plains over a bed of granite from which all the overlying strata have been worn away in the process of erosion. To the southward, as far as the upper portion of Wind River and west to the Yellowstone, there is a vast area, 100 miles long by 60 miles wide, covered to a depth of from 1,000 to 3,000 feet with igneous rock, the greatest outpouring of this material to be found anywhere, perhaps, on the globe. It is found resting upon layers of various age, from the upturned lignite beds downward to the metamorphic granites, showing that the whole

Fig 2.

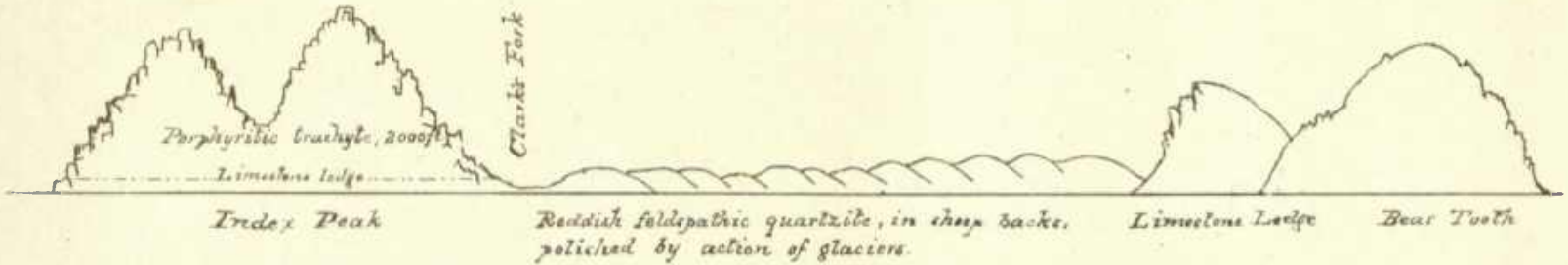
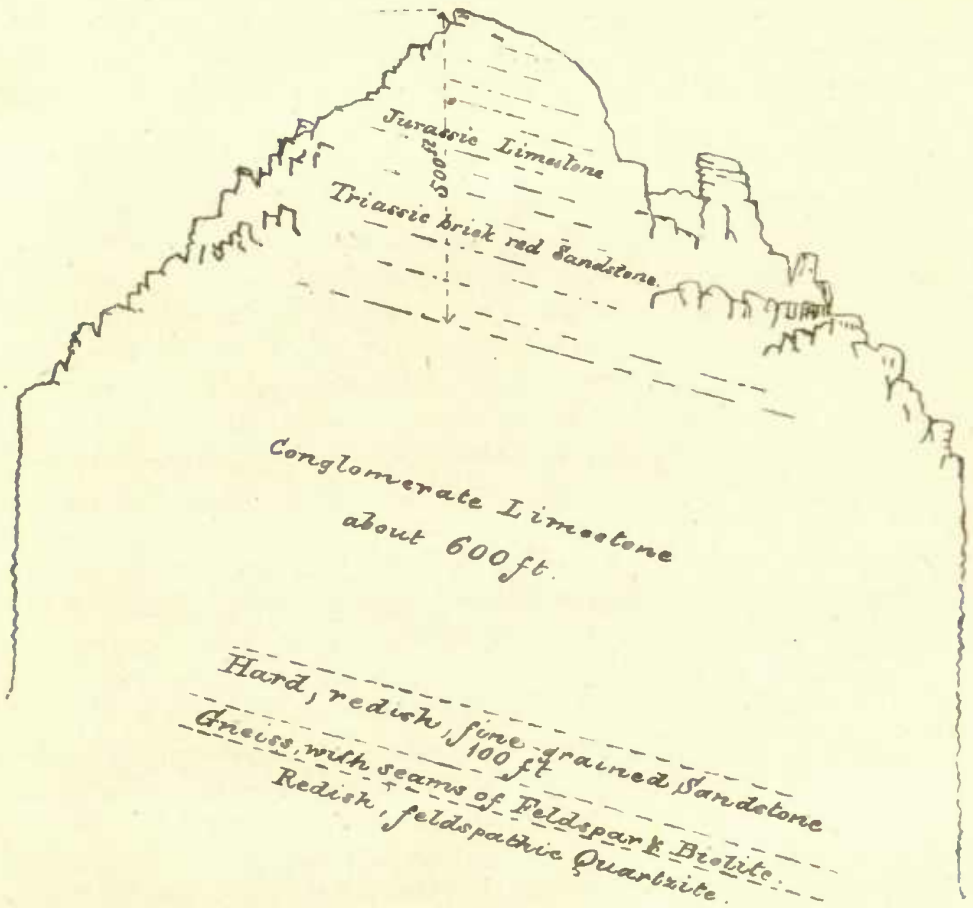


Diagram of Section through Index Peak & Bear Tooth, east and west, about 20 miles.

Fig 3.



Section of Bear Tooth Mountain

series of the underlying sedimentary rocks were first laid down and subsequently worn away to different depths, according to the hardness of their material, previous to the escape of the overflowing lava. The entire region, which might appropriately be called the Volcanic Mountains, presents a succession of tall peaks and broken ridges of the most rugged and formidable character. The lofty barren cliffs, with but scanty vegetation, are covered with perpetual snow, which adds a deeper gloom to the somber nakedness of the rocks. To the northward, on the other hand, not only the igneous rocks, if they ever existed there, but all the sedimentary beds, excepting in isolated patches, have been swept away by the erosive forces, while the metamorphic rocks have been thrust upward forming a region of rugged and lofty mountains composed exclusively of feldspathic quartzite and dark-colored gneisses, known as the Bear Tooth Range. Over a large portion of this area the granite rocks are rounded off into those peculiar oval convex prominences which have been called "Sheep-backs," and smoothly polished by the action of glaciers Fig. 2). All along the north branch of Clark's Fork and northward, including a space of several hundred square miles, the surface consists of these polished sheep-backs of various sizes and heights, in the spaces between which are thousands of small lakes skirted with *Abies subalpina*, *Picea Engelmanni*, *Populus tremuloides*, and a shubbery of *Ceanothus velutinus*, *Potentilla fructicosa*, and other subalpine species.

A prominent feature of this region is the Bear Tooth Mountain, an isolated peak from which the range takes its name, composed of sedimentary rocks, which have escaped from the general destruction and remain standing like an island in the midst of an area denuded of everything down to the primordial granite. It has an elevation of 10,650 feet above the sea level, and 1,250 above the surrounding surface. The upper layers are a hard, yellowish-white cherty limestone, with Jurassic fossils, below which is about 250 feet of brick-red sandstone, and then 600 feet of a hard conglomerate limestone, composed of oval, flattened, pebble-like masses cemented together by a greenish material, but presenting a dull gray or drab color on the weathered surface, which lies directly in contact with a reddish and whitish streaked bedded sandstone 100 feet, presumably Potsdam, below which is 50 feet of dark friable gneiss, with masses of biolite and feldspar seams, resting on the underlying granite. (Fig. 3).

From Bear-Tooth Peak eastward to the plains, about 30 miles, is a succession of granite ridges, the highest crest of which is sometimes capped by patches of the reddish bedded sandstone supposed to be of Potsdam age, with no trace of any rock of more recent date until we reach the precipitous eastern boundary, where the conglomerate limestone, red sandstone, &c., again appear, tilted at an angle of 20° beyond the perpendicular, which gradually subside to their normal position under a surface of lignite beds over the valley of Rocky Creek, as it flows toward the Yellowstone. The altitude varies from 8,500 to 10,500 feet, with a

corresponding subalpine flora. Large masses of snow, numerous lakes of clear water, but without fish, and extensive marshes were everywhere met with along the march. In exposed situations, between 9,000 and 10,000 feet, scrubby specimens of *Picea Engelmanni* were found, only a few feet high, twisted and contorted out of shape and lying nearly flat on the ground above where there was no timber; *Pinus Balfouriana* was not found.

The beautiful *Gentianæ frigida* was quite ornamental on the high plateaus and mountain sides, where the snow had recently melted. As a rule the flora of this high granite region is comparatively meager, owing to the fact that much of the surface is covered with rock; but the subalpine grasses are well represented by numerous species.

The following is a list of the botanical specimens collected, which have been arranged and classified according to their natural orders, and deposited in the herbarium of Harvard University, Cambridge, Mass. I am greatly indebted to Prof. Asa Gray and Mr. Sereno Watson, of Harvard, and to Dr. George Engelmann, of Saint Louis, for determinations of the species and other courtesies, and to these eminent scientists my thanks are tendered.

LIST OF PLANTS COLLECTED.

RANUNCULACEÆ.

1. *Clematis ligusticifolia*, Nutt.—Common along streams everywhere; August.
2. *Clematis Douglasii*, Hook.—High plateaus, Wind River Mountains; July and August.
3. *Thalictrum Fendleri*, Englm.—Wind River bottoms; July and August.
4. *Anemone multifida*, Poir.—Gros Ventre Valley; August. Warm Spring Creek; July.
5. *Ranunculus aquatilis*, L.—In ponds, Gros Ventre Valley; August.
6. *Ranunculus cymbalaria*, Pursh.—In springs, Wind River Valley; July.
7. *Ranunculus nelsoni*, Gray.—Wind River; July.
8. *Ranunculus affinis*, R. Br.—Clark's Fork Mountains; August.
9. *Caltha leptosepala*, D. C.—Swampy places along tributaries of the Gros Ventre River; August.
10. *Trollius laxus*, Salisb.—Moist places in Wind River Mountains; July. Gros Ventre; August.
11. *Aquilegia cærulea*, James.—Open places in timber, Wind River Mountains, white to pale blue; July and August.
12. *Delphinium azureum*, Mx.—Plateaus, Wind River Valley, common; July.
13. *Delphinium occidentale*, Watson.—Open places in timber, Jackson's Lake and Wind River bottoms; July and August.
14. *Aconitum Columbianum*, Nutt.—Jackson's Lake, meadows; August.

BERBERIDACEÆ.

15. *Berberis aquifolium*, Pursh.—Open places in timber at high elevations, common, berries ripe; August.

PAPAVERACEÆ.

16. *Corydalis aurea*, Willd., var. *occidentalis*, Gray.—Moist places, Wind River Mountains; July.

CRUCIFERÆ.

17. *Nasturtium obtusum*, Nutt.—Parks and meadows, Wind River Mountains; August.
18. *Arabis Drummondii*, Gray.—Wind River Mountains; July and August; white and blue.
19. *Physaria didymocarpa*, Gray.—Sandy soil, North Fork of Wind River; July. Snake River basin; August.
20. *Draba stenolaba*, Ledeb.—Open placesin timber, Wind River Mountains; July. Lincoln Pass; August.
21. *Sisymbrium incisum*, Englm.—Lincoln Pass, Wind River Mountains; August.
22. *Erysimum cheiranthoides*, L.—Dry, rocky places, Torry's Fork, Wind River; July.
23. *Erysimum pumilum*, Nutt. (?)—River banks, North Fork of Wind River; July and August.
24. *Lepidium intermedium*, Gray.—On sandy soil, Wind River bottoms; July.

CAPPARIDACEÆ.

25. *Clemone lutea*, Hook.—Wind River and Gros Ventre valleys; July and August.
26. *Clemone integrifolia*, T. & G.—Common everywhere along the trails from Nebraska west to Idaho.

VIOLACEÆ.

27. *Viola canina*, L., var. *rupestris*, Regel.—Marshy places, Continental Divide; August.

CARYOPHYLLACEÆ.

28. *Silene Menziesii*, Hook.—Dry, rocky beds of streams, Gros Ventre Basin; July and August.
29. *Cerasticum alpinum*, L., var. *Behringiana*, Regel.—Along Clark's Fork of the Yellowstone; August.
30. *Stellaria longipes*, Goldie.—Swampy places, North and Middle Fork Wind River; July.
31. *Arenaria congesta*, Nutt.—Hillsides, Wind River Mountains; August.

32. *Arenaria Franklinii*, Dougl., var. *minor*, H. and A.—In crevices of the rocks, Wind River Mountains; August.
33. *Arenaria pungens*, Nutt.—In high altitudes, Continental Divide; August.

PORTULACACEÆ.

34. *Calandrinia pygmæa*, Gray (Pro. Am. Acad., viii, p. 623).—Rocky bottoms, Union Peak, Wind River Mountains; August.
35. *Spraguea umbellata*, Torr.—Sandy soil, summit of Union Peak; August.
36. *Lewisia rediviva*, Pursh. (Am. Nat., viii, Jan. 1874, p. 11).—High, dry benches, South Pass and northward in similar places; August.

MALVACEÆ.

37. *Malvastrum coccineum*, Gray.—Foot-hills North Fork Wind River and Jackson's Lake; August.
38. *Sphæralcea rivularis*, Torr.—Open places in timber, foot-hills, Jackson's Lake; August.

LINACEÆ.

39. *Linum perenne*, L.—Common everywhere on high plateaus; August.

GERANIACEÆ.

40. *Geranium Richardsonii*, F. & M.—Bear Tooth Mountains and Snake River Valley; August.
41. *Geranium Fremontii*, Torr.—Wind River Valley; August.

RHAMNACEÆ.

42. *Ceanothus velutinus*, Dougl.—Hills and mountains about Jackson's Lake; August, in fruit.

SAPINDACEÆ.

43. *Negundo aceroides*, Mœnch.—Common along streams, Wind River, Snake River, and Rocky Creek.

LEGUMINOSÆ.

44. *Lupinus argenteus*, Pursh.—Wind River Mountains and Continental Divide; August.
45. *Lupinus cæspitosus*, Nutt.—Dry hill sides Lincoln Pass, Continental Divide; August.
46. *Trifolium longipes*, Nutt.—Meadows, Wind River; August.
47. *Psoralea lanceolata*, Pursh.—Wind River; August.
48. *Astragalus ventorum*, Gray.—Dry, sandy soil, Wind River Valley; July; rare.

49. *Astragalus alpinus*, L.—Lincoln Pass, Continental Divide; August.
50. *Astragalus multiflorus*, Gray.—Dry creek bottoms, North Fork Wind River; August.
51. *Astragalus sericoleucus*, Gray.—Crevices of rocks, Wind River Mountains; July.
52. *Oxytropis deflexa*, D. C.—Dry, rocky places, Torry's Fork, Wind River; August.
53. *Oxytropis lagopus*, Nutt.—Dry places, North Fork, Wind River; August.
54. *Glycyrrhiza lepidota*, Pursh.—Banks of streams, Warm Spring Creek; August.
55. *Hedysarum Mackenzii*, Richards.—Meadows along tributaries of Wind River; August.
56. *Hedysarum boreale*, Nutt, var. *albiflorum*.—Open places in timber, Continental Divide; August.
57. *Vicia Americana*, Muhl., var. *truncata*, Brewer.—Meadows, Wind River; August.
58. *Vicia Americana*, Muhl., var. *linearis*, Watson.—Meadows, Wind River; August.

ROSACEÆ.

59. *Prunus Virginiana*, L.—Red Cañon, Continental Divide, Rocky Creek; August, berries ripe and abundant.
60. *Spiræa betulifolia*, Pallas.—Open places in timber at high altitudes, Snake River, &c.; August.
61. *Geum triflorum*, Pusrsh.—Bear Tooth Range, common.
62. *Rubus strigosus*, Michx.—Foot-hills, Snake River Basin; August 15; fruit ripe and very delicious.
63. *Rubus Nutkanus*, Moc.—Snake River Basin; August.
64. *Fragaria Virginiana*, Duch.—Shady places, Snake River Valley, &c.; August 15 to 30; berries ripe and very common.
65. *Potentilla glandulosa*, Lindl.—Open places in timber, Gros Ventre Valley and Lincoln Pass; August.
66. *Potentilla gracilis*, Dougl.—Meadows, North Fork Wind River; August.
67. *Potentilla dissecta*, Pursh., var. *glaucophylla*, Lehm.—Gros Ventre Valley; August.
68. *Potentilla palustris*, Scop.—Lewis's Lake; August 19.
69. *Potentilla fructicosa*, L.—Very common in moist parks, middle altitudes; August.
70. *Rosa blanda*, Ait.—Clark's Fork; common.
71. *Amelanchier alnifolia*, Nutt.—Red Cañon, Wind River Valley; August 6; fruit ripe and abundant.
72. *Amelanchier Canadensis*, T. and G.—Red Cañon, Wind River Valley; August 5; fruit ripe.

SAXIFRAGACEÆ.

73. *Saxifraga integrifolia*, Hook.—Moist places along streams, Wind River Mountains; August.
74. *Saxifraga punctata*, L.—Tributaries Gros Ventre River; August 18.
75. *Heuchera parvifolia*, Nutt.—River banks, Gros Ventre, &c.; August.
76. *Parnassia fimbriata*, Kœnig.—Meadows, Gros Ventre River; August 13.
77. *Parnassia parviflora*, D. C.—Swamps along tributaries Wind River; August.
78. *Ribes floridum*, L.—Continental Divide and Snake River Basin; August; in fruit.
79. *Ribes lacustre*, Poir.—Snake River Valley; August; in fruit.
80. *Ribes cereum*, Dougl.—Red Cañon, Wind River Valley; August 5; in fruit.

CRASSULACEÆ.

81. *Sedum rhodanthum*, Gray.—Moist places, Continental Divide; August.
82. *Sedum stenopetalum*, Pursh.—Dry rocky places, Bear Tooth Mountains; August.

ONAGRACEÆ.

83. *Epilobium spicatum*, Lam.—Warm Spring Creek; August.
84. *Epilobium latifolium*, L.—Wind River; July and August.
85. *Epilobium suffruticosum*, Nutt.—Dry beds of streams, Gros Ventre Valley; August 13.
86. *Epilobium coloratum*, Muhl.—Wet places, Warm Spring Creek; August.
87. *Epilobium origanifolium*, Lam.—Banks of streams, Wind River Mountains; August 10.
88. *Epilobium paniculatum*, Nutt.—Snake River Basin, common.
89. *Epilobium angustifolium*, L.—Parks, Lincoln Pass, and Bear Tooth Mountains; August; common.
90. *Epilobium*———, (?) (species uncertain.)—Marshy places, head of Gros Ventre River.
91. *Gayophytum ramosissimum*, T. and G.—Dry sandy soil, Gros Ventre River, August.
92. *Gayophytum diffusum*, T. and G.—Snake River Basin; August.
93. *Œnothera pinnatifida*, Nutt.—River banks and sandy bottoms, North Fork Wind River; August.
94. *Œnothera cæspitosa*, Nutt.—River banks, North Fork; Wind River; August.
95. *Œnothera triloba*, Nutt.—River bottoms, North Fork Wind River; August.
96. *Gaura coccinea*, Spach.—Wind River; July.

LOASACEÆ.

97. *Mentzelia læviculis*, T. and G.—Wind River Valley; August.
98. *Mentzelia pumila*, Nutt.—North Fork Wind River; July and August.

UMBELLIFERÆ.

99. *Carum Gairdneri*, Beuth. and H.—Snake River Basin; August; common everywhere. The root is an important article of food among the Indians.
100. *Cicuta maculata*, L.—Snake River Basin.
101. *Berula angustifolia*, Koch.—Wet places, Warm Spring Creek; August.
102. *Ferula multfida*, Gray.—De Noir Creek; August.
103. *Heracleum lanatum*, Michx.—Gros Ventre River; August.

CORNACEÆ.

104. *Cornus stolonifera*, Michx.—Rocky Creek.
105. *Cornus pubescens*, Nutt.—Snake River Basin.

CAPRIFOLIACEÆ.

106. *Symphoricarpus occidentalis*, R. Brown.—Snake Rive rValley and Bear-Tooth Mountains; August.
107. *Symphoricarpus vulgaris*, Michx.—Snake River Basin, August; ripe.
108. *Linnœa borealis*, Gronov.—Snake River Basin and Bear Tooth Mountains.
109. *Lonicera involucrata*, Bank.—Gros Ventre Valley; August 13.

RUBIACEÆ.

110. *Galium boreale*, L.—Tributaries Wind River; August.

VALERIANACEÆ.

111. *Valeriana dioica*, L.—Wet places, Warm Spring Creek; August.
112. *Valeriana edulis*, Nutt.—Banks of streams, Warm Spring Creek; August.

COMPOSITÆ.

113. *Chrysopsis villosa*, Nutt.—Rocky bottoms, Buffalo Fork of Snake River; August 15.
114. *Aplopappus uniflorus*, T. and G.—Foot-hills, Gros Ventre River; August.
115. *Aplopappus unifloris*, T. and G.—(Var.) North Fork Wind River; August.
116. *Aplopappus acaulis*, Gray.—Steep River banks, North Fork Wind River; August.

117. *Bigelovia Douglasii*, Gray.—Wind River; August.
118. *Bigelovia gravioleus*, Gray.—Wind River Valley; August.
119. *Solidago Missouriensis*, Nutt.—Var. *nutana* (?) Rocky places tributaries Wind River; August.
120. *Solidago multiradiata*, Ait.—Meadows of Gros Ventre; August.
121. *Townsendia Parryi*, Gray.—Open spaces in timber, Wind River Mountains; August.
122. *Aster multiflorus*, Ait.—Very sandy soil, Wind River Mountains; August.
123. *Aster glaucus*, T. and G.—Dry sandy places, Gros Ventre River Valley; August.
124. *Aster integrifolius*, Nutt.—Snake River Basin; August.
125. *Aster campestris*, Nutt.—North Fork of Wind River; August.
126. *Aster elegans*, T. & G.—Hillsides, in wet soil, Gros Ventre Valley; August.
127. *Aster Fremonti*, Gray (near *A. folcatus*, Lindl.)—Meadows, Wind River; July and August.
128. *Aster canescens*, Pursh.—Meadows, Warm Spring Creek; August.
129. *Erigeron acris*, L., (var.)—Marshy places, North Fork of Wind River; August.
130. *Erigeron compositus*, Pursh.—Bear Tooth Mountains; August.
131. *Erigeron pumilum*, Nutt.—Lincoln Pass, Wind River Range; August.
132. *Erigeron cæspitosum*, Nutt. (var. to name later).—Marshy ground, Wind River; July.
133. *Erigeron salsuginosus*, Gray.—Lincoln Pass, Wind River Range; August.
134. *Antennaria dioica*, Gærtn.—Buffalo Fork of Snake River, Wind River Valley; August.
135. *Antennaria racemosa*, Hook.—Warm Spring Creek; August.
136. *Antennaria Carphatica*, R. and Br., var. *pulcherrima*, T. & G.—Gros Ventre River Valley; August.
137. *Balsamorhiza sagittata*, Nutt.—North Fork Wind River; August.
138. *Helianthus Nuttallii*, T. and G.—Dry, sandy soil, Warm Spring Creek; August.
139. *Bahia integrifolia*, Nutt.—Dry places, Snake River Valley; August.
140. *Chænactis Douglasii*, Hook.—Dry creek bottoms, North Fork Wind River; July.
141. *Helenium Hoopesii*, Gray, (Pro. Am. Acd., IX, p. 200 *et seq.*)—Dry places, Lincoln Pass; August.
142. *Actinella acaulis*, Nutt.—North Fork Wind River; July and August.
143. *Achillea millefolia*, L.—Common in rich soil everywhere.
144. *Artemisia tridentata*, Nutt.—Common everywhere.
145. *Artemisia frigida*, Willd.—Gros Ventre Valley.
146. *Senecio aureus*, L., var. *borealis*, T. and G., *discordens*, Gray.—Upper Wind River; July.

147. *Senecio aureus*, L., var. *borealis*, T. and G.—Upper Wind River Valley; July and August.
148. *Senecio canes*, Hook.—Upper Wind River, in dry soil; August.
149. *Senecio hydrophilus*, T. and G.—Wet places, Warm Spring Creek; August.
150. *Senecio triangularis*, Hook.—Along streams, Wind River Mountains; August 10.
151. *Tetradymia canescens*, D. C.—Snake River; August.
152. *Lygodesmia spinosa*, Nutt.—Snake River.
153. *Arnica cordifolia*, Hook.—Open places in timber, Wind River Mountains; August.
154. *Arnica angustifolia*, Vahl.—Upper Wind River; August.
155. *Stephanomeria minor*, Nutt.—Warm Spring Creek; August.
156. *Crepis acuminata*, T. and G.—Upper Wind River; July and August.
157. *Crepis elegans*, Hook.—Gros Ventre Valley; August 13.
158. *Troximon glaucum*, Nutt.—Lincoln Pass and Continental Divide; August.
159. *Troximon aurantiatum*, Hook.—Lincoln Pass.
160. *Lactuca pulchella*, D. C.—Warm Spring Creek; August.

CAMPANULACEÆ.

161. *Campanula rotundifolia*, L.—Very common in Wind River Mountains; July.

ERICACEÆ.

162. *Arctostaphylos Uva ursa*, Sprg.—Upper tributaries Wind River; August.
163. *Vaccinum Myrtillus*, L., var. *microphyllum*, Hook.—In shady woods, 7,000 to 9,000 feet; common; leaves and stems used by Indians for making tea.
164. *Bryanthus empetriformis*, Gray.—Union Peak, Wind River Mountains; August.

PRIMULACEÆ.

165. *Androsace septentrionalis*, L., Lincoln Pass and Snake River Basin; August.
166. *Dodectheon media*, L.—Blue Lakes, Wind River Valley; August.
167. *Glaux maritima*, L.—Swampy ground, North Fork and Snake River.

GENTIANACEÆ.

168. *Gentiana amarella*, L., var. *acuta*, Hook.—Along streams Wind River; August.
169. *Gentiana serrata*, Gunner, var. *grandis*, Gray.—Lincoln Pass, meadows; August.
170. *Gentiana affinis*, Gris. (Bot., Wheeler Surv., p. 192, Gray's syn., 122).—Head Clark's Fork; August.

171. *Gentiana frigida*, Hænke (Bot., Wheeler Survey, p. 192).—Bear Tooth Mountains; August 28.
172. *Gentiana Forwoodii*, Gray (*new species, Ms.*).—Meadows, upper tributaries Wind River; August.
173. *Frasera speciosa*, Dougl.—Lincoln Pass, Wind River and Big Horn Mountains, middle altitudes; August; very common.

POLEMONIACEÆ.

174. *Phlox Douglasii*, Hook, var. *longifolia*, Gray.—High altitudes, Bear Tooth Mountains; August.
175. *Phlox longifolia*, Nutt., var. *brevifolia*, Gray.—High altitudes; August; common.
176. *Collomia linearis*, Nutt.—Jackson's Lake; August 16.
177. *Gilia aggregata*, Spreng.—(Bot., Wheeler Sur., p. 198).—Dry, sandy soil, Gros Ventre River; August 13.
178. *Polemonium cæruleum*, L.—Banks of streams, Warm Spring Creek; August.

HYDROPHYLLACEÆ.

179. *Phacelia sericea*, Gray.—Lincoln Pass and open places, Wind River Mountains; July and August.
180. *Phacelia circinata*, Jacq.—Hillsides upper tributaries Gros Ventre; August 13.

BORRAGINACEÆ.

181. *Eritrichium glomeratum*, D. C.—Wind River Valley; July and Au- August.
182. *Mertensia Sibirica*, Don.—Along streams, Wind River Mountains; August.
183. *Echinospermum Redowskii*, Lehm., var. *occidentale*, Watson.—Wind River.
184. *Myosotis sylvatica*, Hoffm., var. *alpestris*, Koch.—Lincoln Pass and open places in timber; August; common.

SCHROPHULARIACEÆ.

185. *Collinsia parviflora*, Dougl.—In crevices of rocks, Grand Cañon of the Yellowstone; August 23.
186. *Pentstamon confertus*, Dougl.—Moist places, Wind River; July and August.
187. *Pentstamon confertus*, Dougl. (purplish flowered form).—Meadows, Gros Ventre River; August.
188. *Pentstamon glaber*, Pursh.—In dry creek beds, North Fork Wind River; July.
189. *Pentstamon strictus*, Benth. (var.)—Dry sandy soil, Wind River Mountains; August.

190. *Penstamon glaucus*, Graham, var.; *stenopetalus*, Gray (slender form).—Open places in timber, Wind River Mountains; August.
191. *Penstamon laricifolius*, Hook and Arn.—Sandy hillsides, Wind River Mountains; July and August.
192. *Mimulus Lewisii*, Pursh.—Edge of timber, Lincoln Pass and Gros Ventre River; August 13.
193. *Mimulus luteus*, L.—Edge of streams, De Noir Creek; August.
194. *Veronica alpina*, L.—Moist shady places, Gros Ventre River Valley; August.
195. *Veronica Americana*, Schw. (small form.)—In water and springs, Wind River.
196. *Castilleia linariæfolia*, Benth.—Upper tributaries of Wind River; August.
197. *Castilleia miniata*, Dougl.—Open places in timber, Wind River Mountains; August.
198. *Castilleia pallida*, Kunth. (form.)—Moist places, Wind River Mountains; August.
199. *Orthocarpus luteus*, Nutt.—Buffalo Fork and Snake River Basin; August.
200. *Pedicularis racemosa*, Dougl.—Continental Divide between Wind River and the Gros Ventre; August.
201. *Pedicularis procera*, Gray.—Meadows and parks, Lincoln Pass and other places on Continental Divide, Big Horn, and Clark's Fork Mountains, 8,000 to 9,000 feet.
202. *Pedicularis Grœnlandica*, Retz. (*P. surrecta*, Benth.)—Same distribution as above, but more abundant.
203. *Pedicularis Parryi*, Gray.—Dry places at high altitudes, Wind River Mountains.
204. *Pedicularis bracteosa*, Benth.—Shady places, Wind River Mountains; August.

LABIATÆ.

205. *Mentha Canadensis*, L.—Banks of streams, Warm Spring Creek; August.

PLANTAGINACEÆ.

206. *Plantago eriopoda*, Torr.—Wind River Mountains, Lincoln Pass; August.
207. *Plantago Patagonica*, Jacq.—Wind River Valley.

NYCTAGINACEÆ.

208. *Abronia fragrans*, Nutt.—Snake River; August.

CHENOPODIACEÆ.

209. *Suæda occidentalis*, Watson.—In alkaline bottoms of evaporated ponds, Gros Ventre Valley.

210. *Chenopodium capitatum*, Watson (Blitum, L.)—Gros Ventre River.
211. *Eurotia lanata*, Moq.—Snake River Basin and Clark's Forks; common.

POLYGONACEÆ.

212. *Rumex salicifolius*, Weinm.—Meadows, Bear Tooth Mountains; August.
213. *Rumex paucifolius*, Nutt.—Snake River, high altitudes.
214. *Polygonum tenue*, Michx.—Dry soil, Lincoln; August.
215. *Polygonum Bistorta*, L.—Lincoln Pass, in open places; August.
216. *Eriogonum flavum*, Nutt.—Common everywhere, mountain meadows.
217. *Eriogonum umbellatum*, Torr.—Dry places, Warm Spring Creek.
218. *Eriogonum brevicaule*, Nutt.—Sandy soil, North Fork Wind River; August.
219. *Eriogonum cernuum*, Nutt. (Watson's Bot., King., p. 308).—Snake River Basin; August 17.
220. *Eriogonum microthecum*, Nutt. (Watson, l. c., p. 303).—Snake River Basin; August 17.
221. *Eriogonum ovalifolium*, Nutt.—Snake River Basin; August.

ELÆAGNACEÆ.

222. *Shepherdia Canadensis*, Nutt.—Red Cañon, Wind River Valley; August in fruit.
223. *Elægnus argentea*, Pursh.—Red Cañon, Wind River Valley; August 5, in fruit.

SANTALACEÆ.

224. *Comandra pallida*, Nutt.—Snake River Basin, National Park, and Bear Tooth Mountains; August, in fruit.

LORANTHACEÆ.

225. *Arceuthobium Americanum*, Nutt.—On *Pinus contorta* in great quantities, especially in Yellowstone Park.

BETULACEÆ.

226. *Betula occidentalis*, Hook.—Snake River Basin, Rocky Creek, &c.; August.
227. *Alnus incana*, Willd., var. *glauca*, Ait.—Along streams and moist places, Bear Tooth Mountains, &c.; August.

SALICACEÆ.

228. *Populus monilifera*, Ait.—Along streams everywhere below 6,000 feet.
229. *Populus balsamifera*, L., var. *angustifolia*, Watson.—Found mostly with above, but will bear a little higher altitude and not so high as the next.
230. *Populus tremuloides*, Michx.—From foot-hills up to 9,000 feet in the mountains everywhere.

CONIFERÆ.

231. *Pinus contorta*, Dougl., var. *Murryana*, Engelm.—In high altitudes from Wind River to Bear Tooth Mountains, especially in Yellowstone Park, where it is much more common than any other tree. Dr. George Engelmann, in remarking upon this species, says it "will prove distinct from the original *P. contorta* of the West coast and identical with the tree of the Sierras, and will have to bear the name of *P. Murryana*, Balf."
232. *Pinus flexilis*, James.—Wind River Mountains, Yellowstone Park and Clark's Fork. Much larger in the middle altitudes. Fine specimens in Rocky Creek Cañon, at about 5,000 feet.
233. *Pinus ponderosa*, Dougl.—Wind River and Rocky Creek Cañon.
234. *Abies subalpina*, Engelm.—Yellowstone Park and Bear Tooth Mountains, in rich, moist soil, at 7,000 to 9,000 feet. When growing in open places, young trees spring up in a close circle around the parent, forming a remarkably pretty group. "This is the only Abies found in the Rocky Mountains north of Pike's Peak."—Engelmann.
235. *Picea Egelmanni*, Engelm. (*Abies Engelmanni*, Parry).—Found with the above especially in the park, south and east of Mount Washburn, where they are the beauty of the forest.
236. *Pseudotsuga Douglasii*, Engelm.—In middle altitudes, Wind River and Bear Tooth Mountains and National Park; seldom more than 100 feet high.
237. *Juniperus Virginiana*, L.—Snake River.
238. *Juniperus communis*, L., var. *alpina*, L.—Yellowstone Park.

ORCHIDACEÆ.

239. *Habenaria dilatata*, Gray.—Marshy places, Wind River; July 28.
240. *Spiranthes Romanzoffiana*, Cham.—In swamps, Snake River Basin; August 18.

IRIDACEÆ.

241. *Iris Missouriensis*, Nutt.—Swamps North Fork Wind River; July.
242. *Sisyrinchium mucronatum*, Michx.—Marshy places, Torry's Fork of Wind River.

LILIACEÆ.

243. *Allium Schœnoprasum*, L.—Meadows head of Green River, Wyoming; August.
244. *Allium cernuum*, Roth.—Dry, sandy plains, North Fork Wind River; July.
245. *Allium brevistylum*, Watson.—Moist places, Wind River and Warm Spring Creek, Snake River; August.
246. *Smilacina stellata*, Desf.—Moist, shady places, Wind River Valley; August.

247. *Colochortus Nuttallii*, T. and G.—High plateaus, Wind River and Snake River; July.
248. *Zygadenus elegans*, Pursh.—Sandy soil in timber, Warm Spring Creek; August.

LEMNACEÆ.

249. *Lemna gibba*, L.—On surface of warm springs near the mouth of Lewis's Fork of Snake River.

JUNCACEÆ.

250. *Juncus nodosus*, L.—Wind River Valley; August.

CYPERACEÆ.

251. *Carex Jamesii*, Torr.—Torry's Fork and Snake River Basin.
252. *Carex atrata*, L.—Bear Tooth Mountains, 9,250 feet and elsewhere at high elevations.

GRAMINEÆ.

253. *Oryzopsis cuspidata*, Benth. (*Eriocoma cuspidata*, Nutt.)—Gros Ventre and Snake River valleys; August.
254. *Phleum alpinum*, L.—Bear Tooth Mountains; August 27; common on good soil at high altitudes everywhere.
255. *Sporobolus* (*Vilfa*) *cryptandrus*, Gray.—Along tributaries of Wind River and Gros Ventre; August.
256. *Sporobulus asperifolius*, Thurb.—Snake River and National Park; August 18.
257. *Trisetum subspicatum*, Beauv.—Bear Tooth Mountains; August 29.
258. *Kœleria cristata*, Pers.—Wind River; July; Snake River; August.
259. *Catabrosa aquatica*, Beauv.—North Fork of Wind River; July.
260. *Poa pratensis*, L.—Tributaries of Wind River, Snake River Basin; August.
261. *Poa tenuifolia*, Nutt. (var.?).—Bear Tooth Mountains; August.
262. *Poa andina*, Nutt. (var.), see Bot., Rep. Wheeler Surv., 1871–1875, p. 289.—Wind River; July; Bear Tooth Mountains, August.
263. *Poa* ———? (species uncertain).—Jackson's Lake; August.
264. *Poa* ———? (species uncertain, but differs from the above).—Bear Tooth Mountains; August 28.
265. *Poa cæsia*, Smith, var. *strictior*, Gray.—Open places, Bear Tooth Mountains; August.
266. *Poa purpurascens*, Vasey.—Bear Tooth Mountains; August.
267. *Alopecurus glaucus*, L. (?).—Snake River Basin; August.
268. *Stipa comata*, Trin.—Very common in valley of Clark's Fork; August.
269. *Stipa viridula*, Trin.—Found with the above, but less common.
270. *Agrostis scabra*, Willd.—Snake River Basin; August.
271. *Phragmites communis*, L.—Valley of Clark's Fork of the Yellow stone; August.
272. *Festuca rubra*, L.—Snake River Basin; common; August.

273. *Festuca occidentalis*, Hook.—Wind River Valley, Gros Ventre, and Snake River Basin; July and August; common.
274. *Festuca ovina*, L., var. *duriuscula*, Gray (?)—Bear Tooth Mountains, 9,000 feet; August 27.
275. *Atropis tenuifolia*, Thurb.—Snake River Basin; August; common.
276. *Bromus Kalmii*, Gray.—Snake River Basin; August.
277. *Bromus ciliatus*, L.—Wind River and Snake River Basin; July and August.
278. *Bromus breviaristatus*, Thurb. (Watson's Botany, fortieth parallel).—Jackson's Lake; August 19; Bear Tooth Mountains; August 27; 9,500 feet.
279. *Melica bulbosa*, Geyer. (Synopsis Flora of Colorado).—Snake River Basin; August.
280. *Buchloe dactyloides*, Engelm.—Valley of Wind River and Clark's Fork of the Yellowstone; July and August; common.
281. *Glyceria pauciflora*, Presl.—Snake River Basin; August.
282. *Aira cæspitosa*, L.—Bear Tooth Mountains, 9,500 feet; August.
283. *Brizopyrum spicatum*, Hook.—Snake River Basin; August 15.
284. *Hordeum pratense*, Huds.—Clark's Fork and Bear Tooth Mountains; August.
285. *Hordeum pusillum*, Nutt.—Snake River Valley; August.
286. *Hordeum jubatum*, L.—Snake River and National Park; August.
287. *Agropyrum repens*, Beauv. (*Triticum repens*, L.)—Tributaries Wind River; July.
288. *Agropyrum repens*, Beauv., var. *glaucum* (?).—Snake River Basin; August.
289. *Elemus sitanion*, Shultz. (Watson's Bot., fortieth parallel, Synopsis Flora Colorado.)—Snake River; August 15; common.
290. *Elemus condensatus*, Pursh.—Wind River, Snake River, and Clark's Fork Valley; August; common, 4 to 6 feet high, always found with the ergot fungus (*Claviceps purpurea*, Tul.) on it.
291. *Andropogon scoparius*, Michx.—Gros Ventre Valley and Rocky Creek; August.

FILICES.

292. *Woodsia Oregana*, Eaton.—Yellowstone Falls, National Park; August 23.

EQUISETACEÆ.

293. *Equisetum arrense*, L.—Swamps and meadows, North Fork of Wind River.

Very respectfully, your obedient servant,

W. H. FORWOOD,
Surgeon, United States Army.

The ADJUTANT-GENERAL,
Military Division of the Missouri.