

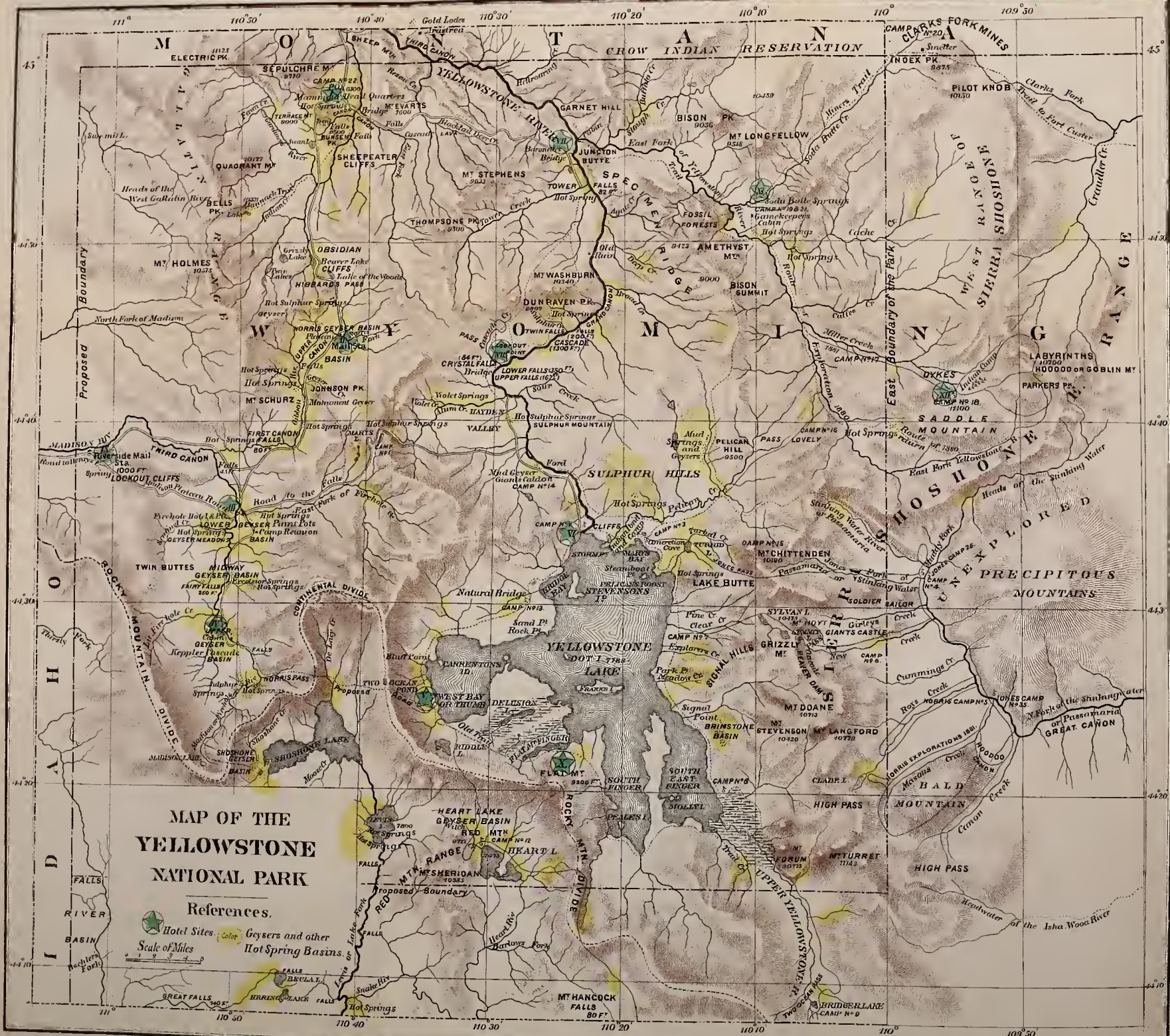
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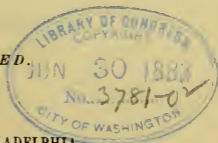


THE
YELLOWSTONE NATIONAL PARK

BY
HERMAN HAUPT, JR., M. D., PH. D.

A COMPLETE GUIDE TO AND DESCRIPTION OF THE WON-
DROUS YELLOWSTONE REGION OF WYOMING
AND MONTANA TERRITORIES OF THE
UNITED STATES OF AMERICA.

ILLUSTRATED.



NEW YORK AND PHILADELPHIA
J. M. STODDART
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TO THE

General Manager of the Northern Pacific Railroad,

AND TO THE

REV. J. HOUSTON ECCLESTON, D.D.,

TOGETHER WITH

ALL LOVERS OF THE SUBLIME IN NATURE,

These Pages are Respectfully Dedicated by

THE AUTHOR.

PREFACE.

HAVING, with a small party of chosen friends, spent a few weeks in the most pleasant manner possible wandering among the wondrous and curious freaks of Nature to be found in the National Park, as a means of perpetuating the pleasant reminiscence, and of furnishing to my fellows of the "army of American tourists" a guide to aid them to reach and satisfactorily traverse this wonderful region, the work of preparing this little book has been undertaken. The object throughout has been to give a clear direction as to the means of reaching the various points of interest, and at the same time to impart such general information, from the best and most reliable sources, as will add to the interest, and so far as possible explain the cause, of the singular phenomena witnessed. It is a land of wonder; and the tourist, after his first round, will yearn to revisit the place a second time, such is the interest and surprise these sights engender in the mind.

The route adopted in this book is by the geyser basin of the Firehole River, and thence eastward by the trail through Morris Pass to the West Bay, or Thumb, of the Yellowstone Lake; thence to the outlet and falls, and so on round to Barronett's Bridge and Soda Butte Creek, and back to the Mammoth Hot

Springs. The tourist who may prefer to reverse this route by travelling to Tower Creek and Mount Washburn before seeing the geysers will find the descriptions by turning to the back of the book and following in regular sequence toward the front, the various places being indicated by head-lines in the pages.

The data for this work have been drawn from the notes of a member of the party, together with memoranda made by the author and the works on the subject by Hayden, Stanley, Wylie and others, to whom due credit is given in the proper places.

Very respectfully,

THE AUTHOR.

ST. PAUL, MINNESOTA, 1883.

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THE YELLOWSTONE NATIONAL PARK.

CHAPTER I.

EARLY HISTORY OF THE NATIONAL PARK, AND ACT OF DEDICATION.

THE Yellowstone National Park region has been more or less known for many years. The Grand Cañon was visited as early as 1807 by one Coulter, who made a trip across it. Still earlier tradition mentions visits made to the country by Spanish and Mexican rovers, and by Canadians from Hudson Bay in quest of hides and pelts. A stump was found near the upper falls, on the west side of the river, with "J. O. R., Aug. 29, 1819," carved in the wood, which is ascribed to one Ross, a famous Hudson-Bay trapper, who was many years ago killed by the Blackfeet Indians.

In the spring of 1864, H. W. Wayant of Silver City, with about forty men and pack-outfit, ascended the east side of the Yellowstone to Emigrant Gulch and the East Fork and Soda Butte Creeks. A part of the company pushed on to Index Peak, at the head of Clarke's Fork of the Columbia River, in Montana. In the same year George Huston and party ascended the main Firehole River, but, fearing from the marvellous eruptions of the Giantess and other geysers and the suffocating fumes of brimstone they were nearing the infernal regions, they hastily decamped.

Up to 1869 the occasional visits that were made

were prompted by the prospect of gain. Trappers came hither for skins and furs, and others made search for the precious metals. But the wholesale slaughter of game did not commence till later. To illustrate the extent of this more recent slaughter, we can state, on good authority, that during the winter of 1881 and 1882 five thousand elk-hides were shipped to the Eastern markets, nothing being said of the beaver and other skins that may have been taken in a like ruinous proportion.

In 1871, Dr. F. V. Hayden, United States geologist, with a full corps of assistants and scientific experts, made a thorough exploration of the Park region and rearranged the nomenclature, besides collecting data for an excellent geological map of that region. The result proved that this section of country was entirely unfit for agriculture, as the cold and snow frustrated any attempt at cultivation, frosts occurring during every month in the year. A bill was therefore introduced on December 18, 1871, in the Senate of the United States, by the Hon. S. C. Pomeroy, to set apart a certain tract of country at the head-waters of the Yellowstone River as a public park, and about the same time a similar bill was introduced in the House of Representatives of the United States by the Hon. Wm. H. Claggett, delegate from Montana, to set apart three thousand five hundred and seventy-eight square miles of public domain as a national pleasure-ground.

On January 27, 1872, Mr. Dunnell, of the Committee on Public Lands, in his report on the bill, says:

“The entire area within the limits of the proposed reservation is over six thousand feet in altitude, and the Yellowstone Lake—which occupies an area fifteen miles by twenty-two miles, or three hundred and thirty square miles—is seven thousand four hundred and twenty-seven feet above sea-level. . . . The ranges of mountains that hem the valley in on every side rise to the height of ten thousand to twelve thousand feet, and are perpetually covered with snow.

“During the months of June, July and August the climate is pure and invigorating, with scarcely any rain or storms, but the thermometer frequently sinks to 26°. . . .

“Persons are now waiting for the spring to open to enter in and take possession of these remarkable curiosities, to make merchandise of these beautiful specimens, to fence in these rare wonders, so as to charge visitors a fee, as is now done at Niagara Falls, for the sight of that which ought to be as free as the air or water.

“The geysers of Iceland, which have been objects of interest for the scientific men and travellers of the entire world, sink into insignificance in comparison with the hot springs of the Yellowstone and Firehole basins.

“If the bill fails to become a law this session, the vandals who are now waiting to enter into the Wonderland will in a single season despoil beyond recovery these remarkable curiosities, which have required all the cunning skill of Nature thousands of years to prepare.”

The act, as passed at this time, is as follows :

ACT OF DEDICATION.

AN ACT to set apart a certain tract of land lying near the head-waters of the Yellowstone River as a public park.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the tract of land in the Territories of Montana and Wyoming lying near the head-waters of the Yellowstone River, and described as follows, to wit: Commencing at the junction of Gardiner's River with the Yellowstone River and running east to the meridian passing ten miles to the eastward of the most eastern point of Yellowstone Lake; thence south along the said meridian to the parallel of latitude passing ten miles south of the most southern point of Yellowstone Lake; thence west along said parallel to the meridian passing fifteen miles west of the most western point of Madison Lake; thence north along said meridian to the latitude of the junction of the Yellowstone and Gardiner Rivers; thence east to the place of beginning,—is hereby reserved and withdrawn from settlement, occupancy or sale under the laws of the United States, and dedicated and set apart as a public park or pleasure-ground for the benefit and enjoyment of

the people; and all persons who shall locate, settle upon or occupy the same or any part thereof, except as hereinafter provided, shall be considered trespassers and removed therefrom.

SEC. 2. That said public park shall be under the exclusive control of the Secretary of the Interior, whose duty it shall be, as soon as practicable, to make and publish such rules and regulations as he may deem necessary or proper for the care and management of the same. Such regulations shall provide for the preservation from injury or spoliation of all timber, mineral deposits, natural curiosities or wonders within said park, and their retention in their natural condition.

The Secretary may, in his discretion, grant leases for building purposes, for terms not exceeding ten years, of small parcels of ground at such places in said park as shall require the erection of buildings for the accommodation of visitors; all of the proceeds of said leases, and all other revenues that may be derived from any source connected with said park, to be expended under his direction in the management of the same and the construction of roads and bridle-paths therein. He shall provide against the wanton destruction of the fish and game found within said park, and against their capture or destruction for the purpose of merchandise or profit. He shall also cause all persons trespassing upon the same after the passage of this act to be removed therefrom, and generally shall be authorized to take all such measures as shall be necessary or proper to fully carry out the objects and purposes of this act.

Approved March 1, 1872.

So that on the 1st day of March, 1872, the Yellowstone National Park entered into existence, and it has commanded more or less attention from the public ever since.

CHAPTER II.

HOW TO REACH THE NATIONAL PARK.

TILL within a few months the National Park was a far-off place, accessible only by the venturesome and the strong-minded, and even in the summer of 1882 a long and wearisome stage- or horseback-ride of several hundred miles was necessary to reach this enchanting place. Now, however, the distance is reduced to fifty-eight miles, or a good day's hard ride from the railroad, and by the early fall of this present year one may go from St. Paul, and even Chicago, direct to the National Park in a Pullman or Wagner coach.

FROM THE EAST.

From the East the objective point is Chicago, from which place the tourist has two routes by which he may reach the Park—one *viâ* the Chicago, Milwaukee and St. Paul R. R., or the Chicago and North-western, and Chicago, St. Paul, Minneapolis, and Omaha R. R., to St. Paul, thence over the Northern Pacific R. R. direct to the Park. (For fare, see Appendix A.) Another route is *viâ* the Union Pacific and Utah Northern Railroads to Beaver Cañon, thence by stage to the Gibbon Geyser basin, in the Park, following the Madison River.

FROM THE WEST.

From the West the tourist may reach the Park by the Union Pacific and Utah Northern Railroad, as before, and also from San Francisco by the Oregon Railway and Navigation Company's boats to Portland or Tacoma, thence *viâ* the Northern Pacific

again direct to the Park—the route which every one having the time will prefer, as the combination of ocean-sailing with a ride through the magnificent scenery along the Columbia River is such that all those who can will take that route; and many Eastern travellers, after viewing the Park, will make the journey westward and return by the Union or the Central Pacific Railroad.

To-day the most practical route by which to reach the Park is *viâ* the Northern Pacific. The tourist, having consulted G. K. Barnes, Esq., at St. Paul, and procured his through- or return-ticket and secured his berth in the sleeping-car, takes the train at the Union dépôt, and is off for the National Park. A good night's ride brings him to Moorhead and Fargo.

MOORHEAD.

At Moorhead connection is made with the St. Paul, Minneapolis and Manitoba Railroad for points on this road to the south-east.

FARGO.

At Fargo "a good square" breakfast is set out, and is partaken of with relish, as the air is generally fresh enough to give one a sharp appetite.

The cities of Moorhead and Fargo are situated, the one on the east, the other on the west, bank of the great Red River of the North, emptying into Hudson Bay.

Noon brings us to Jamestown, where an excellent repast is set before the hungry tourist by Messrs. Klaus & Co. The setting sun finds us on the banks of the Missouri River (Muddy Water), at Bismark, for some years the terminus of the Northern Pacific Railroad. From Bismark one is ferried across the turbid water of the Missouri in one of those old-fashioned Mississippi river-steamers that are said to be able to go where the earth is a little damp, to Mandan, the newly-founded city on the west bank of

the river, north of Fort Abraham Lincoln. Now the trains cross on the fine iron bridge spanning the river. At Billings we left the railroad and staged it to Bozeman. The Northern Pacific R.R. has now reached this point; so that the tourist will have no staging, and it is likely that in a short time he will outfit in the Park itself.

BOZEMAN.

Bozeman is an old settlement and dates back to 1863, when this region was a howling wilderness; and it has grown to be a place of importance—in fact, is the business metropolis of Eastern Montana. It is at the eastern end of the Gallatin Valley, and up to this date every pound of merchandise that has reached this flourishing town was hauled in bull-wagons hundreds of miles; and it is a most picturesque sight to see a train of these wagons, there being eighteen to twenty oxen yoked together, drawing a train of three, and sometimes four, heavy wagons. During one day we counted seventy-five such teams crossing the plains to and from Bozeman, and the sight of wagons and oxen corralled in the street was amazing—a perfect wilderness of wagons. Bozeman is now what may be called “a solid place,” and is rapidly growing.

OUTFITTING.

To Bozeman the tourist will repair in order to outfit, which means to procure his outfit for the trip through the Park. This includes the purchase of everything he needs on the way, from a needle and thread to his cayuse (Indian pony).

The manner in which he expects to make the tour of the Park will determine the extent of the outfit he will be obliged to purchase. For instance, if he be a prospecting miner, he will buy him two cayuses and shovel, pick, blankets and “grub-stake,” consisting of flour, bacon, dried fruit, sugar, coffee, salt, tea, etc., and, with a gold-pan and a frying-pan, he is “made up,” with the exception of rifle and ammunition.

If he be not a miner, but a "tenderfooted gentleman from the States," or a "pilgrim" and not accustomed to "rustle," he will much prefer to have a guide provide all the necessaries and he will foot the bills. He buys neither his horse nor any other part of his outfit, but leaves the whole matter to the dragoon whom he may be fortunate enough to have secured. This is a convenient way to do, as it relieves from all care. But there are certain little comforts that every one wants to provide for himself—as a good heavy pair of blankets, an overcoat long enough to wrap well up in or an ulster, a rubber blanket or rubber coat. A rubber pillow from the States will be a very pleasant adjunct to the outfit. A strong suit of clothes, with a change or so of underwear, as the tourist may please, and a helmet or cork hat brought from St. Paul or the States, with a pocket-flask and a pair of convex smoked glasses or spectacles, will materially enhance the comforts of the trip. Of course you will need soap and other toilet articles, and a good field-glass will not be amiss. But let me advise the tourist of one thing—namely, to avoid a "gripsack," or valise. Put all your traps in a pair of saddle-pockets, or, if you cannot get that, secure a good strong duck sack, such as is used for grain, with a cord tied around the neck, and you will have more comfort on your trip, and less swearing on the part of the guide, than you can imagine. "We have been there," and speak by the card.

The tourist who wants to reduce his expenses will spend a day at Bozeman and buy his horses, which on his return he can sell for almost, if not quite, the price which he paid for them, either to a speculator or to some pilgrim just from the States. In fact, an entire outfit, except the grub-stake, may frequently be procured in this way from a returned party, and sold on the return, which is certainly the cheapest way of doing the Park.

GUIDES.

As to guides, there are in and around Bozeman a few men whom I have met that will conduct parties through the Park in safety and with satisfaction to the tourist. Among this number may be mentioned Jack Barronett, Samuel Jackson, Nelson Catlin and James S. Bennett. And the tourist should look well to this matter if he does not wish to spoil his trip by a surly and obstinate guide. Every year adds new names to the list of efficient guides, and it will not be a great while till they will be too plenty.

STARTING OUT.

The guide being selected and the outfit got ready, the hour for starting out arrives, and the sacks of flour, bacon and sugar and the buffalo-ropes are carried out to the appointed place and the pack-animals brought up and saddled. The pack-saddle consists of four pieces of wood secured together like a saw-buck, with two additional pieces fastened longitudinally beneath the lower arms, on which the whole structure rests on the animal's back, being protected by a few folds of blanket. The four upper arms fasten the cords holding the load, which is secured by a diamond-hitch and a sinch. The small Indian pony, or cayuse, will readily convey a load of two hundred and fifty pounds for a whole day and seem as frisky and playful after his load is removed at evening as ever before. In fact, these little "beggars" have a most effectual way of ridding themselves of a troublesome burden by a trick, peculiar to themselves, known in the vernacular as "bucking" (a name taken from the habit of the elk and the deer of putting all four feet together and stamping with all four simultaneously on the ground, with head down and tail depressed), with a succession of shocks so quickly succeeding each other that rider, pack, or whatever it may be, comes off his back. Then all is quiet, and the animal seems as gentle as a kitten. It does not make any difference where the cayuse

may happen to be when he is taken with the notion to buck; for buck he will—even on the side of a steep mountain, as we know from dire experience. We were going up the side of Mount Henderson on one occasion, and we had on “Old Pinto” a miscellaneous pack of frying-pans, flour, etc., together with a pair of elk-antlers, and just at the steepest part of the ascent the antlers turned a bit and took Old Pinto in the soft parts of his anatomy, whereupon he stopped and went through such a series of evolutions as would have puzzled an acrobat; and the result was that we were full half an hour carrying the scattered items of his pack up the hill again and readjusting them on his back. But almost any horse would have bucked under such circumstances.

With all their bucking propensities, the cayuses are very sensible little beasts, and soon become so well trained that they will carry a heavy load in perfect safety over a narrow foot-bridge or log with the top side flattened, and along the edge of a yawning chasm with more steadiness than a man can walk; and to those with unsteady heads I would say, “Trust your cayuse to carry you through, and shut your eyes if you are nervous;” it will be all right.

It is a motley crew, and a grotesque sight to see the train start out of the town with its freight, bound for the Wonderland. Indeed, it is a wonder in itself, when we consider the fact that on the backs of that band of small ponies is stowed away the endless confusion of pots, pans, bags, cans, bundles, tents, buffalo-ropes, blankets, guns, ammunition, etc., that a short time before lay, a helpless mass, in Catlin’s back yard.

Well, off they go, Catlin in the lead on his big bay, with old frosted-ear “Pinto” following hard on his heels, succeeded by “Black Jack” and the others—all in a line, with no straps to hitch them together; and finally, on the gray, rides Deam, with pipe in his mouth and his long persuader cracking about the flanks of his unwilling brute.

CHAPTER III.

FORT ELLIS.

LEAVING the pack-train, we rode on ahead, and soon reached Fort Ellis, a post which had for a long time been far out on the frontier; but now the frontier has left it and moved west, and soon will the place, with all its stir of marching troops, be among the things that were. Over the prairie-land to the west, and stretching as far as the eye could reach toward the Madison and Jefferson Rivers, were herds of Montana cattle grazing on the rich blue-joint and bunch-grass, and looking as fat and sleek as though fed in the States on the best of grain. In one place we passed a herd of six thousand head, and there was not a single lean kine to be seen anywhere. In the yard at the fort were stacks of rich meadow hay, cut from the banks of the river, and the well-filled barns gave abundant evidence of the fertility of the soil and the salubrity of the climate around Bozeman.

GOPHERS.

One unaccustomed to riding on a prairie will, unless he has a well-trained steed, be in constant danger of being thrown headlong by his horse stumbling into a gopher's burrow, of which there are hundreds all along the road. The gopher himself is a harmless little fellow, of the family Rodentia, and, like his congeners the squirrels, is very nimble and quick when frightened, but so unsuspecting that a horseman may ride by his burrow while he basks in the sun without the least concern; but let a dog come along, and he whisks his tail and is out of sight in an instant. The Indians

esteem gophers very fine eating, and, with a noose spread about the mouth of the burrow, the animals are easily caught by a quick jerk of the cord when they are in a right position for it.

PRAIRIE-DOGS.

Somewhat more peculiar in its habits and associations than the gopher is the prairie-dog, of which the tourist will have seen hundreds ere his journey is completed. He is a little animal, about the size of a muskrat, but never goes into the water. He digs deep burrows in the ground, and will drop into them as quick as a flash when frightened. As you ride along you will see the little fellows sitting up on their haunches on the mounds around each burrow or lying secreted just inside the mouth, making a chirping little bark all the time; and at each bark the little tail is frisked about as if it was the safety-valve which let off the steam. These little fellows sit so still and steady as one rides along that the tourist is tempted to make a mark of them, and he tries his hand at a shot from his pistol or rifle, and always misses him. The instant the shot is fired the little fellow, with a whisk of his tail, drops into the burrow and is safe. I have never seen one shot except by an old Crow Indian, who fired into the ground below the prairie-dog, and as he dropped into his burrow the bullet struck him; and the success was obtained only after repeated failures on the part of the red man.

ROCK CAÑON.

Leaving Fort Ellis on the north, the road led into Rock Cañon, along the banks of a branch of the Gallatin River. On either side of the way rises to the height of several hundred feet cliffs of a compact limestone, leaving a cañon of several hundred yards in width between them. At the foot of the cliff the disintegrated limestone has produced a soil on which

the most luxuriant growth of clover, timothy and other nutritious grasses furnishes excellent pasture for the lowing herds of cattle that graze in the valley. Passing through a short gorge in the mountains, the valley divides and is broken by small rounded hills; while on the sides of the mountains beyond rugged cliffs jut out and hang with threatening aspect over the valley below.

COAL-MINES.

Above the limestone, geologically considered, we find the coal-beds of this locality. Coal in this region of country is very scarce, and after leaving the Ohio beds we discover nothing except hard lignite till we reach the Bozeman beds. Here we find a limited basin of good bituminous coal, five feet in thickness and with good coking and steam-making qualities. The Northern Pacific Coal Company is mining this coal and selling it along the line of the road, with the best possible prospects of a very lucrative business. Two or three other parties have opened mines of coal in this region, and are entirely satisfied with the result.

Leaving the mines to the left, we rode on to the divide between the Yellowstone and Gallatin Rivers over a rolling upland country, and pitched our tents on the Yellowstone side, after a ride of six hours, at the Mountain House.

MOUNTAIN HOUSE.

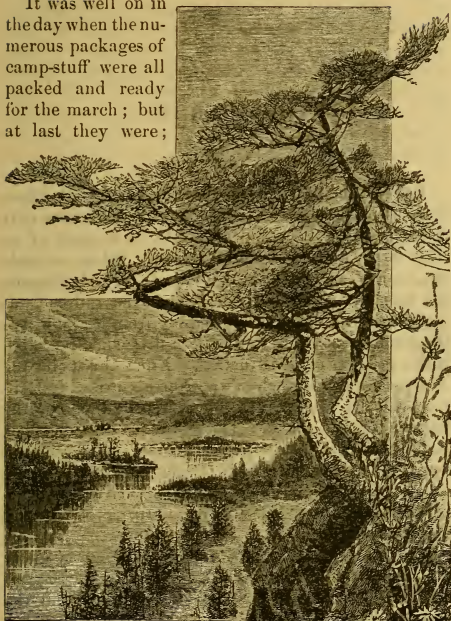
At the Mountain House we made our first camp. The party was small and just fixed for a very enjoyable tour. We were prepared to "rough it," and expected to have a chance. Still, before bidding adieu to all connection with civilized society, we procured what comforts the Mountain House afforded in the way of fresh meat and good milk; so, while Catlin was unpacking the fourteen animals—which he turned loose to fill themselves with the grass that grew knee-

deep around them—and Deam got out the parfleishes and spread out the cloth for supper, we started off to interview “John Chinaman” at the hotel and get some milk and beef. We found “John” good-humored and talking good English; and, promising to return in the morning for more provisions, we sauntered back to camp. In our absence the boys had “rustled up a fire” and spread out the tent, while the “Deacon” had tried his luck with the rod and got some fish from the stream.

The ride had been somewhat dusty; so the next care was to take a bath in the cold snow-fed stream that flowed by our camp. Much refreshed and not a little chilly, we sat ourselves around the fire, with forked sticks broiling our respective chunks of beef, to the no slight discomfiture of Deam, who was endeavoring to get the tea and coffee made and bake his batch of bread. Well, by and by we were summoned to supper by the soul-stirring cry “Grub-pile!”

Soon, however, a feeling of satiety began to creep over each one, and before long the board was deserted for the fireside and the pipe, or to rustle up a bed. First a rubber blanket was spread down on the floor of the tent; then Old Jim (the name marked on a pet buffalo-robe) was spread on top, hair side up; over this, next, a blanket doubled; then another blanket; on top of this John (another robe), with one or two more blankets, and our overcoats covering all. (It was the 18th of August.) The moon was well up in the heavens, and, being tired, the fire was deserted and we concluded to “turn in;” so, inflating our air-pillows and putting on our boots and sack of cloths, pulling on our moccasins and taking up another hole in the buckle of our ulster strap, we rolled in between the blankets and buffalo-ropes. Soon the murmur of the stream lulled us to sleep, and we knew nothing till it was broad day, though the prairie-wolves had howled about us all night.

It was well on in the day when the numerous packages of camp-stuff were all packed and ready for the march; but at last they were;



YELLOWSTONE RIVER,
NEAR LIVINGSTON.

and, being again in the saddle—not a little stiff from the ride of the day before—we jogged along, leaving the pack to join us at Fridley's Ranche.



CHAPTER IV.

LIVINGSTON.

BEFORE the tourist from the East reaches Bozeman he must needs stop at Livingston, a thriving town only a few months old, yet destined to be a place of no little importance in the near future. When we made the tour of the Park, in the fall of 1882, Livingston did not exist except in name. Then the railroad was more than two hundred miles away from it; now it is the terminal point of the Eastern division. So rapid is the progress of construction. From this point the National Park Branch of the Northern Pacific Railroad will be constructed this season in time for the tourists to the Park. The railroad company has made extensive improvements at this point, and upward of twelve hundred people are now on the ground, busy in building permanent structures. A paper is daily published, and enterprise is stamped on everything.

It is truly amazing how rapidly the country along the line of the railroad is settling up. Soon the two oceans will be joined by another iron band, and the produce of the Indies will reach the Eastern market over another and a more direct route.

But we digress; let us return to the subject. From Livingston along the west bank of the river is a good mountain-road leading to the National Park through the Gate of the Mountain.

THE GATE OF THE MOUNTAIN.

About fifteen miles up the river from Livingston we came to the first cañon of the Yellowstone River. On

either side of the river are rugged mountain-sides rising many hundreds of feet from the water-edge. The gorge is narrow, and as it is approached from the north a most splendid view is obtained of the valley beyond. Opening in the near vista is a broad, level plain with here and there a high boulder standing just where the glacier that has worn it round has left it, alone, with few of its kind anywhere in the region to condole with it; and doubtless it will there remain for ages to come.

The Gate of the Mountain, as it is called, is the result of the cutting away of the igneous rocks forming the mountains of either side. Away back in geological eras the river had a bed high up on the sides of the mountain, and doubtless was a stream issuing forth from the foot of a gigantic field of ice covering the upper region of Yellowstone Valley. The constant wear and tear of the ice and the water has cut away the mountains; the glaciers have melted down, and now the terraced valley of the Yellowstone River is the result. What has caused these results we are at a loss to discover; yet we know that the earth is growing warmer, that a larger area is now reclaimed from the domain of the Ice-king than was formerly the case. Those seas of ice that swept over the Mississippi Valley have gone; the days when the elk and the moose lived in Northern Germany amid the snow and ice are no more; yet at every hand we see the traces of their former presence.

UPPER YELLOWSTONE VALLEY.

Passing through the first cañon, as we will call the Gate of the Mountain, we enter the valley beyond, and we are at once convinced of the fact that we are in a volcanic region from the difference of the soil and other surroundings.

Immediately the valley widens out into a terraced plain probably six to ten miles in width. From the foot of the mountain the slope is more abrupt; then

it gradually tapers, till an almost level plain is the result, composed, for the most part, of decomposed lava or breccia, upon which the prehistoric river has deposited alluvium, and now a crop of nutritious though short grass covers the entire plain with a green mantle, somewhat ashen toward the end of summer, but bright enough in the early spring. Since forming the first terrace the river has cut out for itself a new channel, and left a second terrace of from ten to twenty feet in height. The lower terrace is much the most productive, and it is on this that the best ranches have been located.

The tourist must not expect to find in these volcanic regions of our globe the richness of fertility he would look for in the great limestone valley east of the Alleghany Mountains. No; the country is, as a rule, more sterile in this upper region, but still productive, and excellent crops of a certain kind are annually raised, some with, others without, irrigation.

Almost all the way down Trail Creek from the Mountain House we find good land, but on the Yellowstone plateau it is poorer.

FRIDLEY'S RANCHE.

The appointed place of halt for the second day out was Fridley's Ranche; and while the pack was coming up we took a turn about this typical Yellowstone farm. And it is a place where the tourist will always find good cheer and hospitable entertainment. The proprietor of this establishment is what is technically called "a rustler." To some of our readers this term may sound a little harsh, but it means a man who has energy and pluck and has fought his way to success and prosperity through the difficulties that beset him. In fact, none but a rustler, as thus described, could live in this climate.

Mr. Fridley has always sustained a reputation for setting out a good table for his guest, and we can from repeated trials and accumulated evidence render a ver-

dict in confirmation of this statement. The principal business of this worthy man is stock-raising and the gathering of hay, of which his rich meadows yield him a magnificent crop; while his cattle are sleek, round and fat, like the rest of the Montana herds.

CURLEW.

We had ridden hard, and reached our camping-ground long before the slow pack-train came up; and, turning our horses loose, we took the gun to hunt some fresh meat for supper. Stalking over the plain, our attention was attracted by a peculiar whistling noise of a low tone, and protracted like the sound of the wind among the telegraph-wires in our cities; and, stopping to investigate, we found it came from a flock of curlew—a bird of the plover family, with a long curved bill of perhaps six inches, very narrow and fine, and this, cutting the air, gave rise to the sound. The birds are of the size of a large partridge or quail, and, as we had sampled them on a previous occasion and found them excellent eating, wished some for supper. Soon they alighted by the side of a little slough, and while they stalked about hunting the evening meal we crept up over cactus and prickly pear to get a shot. There were twenty or thirty in the flock; and it may not be out of place to state here that at this time of year (August) these birds congregate in large flocks. When within convenient distance, we opened fire with both barrels, and the result was a nice lot of tender birds to be fried that evening by our good friend Deam.

Birds of almost every variety are at some season or other found in the Park or along the rivers. We came across quantities of snipe, etc., and could generally supply ourselves in this way if the coarser meat gave out.

EMIGRANT GULCH.

While the party are spending the leisure-hours around the camp-fire, we will cross the river and take

a look at Emigrant Gulch. From the river south-eastward the plain is broken into small foot-hills, rising higher till we reach the mountain, in which is the Gulch. As Hayden says, it probably started in a fissure, but is the result of erosion, since it is very narrow and excessively deep, being in length about three miles by as many hundred yards in width. At the mouth of the Gulch is the town of Chico, or Emigrant, the first being the post-office, the second the local name. Here placer-mines have been worked for a number of years, even before the Crow Indians relinquished their claim to that territory. The results of the operations have been various: at one time it was a good-paying region, and in some places it is still. The lower level has been, however, pretty fully worked out, and now the miner is pushing his way up to the higher, in hope of finding gold in paying quantities.

Following the trail along the steep sides of the mountain, we ascend to a higher level with remarkable rapidity, and soon reach a region of great interest to the artist. On the one hand, Emigrant Creek dashes along in its rocky bed, plunging over boulders, hurling smaller stones against each other with great fury in the struggle to get to the river. Before you is a cataract several hundred feet in height, in which the fast-descending snow-water is broken into spray as soon as it leaps over the verge, and in showers falls with a mighty roar to the bottom of the abyss. Here, gathering up its energy, it mines out a basin in the solid rock, and, as if angry at the precipitous tumble, rushes vigorously on, cutting away the hard granite and lavatic rocks in its course, while the rocking pine and spruce trees bend their moaning branches to the tempest caused by the rushing water. On the other side rises the bald gray mountain-side. It is a wild spot.

Crossing the stream, we climb higher and higher, over the crest of the falls, and still up over glaciers and snow-drifts, till we reach the upper level, which is rather more barren. Here the industrious miner has claimed the

use of the boisterous mountain-torrent, confining it within a narrow sluice, and, with it washes the disintegrated granite and gneiss to rob it of its glittering gold. Far up into the blue sky reaches the summit of Emigrant Peak, twelve thousand feet above the sea-level, bald and cold, covered with snow, which at times slides down the mountain-side, grinding rocks to powder in its course. There is the abode of the mountain-sheep, and, with the glass, they may be seen feeding on the scanty growth of lichens and moss clinging to the rocks, climbing in Indian file over the sharp stones with a steady tread, and over heights where but a single misstep would hurl them into the roaring cañon below. It is truly an Alpine picture.

BEAR GULCH AND MILL CREEK.

Bear Gulch is a similar crevass in the mountain-side, cut out by the ice and frosts of bygone ages, leaving a field for the gold-miner, while Mill Creek gives him a fine opportunity to display his ingenuity in working the base metal ores for silver and lead.



CHAPTER V.

CINNABAR MOUNTAIN.

HAVING returned to camp, we are called to supper, and with relish the slices of dripping bacon are demolished and the biscuits, hot from the pan, disappear; and, free from any dread of consequent dyspeptic attacks, we lie down to rest.

At dawn the crackling of the fire arouses the slumberer and announces that day is at hand. Soon all is astir, the animals packed, and we are pushing on to Cinnabar Mountain, which is on the west side of the river, where the strata of rocks have been upheaved to such an extent that they stand almost vertical and look like immense stone walls built to protect the mountain from an attack. It is called Cinnabar Mountain from the fact that some of the strata have a red color, which was supposed to be due to the presence of cinnabar; but there is really no mercury in this mountain at all, the red color being due to the iron. Yet, notwithstanding this misnomer, it is a very curious place, and well deserves our attention.

There are a number of these strata superimposed one upon the other, all nearly vertical and parallel, composed of alternate layers of hard felspathic rock, with granite, limestone and clay, giving to the whole mountain a most peculiar appearance. Toward the southern end of this series is what is known as the

THE DEVIL'S SLIDE.

The Devil's Slide attracts the eye at once, and is a very conspicuous object in the landscape. A bed of

quartzite forms one of the walls, which is nearly vertical and rises over a hundred feet above the adjacent strata. An interval of about one hundred and fifty feet reaches to the south wall, having a clayey soil mixed with gypsum and supporting a few scattered pines. The south wall, or dike, is very compact trachyte, standing nearly vertical, eighty feet in thickness, and at some points two hundred feet high. Prof. Hayden says: "It is probable that this igneous mass was thrust up between the strata since they were elevated to their present position." If so, the power that has lifted this tremendous rock-mass and thrust it up between the superimposed strata cannot be conceived even with our most exalted imagination: in the calculation there is an immensity that baffles the mind.

From a distance the slide looks like the coasting-places made by boys on a hillside, as it gradually slopes from the summit toward the base of the mountain and there expands out over the plain.

SECOND CAÑON.

South of Cinnabar Mountain, still travelling up the river, we come upon a plain—in fact, a continuation of the former one, but its character, geologically speaking, is changed. Here we enter upon a truly volcanic region. The bed of the plain is composed of volcanic sand and gravel, with here and there a slough of stagnant water left by the melting snows of last season.

Soon the walls of rock between which we have been travelling draw nearer together and hem us in as with gigantic arms, leaving only a very narrow cañon between them. On the left, or west, bank of the river, a road has been made, cut out of the cliffs which stand up on both sides of the river with defiant aspect. The road is good for its kind and the region of country, but the manner in which it approaches the precipice above the river and the ruggedness of the way make it dangerous save for the traveller on a sure-footed

cayuse. On the east bank of the river there is no way except by a very rough trail that winds its course in among the jutting crags, which often approach the



SECOND CAÑON.

river so closely that the animals with their packs scrape against the rocks as they pick their way like goats from one stone to another. Beneath them the

foaming river plunges along in its deep and narrow bed. This manner of travelling is very tedious, and the dangerous roughness of the path generally compels the traveller to dismount and lead his animal.

The river, from this point up to the falls in the Grand Cañon, is of a most brilliant emerald-green color, and the effect produced by the caps of white foam that mark sunken rocks or curl in eddies from the sides of the cliff as the stream dashes against it is most pleasing to the lover of the picturesque, while the cool, deep eddying pools furnish matter of interest to the angler, whose flitting fly here seldom fails to tempt many fine large trout. But the angler, in climbing among these rocks, will need to keep a sharp lookout for snakes, of which the cañon, on the east side, is said to be full; yet we saw but one, and that a very small specimen of rattling variety. Still, it is as well to be cautious in that region. At night we halted at

YANKEE JIM'S.

“Yankee Jim's” is the toll-gate, and the only one on the road—the only obstacle to a free and untrammelled visit to the Park; and, as the toll is only “two bits” (fifty cents) per head for horses and pack-animals, the tourist does not complain, so long as the road is good. This is the only extortion practised in the Park or its neighborhood, excepting, of course, the toll at bridges and ferries, which in every case is “two bits,” the fip-penny bit (twenty-five cents) being the monetary standard in that vicinity.

The country, apart from its geologic interest, is somewhat monotonous and tiresome; so that when the traveller reaches Yankee Jim's he is glad to dismount and spread his blanket on the sand beneath the willows and cottonwoods after his bath in the cool river, and snooze for an hour or so in the shade, or watch the stately crane as he stalks up and down the little island in the river seeking his prey.

While we lay at Yankee Jim's the party amused

themselves in a variety of ways. Some of them wandered up on the mountain-side with their guns on their shoulders, and ere nightfall returned with a plentiful supply of "narrow-gauge mules" (jack-rabbits), elk-antlers, etc., trophies of the hunt. Others, after scrambling about the short grass for "hoppers," consuming more time by far in procuring the bait than is required to catch a large mess of those Yellowstone trout, struck off for the river, crossed by the ferry, and were soon engaged in angling among the eddies of that emerald stream.

So agreeable was the sport that it was late in the evening, supper was over, and the shades of night were settling down, when, lo! above the raging of the torrent a voice was heard in earnest accents calling, "Over!" They were over, that is a fact—over on the other side of the river, with a swift current and no means of crossing save by a cranky little boat. Still the loud call was repeated, and one after the other of the party on the near side was appealed to to brave the torrent and "rescue the perishing," but to no avail. At length the ferryman was solicited, and with impatient and commanding voice called out, "Go round." We will not chronicle what the murmuring breeze wafted back from the farther shore. Still, the fish were eaten with a relish, for they were fine ones, and we have a fondness for good trout.

On up the river we travelled, and now our course lay over a more broken country with a road-bed studded here and there with bits of agate, obsidian and jasper, some of them beautifully annulated, some deep blood-red in color, while others were bright yellow. Where the fragments came from is not very clear, since there is no evidence of larger masses in the neighboring hills, except of the moss-agate, which is in some places abundant, sticking in the igneous rocks along the roadside.

GARDINER RIVER AND McCARTNEY'S RANCH.

All along the Yellowstone River, up to the mouth of Gardiner River, on the west side, ranches are to be met with. Not that there are none on the east, for the fact is that there are; but the road on the west side furnishes a means of transportation, and that stimulates settlement. It is a matter of astonishment how rich the grass and the verdure in those spots are where the mountain-streams, descending to the river, flow over the expanded plain; and when the industrious farmer has dug his trench and irrigated his fields, the result is wonderful. Large crops of wheat and other grains and hay have been raised, and much more can be done in this line. The reason that irrigation has not been more extensively practised is found in the want of transportation for the surplus crop.

The last ranch before entering the National Park is that of McCartney, mentioned on a previous page. This ranch is not far from the confluence of the Yellowstone and the Gardiner Rivers, and has for some years been a point where the miner and the prospector repair from the mines of Clarke's Fork to procure his "grub-stakes" and forward his order for supplies to Bozeman through the mail or by Arnold's freight-line. Soon the march of civilization will do away with these primitive means of transportation. In fact, even now the shrill whistle of the locomotive is heard in the cañons of the Yellowstone, and McCartney's will before long become a place of magnificent proportions.

CHAPTER VI.

MAMMOTH HOT SPRINGS, OR WHITE MOUNTAIN HOT SPRINGS.

LEAVING McCartney's ranch and crossing a small stream by a log bridge spanning a deep ravine, we are in the Yellowstone National Park, and here we enter upon the contemplation of the pith of our narrative, that which has gone before being in a measure introductory.

Winding along the hillside by a fairly graded road, always ascending, we come to ponds lying in a bed of soft alkaline clay with margins covered with rank rushes and weeds, and frequented by numerous snipe and other water-fowl excellent for the table. Going into camp by the side of a fine stream of clear, pure water, we waited for day, while our animals roamed over the grassy slopes of the neighboring hill, luxuriating in the rich herbage. Just here we must mention one matter that may annoy the fastidious traveller in this particular spot—namely, the dust. The tramp of animals and the frequent visits of travellers to this locality have killed the grass, and hence more dust is met with than is pleasant.

As old Sol was climbing the eastern sky we gathered about the camp-table (after breaking the ice in the stream to make our toilet), and after a hearty breakfast started to "do" the Mammoth Hot Springs. Winding down from the hills, we came out upon the valley of the hot springs. The calcareous deposits of these springs cover an area of about two square miles, and the active springs extend from the

margin of the Gardiner River, the altitude of which is five thousand five hundred and forty-five feet above sea-level, rising higher and higher as we ascend the

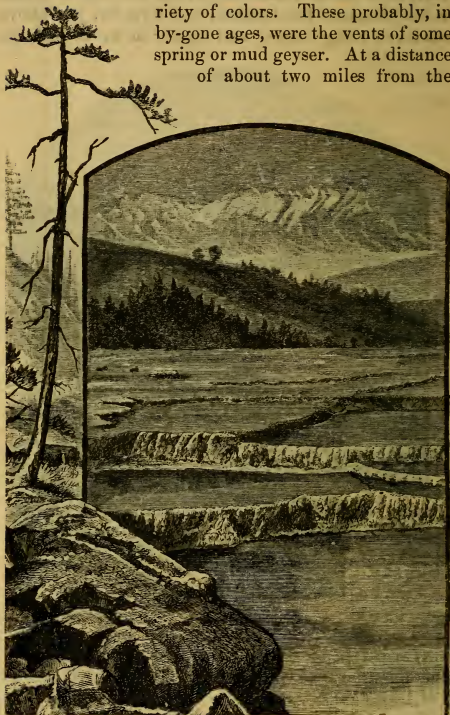


ravine for nearly one thousand feet, the upper bank (according to Hayden) being six thousand five hundred and twenty-two feet in height.

MAMMOTH HOT SPRINGS.

From the river up the ravine the material covering the surface of the ground looks like the refuse about an old disused furnace, and one or two depressions are met with filled with water and decomposed rock, forming a thick deposit of semi-solid clay to the depth of

several inches, and tinted with a variety of colors. These probably, in by-gone ages, were the vents of some spring or mud geyser. At a distance of about two miles from the



HOT SPRINGS.

river are some hot springs to which persons suffering with cutaneous diseases resort; those who have tested their merits are loud in their praises of the beneficial

MAP OF
GEYSER BASIN
YELLOWSTONE RIVER.

Scale of feet.
0 1000 2000



MAP OF
UPPER GEYSER BASIN

FIRE HOLE RIVER.

N



Scale of feet.
0 300 600 1200 2400



effect produced by these waters. "The basins of these springs are nearly circular, six to ten feet in diameter, with a temperature of from 100° to 200° F."

Some distance farther on over the same calcareous white deposit we come to the main body of springs, clustered together on a hill upward of two hundred feet high, whose sides are laid off in terraces composed of the calcareous deposit from the springs themselves. The number of springs is not very great, but the beauty is surpassing and almost beyond description; yet we cannot pass them unnoticed.

The uppermost spring has a temperature (according to Hayden) of 112° F., and is at the height of six thousand five hundred and twenty-two feet above tide. The lowest is at the river-banks, with a temperature of 145° F. and an altitude of five thousand five hundred and forty-five feet, or over a mile above the sea. The hottest spring is at the altitude of six thousand two hundred and fifty-four feet, and has a temperature of 163° F.

Most of the hot springs throughout the Park build up about their mouths bowls or craters of a white calcareous and siliceous material, called geyserite, which is composed of carbonate of lime, chloride of calcium, carbonate of magnesia, carbonate of strontia, carbonate of soda, carbonate of potassa, sulphate of magnesia, sulphur and silica. In New Zealand the hot springs deposit a material which contains more silica than is found in the geyserite of the National Park.

In the case of the Mammoth Hot Springs, the entire spring-formation lies in a ravine or gulch between hills which are fertile and covered with grass and sturdy pines. The general shape is like a wedge, the smaller end being toward the summit of the ravine, while the base spreads out over the plain below.

The springs, as before stated, are located on different benches or terraces, and have at different periods of their existence changed their respective positions, as on the same level there may be an active spring in the midst of a cluster of remains of extinct

ones, and whether they were ever connected with the present active ones no one can tell.

On the upper bench is a single spring, with at present a meagre overflow; yet in days gone by other and larger springs discharged their waters on the same terrace, for there are the yawning craters and the scalloped margins of the basins, with occasionally a stream of hot sulphurous steam issuing forth from the crater and studding the mouth and throat of the crater with fine needle-shaped crystals of sulphur. On a lower bench is a collection of springs—as the Blue Spring, the Main Spring, etc.—on a terrace of from one hundred and forty to one hundred and fifty yards in diameter.

The appearance of the Blue Spring is certainly beyond the reach of words to describe, and you stand upon the spongy white margin and look into the seething, steaming water—down, down into the azure depths, lost in contemplation as to where it all comes from and what causes it. The water is intensely hot and of an ultramarine blue color; the sides of the well are of a paler tint, and are fringed with long white filaments of gelatinous matter that vibrate up and down with the force of the ever-rising current, drawing themselves out in trailing fringes at the margin of the crater and along the little watercourses flowing toward the margin of the basin. Here and there the beds of these little streams are bright with the golden yellow of deposited sulphur. The surcharged water, while hot, carries its calcareous burden for some time; but as it gradually cools the deposit of a delicate wall of lime, silica and other matters takes place, forming a barrier with a most exquisitely scalloped margin, just as slowly-freezing water from a spring will build its ice-terraces one upon the other, except that the little pools in the case of the springs remain fluid, and are either hot or warm according to circumstances. Gradually these walls thicken, and by the accumulations of ages what may be called a mound of springs has formed, over the sides of which

the water, ever flowing, still adds more deposits to the surface, till the result produces a most remarkable effect of stalactite, stalagmite, fringe, and scallop, with a combination of color which is absolutely unique. Here the sides will be of a spotless white, sparkling with the trickling water; there, of a red or yellow color, from the deposit of iron or other mineral matter; in other places, a bright rich green, from the growth of a minute plant. At places you will meet patches of a deeper brown color, and the whole effect is wonderful. A not less curious phenomenon is the rapidity with which the deposit is formed, for a horseshoe, a piece of tin or a twig of a tree, a pine-cone or other object, placed in such a position that the water trickles over it, will in ten days have on it a coating of the white matter one-eighth of an inch in thickness, and even the string that suspends the object will have become a solid rod twice its original thickness; but it is fragile, and cannot be preserved.

Near the upper terrace are a number of extinct oblong geyser-cones, some of which have been so broken down as to show them to be a mere shell or cavern, which in some cases have become the abodes of wild animals. One of them was found to contain sticks and bones, carried there by animals, and swarms of bats flitted to and fro. In places the crust is broken, showing great numbers of layers of sediment, and some of the mounds are overgrown with trees at least one hundred years old. In many places the remains of trees stand embedded in the crust of a basin or pool, or are buried to a depth of eight or ten feet.

It is a well-observed fact that the force of these springs is diminishing, and each year marks a decrease in the flow; whether they will in time become entirely extinct or break forth in another place is a problem yet unsettled. There is unmistakable evidence that the forces at work here were formerly more violent than they are at present, since we find on the lower terrace the remains of geysers and thermal springs now extinct.

LIBERTY CAP.

One of these former springs is the Liberty Cap. Standing on the spongy, hollow-sounding crust is a conical mound of this same white deposit, rising to the height of fifty feet, with a base twenty feet in diameter, and from its form called "Liberty Cap." It is undoubtedly the remains of a geyser, and has piled itself up here by the successive deposits of geyserite in layers one upon the other in infinite numbers. The upper layers are more or less striated, resembling the thatching of a roof, and the whole is perforated by a tube, through which the water was ejected. The same cone-forming action is now going on at the Beehive and other active geysers in the Upper Basin. It is said that a fine large spring made its first appearance in the main terrace in August, 1870; so they come and go.

The theory of the origin of these springs, as given by Professor Hayden and others, is that the water, finding its way down into the earth to a great depth and becoming greatly heated, is forced up through the superimposed strata, finding its way through the deposits of limestone and other rocks, dissolving and carrying with it silica and other ingredients of the rocks, and finally emerging upon the surface and depositing the salts as geyserite. Yet still the matter is not satisfactorily explained, for we find two kinds of springs—one in which the siliceous matters predominate, in the other the calcareous—both coming out upon the same level, and often near each other. Again, one spring will have a high temperature, while its neighbor, on the same plane, not over a few yards distant, will be much cooler. It may be argued that they come from different depths, and hence the difference in temperature. True; but how does it happen that in coming up from the lower regions they did not strike the same fissures in the rocks, seeing they are so near together on the surface? As in the case of many other natural phenomena, we must accept the

fact and await future developments for the solution of the problem. By experiments, it is found that certain springs deposit geyserite on the sides of the basin and on objects placed in it at the rate of one-eighth of an inch in ten days under favorable circumstances; yet it must not be inferred that this is the invariable rule.

We might fill volumes with the descriptions of this wonder; but, with the knowledge that there are other wonders to be seen, we pass on.

HOT BATHS.

We cannot leave this subject without mentioning the hot baths. All over the crusts of the different terraces are, as has been mentioned, small basins containing water of almost any temperature desired; but bathing in these pools cannot be accomplished with comfort, since the pools are almost always too shallow to admit of it. Yet bath-houses have been constructed, where a most delightful bath may be had, the hot mineral water acting on the system very happily, and leaving the bather in a splendid glow, with all his pores open and his skin clean and cool. It is a feature of these springs that the water is soft and will admit of the use of soap in washing, and that it is also, when cold, good as a beverage—healthful, though not always pleasant to the taste. The bath is capable of regulation as to temperature, but generally the first impression is that of a degree of heat that can hardly be endured. Still, it is not long before the temperature becomes pleasant, and the bath generally lasts an hour or so.

Analysis shows the solid mineral constituents of these waters to be carbonate of calcium, chloride of calcium, sulphate of magnesia, silica, sulphur and a trace of iron—a composition which appears to be useful in a wide range of diseases.

In all the pools and basins of these wonderful hot-springs formations there will be found round pebbly

masses of geyserite of a greater or less size, from that of a pea to that of a large walnut, with something of the appearance of a cauliflower, but rounded from the rolling of the mass against the sides and rim of the basins. They are undoubtedly the accretions obtained from the saturated water as it becomes cooled in its contact with the sides of the basin. In some places they cover the ground to the depth of several inches and crunch beneath the foot of a person walking over them.

HOSPITALITY OF MR. HENDERSON AND HIS FAMILY.

The day being far spent, we climbed up the rounded hill on which stands the headquarters building to register our names, and found the superintendent away from home, but Assistant Superintendent Henderson was present, and showed himself very hospitable; and from him and his family we learned many interesting facts relating to the Park.

In front of the veranda of the headquarters is a hitching-post, and it was affirmed that during the winter of 1881-82 elks (not the moose or true elk, but the wapiti) came up to that post and were shot, and that on the hot-springs formation elks are very plentiful in winter. This story seems surprising, but there is abundant evidence to substantiate it.

At nightfall our host insisted that we come out and look at the springs through the glass as they were lit up by the setting sun, and we beheld a magnificent sight, and one that no tourist should fail to see, since it costs nothing but a climb to the top of the hill—only eighty-four feet, and the climb is not a hard one to make.

Returning to the house—for by this time the sun had set—our warm-hearted friends insisted that we should take tea with them, and, even though our coats had been left in camp and our *tout ensemble* was tramp-like in the extreme, they prevailed upon us;

and it was late in the evening and the moon near the zenith when we reached camp.

HOT SPRING IN GARDINER RIVER.

While sitting about the stove—for it was cold—Mr. Henderson told us of a curious freak of nature in the Gardiner River. At one place in the middle of the river is the crater of one of these hot springs, from which the hot water is constantly issuing; and its influence on the stream is such that in the river there is a hot current of water running between two cold ones, and for a long distance these currents do not mingle, but remain separate. This middle stream is so hot that you can stand on the bank of the river, catch a trout, throw him into the middle of the stream with your line, and in a few minutes cook him. The experiment is one easily made, and the traveller can easily verify or disprove the statement for himself. This peculiarity is not confined to this one spot, however, as we shall see farther on.

CHAPTER VII.

SWAN LAKE AND MORASSES.

HAVING put some horseshoes under the trickling water to get them coated with geyserite, we took the road up the north-eastern side of the springs-formation, over the hollow crust, that sounded deep and sepulchral, as if it might at any moment give way and engulf the whole party.

LONE STAR GEYSER—"THE ORANGE."

Higher and higher we climbed, now on the upper terrace, now in the pines, again emerging on to a still higher "springs-formation," where to the left of the road stands the crater of the Lone Star Geyser, a huge mass of geyserite with a globular shape, having on its sides ridges and markings of yellow and buff, resembling an orange; hence the name. It is called the "Lone Star" from its solitary situation. The times of eruption are uncertain; now it is little more than a spring with an elevated crater.

Soon the road begins to climb at a grade that for a wagon-road is truly surprising. We do not think the grade has ever been measured, but others have said of it: "Leaving the Mammoth Springs, the tourist begins the ascent of Terrace Mountain, over the excellently graded but wonderfully steep wagon-road. . . . With a loaded wagon and four horses, this three miles of road is a fair half day's work. It is not one continuous grade or hill, but a succession of hills," to the height of three thousand feet. This may not have been intended for sarcasm, but it certainly looks very

like it. In fact, there is much truth in the assertion; for so steep is the climb that if the tail-board of a wagon falls out, as it may do, the whole load is promptly dumped out in the road. A good road, though a longer one, might have been built over the same ground.

RUSTIC FALLS.

On reaching the summit of this grade the country opens out into a beautiful meadow, and after traveling for about a mile and a half, a trail to the left, for about one half mile farther, brings the traveller to the Rustic Falls, at the head of the cañon of the "West Gardiner River." The falls are described as follows: "The water falls here sixty feet over a large slightly-curved rock of this height. The surface of the rock is wrought into shallow basins of saucer-like shape on the surface, and the descending sheet of water is broken into such form that it presents a rustic appearance. The falls are five miles from the Mammoth Hot Springs."

The upland meadow through which the road takes its course from the summit of Terrace Hill, which we have just climbed, is beautifully rolling and covered with rich herbage, with here and there a clump of pines nodding to the passing breeze; while ever and anon the bleached skull and horns of a buffalo are found by the wayside. On the east Bunsen Peak, a rugged mountain-summit, rears itself up to a height of eight thousand seven hundred and seventy-five feet, with its bald sides cut and furrowed with many a deep gash. To the west on the distant horizon rises the pyramidal summit of "Quadrangle Mountain," towering up to ten thousand and twelve feet. The name is given it from its square shape, being built up on four sides like a pyramid, which it very much resembles, the horizontal strata of rock having the appearance of so many courses of stone laid in regular order.

CASTLE ROCK.

At the foot of "Quadrangle Mountain," to the southward, is Castle Rock, a pile of igneous rock so cut and worn away by the elements that it now looks like one of the ruined castles of the Rhine, or like some dilapidated old fortress in England.

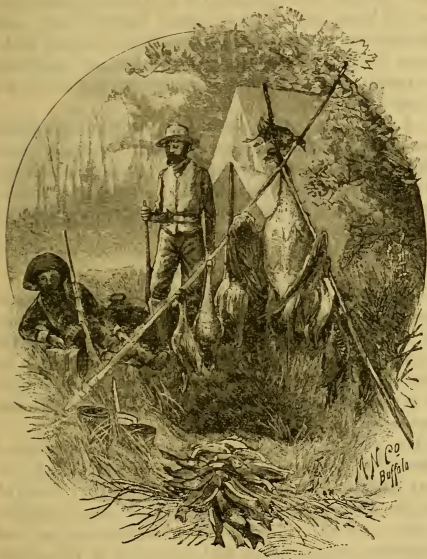
The sides of Quadrangle Mountain are most gorgeous in their tints, and from the valley the view is most pleasing, with a green carpet in the foreground and a cluster of dark pine trees with their branches to relieve the monotony. The distant mountain with its banded sides of pink, yellow, gray and black in horizontal layers, a capping of snow, and above all the clear blue azure sky, make a picture that is not easily forgotten.

SWAN LAKE, OR ANNIE'S LAKE.

To the west of the road, in the grassy meadow through which we have been travelling, is a small lake, perhaps half a mile in length by a few hundred yards in width, which we were informed was once covered with ducks and swans; hence the name. (It has been called Annie's Lake by some authorities; and the multiplicity of synonyms that have been given to many of the points of interest within the Park render it difficult for any one to guide the tourist, but we have in this work adopted the nomenclature of Professor Hayden, and, so far as possible, give that of others also.) The margin of the lake, on the east side, is low and grassy, and the surface of the water is rendered unapproachable for some yards by the bogs, or morasses, and reeds growing at the edge, except at one point, which is covered with sage-bush and willows. The west bank is steep and rocky, and not easy of approach.

We needed some fresh meat, and determined, if possible, to have some duck; so we rode to the edge of the lake and scanned the margin. The wind was toward us, and the ducks were on the other side of the lake, on the lee-shore. We started after them, follow-

ing around the edge of the lake, our horses sinking into the oozy earth at every step. We finally dismounted and crept on, and on reaching a little clump of willows came upon a fine flock of mallard duck



A DAY'S SPORTING.

and blue-wing teal. We emptied both barrels, scattering the flock in all directions. Leaving the dead ducks to drift to the eastern shore, we mounted to go in quest of the survivors, that had flown to a smaller lake to the southward. Following an old game-trail, we were suddenly brought to a stand by the founder-

ing of the horse, who had sunk up to his belly in a bog, from which it was some time before we could extricate him. His plunging had thrown the rider and gun off into the mud, filling the latter up to the muzzle. By dint of tugging at the bridle we got the horse on his back, and he then kicked himself on to solid ground and regained his feet. Remembering that a mule had been lost entirely in this bog, we concluded to experiment no further, so picked up our birds and pushed on.

A few miles farther on we again came to the Gardiner River, flowing eastward, a clear stream of water full of deep grassy pools—just such places as the angler feels he must cast a fly into. But 'tis of no use: there is not a single trout in this stream; which is strange, but true.

WILLOW PARK.

Following up the Obsidian Creek, just before reaching the cañon we came to Willow Park, which is one of the finest camping-places in the Park. It is the point where the wagon-equipped tourist must stop for the night, but pack-trains may push on much farther. It is ten miles from the Mammoth Hot Springs, and two miles from Obsidian Cliff.

On leaving Willow Park the road soon enters a stretch of dense forest of pines through which the way has been cut, and the cool shade is very grateful, as the tourist is at this time of the day somewhat weary. "Pine" squirrels are abundant and in good condition in the thicket, and not a few of them went to fill our game-bag.

OBSIDIAN CLIFF.

After riding ten miles in the timber, crossing the creek to the east bank again, you come out at the foot of Obsidian Cliff, and near Beaver Lake. The valley stretching to the westward is peculiar in appearance, being shut off on the north end by a cliff of obsidian, or

volcanic glass, as black as jet and rising to the height of many hundred feet, of a clearly columnar structure ; it seems to have crystallized from a melted mass, being composed of six-sided columns resembling the basalt composing the Giants' Causeway. It is difficult to believe that the huge mass of glass was poured out over the valley at one time from the interior of the earth, yet such must have been the case. The whole region in its vicinity is volcanic and curious. The road has been quarried out from the sides of this cliff, and for miles before it is reached and after passing it more or less glass may be seen on the wayside. As stated, the color of the obsidian is, in general, black, but some pieces have a variegated appearance, being streaked with red and brown, due to iron, and are very beautiful. In thin layers the whole is transparent, showing that the coloring-matter must have been thoroughly fused into the silica.

At the base of the cliff, to the right of the road, is a most beautiful clear, deep spring with a rim of moss growing all around it, and from the blue depths bubbles of gas constantly arise. Climbing over the broken masses of obsidian, we went down to examine the spring, and found it cold, with a very peculiar taste of alum and iron with sulphur, the gas being apparently carbonic acid. The water has a sparkling appearance, resembling that of champagne, and is similar in character to that from the Soda Butte Spring ; of which more anon. The taste of the water, though peculiar, is not unpleasant, and a great fondness is soon acquired for it.

The tourist must not venture to walk about on the soft mire surrounding the spring, for the ground is very treacherous and quicksands are abundant. There is no danger if the footing is made sure of before taking a step, but care must be exercised at all times in this region.

BEAVER LAKE.

Southward from the cliff stretches the Beaver Lake, a small sheet of water surrounded by high cliffs of vol-

canic rocks and hard stones, and tapering off into marshes so filled with quagmire that the hunter will avoid them except in winter. On this lake flocks of ducks and other water-fowl may be seen at all times in summer; but, the banks being dangerous, the birds remain in safety. Here, too, are seen the evidences of the former industry of the beaver in the gnawed trees and mud-dams; but the builders have long since fallen a prey to the traps of the hunter.

The view of this lake and valley in the light of a declining sun is very fine, as the atmosphere is at that time of day golden, and from the clear bosom of the lake the tall pine trees are reflected with perfect clearness as from a mirror.

The water of this lake and that of the neighboring ponds is of a peculiar blue color, differing from that of the geyser region, as it is not so clear a blue, but has a greenish tint.

Leaving the lake to the right, the road turns to the eastward and ascends a series of hills. Having climbed nearly to the summit, we found a small clear stream flowing through the moss and grass over a bright sandy bottom, and concluded to take our lunch and wait for the packs. Having opened the lunch-pocket and turned the horses loose, we proceeded to the repast; but, lo! the water was "Mara"—a strong solution of alum and sulphur, which came down from the neighboring hot springs, situated to the right of the road, in the trees. The horses having taken a hearty meal on the rich grass, we mounted and were soon pushing on to overtake our pack-train, which had come up and preceded us.

BLACK-TAIL DEER.

The shotgun was over the bow of the saddle, and we were climbing a steep grade in the road through a cut in the white sandstone, when, on lifting the eye to the bluff by the roadside, only a few yards distant, stood a fine black-tail deer with large branching antlers.

He did not appear much astonished—not nearly so much so as the rider, who stopped his horse and, dismounting, proceeded to draw the fine shot and load with “buck,” leaving the horse in the road. By this time the deer concluded to move off and gently trotted back from the bluff. Following as rapidly as possible up the steep bank, stopping for breath, we again found ourselves within a few yards of the buck, who stood with muzzle up, sniffing about, but so secreted among the lodge-poles that with shot it was impossible to kill him; so we crept toward him, keeping well hidden among the trees. But before getting to the glades he took fright, and, frisking his brush, dashed off through the trees and was lost, to the utter discomfiture of his pursuer, who with chagrin returned to find his cayuse.

LAKE OF THE WOODS—GIBBON LAKE.

Reaching the summit of the divide which separates the waters of the Gibbon River from the Yellowstone, we come to the Lake of the Woods, or Gibbon Lake—a beautiful sheet of water surrounded by pine forests and rich meadows—from which flows one arm of the Gibbon River. This lake is seven thousand seven hundred and sixty feet above tide, and is a resort for the larger game—elk and black-tail deer—at certain seasons of the year, though at the time of our visit (August) the game was higher up, near the snow-line, to avoid the flies.

OLD SULPHUR SPRINGS.

Soon after passing the Lake of the Woods a collection of old sulphur springs are passed, on the right of the road, emitting a very offensive odor of sulphuretted hydrogen, which bubbles up through yellowish water from the deposited sulphur covered with a thick scum—altogether, a very uncanny place. All around this spot for many hundred yards is the débris from

these springs, which at one time may have been active geysers. Soon, however, we descend by a gradual slope to the fine grassy meadow at the head of the Gibbon River. A very remarkable feature of this Park region is the fine meadows of rich grass with which it abounds.



CHAPTER VIII.

NORRIS GEYSER BASIN, OR GIBBON GEYSER BASIN.

NIGHTFALL brought us to the edge of the Norris Geyser Basin—or Gibbon Geyser Basin, as it is otherwise called—and we halted for the night on the beautiful lawn by the side of the river. While supper was preparing we took our accustomed bath—this time in the clear water of the river, so cold that a few seconds sufficed for the plunge. The water is excellent and is pure, being fresh from the snow-capped mountains surrounding the basin. To the south and west of our camp, through the trees, was visible the steam from the hot springs and geysers; and, as Hayden has aptly observed, the valley looks like an immense manufacturing town with the jets of steam from its many factories.

On the morrow, as the sun was shining through the cloud of mist and steam, we were awakened by the hoarse croaking of the blue cranes as they waded about in the marshes and streams feeding the river. Their note is most peculiar, and resembles the noise made by a mechanic pounding rapidly on the end of a stick of dry timber. It is shrill, and can be heard for more than a mile in the clear atmosphere of the Park.

Learning that the crane was a favorite dish among the mountaineers, we resolved to have a trial of the flesh for our morning meal; so, shouldering the gun, we tramped off through the dewy, frosty grass in the direction of the voice, but found our prey far, far off in the marshes, where no shot or foot could reach him.

Somewhat mortified at this ill-success, we returned to camp by another route, and found the way leading to

a curious bare earthy spot of several acres in area, from which, at different points, small puffs of steam were arising. On closer examination we ascertained that they were fumaroles, or vent-holes, and, breaking open the crust, found the tubes lined with most beautiful crystals of sulphur. In some places the steam hissed and sputtered out from a narrow crack; in others, it came up as if through the huge mouth of an exhaust-pipe. A little farther on is a collection of small mud geysers and springs, where the slate-colored clay is all the time boiling up in little mounds, sometimes shooting up higher, then sinking lower, but never ceasing to boil.

After spending some hours in watching these curious phenomena, we returned, to find the pack almost ready for the march; and, hastily breakfasting, we mounted. Taking the road, we soon entered the active portion of the basin, which seems dreary and uninviting, as the trees are mostly dead and the earth has a more or less yellow coat from the intermixed sulphur, and the air is tainted with the fumes of sulphuretted hydrogen. But still there is much to interest even here. To the right hand of the road are a number of boiling springs of various colors—some blue, others green, while others are yellow—each having an edge more or less scalloped and fringed with beaded rocks of geyserite. Here we find the first important geyser; from this point to the end of the upper basin we encounter a greater or less number of these curious waterspouts. The number of large geysers in this basin is small, and on that account the guides are disposed to hasten the traveller on to the other and more noted basins; but these springs are curious, and in some features unique, so we stop to examine them.

CONSTANT.

On the plain to the south-west, in what is known as the "Porcelain Vale," is the "Constant," a geyser throwing up a column of water every thirty seconds.

FOUNTAIN.

Near it are the "Twins" and the "Triplets" and a small geyser throwing out water all the time, called the "Fountain." Each one of them has its crater of more or less curious shape, with the many-colored strata in their sides, and sinuses filled with the descending hot water.

MUD GEYSER.

About twenty yards to the right of the road, on the summit of the basin, is a mud geyser which once in every twenty minutes hurls a column of thick mud (like paint) to the height of ten feet, and sometimes throws it higher. The eruption lasts about ten minutes, and as the mud falls back into the crater it assumes very curious shapes. After the eruption the water recedes into the crater and exposes fine examples of the formation.

EMERALD POOL AND GEYSER.

About ten yards back, on the other side of the road, is a curious pool which is of a most brilliant emerald-green color. The water is clear as crystal, while down to an almost unfathomable depth the walls are scalloped and beaded, as is so frequently seen throughout the Park. It would seem that these deep pools would fail, from their frequency, to elicit attention, but such is not the case: each is so different from any that preceded it that the tourist is given a fresh interest. This pool is doubtless the crater of a geyser, though an eruption has never been witnessed.

MINUTE-MAN GEYSER.

Following the road over the summit of the basin to the left, at the foot of a small bluff stands the Minute-Man, with a small round crater on a very flatly-conical mound. A column of steam constantly arises, and once in each minute, day and night, with a duration of about ten seconds, this little geyser sputters out

hot water to the height of twenty-five or thirty feet, the column being about four inches in diameter. It is curious to contemplate the regularity of the action of this and some other geysers. While I write these words, and while the reader is perusing them, this curious fountain is playing, as it has been doing, and as it will continue to do, we know not how long.

MONARCH (OR MAMMOTH) GEYSER.

Near the Minute-Man Geyser, on the side-hill, stands the Monarch, a geyser that throws columns of water one hundred to one hundred and twenty-five feet high once a day for from twenty to thirty minutes, and usually discharges at or near half-past six in the morning. It sends out its columns through three orifices—one of which is two feet by twelve feet, another three by eleven, while the third is five by six—at the same moment, and the combined flow is very large.

NEW CRATER GEYSER.

Not far removed is a new crater geyser, which is peculiar in having two kinds of eruptions, one every half hour, when the water is thrown fifty feet high, and another once a day, at which time the water is hurled up one hundred feet into the air.

VIXEN GEYSER.

The Vixen Geyser every two or three hours sends out a column of water forty to sixty feet high; and there are many other smaller geysers that we have not room to describe.

There is one peculiarity about the geysers of this basin that elicits attention; which is, that a great many of them have their craters on the sides of a bluff or near the base, which is not the case generally in the other basins, and it would seem that the crater has been formed by the bursting through of the subterranean water, which has washed away the superimposed débris and drift.



GIBBON'S FALLS.

GIBBON MEADOW.

About six miles farther the country opens into a fine grassy meadow of about five miles in area, through which flows, in a westward course, on to the Gibbon River, Geyser Creek. On all sides of the valley are fine wooded hills and high timber. The most favorable hunting-ground for the elk and deer is to the northwest of this basin and in the pasture lying in the basin itself.

At the point where the basin narrows just before entering the Gibbon Cañon is the place where many parties camp for the night (particularly is this true if they have come by wagons), for there is fine grass and water at this point, and there is not another eligible camping-place until we reach the Lower Geyser Basin, seventeen miles farther on; but if this point is made about noon, there is no occasion to halt.

PAINT-POTS AND BLOOD GEYSER.

At the south end of the meadow, at a point where a pen of logs has been made to catch animals, will be found a blazed trail near the bank of the Geyser Creek; following this about half a mile, we come to the Blood Geyser and Paint-Pots. The geyser throws a column of water through a stratum of red mud, which stains the water of the creek flowing from it and gives rise to the name "Blood Geyser." The action of the geyser is irregular, it playing twice or thrice a day.

Near the geyser are the Paint-Pots, a collection of extinct mud geysers, in which the semi-fluid clay is constantly bubbling and boiling. In this group the colors are more brilliant than those of some other localities.

MONUMENT GEYSER AND MOUNT SCHURZ.

Returning to the road and travelling through the cañon for about a mile, we come to a foot-bridge and trail, with signboard; "To Mount Schurz and Monument Geyser." All along the banks of the river, here

and below, the tourist will find hot springs boiling forth at the water's edge and making hot streams of water in the river, which should be avoided in fording, for the comfort of the horses; this may be done by going above the cluster of springs found at the foot-bridge. On the west bank of the river the trail leads along the side of Mount Schurz; on the north-east side, to the Geyser Basin, which is a thousand feet higher than the river, and may easily be reached with a horse. The name of the basin has arisen from the collection of masses of geyserite, as hard as granite, standing upright, of a variable height—some six feet, others twelve. They are smooth and white or gray, with no definite order of position. They are all open at the top, and most of them emit columns of steam, though some are extinct; none of them eject water, it is believed. They are geyser-cones, and afford evidence of the truth of the assertion that the character of this region is changing, for they were once active and are now extinct.

HOT-AIR FISSURE.

A very peculiar feature of this basin is a steam-vent or hot-air fissure, an orifice in the rocks from which is emitted a stream of air or steam so dry that it can scarcely be seen or detected except by the constant noise, as from the safety-valve of a locomotive; and so loud is the roar that it is impossible to maintain conversation in this region. It is peculiar, besides the great noise, in being almost invisible and intensely hot. In the basin are some minor boiling springs, and in the fissures fine specimens of sulphur may be found.

The outlook to the north over the Gibbon Valley is not among the least attractive features of this basin. The basin itself was but recently discovered, and, though the Park is now well known to abound in wonders, it is not certain that there is nothing more to be revealed or discovered.

GIBBON CAÑON.

Returning to the river, we enter the Gibbon Cañon. Here the walls of basaltic rocks close in on the stream and form scenery which is most pleasant and picturesque. On either bank of the river may be seen the hot springs, pouring a stream of hot sulphur-water into the current, forming for themselves their small craters or pools with a wall of geyserite. In the river, where the bed is shallow and the grass plentiful, the water-ousel may be found in search of its prey, and it in its turn makes a very delicious stew or broil.

Above the stream, towering at times to the height of two thousand feet, stand the walls of basalt, carved and cut by the erosions of currents long since unknown, yet leaving their impress in the rocks. Here and there, as they could find standing-room, the gigantic trees have crowded themselves on the sides of the cañon, and add much to the beauty of the scene, as the rocks of the stream are of a light yellow, the hot springs of white geyserite, while the sides of the cañon are sombre with basaltic rocks and dark-green foliage, above all being the bright sun in the clear azure sky.

GIBBON FALLS.

Riding through the stately pines for about six miles, the signboard on the tree to the right of the road announces "Gibbon Falls;" and, dismounting, you follow a very steep trail down the sides of the cañon for some little distance, and by "holding on by the eyebrows" you get a view of the falls, which are not uninteresting and rather peculiar. The fall is eighty feet in height, but from the point of observation it does not seem to be over thirty; still, from below, it has a much better appearance. The water does not plunge over the cliff and fall headlong into the abyss below, as we might expect, but clings to the wall and falls over it in a cascade, wearing away the rock in many a curious and fantastic fashion.

After passing the falls we jog along for nearly eleven miles farther, through a country that has little of special interest, till we reach the Madison River, when the landscape opens out in a fine broad valley with a river meandering through it, glimmering in the setting sun and confined within banks studded with trees and grassy meadow, varied at times with dead pine forests, the work of the careless tourist in neglecting his camp-fire. At the forks of the river we camped on the edge of the little timber that skirts the river.

CHAPTER IX.

LOWER GEYSER BASIN.

THE territory covered by this basin is the largest in the National Park, and, for convenience of describing, it has been divided into several divisions, or groups of springs and geysers.

The basin itself is very broad and generally level, with fine meadow- and grass-land edged with timber; its greatest length is from east to west, and within its limits the two forks of the Madison, or Firehole, River unite, near the camping-ground. The southern branch of the river is called Firehole, while the eastern branch is known as the east fork of the Madison. This will serve to remove the confusion as to which is the Firehole River and which the Madison.

FIRST GROUP.

About two miles to the eastward of the confluence of the rivers is a group of springs which we may designate as the First group.

This collection of springs stretches for nearly two miles along the side of the river, and within this distance some sixty-six springs have been counted, with temperatures ranging from 106° to 198° F. In many places there are small geysers, playing to the height of from two to five feet, and sending up their small jets of steam many feet higher. Quite a number are ordinarily quiescent and only boil and seethe, now and then boiling vigorously and overflowing the basins containing them, then dying down again for a season,

PRISMATIC SPRING.

One of these springs has a basin consisting of a series of concentric layers of the white geyserite, each containing ridges, along each of which is a line of colors of the spectrum, most gorgeous in its effect: hence this is called the Prismatic Spring. In many places the geyserite formation is of a red or brown color, from the admixture of iron with the silica deposited from the springs.

SECOND GROUP.

This group is near the middle of the basin and south-east of the forks of the river, which we will take as our centre of location. These are principally geysers, occupying an area of not quite one mile square. The group contains about eighteen springs, all hot, with varying temperatures, as was the case with the last group. The small streams from each converge to form a creek of considerable size, flowing into a small pond and thence into the Firehole River, which is fed principally by the geysers and springs along its course in this chain of Lower, Middle and Upper Geyser Basins.

THUD, OR FOUNTAIN, GEYSER.

Toward the northern extremity of this group is a peculiar geyser known as the Thud, or Fountain, Geyser, which is situated on the side of the gently-sloping hill, facing the north-west. The crater is double, consisting of an outer rim or basin one hundred and fifty feet in diameter, with an inner one of twenty-five feet. The rim of the inner crater is about five feet wide and as many high, and from it a vast column of water is thrown to the height of sixty feet, accompanied by a heavy thud-like noise underground, followed by a higher projection of water. The main column fills the mouth of the crater. The exact duration of the eruption of this geyser and the frequency of the eruptions are not

definitely settled. By some authorities, as Norris, it is stated to last from ten to fifteen minutes and to occur every afternoon. (This was in 1881, as per *Report of Superintendent of Yellowstone National Park* for 1881, p. 57.) Wylie gives it as acting about every six hours, the discharge lasting more than an hour.

When the eruption has subsided, the tourist may approach to the very edge of the crater, and, standing on the rim, gaze down into a chimney of most exquisite beauty, with walls of rich coloring and a bed of water at the bottom of the purest blue, boiling and bubbling most actively. It is a very strange and interesting sight—one which will never be forgotten.

In the walls of this crater are numerous pockets, or sinuses, filled with water and containing rounded masses of geyserite, from the size of a pea to that of a walnut, of a cauliflower appearance, similar to those found at the Mammoth Hot Springs.

The water of this geyser seems to possess a peculiar property of depositing geyserite in the tissue and fibre of weeds and other vegetable substances, and fine specimens of these pseudomorphs may be found in the neighborhood, petrified more or less completely, some of a rosy tint, others white or buff.

MUD GEYSERS, OR PAINT-POTS.

South and a little east of the Thud Geyser is a collection of mud geysers, or springs, three in number, with contents of red, white and pink mud in a violent state of agitation. In general appearance these mud geysers resemble a large mortar-bed in which the lime is slaking and throwing up its spurts of semi-fluid mortar.

But there are many peculiarities about these Paint-Pots. All round the edge is a ridge of more or less solid clay, upon which it is safe to walk, while back from this for many yards the clay has dried and left irregular cracks and fissures, with here and there deep pits of several inches' diameter, at the bottom of

which is a mass of more fluid clay, not boiling, but just in a semi-solid condition. In many places a jet of hot steam issues from these pits. In the main beds—or craters, more properly speaking—we find a very peculiar condition of things. In one the contents are very soft and fluid, boiling with great activity and sending the spurts of mud upward in rapid succession, like, as has been aptly said, a caldron of thin mush. This mud is of a white color and very fine to the feel, but extremely hot—about 176° F. in temperature. The mud of a neighboring bed is pink in color and confined in a circular basin, as was the first, with a wall of quiescent clay between them. The consistency of the clay in this basin is denser than that in the former and bubbling less actively, while in a third basin the clay is of a deep-red color and of about the consistency of very soft putty; and this last basin is perhaps the most interesting of them all. As the hot steam or air arises through the mass it heaps up small mounds or bubbles of mud, which presently burst with a thud, while the throat of the vent-tube contracts and the edges of the bubbles are folded back with a graceful curve like the petals of a lily. Into the air is hurled a small conical piece of mud, which generally falls again into the centre of the expanded lily, forming the pistil. Owing to the tenacious character of the mud, this form is retained for some time, giving a very peculiar appearance to the surface of the crater. In many cases the bubbles or mounds simply burst with a puff, and a jet of steam shoots out into the air, when the walls fold in again and the surface becomes smooth but for the series of concentric ridges or rings marking the spot.

The mud or clay in these Paint-Pots is worked up to an impalpable condition, without the least gritty matter to be felt in it, and the color in the individual basins is entirely homogeneous. It is impossible to account for these singular beds, lying as they do so near each other that they may be considered as one, yet with contents in such various conditions, and having

such diversities of consistence—from that of very soft white lead to that of hard putty—and colors varying from pure white to deep red.

It is said that these springs are not so violent as they were some years since, but they are still very active and extremely interesting.

CHALYBEATE SPRINGS.

Lower down on the hillside are found, in a boiling condition, some chalybeate springs, the water and the deposit from which are bright red in color, presenting a very strong contrast to the white of the siliceous geysersites.

FISSURE SPRING.

Still farther to the south-east, at the head of a small stream, near a little lake, is the Fissure Spring, so named on account of its shape. It has a temperature of 196° F., and near this spring are some small geysers, one throwing the water to the height of from twenty to twenty-five feet.

FOURTH GROUP.

In the south-eastern corner of the basin is the Fourth group of springs, extending for nearly a mile and a half along both sides of the ravine in which it is found. It is south of the Fissurè Spring.

In this group there are upward of fifty springs, all hot, and the group extends high up on the mountains. It contains many interesting springs, but only a few geysers, and none of the first class; yet almost all of them are very active, throwing columns of water from a few inches to many feet in height. In some of them a black deposit of fine sand is found, and these emit a very disagreeable odor of sulphur.

WHITE DOME.

In the lower portion of this group is the curious formation known as the White Dome. It stands near

a most beautiful spring with a handsomely-scalloped, funnel-shaped basin. The hard mound is fifteen feet high, of a dome-shape, surmounted by a chimney, or flue, nearly twenty feet high; from the top of this a column of steam is constantly issuing. There are scores of springs in this group; but we cannot describe each.

FIFTH GROUP.

This is located west of the Thud Geyser and Fountain Geyser, north of the small stream which drains them.

CONCH SPRING.

There are upward of five hundred springs along both side of the Firehole River, but few deserve a passing notice. One of them, the Conch Spring, has a peculiar triangular basin, eight and a half feet by ten feet, and a temperature of 186° F.

HORN GEYSER.

Near this spring is a geyser called the Horn Geyser, from the horn-like shape of the crater which it has built for itself, gradually tapering from a base six feet in diameter to a top only about one foot across. It is in constant action.

BATH SPRING.

On the river-bank is a large square basin, of unknown depth and nearly twenty-five feet across, which, from a fancied resemblance to a bath-tub, is called Bath Spring.

CAVERN SPRING.

North and west along the north-eastern bank of the river is found the Cavern, a basin from twenty to thirty feet wide and probably twenty deep, filled with perfectly clear blue water, through which every object may be seen to the very bottom. The sides are splendidly studded with rosettes of geyserite of an endless variety of shapes and sizes.

MUD SPRINGS.

North of the Cavern Spring, on the summit of a small hill among the timber, is a collection of mud springs of a variable size and having contents of varied consistency, from thin clay to a thick mortar, and giving out a succession of strange noises as the hot steam forces its way through the writhing mud. Some of the springs are a few inches in diameter; others, many feet; all are in a constant state of agitation. They are almost all situated at the bottom of a funnel-shaped crater, sometimes as much as twenty-five feet in diameter and more or less deep. The mud is in some cases white, in others gray and stiff; so that the escaping steam throws out the mud to a considerable distance. The sides of the crater are studded with conical pieces that have thus been hurled out by the steam, hardening where they fell.

VENT-HOLES.

Somewhat back from the river, high up on the bank, are a series of vent-holes from which steam is constantly escaping with a simmering noise. These tubes or cones are almost invariably lined with crystals of sublimed sulphur, which has in some instances closed up the vent altogether by its deposit.

PERIODICAL LAKE.

On the west bank of the river, and near a small stream coming in from the west near the base of the mountain, is a large spring or lake. It sends out large columns of steam and has a most curious bed, which at times is entirely exposed by the receding of the waters. This spring is one in which the volume of water swells and recedes at times, leaving the bed dry or covering it to the depth of many feet.

This alternate filling and emptying of the basin has produced, by crystallization of the silica, a most gorgeous effect of frost-work and delicate tracery. The margins project far out into the centre of the basin,

and are supported by the most beautiful snow-white brackets of frost-work, from the lower edges of which hang long tapering stalactites of geyselite, assuming a great variety of fantastic shapes.

Near the centre of the basin is a rounded hour-glass-like structure composed of geyselite and rising up to a level with the margins of the basin. The centre is somewhat depressed and has concentric layers of a siliceous deposit, each a little more elevated than its neighbor, all together forming an inverted cone inside of the external basin. The base of this structure is conical and studded with excrescences of a pearly lustre and variously tinted. In another place, projecting out into the basin, there is a point of geyselite with a most irregular outline, and there are deep cavernous sinuses in the sides, and in some places natural bridges joining one side of the walls with another, showing that as the deposit of the geyselite progressed the two then isolated nuclei of crystallization approached each other, until at last a coalescence is the result. Continued deposit has formed this peculiar structure, and its appearance is certainly marvellous. Some aspects of it are smooth, very hard and of a pearly lustre, while others have a structure resembling that of delicate moss and so fragile that it would seem that a strong wind might demolish the whole mass.

In still another part of the basin the deposit is laminated, and the leaves are arranged in an angular manner, each resting with its upper margin on its fellow. The whole structure looks as if a mighty current had swept a vast number of plates of this material through the narrow gorge, and, the force spending itself, they have sunk down and remained fixed at the bottom. A whole volume might be written describing this wonderful place, but we desist.

SIXTH GROUP.

Almost directly south from the camping-place, and south-west about two miles from the Fifth group, is

the Sixth group—a collection of springs situated on the open prairie and surrounded by much marsh, so that it is not easy to approach them.

FAIRY FALLS.

Following up the small stream which they feed at the head of the ravine, we find the Fairy Falls of the Lower Geyser Basin. This is a beautiful cascade, the column of water falling in a steady stream and dashing itself into spray against the rocky wall over which it glides.

SEVENTH GROUP.

About three and a half miles directly south of the forks of the Firehole River is the Seventh group. On either side of the river and scattered along the sides of the cañon—principally on the west bank—are the springs.

THE CALDRON.

One of them has a very large crater, and the surface of the boiling water is more than twenty feet below the ground upon which you stand. So much steam is constantly arising from it that it is difficult to get a glimpse of the surface at all, but when seen it is found to be of a most beautiful blue. The side of the spring toward the river is notched, and through these depressions the boiling water pours into the river in small streams having beds lined with the sesquioxide of iron, giving them a very strange appearance. In this group are many more springs—probably something over a score; but we will not burden the reader with a description of them.

TWIN BUTTES.

To get a view of the Lower Geyser Basin, cross the river to the west side, going south-west past the beautiful little lakes clustered together on the high plateaux above the river. These lakes are of considerable depth and present a most beautiful appearance, the margins being thickly wooded with tall, tapering

pinces and spruces, while on their surface the broad leaves of the water-lily float backward and forward with the varying breezes.

The little streams which drain these lakes are of themselves interesting, and tumble their waters down over the sides of the rocks in very picturesque forms. One of them falls by a clear descent two hundred and fifty feet, breaking into spray long before it reaches the bottom; this has also been called "Fairy Falls." It is visible at only one point, as it falls into a deep basin surrounded by tall trees, which shut it out from view.

But to return.

Climbing up the most northern butte—which is six hundred and thirty feet above the Firehole River and seven thousand eight hundred and seventy-seven feet above tide—we get a view of the Lower Geyser Basin of the Firehole River, the largest of the geyser basins in the Park, so far as known at this date; it has an area of about twenty-five square miles. But not all of this vast basin contains active springs; some are extinct, dying or so small as not to be worthy of notice in a region where hot springs are so numerous.

The view from the summit of the buttes is very fine, extending for many miles over a plain of white or light-colored geyserite, with here and there large areas where the rich deep-green foliage of the evergreen trees is contrasted with the lighter-colored grass, and with patches of yellow or gray earth and the white of the geyserite. At hundreds of places all over this vast area arise columns of steam, of greater or less size, issuing from the numerous geysers and hot springs scattered over the landscape. From their varied characteristics, the springs of this basin may easily be divided into three divisions. For instance, some of the springs are continually boiling and seething, never quiet. Then there are others that boil only at intervals, remaining quiescent most of the time, then suddenly boiling up vigorously and dying down again to their former cou-

dition; while a third class remain placid and quiet till the time for an eruption, then burst out into a fountain of hot water, a geyser, playing to a greater or less height for some time, then dying down. As a rule, the water in the geyser crater recedes with the cessation of the eruption, and the basin fills again before the next spout.

ROAD TO HENRY'S LAKE AND VIRGINIA CITY.

About two miles before reaching the forks of the Firehole River a road is passed running to the north-westward. This is the road to Henry's Lake and Virginia City, following along the course of the Madison River. Here a number of roads unite, forming a point of divergence to many interesting places in the Park.

RIVERSIDE MAIL-STATION.

The roads to the westward here separate, one taking a direction north-west, over the Madison plateau, passing the Lookout Cliffs on the north, and again unites with the other branch on the border of the Madison River, at the Riverside mail-station, which is a point where the tourist from Virginia City will halt for the night. The other road runs north over a part of the way travelled from the Gibbon Basin, or Norris Basin, then turns to the westward and northward, passes to the north of Madison River and Lookout Cliffs through the third cañon of the Madison, and joins the southern route at the Riverside station.

Going to the eastward from this point is the road to the falls of the Yellowstone River and Grand Cañon. This road passes a few small hot-springs deposits and Mary's Lake, which has an elevation of eight thousand three hundred and thirty feet above the sea. The road takes its course along the east fork of the Firehole Creek, crossing a broad meadow, till nearing Mary's Lake, when the valley narrows. About half a mile before reaching the lake the valley is contracted

by two hills that mark the summit of the divide. East of this divide is found a hot-springs formation, and about three miles farther on a branch of the Alum Creek is crossed; then the valley spreads out into a broad prairie covered with fine grass.

The road to the south leads to the Midway Geyser Basin.

FIREHOLE HOTEL AND POST-OFFICE.

On the west bank of the Firehole River, near the intersection of the roads, is a hotel and post-office, where the tourist may send letters or receive the same, though it is a little inconvenient to get letters there because of the very circuitous route they must take to reach this point; but they may be mailed to the "States" at this place, and in due time they will be received by absent friends.



CHAPTER X.

MIDWAY, OR MIDDLE, GEYSER BASIN.

ABOUT five miles from the camping-place in the Lower Basin, following the road along the river, across the Gibbon Meadow, and then entering the timber for a short distance, we come out again upon the east bank of the Firehole River, below the Excelsior Geyser. This spring possesses some features of remarkable interest. It lies east-by-south of the Twin Buttes and east of the Fairy Falls mentioned in the last chapter. The road through the basin divides just as it reaches the river, and one arm follows the west bank, the other the east, but both again unite about a mile and a half up the stream.

EXCELSIOR GEYSER, OR SHERIDAN GEYSER.

Crossing the river at the first ford—which may be done with ease if the place is reached not too soon after one of those powerful eruptions of this famous geyser—climbing up the steep bank of geyserites that has been formed on the west side of the river, and turning then to the south, you come to the crater of the Excelsior Geyser. It is well that the tourist ride with care near the edge of this crater. He may ride quite to the margin, for it is cut out of the side of the bank, near the river, but it is not safe to venture too near with a horse. Those who are timid may tie their horses to the trees on the east bank of the river, and, crossing the rude log foot-bridge, they may finish their visit on foot.

Approaching the mouth of the huge crater of the geyser, you find yourself on the brim of a deep

boiling caldron, or basin, of steaming water, of a pale-blue color and exquisite clearness. The mouth of this crater has grown since its first eruption, which is thought to have occurred not many years ago. The first outbreak undoubtedly took place near the river. The geyser, by the violence of its action, has undermined and thrown out the rocks forming its sides till a crater at least two hundred and fifty feet wide has been formed, with walls twenty to thirty feet high, and decreasing in height as we approach the river. The laminated structure of the walls of geyserite through which it has forced its way clearly proves its recent origin. The water is always in a state of great agitation and boiling vigorously, and as one stands on the margin and looks down into the seething pit a feeling of terror pervades the mind. The ground trembles and shakes beneath the feet, and there is an involuntary movement backward from the brink, lest the earth should crumble away and precipitate the visitor into the boiling caldron below. It is at the same time both a most interesting and a horrible place. Almost all the time some of the hot contents of the caldron pass over the margin of the basin; but at the period of eruption the volume of boiling water which overflows is truly immense, and it at times is equal to the entire volume of the river itself.

A peculiarity of the side of the crater over which the current of hot water flows is that the layers of geyserite that have been deposited are of a great variety of colors and tints, from red and yellow to buff and pink, spread over a groundwork of almost spotless white. Many of the small channels have their beds lined with a delicate filamentous substance, of a yellow color, that moves with the motion of the current and sways from side to side in the stream. It is composed principally of sulphur, and is of the consistency of tough glue or jelly, breaking in the hands when an attempt is made to remove it in places where the temperature is not too high to admit of such an attempt.

The action of the Excelsior Geyser is very peculiar and irregular, and about it there are some features which are very puzzling. Colonel Norris, then the efficient and observant superintendent of the Park, in 1881 sent a detachment of men to note the action of the geyser, and from his report may be gleaned many interesting facts. The period of observation extended from September 27th to October 7th, and it was found that eruptions of the geyser occurred at almost any and every hour of the day or night, without the least regularity as to the height of the column or the period of duration. A fine display, lasting not longer than fifteen minutes, might be expected about ten o'clock in the morning and not later than half-past five in the evening, at which times the column of hot water might reach as high as three hundred feet—generally from two hundred to two hundred and fifty feet at such times, and at other times playing to a variable height, not, however, less than fifty feet. In frequency of eruptions it was observed that on some days in twenty-four hours there would be six, five, four, eight, ten, and even eleven, ejections of the aqueous contents; so that no definite table can be compiled of the eruptions. Yet the tourist who will tie his horse and patiently wait will most likely be gratified with a fine display within a few hours.

In their effects the eruptions of this geyser are perhaps the most disastrous of any in the Park, since the force is tremendous, and the rocky walls of the geyser-tube, being of a less compact nature than the material found in most other geysers, is frequently in the violence of the action broken and detached in large masses, which are hurled hundreds of feet in the air and landed sometimes in the bed of the river or on the opposite bank, at other times falling back into the crater, to be again shot up. Masses of rock thus ejected are found more than two hundred yards away from the crater. The Firehole River at this point is more than a hundred yards wide and from eighteen inches to two

feet deep ; but after most of the eruptions from this geyser its volume is doubled, and so deep and hot that for a long distance down the stream fording is not practicable. It even becomes dangerous to cross at some distance up stream, from the damming up of the descending current.

A very fine display of this geyser was witnessed by Rev. Dr. J. H. Eccleston and the author on the 23d of August, 1882. Being in advance of the pack-train, we crossed the river to the west side and looked into the turbulent crater, wondering at its agitation. Seeing that the road was rather obscure on that side of the river, we again forded the stream to the east bank, and in the shade of some pine trees hitched our horses and awaited the pack, which presently came in sight on the opposite bank and went on up stream on that side, and soon vanished among the trees. Turning toward the ford again to follow, we were admonished by a dull rumbling sound like a peal of distant thunder to pause. At that moment some small puffs of steam arose from the mouth of the crater, and suddenly, with a noise like the discharge of a tremendous submarine blast, a column of water shot hundreds of feet up into the air. In a few seconds it was followed by the rattle of descending stones and masses of rock ; while at the same time a huge cataract of boiling water poured over the side of the crater into the river. The display did not last very long—only a few minutes—but it was magnificent and worth spending a whole day to witness.

About a year before this, on the 28th of August, 1881, General Sheridan witnessed a similar grand eruption of the geyser. In that instance the column of water in a solid body was from sixty to seventy-five feet in diameter and shot up to the enormous height of three hundred feet, the steam arising over a thousand feet into the clear azure of the cloudless sky.

Professor F. V. Hayden in his report for 1871 speaks of this as a spring, saying: "The most for-

midable spring of all is near the margin of the river. It seems to have broken out close by the river, and to have continually enlarged its orifice by the breaking down of its sides." From what follows there seems to be no evidence that he saw an eruption, as no mention is made of one, and, had it taken place, he certainly would have witnessed it and stated the fact. It is commonly believed and reported that this geyser first broke out in 1878.

HELL'S HALF-ACRE, OR DEVIL'S HALF-ACRE.

The summit of this geyser-crater is about fifty feet above the level of the river; it is composed of geyserite piled up to that height by the accumulations, it would seem, from the spring to the west of it, euphously named "Hell's Half-acre" or "Devil's Half-acre," which is a few yards west of the Excelsior Geyser. Here is one of the most remarkable springs of boiling water in the Park, not only from its size, which has given rise to the name "Half-acre," but also from the rare beauty which it possesses. Upon the summit of a very gently-rising terrace or series of terraces of geyserite is the crater of a spring more than one hundred and fifty feet in diameter, boiling up in the centre to the height of several inches and flowing so regularly over the edges that there is no raised rim, but the mineral constituents of the water are deposited in a series of miniature terraces all around the top and down the sides. On these terraces are shallow pools containing water, the sides and bottom of which are variously colored—red, orange, green, yellow, brown and white, according as the iron or the vegetable matter in the water preponderates; and the effect is truly singular.

The volume of the water in the spring is of an intensely deep-blue color and so deep that the bottom cannot be seen (though the water is perfectly clear and objects on the beautifully-scalloped walls are visible to a great depth), tinted with blue of a deeper and deeper color as the glance is cast farther and farther down into

the depths. A column of steam constantly arises from the surface of the boiling lake, and at times, when the sun is at a proper slant, the play of color on the surface of the water is most gorgeous; the effect is prismatic over the entire surface.

RIVERSIDE HOT SPRINGS.

Following the river on the west bank, a number of small spouting hot springs are passed, some of which, right at the water's edge, have built up for themselves conical craters to the height of a foot or more, forming the Riverside Hot Springs.



CHAPTER XI.

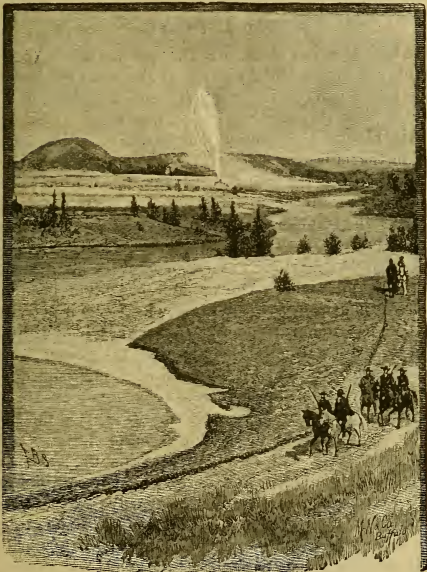
UPPER GEYSER BASIN.

CONTINUING the course southward along the river for about five miles through the tall evergreen timber, and making a ford back to the west bank of the Firehole River above the place of junction with the Little Firehole Creek, we come at once upon the geysers of the Upper Geyser Basin, the most wonderful spot in the whole region, and one that fills the tourist with surprise from the moment he enters its precincts. The impression made on the mind will be retained long after he has left the Park and is travelling homeward. His thoughts will revert to the Giantess, Old Faithful, the Castle or some other of the wonderful geysers, and he will ponder on the mighty forces that are at work beneath that siliceous crust throwing up these tremendous columns of boiling water.

From the north this basin presents a peculiar appearance. On either side of the river stand geyser-craters, and the banks of the river itself are composed of geyserite piled higher and higher, layer upon layer, until it has built up a wall ten, twenty, or even thirty, feet in height, over which, in descending to the river, the hot water flows in a succession of beautiful cataraacts. In many places the river-bank is crowned by a hot spring just at the edge of the water, with its crater on the summit of a small cone and its stream of boiling liquid flowing over the sides, streaking them with various tints of red, yellow and green.

The basin is situated in a broad valley surrounded by low hills and hedged in by a fine growth of evergreen timber; here and there patches of grass of a

bright-green color relieve the dull monotony of the white calcareous and siliceous deposit of which the basin is composed. With the columns of steam arising at different points in the landscape and an occasional



OLD FAITHFUL GEYSER.

jet of water, the picture, as you view it from beneath the shade of an overspreading spruce tree, is certainly a vivid one.

Without stopping to examine the many geysers on either hand, we push on to the hotel-site or camping-

spot, in the centre of the basin, from which may be had a view, more or less remote, of all the geysers in the region. Having made camp and prepared to stay for a time to see the sights and "do" the region, we will set about our explorations.

OLD FAITHFUL.

About the time these preparations are made the reliable old geyser Old Faithful, at the southern end of the basin, will be in eruption, and the shout of applause from the admiring crowd who stand awestruck at the base of the column will be heard. You hurry off in that direction to get a closer look at it, but before you reach the spot the eruption has died out; but the geyser will spout again in less than an hour. During the summer of 1882 it played once every fifty-four minutes, with an eruption lasting from four to six minutes; so that there was a display every hour during the day and night. The opinion has often been expressed that the geysers are rapidly losing their activity. But this can hardly be the case with Old Faithful. There is little room to doubt that the geyser is of great age, for the huge mound of deposit upon which it stands must have taken many years to form and harden to its present condition. On the side away from the river the mound is more flattened and less interesting, but on the river side the crater is beautifully scalloped and terraced with cauliflower-like excrescences protruding all over the surfaces and margins of the terraces. At the mouth of the crater are large piles of these concreted masses of geyserite, with no definite outline and all rounded and smooth, with a pearly lustre, resembling drops of porcelain cemented together in a single mass.

While admiring the curious architecture of this geyser basin, we notice a slight puff of steam emerging from the crater and hear a deep rumbling noise like the prolonged roar of an angry lion; then for an instant it is still, but the next moment a column of boiling water

is shot up into the air in a majestic stream fully one hundred and sixty feet high. This height of the column is maintained almost uniformly until near the close of the eruption, when it begins to fall, and as suddenly as it commenced the flow ceases, and the geyser emits nothing but very hot steam which continues to issue, in greater or less volume, until the next eruption.

This geyser was in 1870 named "Old Faithful" by the early explorers, who found it at that time regular at its work, playing every hour, and it has kept up the same rate of working ever since; and what length of time it had previously been active no one can tell.

Near the Old Faithful are found hills of geyserite filled with old craters; and it is probable that Old Faithful may be the lingering descendant of a numerous family of geysers in this locality.

BEEHIVE.

After crossing the river on the foot-bridge, about a thousand yards north-west of Old Faithful, and turning to the right there will be found a singular conical pile of geyserite three feet high, three and a half feet in diameter at the summit and about four feet at the base. This is the cone of the Beehive Geyser, and its shape has given origin to the name. The crater is twenty-four by thirty-six and a half inches, of an oval shape. It stands on a gently-sloping plain of smooth deposit, with no other mound leading up to it. (Most of the other conical craters have built up a small hill at their bases.) Suddenly you come upon the cone, looking like a huge nest of the flamingo, and one might be tempted to stop and rest upon it were it not for the ever-rising steam and hot air. About ten feet north of the cone is a little steam-vent, as it is called, which for fifteen or twenty minutes before an eruption gives warning by its vigorous action of the discharge which is to come: when this precursory action ceases, the



BEEHIVE GEYSER.

grand spouting of the geyser may be momentarily expected. Soon, with a roar of escaping steam, a column of water shoots up two hundred and nineteen feet toward heaven with perfect symmetry, falling back in pearly drops all over the region around in a deluging flood, while the steam rises thousands of feet and is wafted by the passing breeze in a cloud of vapor. During the whole eruption the little vent plays, keeping it up with tremendous vigor, as if trying to attract some attention as well as its more exalted neighbor.

The display of this geyser while in eruption is one of the most graceful and pleasing in the basin, though from the external appearance of its cone while quiet nothing of the kind would be expected. The eruption generally occurs at least once in twenty-four hours, though the geyser has been known to act twice between daylight and dark, and on one occasion no display followed the spouting of the vent; but such an omission of its action is rare.

The time when the geyser may be expected to play is, however, very uncertain, as the scale is a shifting one. When Professor Hayden witnessed it, in 1871, the eruption took place about six in the morning. When witnessed by Colonel Norris's men, in 1881, it occurred at quarter of ten P. M. one day, quarter after two P. M. the next day, and twenty minutes of nine P. M. on the third day. When witnessed by the author, it occurred about three P. M., and it would seem, from the data above given, that the eruptions may be expected after an interval of twelve hours, instead of twenty-four, or, as some authorities have put it, "once in every two or three days." Yet there is a certain regularity about it; and if the time can be ascertained when the geyser played the day or the week before, it is considered best to look for it near that hour.

The cone has been much mutilated by the vandals that have from time to time visited the Park, yet the geyser is doing good work at reparation, and soon the mound will be restored to its original beauty.

VANDALISM.

A word here about this vandalism. Notwithstanding the fact that the authorities in charge of the Park have made stringent regulations in regard to this matter, it should be the duty of each and every tourist to have the interest of the public and his fellow-citizens so much at heart that these precautions and rules will not be necessary. Every intelligent visitor should

feel sufficient interest in this museum of nature to frown upon the barbarism of persons who come with axes and hammers to break up and carry away baskets full of the coral-like formation around these craters. Such acts of vandalism are perfectly useless, for one cannot carry his stolen curiosities out of the Park even if the authorities would permit it, since they crumble and are broken up into fine powder, whether carried by the pack or in the wagon.

GIANTESS GEYSER.

About one hundred yards north and a little east of the Beehive, on the summit of a large mound of geyserite, some fifty feet in height, of a gray color, there is an unfathomable pit of irregular outlines, indented and scalloped on its margin with the peculiar pearly geyserite already spoken of. The crater is depressed, and is lined with a pure white deposit; and so clear is the boiling fluid which fills it and then recedes from the mouth that it is easy to discern objects at the depth of one hundred feet when there is not too much steam arising and the water is not boiling. The color of the water is intensely indigo in tint. The size of this crater is, by actual measurement, eighteen by twenty-five feet. It is depressed, there being no cone or nozzle above the general surface of the mound.

At certain times the crater of this geyser is full of water, which runs over the side in a stream; at others the water recedes deep into the recesses of the cavern. During the intervals between the eruptions it appears like a harmless hot spring, boiling slightly and giving off small columns of slowly-rising steam. In fact, it looks so tame that the tourist is disappointed and turns away in disgust from the "Giantess;" yet, if he has an opportunity to witness one of her eruptions—which sometimes last for eighteen hours—he will not again be likely to gaze with scorn at her. The eruptions of the Giantess take place at longer intervals than those of any other geyser (so far as is known) in the

Park, there being from fourteen to seventeen days between them, though we believe the interval is a little indefinite, since there is no correct record of this geyser, the intermissions being long and no one having spent the time to make adequate observations. The author and his friends had a view of the geyser in action on the 26th of August, 1882, it having commenced at half-past three A. M. It was seen till after ten A. M., and was then still in eruption.

Before the eruption comes on, for some thirty-six or twenty-four hours the "thing" is getting ready, and a low rumbling is heard at the mouth of the crater, accompanied with most violent boiling in the pool. The agitation continues, and the noise becomes louder, being accompanied by a continuous rumbling, with a trembling sensation in the earth under the feet. As the crisis approaches the water sinks in the basin, and when stones or other objects are thrown into it, it boils furiously, foaming up, and sometimes running over the edge. The action now becomes very violent, and small jets of water are occasionally hurled out from the foaming and surging caldron. Suddenly, with great violence, the water rises in the basin, and almost before a place of safety can be reached a mighty flood of water is hurled out to the height of two hundred and fifty feet, stampeding the lookers-on, who flee in every direction.

In the eruptions of this geyser you behold a truly marvellous succession of waterspouts. During the first impulse or throes of this terrible fountain a column of water, which completely fills the mouth of the crater—eighteen feet by twenty-five feet—is lifted in a body sixty feet, falling in a tremendous flood, with a deafening, thundering noise, upon the earth, while from the centre of this column some six or more jets or columns of water, each over a foot in diameter, are shot up to the height of two hundred and fifty feet. This is a most singular feature of the geyser; and it is probable that these streams come from distinct and sepa-

rate nozzles, opening into the bottom of the main crater. The grand eruption lasts twenty minutes, and is succeeded by minor ones, which for many hours play, with greater or less force, as high as twelve or sixteen feet.

Professor F. V. Hayden reports that in 1871 two of these wonderful eruptions occurred in twenty-two hours, but they are by no means so frequent at present; and if the eruptions have decreased in frequency, from two in twenty-four hours in 1871 to one in seventeen days, as at present, it may not be many years till the eruptions have ceased. And it is possible that the Hell's Half-acre of the Lower Geyser Basin is an extinct geyser, having spent itself in days gone by.

There is a singular phenomenon that is worthy of note in this connection—namely, that when the Giantess is in action a wave of activity extends to at least nineteen minor geysers and vent-holes in the neighborhood, setting them all to boiling and steaming.

After the conflict is over and the eruption ceases the Giantess settles down to a more regular course of life, and lies placidly in the crater while the internal forces are accumulating for another outburst.

LION GEYSER GROUP.

The Giantess Geyser is situated in the midst and on the summit of a small hill or plateau of probably five hundred yards' radius, with small geysers scattered all about it. One of the principal in this group is the Lion, which is the highest of four geysers, the other three being the Lioness and Two Cubs, or, as they are sometimes called, "The Three Jokers." The crater of the Lion is on a triangular pile of geyserite, rising a few feet above the plain and lying close to the river-bank; the mouth of the crater is on one side of this pile. The action of the Lion group of geysers is very uncertain, and they are of little note, on account of their insignificance, when compared with the mighty fountains at work in the vicinity.

SAW-MILL GEYSER, OR "THE RUSTLER."—THE
FOUNTAIN.

Following the river down-stream on the north bank till we are due west from the Giantess and about two thousand yards from it, and nearly opposite the second foot-bridge or log crossing the river, in the midst of a white plain, is the crater of the Saw-Mill Geyser. This is a small geyser, compared with the others of this basin, and, were it not for certain peculiarities, it would be passed by unnoticed by the tourist. The crater is only six inches in diameter, and has no margin to speak of raised above the level of the surrounding basin. The basin is bowl-shaped and depressed several inches, with a diameter of twenty feet. The names of this geyser are derived—the first from its peculiarities, and the last from the shape of the basin. The eruptions are not very grand, but are worth seeing. Down through the small orifice can be seen the bubbles of steam; and as they rise to the surface they explode with a noise like a puff of steam from a steam-pipe, at the same time tossing a column of water several feet into the air; as this descends it meets ascending jets of warm water and steam, and is thrown still higher, sometimes reaching forty feet or more, being in effect very like the action of a battle-dore and shuttlecock. The duration of the eruption is short, but the geyser is playing about half the time; and at each eruption the basin is filled with water, through which the steam forces its way. The probability is that the water is held in the basin by a body of hot steam rising in the tube beneath, for as soon as the eruption is over the water recedes far down into the crater and is lost to view.

The basin at times contains fine specimens of silicified wood and pebbles of geyserite. Some "funny" tourists to the Park have amused themselves by throwing tin cans and other odds and ends into the crater of the Saw-Mill Geyser, to see them hurled out at the next

eruption, and to a great distance; but all such interferences of man and "evidences of civilization" detract very much from the pleasure of a visit to the geyser. This has also been called the Fountain Geyser, from its playing up from the centre of a saucer-like basin.

Near the Saw-Mill Geyser are a number of tubular hot springs which have raised for themselves walls, forming basins of rare beauty. Some of them are large, others small; and geologists think they are the cones of extinct geysers long since active, and that even now these springs are degenerating and the walls of their basins going to decay.

GRAND GEYSER.

"The shades of night were falling fast" in other lands, but in summer it does not get dark in the Park till after nine o'clock. Still, the sun was far aslant when a shout from the crowd near the Grand Geyser warned us that a display from that quarter was imminent; so we scampered over the rocks and up to a seat on the high rocky bench at the foot of which lies the crater of the Grand Geyser, and awaited developments. This geyser is about five hundred yards north-west of the Saw-Mill Geyser, and nearly in the same line from the hotel-site, near the Castle.

This geyser is in eruption once in twenty-three or twenty-four hours as we saw it, but the books give its interval variously—one putting it at thirteen hours, another at from twenty-four to eight hours. Some allowance may be admissible for the times of the year when the observations were made. We think it safe to say that an eruption may be expected once in the twenty-four hours, and probably about sunset, as all the geysers seem to be more or less restless at that time of day.

The crater in this case is funnel-shaped and very beautiful, but not like a geyser in its external appearances. The orifice of the geyser is about three by four feet in breadth and length, though very irregular in

outline, and oddly inlaid with rounded masses of geyser-formation, smoothed and polished by the boiling currents and painted with various hues. Near it is a second pool, or spring, smaller in size, but generally boiling vigorously. In fact, during the interval of repose the geyser itself is very calm, and the water is of a fine blue color; so that the existence of a geyser would not be suspected. There is no premonitory symptom to initiate an eruption, yet its action generally lasts upward of twenty minutes; so that it can be seen at some time, even though the tourist may be at a remote part of the basin when the action commences.

The action of the geyser is very powerful as well as beautiful, and the tourist is afforded a most comfortable place from which to witness it, for just back of the geyser is a cliff of rocks upon which a position may be selected where the whole display may be watched with advantage. Seated upon a rock, you may see the water in the crater suddenly recede, and the most terrible thundering and thumping noises are heard. The earth around trembles and shakes when with a terrific explosion a column of water is thrown out of the crater to the height of two hundred feet, with a diameter of over six feet—the column being maintained at this height for many minutes. On a calm day the steam rises thousands of feet above the flood of water, escaping like the puffs from a steam-pipe, and in the slanting rays of an afternoon sun the display of this fountain is exceedingly beautiful. When the column reaches its extreme height, the water diverges and falls back into the basin in glittering showers of rain and spray, with a deafening noise, while about the crest of the fountain hovers a prismatic bow. The column is composed, like that of the Giantess, of a number of streams of water aggregated together. The central one playing to a greater height than those on the periphery, a fine effect is produced—spectral colors playing all over the aqueous mass. As suddenly as the action of this geyser commenced, so suddenly does

it cease. For a moment all is quiet, save the rush of the waters returning into the crater, when the water is again hurled in a sparkling fountain into the air with the same noise intensified—the column usually standing a little higher than before. Thus does the geyser play and cease at intervals till at least seven eruptions are counted, when all is over and the discharge subsides, leaving the ground deluged with pools of hot water.

On the 24th of August, 1882, a most splendid display of this geyser was witnessed, when eight successive impulses were counted, the first being much the grandest, and the others showing a gradual falling off, until the flow ceased altogether and the mighty geyser sunk again to repose, to slumber for a time in its dark bed many fathoms under ground.

WASH-TUBS.

Again crossing the river to the south side, we come to a series of small basins, or "wash-tubs," about ten feet in diameter, each with a hole probably four inches in diameter at the bottom. The edges are rounded off, and the walls of the basins are lined with wart-like excrescences of geyserite of a buff color. The peculiarity about these basins is that at times they are filled with water boiling hot, or nearly so, up to the very brim and running over; and so shallow and convenient are they that the tourist of cleanly habits is tempted to do some laundry-work. Everything being handy and no trouble to boil the garments, he not unfrequently throws in a bundle of things to be washed, and while busy in the suds he may suddenly find his batch of clothing receding down the hole in the centre of the basin; and before he can clutch them they are gone and the basin is once more dry and empty. He waits patiently, and sometimes in vain, for the monster which stole his clothes to return them. Sometimes the clothes are returned with one or two pieces missing, but generally they are all safely

restored in due time. We noticed about the edges of one of these pools, in the water, a quantity of fibrous matter which may have been the torn shreds of garments long ago engulfed.

DEVIL'S WELL, OR DIANA'S SPRING.

About three or four rods north of the Castle Geyser, which stands on the south of the camping-point, is the Devil's Well; or let us substitute "Diana's Spring," since there is nothing but the heated condition of the water to suggest the presence of His Satanic Majesty. The well is raised on a very slight mound of earth, with a narrow rim of geyserite about six inches high all around the edge, with indentations and scallops of a very singular shape. At one or more places the edge is broken, permitting the water to boil over. The entire area covered by this spring is probably one hundred and fifty square feet.

What this spring is has long been a mystery. It is near the side of a powerful geyser—the Castle—but during the active and quiescent periods of this geyser the well manifests no alteration in its placid condition. Occasionally, at long intervals, the action is slightly more violent and a little mound of water is heaped up in the centre. Generally the bosom of the spring is smooth and placid as a mirror, and, standing at the side of the crater, the sides of the tube are visible for a hundred feet, showing a most beautiful structure, composed of folded and rounded masses of geyserite projecting from the sides. These masses are of a more or less intense blue color, and objects seen through the waters in the light of a meridian sun have a prismatic play of color about their edges. In some places, and through certain strata of water, the objects viewed beneath are of an exquisite emerald green; and yet this spot, with all its beauty, is called "Devil's Well."

This spring being near the camping-point, it is a favorite place for tourists to do their cooking and wash-

ing; and many a pot of beans has been cooked in it by immersing the can in the boiling waters.

The cleansing properties of this spring are wonderful. The water being strongly alkaline, a few minutes' boiling in it of a well-soaped garment will produce a result that is surprising as well as pleasing to the laundry-man. The equilibrium between repose and the boiling condition is so unstable that the introduction of a garment, or even the throwing of a stone, into the pool will initiate a most vigorous boiling for a few seconds, causing the water to overflow the rim; and in many cases the feet are scalded in consequence.

THE CASTLE GEYSER.

Just south of the Devil's Well, or Diana's Spring, is the crater of the Castle Geyser, one of the most conspicuous and greatly admired objects of interest in the basin. It stands upon the same raised mound as Diana's Spring, and has formed for itself a most elaborate and imposing crater. The side away from the river is smooth and polished, having the appearance of porcelain, while the opposite side is broken by a series of rounded steps falling off toward the river. Each step is pitted with depressions containing water and balls of geyserite, of greater or less size and rolling backward and forward with the shifting currents as they ripple over the glistening walls of the crater.

The chimney of the crater is ten feet in height, and probably twenty feet in diameter at the base, falling abruptly on one side and sloping gradually away at the other, the entire mass composed of geyserite. At the top of the cone is the crater proper, having an internal diameter of about four feet, with its margin studded with rounded masses of siliceous material several inches in diameter, like huge beads, which are in their turn studded all over with the cauliflower-like excrescences peculiar to this geyser region, and found only near the crater of geysers or springs. The color of the larger masses is that of an orange, which fruit

they somewhat resemble in appearance. The interspaces between the masses of geyserite and the margin of the crater at a distance present the appearance of port-holes, and the resemblance to a ruined castle is certainly very close.

The eruption of this geyser was by no means insignificant when we witnessed it, though the times of its eruption are somewhat uncertain. Intensely hot steam is constantly issuing from the mouth, and while the wind blows the steam away from the tourist the mouth of the crater may be viewed for a long distance down, showing a porcelain lining of a fine quality and almost spotless whiteness, but as soon as the wind changes its quarter the spectator is very apt to fall sprawling upon the ground below, so sudden is his haste to get away from the scalding current of steam. Accompanying these spurts of steam there generally comes out a column of water a few feet high, but this is no indication of an eruption; nor is the agitation of the small vent alongside of this geyser any premonition of the intention of the inmates of the Castle to sally forth.

The periods of repose of the Castle are variously stated. Some give it as in eruption once in forty-eight hours; others, once in twenty-four hours; and it is possible that for certain months of the year the interval is various. When we beheld the geyser, it was on the 24th and 25th of August, 1882, and then it had an eruption every day, about ten A. M. It is mentioned by Colonel Norris in his report for 1881 that the Castle was in eruption on October 4th at three P. M., and on the 6th of same month at quarter of ten A. M.; and it may be assumed that at about ten o'clock A. M. and from two to three o'clock P. M. are the proper times to expect a display of the Castle Geyser. Even should the tourist be obliged to remain over a day, the spectacle will well repay the delay.

As seen on August 25, 1882, it was grand. About

quarter of ten A. M. the column of steam which had been rising from the mouth of the crater increased greatly in volume, and occasional puffs shot up far into the heavens; but the eruption was not yet. Soon, however, the water began to run down the sides of the crater as the tube filled from below, and now the roaring and rumbling sounds commenced, accompanied by the most violent shaking of the earth, whilst at the same time a most splendid column of water was ejected to the height of one hundred and fifty feet, completely filling the mouth of the crater. For real intrinsic beauty we think this geyser excels all the others. When seen the heavens were cloudless, except from the steam that arose from the geyser, and the sky of a rich tint of blue. Standing on the south side of the geyser, with the sunlight falling full upon the fountain, the effect was gorgeous. As the column spent itself a tremendous shower of brilliant spangles fell in large drops back over the crater, enveloping it as if in a veil of diamonds, while a thin mist of finer particles was wafted farther off by the passing breeze, and fell in a sparkling shower at a little distance, there forming a majestic arch reaching to the earth, while the foot of the geyser was encircled by a prismatic halo of great size. These sights, contrasted with the blue of the sky, the deep tints of the evergreen foliage and the variegated colors of the geyser-cone, produced an effect that was certainly fine; and this one spectacle is worth all the fatigue and trouble it may cost to see it. One of our party sat watching the magnificent display, and would ejaculate, "Isn't that splendid?" while the rest had nothing to say, being rapt with awe and wonder. The eruption lasted three-quarters of an hour, and then gradually subsided, but the geyser kept up more or less sputtering for the remainder of the day. While the geyser was playing, Old Faithful, the Saw-Mill and one or two others went off, but they were not noticed by our party, owing

to the absorbing interest we felt in the beautiful eruption of the Castle.

It is now too near lunch-time to endeavor to see any more geysers; so we repair to the Firehole River for a bath, and find one of those quiet shady places where the pines screen the river, and where the bed of the stream is paved with many-colored pebbles and the clear water eddies and flows along by banks covered with rich grass. Above is a hot spring emptying its contents into the stream, so tempering the bath that the swimmer may select what suits him in the way of temperature, having it all hot or all cold, or, if he choose, one side of the body hot to a painful degree, the other almost icy cold by contrast. And how refreshing is the quiet nap in the shade of the little grove till dinner is ready!

COMET GEYSER.

Starting out now and going north-west about two thousand feet, near the banks of the river, on the south side, we come to the Comet Geyser. Here is again one of the funnel-shaped orifices with rounded margin and no crater, with its subsidiary pools and hot springs. The pool itself is very beautiful, but the great size reduces the height of the column, and it is not the subject of much notice among so many large geysers, especially since its near neighbor, the Giant, is south just thirty rods from us. Eruptions occur about every six hours.

GIANT GEYSER.

North-west of the camping- or hotel-site at the Castle, about half a mile and thirty rods north of the Comet, stands the broken cone of the Giant Geyser. There will be no mistaking or missing this geyser, as it stands to the left of the road as you enter the basin from the north, or on the right as you come from the Castle Geyser. We have taken the Castle as the centre, as

it is more nearly in the middle of the basin than any other, and, being conspicuous, is a good landmark.

The cone or mound of the crater has been described as resembling a broken horn, but the fancied resemblance to a horn is very vague. It is conical in shape, and on the north side a part has been broken away or may have failed to form; at all events, it is wanting. Internally, the walls of the crater are paved with a tessellated stratum resembling the old Roman and Pompeian mosaic in brilliancy of colors, the white predominating, but relieved by crimson, red, yellow, green, gray, etc., in an endless variety of tints, while the exterior of the cone is chiefly white. Like that of the Castle, the inner wall of the crater is perpendicular on one face and sloping on the other, but the directions are reversed: the Giant has its perpendicular wall on the north-east side, while the Castle has its on the south-west. Then, too, a dissimilarity exists in the height of the cone, that of the Castle being greater and more flattened; the Giant is lower, but more acute.

This geyser has justly been styled "the Father of Geysers," and, in fact, it is the largest known geyser in the world. The tourist gazing at the gigantic flood of water shooting out of its crater will congratulate himself that he is one of the favored few who are permitted to witness this unique wonder—a sight which no country but our own in any wise can produce.

We stood looking with absorbed interest at the Grand Geyser on the evening of the 24th of August, 1882, when a "shout, prolonged and loud," arose from the crowd at the west end of the basin: "There goes the Giant!" and in an instant there was intense excitement, some scrambling around for their ponies to hurry to the scene, others rushing down the road with all possible speed, yelling like demons. Others plunged into the river and rushed madly through the swift-flowing water to get a glimpse at this grand foun-

tain. But no haste is necessary: the Giant is very accommodating, and will play so long that every one may have a chance to witness its display. With the rest we hastened to the scene, but could not approach within less than one hundred yards of the crater, on account of the steaming flood of water that surrounded it to that distance.

The Giant "goes off," as it is said, once in four days, but this interval is not constant; and from observation its action is generally found to occur at sunset or near that time. It will play for an hour and a half, and sometimes two hours; so that there is ample time to see it. However, the tourist will want to get on the spot as soon as may be, for his own satisfaction.

Language is almost too circumscribed to describe this phenomenon; yet something must be said of it. As with the Giantess, a little vent by the side of the crater gives a premonition of the coming storm, and for some hours is in a violent state of confusion, boiling and sputtering away furiously, and never ceases until the Giant is once more at rest. Accompanied by all the noise and uproar of a cyclone or a tornado, with a tremendous explosion the crater is filled with steam, and a huge column of water nearly eight feet in diameter rises to the towering height of from two hundred and fifty to three hundred feet. This elevation is maintained for some time, when the torrent gradually sinks to two hundred feet and plays steadily for an hour and a half. During the whole period the noise and the roar are almost intolerable and deafening; so boisterous is the tumult of the elements that conversation is impossible, and "you can hardly hear yourself think."

The form of the jet while the geyser is playing is that of a huge column standing perfectly erect, with a brow encircled by a halo of steam and a rainbow of brilliant colors, rising and falling with the pulsations of the fountain, while the column of descending drops shrouds the pillar in a sparkling

covering. A dense cloud of steam rises toward the sky and floats off on the breeze, filling the valley. Soon the water rushes down the sides of the mound, and the tourist is admonished by having his feet immersed very suddenly, ankle-deep, in a stream of extremely hot water to seek the higher ground; and the bed of the river fills to overflowing by the increased flood that gravitates into it. Ordinarily, the river is here thirty-five yards wide and very rapid, but its volume is more than doubled by the eruption of the Giant, so vast is the quantity of water thrown out.

Near the scene of this wonderful display is a very singular bed of semi-solid siliceous deposit; it lies just north of the Giant Geyser, toward the river. Here, for several hundred square feet, is a deposit of a peculiar elastic siliceous matter resembling glue; in a semi-solid condition it is smooth and unctuous to the feel and very slippery to walk on. It is laid out in beds, or layers, about an inch thick, which may be peeled up, when the structure seems to be columnar or shreddy. It is elastic, and bounces like india-rubber. In many places it is of a brilliant green color; in others red, of a very bright hue; then yellow, and more frequently white and opalescent, filled with little pits, or depressions, containing water. Chemically speaking, it is probably silicate of alumina, which in time, by hardening, gives us the beautiful formation on which these geysers rest. How long it takes to harden is not yet known; and now, after more than ten months, a specimen, after being kept all winter, is as soft as when taken from its bed by the side of the Giant Geyser; and it appears likely to remain so for some time longer.

CATFISH GEYSER.

Near the Giant are a number of small geysers throwing more or less water all the time, except when the Giant acts. The largest of these is called the Catfish—why, we cannot explain.

GROTTO GEYSER.

North-west of the Giant about five hundred feet, and on the right of the road as you enter the basin, stands the Grotto Geyser, with the oddest of all the geyser-craters, and of a form that will puzzle the most profound to account for. We all have pet theories and fancies as to how this curious thing was formed, and, in fact, the attempt to unravel the mysteries is a great part of the enjoyment of the visit to the geyser basin. On a low elongated mound a few feet in height stands (as you view it from one side) a pillar of geyserite five feet in height, slightly leaning to one side. About this, in a semicircle, is a hollow bank or parapet also of geyserite formation, with openings at both ends like a tunnel, arched over and curved, so that both openings are on the same side of the crater. Near the pillar is a vertical opening of small size. The entire mass is white and snowy. On one side the outer wall of the tunnel is perpendicular; on the other, sloping. The display of this fountain is not very striking in point of height, but it rivals all the others in the peculiarity of its action. Two streams of water are thrown out at an angle and with a sort of rotary motion, so that they impinge upon each other and unite in throwing a large column to the height of about forty feet, the water being churned about in a most singular fashion. The eruption lasts about half an hour, and may be looked for every six hours.

This geyser-mound is a wonderfully curious thing to look at, and so we go from one object to another with an untiring interest until, from sheer exhaustion, we are obliged to return to camp to rest. Having taken some refreshment, we again start out to visit the other geysers, at the north end of the basin.

RIVERSIDE GEYSER.

Returning to the Giant, which so recently was in such violent action, we find nothing but the empty crater

and a little steam coming from the vent, so we pass on and over the river to the north side; and there, just at hand, on the left side, is the Riverside Geyser. This is small in comparison with the rest that have been witnessed, and, were it not for the peculiarity of its crater, would be overlooked; but it is a vigorous little fellow, and, could it be planted in some of our large cities, would attract some attention. It spouts irregularly, and sends a column sixty feet high. The crater stands on the summit of a mound that has been built up in six or more terraces, each smaller in area than the former one, thus making a curve with the edges of the terraces rounded off. There is no definite period when an eruption may be expected, but twice or thrice a day a "spout" may be seen, lasting about seventeen minutes.

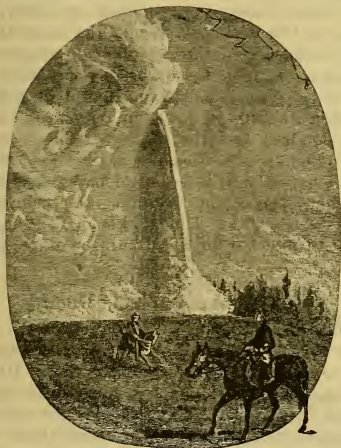
FAN, OR FANTAIL, GEYSER.

About two hundred yards north-west of the Riverside Geyser is the Fan, or Fantail, Geyser, intrinsically small, but from its display very interesting. It consists of a group of five geyser-tubes opening at the same point, having a common crater and discharging at one and the same time. Each one of the tubes is inclined a little from its neighbor, and all radiate from a centre; so that the effect of the eruption is to produce a huge outspread fan one hundred feet in height and as many wide. The central stream being higher and the four lateral ones shooting out to a less distance, the result is a fan of hot water which rivals the most showy production of the "german" or the "opera." Frequently, when the fan is spread, a fine bow will encase its entire margin, adding an exquisite fringe such as is never produced by the arts of man. It is a marvellously strange spectacle, and as it occurs three or four times a day—though the exact time is irregular—it will repay the tourist to saunter about in the neighborhood and wait to see it. The display lasts about fif-

teen minutes, sometimes occurring in the light of a full autumnal moon, when it is beautiful in the extreme and seems very coquettish in its behavior.

SPLENDID, OR PYRAMID, GEYSER.

Returning now to the south-west side of the river and reaching the Giant, you turn to the right and follow around the base of a little hill. Skirting the



SPLENDID GEYSER.

north side, near the foot of a high hill you come to the cone of the Splendid, or Pyramid, Geyser. This is a comparatively new geyser, but issues from an old cone. Professor Hayden, in 1871, says of it: "There is one quite conspicuous cone marked on the chart—Pyramid—which is now extinct, except that from the summit steam is constantly escaping. This has been a geyser of some importance, and has built up a struc-

ture twenty-five feet high and one hundred feet in diameter at the base. Near it is a quiet spring with a most elegantly scalloped rim. . . .”

This geyser is very beautiful, and in appearance somewhat resembles the Grand. Since Professor Hayden wrote, it has broken out afresh, and is now very active. For the three years previous to 1881 it slept in quiet, save the little steam that issued from the crater; now, however, in point of regularity, it is a rival to Old Faithful, though the intervals are longer, being once in three hours; but sometimes it will play in the half periods, or an hour and a half. There is no special indication that it is going to play, when suddenly it shoots up a jet to the height of two hundred feet, the display lasting from five to ten minutes. Occasionally, at the same time, a smaller fountain near it begins to play; and, having an oblique stream, the two mingle, producing an arch of pearly drops that sparkle in the sun most brilliantly and fall in a glittering shower to the earth.

FAIRIES' WELL, OR PUNCH-BOWL.

About eight hundred feet south-west of the Pyramid, or Splendid, Geyser is a very curious formation known as the Fairies' Well, or Punch-Bowl. Here, on the summit of a flat mound, is a raised rim of geyserite about eighteen inches in height and several feet in diameter, enclosing a pool of that beautiful blue water so frequently met with in the Park. There is evidence—which to most minds is conclusive—that it was once a geyser and this is the remaining crater. The edge is scalloped and composed of layers of shell-work covered with excrescences of geyserite. The edge is very firm and hard, so you may approach quite to the margin, as in the Devil's Well, and look down into the chaos of blue water, in the mid-day sun resplendent with all the colors of the rainbow.

BLACK SAND GEYSER.

Seven hundred feet farther up the ravine, in the same direction from the Pyramid, we find the curious remains of an extinct geyser which is unique in its peculiarities. Approaching by way of the stream which flows from it, you come to a circular depression in the bed of geyserite, with a raised rim eleven feet in height and gently tapering with a funnel-shape to the margin of a beautiful pool, where the water is boiling up in the centre, and, breaking through the rim, forms the little stream which has led us to the spot. The water in the geyser is at a temperature of 200° . Unlike most of the geysers, in this one the margin is of very black sand, which leads one to the supposition that at some time in bygone ages it may have been a mud volcano.

DEMON'S CAVE.

Near the Black Sand Geyser is a deep pit in the geyserite, which has been washed out, leaving a crust suspended over a boiling caldron, from which steam is constantly arising, filling the cave with a cloud of mist, which at times obscures the surface of the water below.

SODA GEYSER.

Off in the north-west corner of this basin, on the top of a very broad mound of geyserite, nearly two miles north-west of the camp at Castle Geyser, is a new geyser—the Soda, as it is called. It stands on the south-west bank of the river and about five hundred feet from the mouth of the Iron Spring Creek, which comes in from the west. Following the west bank of the river, passing several small springs, the geyser is easily found. It is not very pretentious, yet it is very pretty, from its symmetry and the regularity of its action. It is a cone-builder and spouts every ten minutes, sending up a very handsome column of water to the height of twenty-five or thirty feet. Its action

is so much like that of a soda-fountain that the name "Soda Geyser" has been given it, which is confusing, as it might be supposed that there is soda in it; which is not the case.

This finishes our list of large geysers, and we have condensed it as much as possible. The tourist must not think that only those springs and geysers we have mentioned are worthy of observation: this is an error. There are many that we could not, for want of time, mention. In passing, we would say Professor F. V. Hayden and party counted in the Lower Geyser Basin seven groups of springs and geysers—in all, two hundred and twenty-two—at an altitude of from six thousand eight hundred to six thousand nine hundred feet, and in the Upper Geyser Basin one hundred and six, at an altitude of seven thousand feet.

Before leaving the subject of geysers—for we do not meet any of much size after leaving this basin—a short sketch of the theories concerning geysers may not be out of order.

Bunsen's theory is briefly stated. Into the fissures of the rocks, coming up from an immense depth, water has found its way and become heated. Rising through the upper strata of rock in a boiling condition, it has dissolved out some of the earthy constituents of the rocks through which it has passed, and in this extremely heated state rises higher and higher in the fissure. The direct origin of the heat is believed to be the decomposition of the sulphides of iron, lead and copper that are found in the rock of the regions about the Park, which are rich in these mineral deposits; and it is well known that the exposure of large bodies of these minerals to air and moisture will engender intense heat—so much so that the bonanza mines of Nevada cannot be worked continuously, and great fires in some of the coal-mines have been attributed to this cause. It is very probable that this is the origin of the heat producing the geysers. It would seem that the origin or cause of the display is this: The

water in the geyser-tubes being confined under great pressure and at a high degree of heat, the pressure from below forces the column of water up higher and higher in the tube; as it reaches the surface the pressure is more and more released, and finally a point is reached where the pent-up, superheated water flashes into steam and the pressure is relieved by the discharge of the jet.

To account for some of the geysers, this plan must be to a certain extent modified. For instance, we find that some of them pulsate, while others send up a steady stream. The pulsating geyser may be accounted for by supposing a large reservoir, or cavity, in which, as the heated water rises, it is flashed into steam and fills the cavity with water and steam. By degrees the pressure has accumulated to such an extent in this cavity that it is blown out, and the first impulse to the geyser is witnessed. Part of the water again returns down the geyser tube, and at the instant the pressure is released by the upthrust of the column of water a body of steam is again suddenly created in the cavity, which, meeting the descending water, hurls it back, giving the second impulse; and so on till the water is cooled to such a degree that it fails to make steam in sufficient quantities for an eruption. In the steady geysers we may assume that there is no such cavity, unless it be very far down, and that the accumulating steam shoots the collected water out at a single effort.

The geysers are all more or less coated with geyserite—a species of opal—and the water, when cool, is perfectly potable, having a very pleasant mineral taste when the iron is not too strong.

There is one fact in passing that may be of interest to the scientific tourist—namely, that most of the now active geysers on the north side of the river have no cones or elevated craters, although some of the great springs have a large cone, or rim. The Beehive and the small groups near the Lion, with the Riverside and the Fantail, are the only ones with a cone on

the north side, while, without exception, all the geysers on the south side have cones, and very considerable ones. These facts might seem to indicate that the coneless geysers are the later ones and have not yet had time to build up a structure. The water from all seems to deposit opal, or geyserite. Here is the fact; but it will not do for us to stop to discuss this matter at this time.

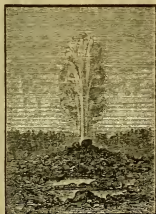
The name "geyser" (ghī-zer) is an importation from Iceland; it means, in that tongue, "rager" or "roarer," and the name is derived from the horrible sounds emitted during the eruptions. The word "geyser" is, in fact, a near relative of our word *gusher*, which it so nearly resembles in form.

The tourist, mounted on a cayuse and accompanied by a pack-train, will take the road to the south end of the basin, once more passing and stopping to take a last lingering look at Old Faithful, now vigorously spouting as a parting salute; and, looking back with regret on the wonderful valley with its pillars of cloud rising on every hand like incense, he turns into the trail, south of Old Faithful, to visit the Shoshone Lake and geyser basin, if time permits, or to go right to the West Bay, or the Thumb of the Yellowstone Lake. If he has a team, he must forego the trip to the West Bay of the lake, and return by the road to the Lower Geyser Basin and take the road to the right to the falls and lake by the way of Mary's Lake and Sulphur Mountain.

In leaving the Upper Basin by the trail the tourist unaccompanied by a guide will be very careful to keep the trail. South of Old Faithful, on the extreme right, there is a well-marked trail leading to the left that will conduct the tourist into a dense wilderness, in which he will lose much valuable time trying to get out. Keep the right-hand trail till after the first left-hand trail is passed (the one we have just spoken of); then, if you wish to go to Shoshone Lake, keep to the

right at the next path, which will take you past a small hot-spring deposit of minor importance; then, about a mile and three-quarters south of this, on the south side of a little stream, which must be crossed, the trail again forks, the right-hand trail going to Madison Lake—a small sheet of water about half a mile long lying right on the north side of the main chain of the Rocky Mountains, with a dense forest of pine trees extending down to the very shore. There is a ridge projecting into the lake, giving it a heart shape.

The trail to this lake follows the Madison River, then, turning to the east, crosses the Rocky Mountains and descends to the geyser basin of Shoshone Lake. The trail to the left is more direct, crossing the mountains and following down the Shoshone Creek to the geyser basin.



CHAPTER XII.

FALLS OF THE MADISON, OR FIREHOLE, RIVER.

THE route by way of Mary's Lake being uninteresting and most of it a repetition of that already travelled, the tourist will do well to take the trail to the West Bay, or Thumb. Keeping to the left, therefore, after passing the first path, south of the Old Faithful Geyser, and travelling about two miles over a constantly ascending path, hugging closely the sides of the cañon and crossing over short stretches of corduroy road, by a sudden turn in the way you come face to face with the Falls of the Firehole River—a beautiful fall of upward of one hundred and fifty feet, the water pitching over a ledge of volcanic rock down into a deep pool below, the narrow gorge through which it falls contracting to a mere defile between the bald faces of the cliffs. With the river like a fine thread of silk, far below, winding among the pine trees at the foot of the cañon, the picture is very fine, and from the point where it is best seen the traveller is loath to go, but, remembering that a long ride awaits him, reluctantly leaves this wild and picturesque spot, which in its quietude offers a welcome rest after the roar and tumult of the geysers.

NORRIS PASS.

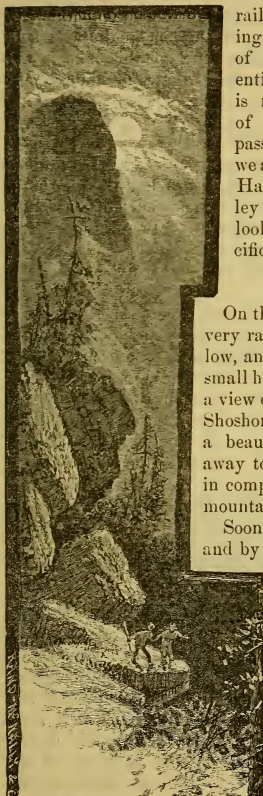
Pushing on through forest trees and open parks of magnificent verdure, by a gradual ascent we reach the Norris Pass, in the Rocky Mountains. The pass is a narrow cañon, or gulch, cut through the ridge in the mountain as smooth and evenly as if excavated for a

railroad, the rocks standing on either side like walls of ruined masonry. The entire length of the pass is not above one-quarter of a mile, and, having passed through this gate, we are on the Pacific Slope. Having shut out the Valley of the Mississippi, we look now toward the Pacific Ocean.

SHOSHONE LAKE.

On the east side we descend very rapidly to the valley below, and from the crest of a small hill, turning to the right, a view of the north arm of the Shoshone Lake is had, with a beautiful valley stretching away to the north of it, shut in completely by a fold in the mountains.

Soon we are in this valley, and by taking the trail to the right, on the east bank of De Lacy Creek, which is forded, we are in a short time on the shore of the lake, a sheet of clear, pure water without a single fish, but possessed of abundant vegetable life, having an area of about one hundred square miles, with a cluster of hot



MADISON CAÑON.

springs of little note at the north end on either side of the De Lacy Creek, and another on the west side, as before described. The level of this lake is two hundred feet lower than the Yellowstone, though only six miles distant.

LEWIS LAKE.

The waters of this lake empty into Lewis Lake, about three and a half miles to the south, and there form the Lewis Fork of the Snake River, a branch of the Columbia River. To the south-east of Lewis Lake is the the Red Mountain range, with Mount Sheridan (ten thousand three hundred and eighty-five feet high) a conspicuous object.

We soon pass through one of those singular grassy parks or lawns so common in many places in the Park—a spot in the midst of a dense pine forest, generally circular, where the trees seem to have been blighted in some peculiar manner. There is no evidence of their having died; no stumps are found, no decaying trunks, no thinning out of the trees near the margin, but there is simply a hole cut out in the forest, the floor perfectly level and carpeted with a rich growth of fine grass. There seems to be no explanation for the occurrence of these curious lawns.

TWO-OCEAN POND AND THE BACKBONE OF AMERICA.

Taking the left-hand trail after fording De Lacy Creek, the way now commences to ascend the mountain and is the most precipitous trail ever travelled by human beings: it is with difficulty the rider can keep his seat as the cayuse makes his way upward; but presently you rest on the summit, a few rods from Two-Ocean Pond. Here, upon the summit of the Rocky Mountains, we stand on the backbone of the American continent, and on the one hand see the waters of this pond in a fine stream flowing off to the westward, down mountain-sides, over rocky precipices,

to mingle at last with the waters of the mighty Pacific Ocean, on the other hand a similar stream hastening on its way to the Atlantic Ocean, the two streams thus absolutely dividing the continent into two islands. The timber is so dense here that you cannot see the horizon except to the southward, where you have a view of the Red Mountains and the valley of Lewis Lake.

While resting on the summit one of the mules, scenting, no doubt, the rich pasture at the foot of the mountains, gave vent to one of those brays such as only a mule can give, and started off on a run down the mountain-side, with its pack banging against the trees. To avoid losing both pack and mule, we put the spurs into the most stubbornly slow cayuse we ever had mounted. The ride down the trail to the West Bay of the lake was not slow, and, fatigued, we spread out on the grass and waited for the "boys."



CHAPTER XIII.

WEST BAY, OR THUMB, OF YELLOWSTONE LAKE.

AT the point where the trail first strikes the shore of the lake is an excellent place to camp, and it has been selected for a hotel-site. The grassy bank is raised some twenty feet above the surface of the lake, with a level floor, on which grow majestic pine trees not so tall as the sequoia, but giving abundance of grateful shade and adding another interesting feature to the landscape, already very charming. Some distance from the foot of the bluff a broad, smooth, tapering beach stretches away to the water of the lake, composed of light-colored pebbles and sand ground to atoms by the ceaseless ripple and surge of the waters, which are lashed to foam on the beach or broken into spray against the neighboring rock to the north.

The woods extend quite down to the edge of the bluff, and the tourist, leaning his back against one of the huge trunks, feasts on the landscape. To the south a high range of snow-capped mountains raise their lofty heads to the clouds, their noble summits resplendent in the brilliant whiteness of the snow and ice that rest upon them, now bathed in the crimson light of a setting sun, while the rosy-tinted clouds hanging over the horizon and reflected in the blue and rippling water of the lake at your feet carry the mind away, and reverie takes possession of the soul. In front, to the eastward, stretches a waste of blue water to a distance of five miles, hemmed in by an even row of forest trees, surmounting the white bluff and standing, a dark-green line, between the white of the bluff and

the blue of heaven. This is Delusion Point, which shuts in the West Thumb. Near the camp, on the south, is the mouth of a small stream, which comes in from the mountain, widening, when it reaches the lake, into a considerable bay rank with weeds and rushes and abounding with ducks and teal. The woods on either hand furnish a plentiful supply of pine-squirrels, which are very fine eating, and at this time of the year generally in good condition and go well with the flapjacks when made into a stew. In the mountains to the south-west a blacktail deer or an occasional elk may be found. To the north of our camp is a cluster of hot springs, to which we will return.

YELLOWSTONE LAKE.

So grand is the view which we have described, as we see it for the first time after descending from the mountains, that we have almost forgotten to speak of the lake itself. It is traversed by the Yellowstone River, whence it takes its present name. The older writers often call it Sublette's Lake.

The tired citizen pursuing his daily vocation amid the hot walls and dusty streets of a sultry metropolis little dreams of the vast outspread area of crystal water, with a temperature of nearly 45° F. at midday in August, that hangs suspended amid the clouds, seven thousand seven hundred and eighty-eight feet above him, with three hundred miles of coast-line and a view extending for more than forty good miles across its bosom, which is dotted with islands. The contour of the lake is very irregular, being deeply indented with bays; and, from the number of these bays, the lake has been likened to a hand, and the west bay is called the Thumb.

FLAT MOUNTAIN.

Travelling southward and following a dim trail, we may make a complete circuit of the waters; but time

will not permit it, and we halt at Flat Mountain, a point directly south of the outlet. Here the mountain rises to a height of nine thousand two hundred feet and presents a most extensive view over the lake and mountains beyond. At the foot of the mountain, to the north, is Flat Mountain Finger of the lake, and a little north of this is another finger, called Delusion Lake—a marshy region with water-fowl in great abundance at certain seasons of the year, and a fine breeding-ground for the duck and teal, while the stalking heron and the pelican wade among the marshes in quest of food. Across a narrow stretch of water is Frank's Island, a strip of land three miles long and only one wide, covered with trees and giving shelter to much game, and about two miles farther north-east is Dot Island. To the east lie the South Finger and the South-East Finger of the lake, separated from each other by a high point of densely-wooded land. Nearly in the same line with this point from Flat Mountain is Brimstone Basin. To the south, over the main range, may be seen Mount Sheridan, rearing its even summit toward the sky, with its broad crown covered with a capping of perpetual snow, while in the deep ravines of its rugged sides lie the inexhaustible source of its many streams, the glaciers, and ever and anon may be heard the thundering of a mighty avalanche as it sweeps down the mountain, mowing the trees in its course like grain before a reaper's scythe. Its summit is ten thousand three hundred and eighty-five feet in altitude.

HEART LAKE AND GEYSER BASIN.

On the eastern slope of Mount Sheridan is Heart Lake, with a small geyser basin on the north-west; this has little interest as yet, being entirely eclipsed by the upper basin of the Firehole River. This basin, as well as Mount Sheridan, is reached by a trail which turns to the right about two miles out on the

trail to Flat Mountain from the camp at West Bay, or Thumb, which is called, also,

“HOT SPRINGS CAMP.”

Before quitting the West Bay, or Thumb, we will take a look at the springs and geysers to be found at this point, and whose presence gives rise to the name of “Hot Springs Camp.” The basin extends three miles along the coast, and some half a mile back into the country. In fact, a most singular phenomenon is to be seen in this basin. In many places the chimneys of the hot springs stand up like boiling caldrons in the midst of the cold waters of the lake, with which they are surrounded to a depth of many fathoms; and where the hot water pours over into the lake those who desire it may find a most refreshing bath. The upper stratum of water being hot and the deeper ones cold, you can vary the temperature to suit the inclination—from 45° to 190° .

CRATER ISLAND.

One of these chimneys stands apart from the shore, an island of itself, with a boiling crater in its centre. It is an actual fact that the tourist may stand on the sides of this crater, and, catching a trout, may, without taking him from the hook, toss him into it and cook him. It is not a trick, and every one does it.

TAPERING SPRING.

One of these hot springs is remarkably beautiful. It is back a little from the water's edge and has a scalloped, indented margin, the edge projecting for some inches over the water, so that it shelves out and, it being composed of fragile geyserite, the tourist will be cautious how he approaches, as it may perhaps give way and precipitate him into the boiling pool. The sides of this pool appear to taper, but the great depth may account for this appearance, as three hundred and fifty feet have been reached, and at that depth any cylinder would appear to taper. Still, the effect is all the same,

and, as at many other springs of the Park, as you gaze down into the indigo depths of these seething basins you wonder, "Why is this?" Three hundred and fifty feet, and no outlet below, no boiling or bubbling to prevent your seeing the bottom (or what appears such); yet it is not a geyser, and still it maintains its heat near the boiling-point of water. It is most strange. Truly, the National Park is a phenomenal place, and on every hand the tourist is beset with wonders such as no other spot on the face of the whole world can afford, for either numbers, grandeur or the facilities with which they may be witnessed.

MUD SPRINGS AND PAINT-POTS.

Back of the Tapering Spring is a fine collection of paint-pots or mud springs. They have built for themselves small crater-mounds in some places, while in others the mud-spouts are shot up from the bosom of a large bed of soft mud of a most beautiful pink color and of extremely fine and soft texture, reminding one of the beds of "white-coat" used by plasterers in finishing up. The mud is thrown to a height of several feet, and it is very interesting to see with what precision the drop of mud falls back into the small orifice from which it has been ejected when the wind is favorable, or, rather, when there is no wind at all. At certain times the power of the eruption will hurl out a cluster of mud-drops, which descend on the soft mud and stick there in little conical masses, presenting a very curious appearance. This mud contains a large amount of iron and alumina, with some lime and silica.

YELLOWSTONE LAKE TROUT.

The tourist will hear many and wild stories about the "wormy trout" of the lake, and there is some truth in the rumor that the fish are hosts for a parasitic worm. This is a circumstance which has puzzled scientific men for a number of years—ever since the

fact was known. In the water of the lake and its tributaries, and down the Yellowstone River as far as the upper falls, you will find some of the fish infested with a long, slender white worm, named by our honored instructor, Prof. Joseph Leidy, who has made a minute study of this animal, *Dibothrium cordiceps*. The worm is found in the intestines and flesh of the trout (*Salmo pleuriticus*) at certain seasons of the year and at certain ages of the fish. The infested fish may be seen to be languid, paler in color and poorer in flesh than the healthy fish, and will, as the number of worms increases, swim higher in the water; but they seldom die of this malady, and it is said that after a certain length of time the animal will make his way out of the body of the fish, leaving it even more healthy and in better flesh than originally. In such fish a cicatrix may be found on the sides. Some say these fish, as a rule, are unfit for food; but the rule is (at least, such is the writer's experience) that the majority of the fish are fine eating, and that the wormy specimens are the exceptions to this rule.

You can always tell the wormy trout by one or more little bulges or lumps on the sides of the body, and usually near the pectoral fin. Then, again, the sickly fish are poor in flesh, and you will detect at a glance the marked difference between the fine, healthy trout of a pound or two in weight you have just hooked out of the lake, because he was so hungry for your grasshopper, and the sickly specimen that hangs limply to your line without a single flop. And no one should be deterred from eating these delicious salmon-trout because he is afraid of getting a wormy one. The meat is very fine and fully equal to the celebrated brook trout of our Eastern States. By all means try some of the Yellowstone trout.

The cause of the existence of the worm in the fish is a mystery, and will no doubt remain so. It is known that it is found only in the fish of the Yellowstone Lake and its vicinity, and that this is a distinct spe-

cies of worm and found in no other fish and in no other locality—not even the Yellowstone River itself below the falls, though the fish is very plentiful.

The ease with which the trout are caught in the lake has led to the most uncalled-for and wanton destruction of them by the “crazy” angler, who will pull out trout by the hundred for sport, and leave them rotting in the sun just for fun. We are glad to know that this species of vandalism will soon be stopped, and every American tourist should, for the sake of the honor of the human family, constitute himself a vigilance committee of one to stop this diabolical work and perpetuate the attractions of the National Park.

ELK-HUNTING.

By those who are sportsmen fresh meat is obtained from the neighboring forest and hillsides in the shape of elk-meat, which at certain seasons of the year is very good and not prohibited by law as an article of food, but the tourist is admonished to refrain from shooting elk merely to be devoured by the wolves, as has been done. One “man”—a gentleman from New York—boasted that he had shot five cow-elk just for sport. The tourist in the East may not think anything of this statement; but if he had experienced how useful this noble animal is, he would deplore the wholesale slaughter that is going on.



CHAPTER XIV.

BLUFF POINT.

LEAVING Hot Springs Camp, the trail follows the shore of the lake northward over the shelly white deposit which the springs have formed. In many places the pieces, broken small, are cemented together like shells on the coast of the Mexican Gulf. Soon the trail enters a dense evergreen forest of pine and spruce trees of conical forms, like those so much admired by us in the East. Evergreen trees of highly ornamental shapes are here scattered about at random on a sward of fine-bladed grass upon a gently-sloping hillside, constituting a park of very pleasing arrangement. Hither and thither among the branches of the trees the squirrels gambol, while creeping under the pendent boughs on the ground is the mountain-grouse.

Three miles of such riding brings us to the summit of Bluff Point, a high projection on the west side of the lake: from this point may be had a view of the lake which, while it is not so far-reaching as that from the outlet, is still very fine. Several hundred feet below you the restless waters of the bay lash the white sands of the shore; and the graceful shore-line, with high bluffs and tall pine trees, stretches away to the south. In front lies Carrenton's Island, with its grove of evergreen trees, and a sea of bright blue water surrounding it. The finest view is that to the northward, where is stretched before you a miniature Bay of Naples, with its graceful beach of light sand and gravel backed by a gently-sloping lawn of grass and trees. At the farther end of the beach, about a mile distant, is the crater of a boiling spring, the water

splashing over into the lake amid the splutter of steam, an aqueous Vesuvius.

ROCK POINT AND SAND POINT.

Beyond, the shore-line stretches to the eastward, and the rocky bluffs of Rock Point and Sand Point are cut out against the distant horizon. Through the narrows to the south of these points may be seen Dot Island and the farther shore of the Yellowstone Lake.

The way now leads into and through a dense forest of evergreen trees, past some of those curious little parks of beautiful, rich grass, the haunts of the elk and the deer at a later season. Now we ascend the high land and turn away from the shores of the lake.

Eight miles from the Hot Springs Camp we come to a forest of lodge-poles, all dead, and the country a barren wilderness, with the sun beating down on the head of the tired traveller with relentless fury, in retaliation for the carelessness of tourists who left their camp-fire unextinguished and ignited the timber in consequence.

NATURAL BRIDGE.

Eleven miles from the camp at Hot Springs we descend by a steep path over loose sand or gravel to the south shore of Bridge Creek, and across this, on the opposite side, is the hillside and chasm spanned by the Natural Bridge.

Crossing the stream, we ride by a circuitous trail backward and forward along the mountain-side to the top of the bridge, which is an arch of volcanic rock some thirty feet long spanning a ravine cut out of the solid stone by the action of a stream which now flows beneath the arch and plunges over a step eighty feet high, traversing the grassy meadow below and rushing on to the creek. On one side the chasm is very deep; on the other it is probably but fifty feet in depth.

Colonel Norris says the bridge has at one time been the crest of a fall, and that the stream has found its

way out at the bottom of the thin dam and undermined the rocks above, which have fallen away, leaving the arch of the bridge. But certainly a very long time must have elapsed while these elements were at work; for since the water has ceased to fall over the upper crest trees of considerable height have grown up.

The footway of the bridge is five to six feet wide and safe to travel over even with a horse. The timid tourist will cross the ravine higher up the stream, taking the trail on the west side.

The Natural Bridge has been known only for the past couple of years, and it is very probable that many new curiosities will be found in its vicinity as the progress of research advances.

Soon after leaving the Natural Bridge, rounding a point in the trail, you come in sight of Bridge Bay, and across a stretch of water two miles wide are the wooded banks of Stevenson's Island. The view of this bay is very pleasing, and affords great relief after the passage amongst the dead timber through which you have been journeying for the last five miles. On the north shore of the bay the country is comparatively level and the verdure is fine. Here are the abandoned camps of Indians, and by the old camp-fires arrow-heads and trinkets of obsidian and lava may be found.

ELEPHANT'S BACK.

About three and a half miles from the Natural Bridge the trail again begins to ascend, and climbs along the side of a mountain which reaches to the height of eight thousand eight hundred feet. The round and somewhat flat summit and the very steep sides give it the name of "Elephant's Back." The trail is almost impassable from its steepness and from the fact that you are at any moment liable to be dragged off your horse by the trees through which the path leads. With a little labor there could be made a most charming path that would give a fine

view of the lake and enable the tourist to journey in comfort.

About a mile of this scrambling over the Elephant's Back brings you to another fine meadow. Stretching out to the north and east for many miles, it is a vast park studded with evergreen trees. Through it meanders the little stream flowing from the mountain-side, and farther on the Yellowstone River. Wheeling to the right, we arrive at a little clump of trees on a low bluff by the lake-shore, where again we halt to look about us.

OUTLET OF THE YELLOWSTONE LAKE.

We have now reached the point where this mighty lake, lying in the midst of jutting mountain-peaks, with its depth of water exceeding forty-nine fathoms (two hundred and ninety-four feet), is contracted to a small stream of beautifully clear water, a few hundred feet wide and so shallow that it may be waded.

SCENES ON THE LAKE-SHORE.

The tourist must not think that now he has reached the end of the lake everything is over; on the contrary, sights that differ from anything we have yet seen, and which surpass anything of the kind to be seen elsewhere, will be met with right at this point. While the guide is making camp we sit upon the bluff and look out over the water. At our feet is a beautiful shelving beach several rods wide, reaching down from the foot of a steep sand-bluff from fifteen to twenty feet high and extending far out under the rippling water. On the summit of the bluff stand the pine trees, reaching upward toward the blue sky. On the beach below are patches of large pebbles of agate, carnelian and other precious stones intermixed with small masses of obsidian and lava. On the right hand is a little bay, its wooded point jutting out into the lake and partly hiding the opposite shore. In the distance rise the lofty summits of the Red Mountain

range. Nearer we see the crown of Flat Mountain, and in the foreground is Frank's Island, shutting off the view of Flat Mountain Finger and the mountains beyond. Then, casting the eye more to the east and peering through a defile in the mountains one mile wide, we have a view of an uninterrupted stretch of water upward of twenty miles in extent, broken only by the white caps and ripples that later in the day keep the surface of the lake in constant motion. The mountains shut in the South-East Finger, except at the defile mentioned. On the west is Promontory Point, rising to a height of one thousand one hundred feet above the level of the lake, with its sides tapering gracefully upward, steeper on the east and more sloping to the northward. On the east of the South-East Finger rise the Signal Hills (one thousand six hundred feet), and back of them Mount Stevenson, ten thousand four hundred and twenty feet high, and Mount Doane, ten thousand seven hundred and thirteen feet in altitude, presenting a picture that is grand beyond expression. As the tourist contemplates such magnificence he is constrained to say, "What is man?" On Signal Hills and Mount Stevenson the pure white snow is still lying in large patches like white blankets. Away off, at the foot of these mountains, over the west end of Signal Hills, on a clear day may be seen the ascending steam from the craters of Brimstone Basin. Following on round the east coast we detect, at the foot of a hill one thousand two hundred feet above the lake-level, another column of steam; this is from the hot springs of Lake Butte Basin.

Now we have passed with our glance the little island, Pelican's Roost, and north-east of this Steamboat Point, which form the eastern boundary of Mary's Bay and Concertina Cove. Just opposite us is Storm Point, the west boundary of Mary's Bay. Here is a famous camping-place for the nomadic bands of Indians that in years gone by came to the lake to fish and hunt for wild-fowl in the little water called Indian

Pond; here diligent search may reward the curiosity-loving tourist with many specimens of arrow-heads and stone spears. It is a singular fact that at the north end of the lake the relics of the early Indian visits are discovered in great number, but none to any extent are found at the south end; it is very



SCENERY ON THE YELLOWSTONE LAKE.

probable that the aborigines never crossed the mountains to the south.

SUNSET ON THE LAKE.

Pelican Creek empties into Indian Pond, and we have now made the tour of the shore of the lake. While we have been contemplating the scene the sun has gone down many degrees, and the lengthening shadows steal across the blue water. Now they have reached the foot of the distant mountains, and steadily climb higher and higher, and the setting sun tinges the sides and summits with a warm hue. Now the declining rays cast a lingering glance at the fading landscape, and the mountains blush with a rosy pink to the very summits as the snow on their bald heads changes into a ruddy glow and the deeper shadows bathe the bosom of the lake with their neutral tints. Now the clouds that hover over the mountains have caught the inspiration, and with the most gorgeous tints of softened crimson float away in an ether of azure blue. The whole effect is heightened by a most singularly clear bluish atmosphere which is remarkable. A sight like this fills the soul and hushes the breath; you gaze in silence at the ever-changing panorama till all is lost to the view.

MOONLIGHT ON THE LAKE.

The scene shifts, revealing the lake in the mellow light of the moon. All the stage-furniture has remained; the background is the same, but the light is different. Now everything is bathed in the pale light of a brilliant moon. The distant mountains stand out against the horizon like gaunt, spectral shapes frowning down upon the tranquil water with a grim visage. All nature seems hushed, and one stands bewildered at the sudden change that has come over the scene. Now the moon has reached the zenith, and broad beams of silver light come rippling over the water. In it dance airy shadows, wafted hither and thither by

the evening wind as it stoops to kiss the placid bosom of the lake. Now the romantic tourists steal forth in fantastic garbs to enact on the sandy beach some fragments of a drama, while from the water comes the orchestral murmur of the waves like soft and distant music. If the tourist visits the lake at that season of the year without catching a fever of enthusiasm at the sights he witnesses at the Yellowstone Lake and bursting out in some kind of pathetic strain, he must be a most unimpressionable mortal. At sunrise the lake is again resplendent with the many and varied tints of the rainbow, and it is no exaggeration to say that it is gorgeous.

SWANS, PELICANS AND OTHER FOWL.

With the glass more plainly, but still quite clearly without it, you will see the majestic swans gracefully sailing about in their white coats, with their arched necks bent artistically back upon the body as proudly as if the whole human family stood looking at them. Flocks of twenty or thirty may be seen clustered about the shore at Pelican's Roost, or pluming themselves on the bank after the morning bath in the cold waters of the lake. Now they separate into smaller bands and wander far out on the bosom of the now smooth, calm lake, whose water is ruffled by not a single ripple and lies like a sheet of molten gold. In the marsh and along the river the pelican may be seen striding amid the reeds and rushes with cautious tread, hunting the slumbering trout or snapping up the noisy frog in the midst of his morning chant. Now the flocks of wild ducks and geese come out from the marsh with their noisy quacking, and bustle about incessantly, as if all the business of the day must be settled at once; while the great northern diver, with his mate, starts out in a straight course for the distant shore. Altogether, this is a spot where the tourist may exclaim, "Oh, for a lodge in some vast wilderness!"

CHAPTER XV.

MUD GEYSER, OR GIANT'S CALDRON.

HAVING rested amid the charms of the lake, we again take up the line of march by the wagon-road to the falls and the hot springs. Climbing up the hills to the northward before leaving the lake for ever, we halt upon the crest of a little hill and take one fond, lingering look back on the beautiful sheet of water below.

Now the road enters the timber, and we ride a mile or so along a beautiful road, then emerge again upon the banks of the river. After crossing a little flat meadow, from the road we look right down upon the river, whose water is so clear and still that the large trout may plainly be seen gliding about from place to place, singly or huddled together in schools.

Two miles from the outlet is a small hot-spring basin in the woods, and a trail turning to the left leads directly to it. Leaving this, the road still continues through the timber for about four miles, passing places where the woods have been wantonly destroyed by the careless tourist, when we reach the Mud Geyser of the Yellowstone River, or the Giant's Caldron. It is six miles from the outlet of Yellowstone Lake. Here is a cluster of several interesting mud springs and geysers. One of them has a circular rim, raised about four feet in height above the ground, with a mouth or crater nearly eight feet in diameter. In this spring the surface of the mud is seven feet below the mouth or orifice. The geyser is constantly active, throwing out its drops of mud and puffing like a pot of boiling mush. At times the mud is thrown

out vertically and drops directly back; at others it falls on the rim. The crater-wall has been formed by the accumulation of these drops of mud. Near this is a basin forty feet across, which is much depressed; water is flowing into it from a small stream, falling over the edge, down some ten feet to the surface of the pool, which is covered by a thick scum, presenting a repulsive appearance. In the immediate neighborhood are some smaller springs of various-colored mud, all active, throwing the mud to a greater or less height.

On the side-hill, in a small ravine to the west of this spot, is a singular boiling spring, the Giant's Caldron. Immense volumes of steam are issuing from it, and as you approach the sides of the crater you will hear the intermittent roar of the boiling water. The crater's rim has been built by the mud thrown out by the spring, and is nearly circular, at top forty feet in diameter and of a funnel-shape internally, at the bottom (thirty feet down) only some twenty feet across. The interest of this spring is mainly in its action, for all the mud springs have a more or less similarly shaped crater, but the Giant's Caldron is unique. Unlike most of the mud springs, it is not content to boil quietly and "throw mud" at the surrounding rim, but accompanies its action with a roar that may be heard half a mile away, while the solid earth quivers with the fury of the action. Looking over the deep, cup-shaped edge of the crater, you see at times, when a breeze stirs the steam and allows a glimpse of the bottom, a basin filled with black mud surging violently backward and forward with the force of the tempest. On one side, emerging from under the dark rock, issues forth a flood of inky water in a violent state of ebullition, gushing out with a deafening roar, hurling the hot mud out of the crater and depositing it on the branches of the trees near the mouth. The fact that trees thirty feet in height have grown upon the deposit of this crater proves it to be of considerable antiquity and tells us

without words that this spring has for many decades been rumbling and boiling in this way.

THE GROTTA.

Near the Caldron is a spring called the Grotto, which consists of a cavern in the rock about five feet in diameter, from which a column of steam issues, and a turbulent roaring is kept up by the boiling flood within. The water is perfectly clear, and when the steam is blown aside, so that you can look into the cavern, it is found to be very beautiful. The cavernous walls surrounding this spring render its sounds awful, and its sepulchral tones echo from wall to wall in one continuous refrain. The rising steam and moisture give nourishment to herbage, which is very luxuriant about the mouth of the cave.

This spring is singular in its clearness. All the other springs of this basin are clouded or muddy, but here is a clear spring of beautiful blue water. To attempt to explain this would fill many more pages than we can spare.

On the south there is a large basin, in the rim of which are three active springs. Two of these are mud springs, with basins ten to twenty feet in diameter. The other is a geyser; and when not in action, the water is clear. At certain seasons it will play several times a day, throwing mud and water to the height of fifty feet. The action is singular, and may be described as follows: The pool gradually fills with water till the diameter reaches nearly one hundred feet; at this time a wave three feet in height runs from the centre and dies away, followed by three similar ones. Then, with a dull, heavy roar, a column of mud and water is thrown out to the height of thirty or forty feet and flows for about fifteen minutes, when all is quiet again, and the pool contracts to a small radius; the black rings of mud formed during the eruption in the pool disappear. In a short space of time the pool again begins to fill, and continues to do so till

the next eruption. The eruptions take place about every three hours and fifteen minutes.

On the other side of the river, right on the bank, are some mud springs, in which the mud is light yellow, from the large quantities of sulphur mixed with it. The water coming from the springs is strongly impregnated with alum and iron.

After leaving the Giant's Caldron the road climbs the hill to the northward, and from the summit a grand panorama is spread out before you. At your feet the river flows smoothly along without a ripple, and on either hand are grassy hills studded with small evergreen trees. In the distance the higher mountains, their summits with sides of a dark-green color, stand out in bold relief against the clear sky. To the south the shore of the glimmering lake is clearly visible at times, and the rounded summit of the Elephant's Back forms a background to the westward. A most singular feature of the Yellowstone region is this beautiful park, that seems to have been the work of a skilful landscape-gardener, and no work of art could be more charming.

ROAD TO LOWER GEYSER BASIN.

Eight miles from the outlet, in the midst of a small collection of mud geysers and springs, or rather a little north of this, a road comes in from the west, which is the one from the Lower Geyser Basin and Mary's Lake. The course taken by the tourist in wagons from the Upper Basin is back again to the Lower Geyser Basin, and across the prairie through the timber, twenty-two and a half miles, to this fork in the road. Thus the wagon-trains fail to visit the splendid country between the Upper Basin and the outlet of the lake. At a glance it will be seen why the pack-train is to be preferred in making the tour of the Park.

SULPHUR MOUNTAIN, CRATER HILL OR DÉBRIS HILL.

Two miles north of the fork of this road, across some prairie country, we find a singular accumulation of *débris*, variously called Sulphur Mountain, Crater Hill and Débris Hill. It is a huge pile of rocks and hot-spring deposit, rising up from the level of the surrounding prairie to the height of about one hundred feet. Around the base is a fringe of trees, there being not a single tree except just at this place for many miles.

The remote view of the hill is peculiar and striking. The color of the mound is dirty yellow, from the presence of sulphur; and all over its sides are streaks of a white and brown deposit, from the water that has trickled down. At present the upper springs are at rest, and the action is confined to the lower levels.

At first sight this pile is uninteresting, and the tourist is inclined to ride on with the mere remark: "That is a singular hill." But, hitching to a tree, we dismount and look at this thing: it is full of interest. The road approaches nearest to it at the White Sulphur Spring. The entire hill is composed of siliceous deposit, and gives forth a hollow sound as you tramp over it. The crust is thin and the mass porous; so that the tourist will have to exercise some little caution in walking about, to avoid breaking in and being scalded by the steam which issues from myriads of little chimneys all over the hill.

The White Sulphur Spring, on the south side of the hill, is singular in its formation. The rim is irregularly circular, with a diameter of some fifteen feet. The edge is scalloped and of a pearly-white lustre and a beaded structure. The margin is shelving, extending out over the surface of the pool several feet, like the ice about an air-hole in a river; and it behooves the tourist to look to it that he does not get too close, for the pool is boiling hot and the water many yards deep. Hayden says of the pool: "No kind of em-

broidering that human art can conceive or fashion could equal this specimen of the cunning skill of Nature." At present there is no geyser among these springs, but there must have been at some time,—indeed, this whole formation is undoubtedly the result of geyser action in the past.

In one place there is a vent sending out a column of steam so hot and sulphurous that it is difficult to approach it, and by its side, not two feet off, there is a large deep spring boiling at a most furious rate. In another place is a "turbid spring" with a basin twenty feet in diameter. This is really a mud-pot. The consistence of its contents is like that of thick mush, the whole being of a yellow color and resembling the "hasty-pudding" of colonial times. The mass is just of the proper consistency to form a series of rings when the mud covering a bubble of steam bursts. Throughout the Park there are many mud-pots, but each has an action and interest peculiar to itself. In this same region is a basin of mud of a rich lavender-color, boiling and sputtering away vigorously.

A most remarkable feature about these mud springs is that the source of supply for the moisture which keeps them in a semi-fluid state is not apparent, there being no visible flow of water: yet the springs are boiling hot.

In the group of curiosities to the north of the White Sulphur Spring is a chimney emitting a column of steam by impulsive jets, like the escape-pipe of some huge engine, and accompanied by a sound that may be heard for a long distance. This is called "Locomotive Jet." All over the hill are springs of sulphur, some yellow, others white; some red, from iron, some containing a strong solution of alum; and at every step are crevasses and small round holes looking like squirrel-burrows, lined with most beautiful crystals of sulphur or brimstone as fine as a needle and fragile as glass. But we cannot stop to examine each one, though the tourist will do well to devote much attention to them.

ALUM CREEK.

About a mile and a half farther on we cross the small creek flowing from the westward known as Alum Creek. The water is clear and beautiful, but strong with alum. On each side of the stream is rich meadow.

VIOLET SPRINGS.

Following up Alum Creek about four miles, we come to Violet Springs, a collection of springs in a small geyser-basin, where the hues of the violet predominate, giving rise to the name.

UPPER FALLS OF THE YELLOWSTONE RIVER.

The river at the mouth of Alum Creek flows along smoothly in its bed, a clear, deep stream of emerald-tinted water, placid and serene, giving no indication of the tremendous violence with which in a few miles it hurls itself over the rocks down a terrible abyss. A little before reaching Alum Springs the road abruptly terminates at the river, and a faint trail to the left is the one you take, which leads to the falls.

Fourteen miles of prairie and woodland have been traversed since we left the camp at the outlet of the lake. Now the path becomes more rugged, and we ride along the river-bank on high bluffs winding in and out among the trees in a circuitous manner, following all the while a well-beaten trail. Here the bed of the river grows narrow and the smooth, placid sheet of water gives place to a more hurried current, broken by a succession of ripples and dashing along among the boulders at a rapid rate. The view of this changed condition of the river from the jutting point on which we stand is very fine, and at the lone pine tree by the bank, where the deadened grass indicates the halt of the tourist, is the spot at which you dismount to observe it.

A short distance down the river, we turn to the right, climb a steep trail, rein up the pony on the jutting buttress of the Upper Falls and clamber out on

the rocks to look down into the gorge below. The river is contracted just as it plunges over the falls to a width of one hundred feet, and, looking up the river, we see that the walls of the cañon are not high, but composed of massive basaltic rocks. The country above as a rule is prairie, but in the stream are some huge blocks of basalt, which fact indicates the force with which the river has cut its way. Just above the crest of the fall are two cascades, thirty feet high. At the fall the mass of water is collected into a narrow volume and hurled off the edge of a precipice one hundred and fifty feet high with all the force it has accumulated in the rapids above, and, unlike a great river tumbling leisurely over the brink, it is shot far out from the edge and falls with a mighty plunge and roar into the chasm below. In striking the bosom of the pool the waters are depressed by the concussion, and a most singular appearance is the result. The force is so tremendous that the descending water ploughs through the bosom of the pool for over two hundred feet, throwing up a furrow of snowy foam the entire distance. From the sides of the descending sheet of water arises a column of spray and mist, and as we stand viewing the spectacle in the evening light, when the fall itself is wrapped in shadow and a sombre background is thus produced, while the slanting rays of light strike the walls of the cañon, a halo of most superb beauty encircles the brow of the falling water—a most enchanting spectacle. The rainbow is visible on some part of these falls almost any time of day.

A curious circumstance about the Upper Fall is that it makes a turn to the right just as it plunges over the cliff, so that, as you come out on the point, the river seems to be falling away from you. On the other side of the point of observation, away from the falls to the north, you look down into the yawning chasm, a deep depression or basin cut out of the basaltic rocks that tower up above it with almost perpendicular walls many hundred feet, and at its base lies the rushing

flood, recovering from the precipitous fall and gathering itself together again into a river, only to hurl itself over a more fearful precipice a few rods farther on.

On the eastern side of the cañon, where the spray falls heavily, a luxuriant growth of vegetation has sprung up and clothed the bare rocks with a rich green velvet of grass, while here and there an evergreen tree has taken root and clings to the wall for its life.

While the river is running along over its flat rocky bed to the Lower Falls, or Great Falls, we will return to the trail and climb to the top of the cañon on our sturdy little cayuse.

GROTTO POOL, CRYSTAL CASCADE AND CASCADE CREEK.

Now riding up a steep ascent, now descending rapidly over a trail that only a cayuse or his sure-footed companion the mule could safely traverse, you reach the narrow corduroy bridge spanning a frightful abyss. Below are Grotto Pool and Cascade Creek. Here, crossing to the north side of the ravine, you tie your horse and descend by some rude ladders to the bottom of the grotto, over fifty feet in depth, at the surface of the pool, and, walking along a narrow ledge that has been cut out by the water in the solid rock, you meet the descending current of a cascade some sixty feet in height, plunging into the pool from the south side, and through the mist and foam you look down upon a large basin of dark water deep among the rocks, clear and transparent, and curling in eddies as it flows toward the narrow gorge through which it forces itself out, running on with a low, merry murmur, and then plunging over the rocks in a series of steps several hundred feet to the Yellowstone River—a most charming little cascade, but generally overlooked by the tourist, who is naturally more interested to see the Great Falls, beyond.

LOWER, OR GREAT, FALLS.

Following the trail about one-quarter of a mile into the timber, and keeping close to the little stream that comes in from the west, we come to a fine lawn of rich grass, where we camp, and, retracing our steps, "do" the falls and the cañon. Taking the path and scrambling by means of the "alpenstock" (which each tourist who understands the use of one should procure), we climb down, down, down the side of the sloping cañon to the crest of the Great Falls, and, seated upon a jutting crag, look for an instant down the vast sheet of water pouring with thundering roar over the cliff into the invisible abyss below with shrieks and cries as of the unhappy spirits in torment. Nothing can aptly be compared with the sights and sounds that meet us at this point. The look is only momentary, for instantly a dizziness fills the senses, and we are admonished to retreat from the brink to avoid the almost irresistible impulse of pitching ourselves over the chasm. Yet so strong is the desire to look over the fall that the tourist will often crawl out to the edge on hands and knees to get a look into that awful abyss below. Here, and here alone, can be appreciated the true magnitude of the fall.

LOOKOUT POINT.

Returning to the main trail again, we follow down to a point where a branch leads to the left to the camp, another to the right across a small bridge, and thence up to Lookout Point. Climbing out on a jutting pinnacle, we are in full view of the falls. It is a subject of much regret to many tourists that a nearer view of the falls cannot be obtained, as the distance is somewhat great, and, in this case, so far as the falls is concerned, lends no enchantment. Yet far be it from me to convey the impression that the falls are anything but grand, even when seen at this distance. Indeed, the view from Lookout Point is one which subdues the soul and awes the

spirit of man into silent contemplation. The critic who has studied Moran's painting of this scene in the Corcoran Gallery at Washington, and has blamed the painter for the too profuse use of gorgeous pigments



GRAND CAÑON OF YELLOWSTONE RIVER, BELOW THE GREAT FALLS.

upon his canvas, will here exclaim that the half has not been shown.

It is extremely difficult to give anything like an adequate description of this place. The distance from the crest of the fall, which is two hundred feet in

width, to the level of the river below, is three hundred and sixty feet straight down ; and the water, gathered into a compact mass, is shot over the brink, and before it reaches the bottom is broken into a huge column of spray ; the mist, arising, obscures the foot of the fall, so that but two-thirds of the sheet of water is visible. With a deep-toned thunder the vast column of water plunges into a basin of exquisite grandeur below. The roar of this cataract may be heard for many miles, like the noise of the muttering storm. Nearly two thousand feet below us the scattered waters gather themselves into a river that with many a ripple and fold appears like an emerald ribbon as it glides along at the foot of the cañon.

The sight of this fall inspires in the tourist all the poetry of which his nature is capable, and he will in some way or other give vent to his pent-up feelings. Such was the effect produced upon our countrywoman upon beholding Niagara that she says :

“ Flow on for ever in thy glorious robe
Of terror and of beauty ! Yea, flow on,
Unfathomed and resistless. God has set
His rainbow on thy forehead, and His cloud
Mantles around thy feet. And He doth give
Thy voice of thunder power to speak of Him
Eternally, bidding the lips of man
Keep silence, and upon thy rocky altar pour
Incense of awestruck praise.

“ Ah ! who can dare
To lift the insect-trump of earthly hope,
Or love, or sorrow, 'mid the peal sublime
Of thy tremendous hymn ? Even Ocean shrinks
Back from thy brotherhood, and all his waves
Retire abashed. For he doth sometimes seem
To sleep like a spent laborer, and recalls
His wearied billows from their vexing play,
And lulls them to a cradle calm ; but thou,
With everlasting, undecaying tides,
Dost rest not, night or day.

“ Every leaf
That lifts itself within thy wide domain
Doth gather greenness from thy living spray,
Yet trembles at the baptism. Lo ! yon birds

Do boldly venture near, and bathe their wings
Amid thy mist and foam. 'Tis meet for them
To touch thy garment's hem, and lightly stir
The sunny leaflets of thy vapor-wreath,
For they may sport unharmed amid the cloud,
Or listen at the echoing gate of heaven
Without reproof. But, as for us, it seems
Scarce lawful, with our broken tones, to speak
Familiarly of thee. Methinks to tint
Thy glorious features with our pencil's point,
Or woo thee to the tablet of a song,
Were profanation."

MRS. SIGOURNEY.

How much more truly this may be said of the Yellowstone Falls the tourist will judge for himself.

Down there, in the foreground, stands a jagged point of blood-red rocks, with the shattered pines clinging to its sides with the grasp of despair, shuddering at the prospect of a fall into such a terrible chasm. Far down below this still is a cliff several hundred feet in height above the foaming water, and sloping away to the rear is the brow of the cañon, with many-colored streaks along its sides. On the east bank the verdure, in one broad velvet curtain of drapery, has reached down to the very surface of the river.

Such was the desire to linger created by this imposing sight that the rising moon found us wrapped in our thick overcoats, huddled about on the rocks, watching the descending moonbeam as it stole over the landscape. Now on the crest of the fall, now creeping slowly and silently down the sheet of silver water, down, down it goes, lighting up first one jutting crag, then another, till all is aglow with a pale silver light. The scene is truly sublime, and it was far into the night before we sought the genial warmth of the campfire and dreamed of the roaring cataract which sounded in our ears.

GRAND CAÑON OF THE YELLOWSTONE RIVER.

Again, in the morning, we return to the sight, and turn the glance northward down the river into the Grand Cañon. Nowhere in all this land of wonder is

there a spot where a view of such magnificent extent is coupled with such gorgeous coloring. So grand a prospect is here opened out before the eye that it becomes weary with looking. The sides of the cañon, unlike the dark rocks that we might expect in such a region, are of delicate shades of all the colors, tinted and blended with the most perfect harmony, and could in no way be improved upon even by the most skilful artist. The base-color is a bright yellow mingled with the lighter tints of brown, and in many places a wide streak of white sand comes into the picture; while on the summit or along the side of the cañon is a coping or border of delicate pink. In other places the rich dark-green foliage of the forest trees is seen in clustered masses on the sloping sides, and from the precipitous walls numerous pinnacles and towers jut far out and stand like mighty sentinels watching the scene below. On yonder narrow pinnacle the eaglet in its eyry shrieks with plaintive cry, and the parent-birds with widespread pinions hover in widening circles far out over the river and up into the azure above, echoing back the cries of their young. Far below us, like a narrow ribbon of emerald green interlaced among the rocks and cliffs, is the Yellowstone River, flowing on in a succession of cascades and rapids, in the course of which it falls fifteen hundred feet. From the side of the cañon, on the right, comes in a mountain-stream, falling down over the cliff in a considerable body of water, which ere it reaches the bottom of the cañon is entirely dissipated into vapor and falls on the bosom of the river as a cloud of airy mist. Amid such scenes we might linger for days and never tire of the sight. Each turn in the trail brings out a new phase of the picture, and all is very gorgeous and real. Every part of the scene is deeply impressive,—so much so that even with the most exalted anticipation the tourist will be agreeably disappointed. But we reluctantly hasten on to join the pack.

TWIN FALLS.

Four and a half miles down-stream is the Twin Falls, a veil of water two hundred feet high, which may be reached by a scramble down from the top of the cañon.

But, as we are bound for Mount Washburn, we pass Lookout Point and follow the crest of the cañon, keeping well in the blazed trail for about three miles, then turn to the left through the timber and leave the cañon for a time, with its roaring and tumbling waters, and enter the realm of Silence. Tall spruce and pine trees stand on every hand, bright with the many gay-colored lichens that cling to their gray trunks, and with trailing mosses hanging in short festoons from the motionless branches. Noiselessly does the hunter ride along over the mossy turf beneath his feet, his trained eye ever watchful for the game he may expect to meet in this secluded region. Why does he stop his horse so quickly and noiselessly? Why did he draw his rifle from its holster so quickly and so silently? Why does he crouch for an instant upon his knees and advance the muzzle of his gun in that direction? The sharp crack of the Winchester explains it all, and the noble monarch of the forest (*Cervus Canadensis*, the elk or wapiti) bites the dust not fifty yards from the path, and our camp is supplied with fresh meat for the rest of the journey.

Now we reach a beautiful little stream flowing through a rich grassy park, and at the foot of a hill dismount for lunch. But the waters are Mara. We have reached Sulphur Creek, near the foot of Mount Washburn. From thence the trail leads to the margin of a fine level meadow; and, skirting along the eastern side of the meadow for some time, we come to a sign-board, and here we take the left-hand road. At this point through the openings in the trees, the dome-shaped crest of Mount Washburn is visible towering above us. Again crossing a broad, flat, prairie-like meadow, approaching the mountain from the southward, we pass

to the right of a dead tree standing alone, and keep on through a small park beyond. Here two trails will be met, one going straight on, leading to and into the forest; that is well beaten and should be avoided, as it will take the traveller into a bewildering thicket: it is an old game-trail. The other and fainter one leads to the left, and is the proper trail to follow.

After passing a small stream, by the side of which we journey for a time, the trail again strikes into a park and is lost. From the farther end of this park two trails go out, one following the blazes on the trees beside which it passes: this should be avoided unless a signboard indicates that it is finished. It was a dim intimation of a road in the summer of 1882, and lost the tourist if he was not careful to leave it "severely alone." The superintendent was then making a road in this direction, but it may not yet have been completed. The left-hand trail is the one to take, and the tourist should keep well up on the hillside. By so doing he crosses the eastern end of Mount Washburn at a low grade.

Just at the summit of the divide we come to a cleared spot in the forest, and can look out on the valley of the Yellowstone, beyond; but, as we have a much finer view of the country from the top of Mount Washburn, we will defer the description till reaching that point.

Passing just over the summit of the eastern end, we find a trail leading to the left, which brings the tourist by a very easy grade to the top of the mountain. It is so gentle in ascent that the traveller may ride his pony to the very summit without the slightest difficulty. Following the windings of this trail for some two miles by a fair road, we reach the top, ten thousand three hundred and forty feet above sea-level, and take a view of the horizon. We are above the "timber-line;" so that there is nothing to obstruct the view, for the summit is bald save of short grass.

CHAPTER XVI.

MOUNT WASHBURN.

RESTING upon the summit of the mountain, we take a view of the entire horizon from an altitude of 10,340 feet. All round are mountain-peaks jutting upward to the sky, and as we sweep our glance over the landscape we take in a circle of country extending for upwards of one hundred miles in almost every direction. Turning to the north, we look down on the valley of Tower Creek, in the near foreground; and beyond this is the Grand Cañon of the Yellowstone River at its junction with the East Fork. Still farther on is Garnet Hill, and beyond it is the boundary of the Park, with the snowy summits of Old Emigrant Peak and its colleagues rising up like mighty walls to shut in the view.

Looking now to the eastward, we come to the beautiful rounded hills, with their wooded and grass-covered sides, of the valley of Slough Creek (a most excellent game region), with Bison Peak on the east, rising to the height of 9036 feet. East of this still is Mount Longfellow (9518 feet high), forming the water-shed between Slough Creek and Soda Butte Creek. Now we are in line with the cañon of Soda Butte Creek, and look on the summit of Amethyst Mountain (9423 feet), and over the Fossil Forest, to the north of Amethyst Mountain. On a line directly east is a round summit, densely wooded, rising up from the surrounding wilderness of mountains some 9000 feet; this is Bison Summit. On its

eastern slope passes the trail from Fossil Forest to Pelican Creek and the Yellowstone Lake.

Looking north-easterly from this point, on the distant horizon is a high tapering mountain with its rugged edges, Index Peak (9875 feet), and southward of this Pilot Knob (10,150 feet), rising from a chaotic mass of mountain-summits that bewilder one with looking at them, and the tourist of a poetic turn will see in fancy the shapes of animals and strange grotesque figures in the varied outlines of the distant mountains seen on the horizon.

Looking south-eastward now over Bison Summit, the eye rests upon the Labyrinths of Hoodoo, or Goblin Mountain (10,700 feet above tide)—a most singular collection of fantastic shapes, carved by the elements from lava and volcanic rocks, leaving stones hundreds of feet above the basin on huge pedestals. Some resemble camels, others soldiers in military uniform; and almost every conceivable shape may in fancy be seen somewhere among these rocks.

Shifting the glance now a little more to the south, outside of the boundary of the Park stands Saddle Mountain (11,100 feet in height), while all along the south-eastern horizon are the ragged and broken summits of the unexplored precipitous mountains of the Sierra Shoshone range, visible over the top of Pelican Hill (9500 feet in height).

Southward still are the tops of Mount Chittenden (10,190 feet) and Mount Hoyt (10,473 feet), from whose side arise the head-waters of the Passamaria or Stinking Water River. Now the eye roams over a sea of mountain-peaks rising like waves upon the ocean, with their summits capped with the eternal snow and their bald sides streaked with white and green. Among them are the tops of Sulphur Hills; beyond them, Signal Hills, Grizzly Mountain, Mount Doane (10,713 feet), Mount Langford (10,779 feet), with Mount Stevenson (10,420 feet), in one cluster, and Turret Mountain (11,142 feet) and Mount Forum

(10,728 feet) in another group, walling in the south-east corner of the Park, some forty-five miles distant from the observer perched on Mount Washburn.

We have now reached the meridian, and with it the acme of the view. Eighteen miles to the southward, over the western sides of Sulphur Hills, we see the glimmer of the sunlight upon the ruffled surface of the Yellowstone Lake, set like a sparkling gem in the midst of the sombre, white-capped mountains with which it is surrounded. Away off there on the horizon is the main range of the Rocky Mountains, and beyond the summits of Red Mountain Range, with Mount Sheridan rising conspicuously among them. Thirty miles to the south-west, on a clear day, the towering columns of steam from Old Faithful, the Beehive and other geysers may be seen rising like beautiful marble shafts toward heaven, as if to support the arched dome of azure above them.

In the foreground of our picture is the deep, many-colored cleft in the green carpet of the landscape, the Grand Cañon of the Yellowstone River; and as we gaze down upon the scene we fancy we can hear the roar of the Great Falls, eight miles away. At our feet is Dunraven Peak (8867 feet), along the western side of which passes a trail from the Great Falls to Tower Creek. Off on our right, on the west side of the Park, are the Quadrate Mountain (10,129 feet), Bell's Peak (10,331 feet) and Mount Holmes (10,578 feet), all points on the Gallatin Range, in the Park, while in the north-west Electric Peak (11,125 feet) guards that quarter. East of it are Sepulchre Mountain (9770 feet), Terrace Mountain (9000 feet) and Bunsen Peak (9500 feet), all within a radius of five miles of the Mammoth Hot Springs. So vast is the view over the country that it is hard to realize that we stand where the whole earth is below us at our feet, and we are on the top of the world.

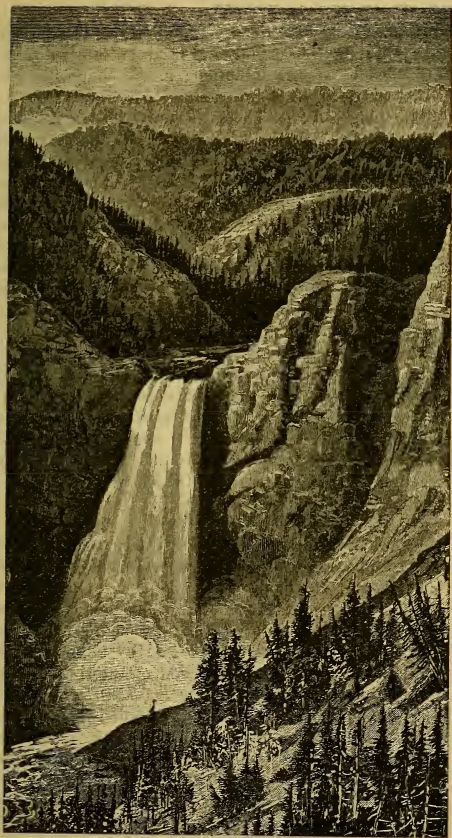
Descending now from the airy height, we follow the trail northward from the forks, at the foot of Mount

Washburn, for about two miles, where on our right we pass, something over a mile from the trail, an old ruin, a relic of former dwellers in this mountain-region. Here are heaps of stones laid in lines along the side of game-trails, formerly used to drive the game over the cliffs; and circles of stone in which to secrete the huntsman, evidently not the work of the red Indians that now inhabit the country. The people who built these remarkable works were mechanics, and had vessels made of soapstone or steatite. Possibly they were the same race of men as dwelt in the cliffs and the cañons of Colorado.

A ride of about three miles brings us to the fork of the trail, where the trail over Dunraven Peak comes in from the left and meets the Mount Washburn trail near a branch of Antelope Creek.

TOWER FALLS.

After a ride of some six miles from Mount Washburn over a rolling prairie country we halt at Tower Creek. The country over which we ride from Mount Washburn is a vast prairie, without a single tree or shrub except at the water-courses, and with all the speed our ponies can accomplish we push on. Just as we reach the vicinity of Tower Creek we drop into a deep cañon with steep sides covered with trees and grass of a uniform growth. Here the trees are not all evergreen, but an occasional quaking-asp or aspen is met with. The fall we have named is a very singular one, from the peculiarity of its surroundings. The rock through which the creek has cut its way is of very hard, igneous origin and has a shelly structure, resembling slag from a furnace. Its extreme hardness has resisted the action of the water, and, not being of a crumbly nature, the stone holds its own against the floods, making the ravines deeper and the towers more pointed than are seen in any other place in the Park where the same elements have been combating each other. Here are two falls, as is the case on the Yel-



TOWER FALLS.

lowstone River—an upper and a lower. The former is small, though beautiful, and in almost any other locality would attract attention; here it sinks into oblivion at the side of its grander neighbor.

The name "Tower Falls" is derived from the two huge, slender, tapering towers of basalt that stand at the crest of the falls, one on either hand—gigantic pillars like the door-posts of an ancient temple, rising more than fifty feet above the brow of the fall and continuing down to the foot, with the doorway hidden by an ever-moving curtain of translucent white, hiding the dark portal. Back from these two towers, extending up the stream, are hundreds of similar pinnacles of a less size and varying height, resembling the minarets of a cathedral gray and sombre with age. Making a sharp angle, the creek, in a concentric form, leaps over the verge down to the depth of one hundred and fifty-six feet into the circular pool below without a single irregularity, falling almost straight. It plunges into the chasm with a mighty roar, which seems deep and hollow as the sound reverberates up through the narrow gorge into which we gaze.

DEVIL'S DEN.

The sides of this cañon are absolutely perpendicular in some places, and the weird appearance of the glen has given it the name of Devil's Den. On one side rise the bare rocks, on the other a few pine trees have taken root. The fall is about two hundred yards above the mouth of the creek, and by following the trail down on the south-east side of the creek to the rim the brow of the falls may be reached after a somewhat difficult scramble over the rocks and timber. No tourist should fail to view it from this point, since when thus viewed it is by all odds the most peculiar fall in the Park. Approaching up the cañon from below, you see the edge of the sheet of water, as it were, a thick white band extending with a graceful arch from the crest of the fall to the pool below, and springing out from the

basaltic rocks at a single bound. The eastern wall of this glen is of a bright-green color, from the fresh mosses and lichens that, nourished by the spray, cling to the cold gray rocks and confer upon them not a little beauty. The cloud of mist and spray is such that it is impossible to approach within two hundred feet of the fall without being drenched with water. With a slanting sun upon the cloud of mist a fine rainbow is seen, which, playing at the brow of the column and backed by the sombre tints of the rocks, has a very fine effect.

Some writers and tourists speak of the Tower Falls as being finer than the Great Falls, or Lower Falls of the Yellowstone River; but, while we appreciate the beauty of Tower Falls, we cannot allow it a place alongside that majestic view of the Lower Falls of the Yellowstone: there is no comparison.

All about the camping-place is an abundance of "hoppers;" and it is a trite saying in that region that every hopper caught is equivalent to a trout landed, so plentiful and voracious are the fish in the Yellowstone River at the mouth of Tower Creek. The creek itself is very beautiful, apart from the fall; for it is a wild, turbulent mountain-stream tumbling over high boulders and with banks fringed with deciduous as well as evergreen trees.

HOT SPRINGS CREEK.

About four miles up from the mouth of Tower Creek, on the west bank of the Yellowstone, is Hot Springs Creek, so named from a number of hot springs which send forth their boiling water in small streams that ooze and boil up through a soft mud of a peculiar appearance, emitting a strong odor of sulphuretted hydrogen—so strong that the silver watches of the tourists will very markedly indicate its presence. In certain places are basins which seem to be the craters of active springs, full of water covered with a thick blackish scum on the surface;

and all about on the ground free sulphur may be seen.

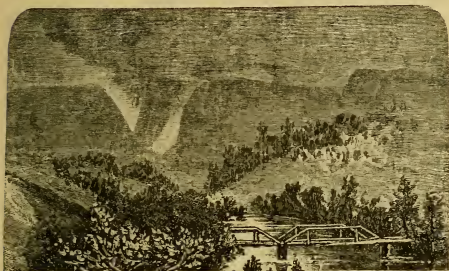
Opposite the mouth of Tower Creek, on the east side of the river, the mountains, or rather the walls of the cañon, rise with a regular succession of steps of immense height, composed of various deposits of basalt and breccia which from time to time in past geological epochs have been laid down. At times the basalt has poured out and covered the surface to a depth of many scores of feet, and upon this a layer of softer volcanic rock has been deposited. Thus has the pile been built up, and in the periods of erosion the harder basalt has resisted the action longest, while the softer part has gone first, leaving the gigantic steps as monuments to some powerful action to which the whole region has been subjected. Since the period of erosion hot springs have burst forth along the sides of these steps; and, while some have run their course and expired, others remain still active. The effect produced by a white or whitish substance deposited from the hot springs upon the black basaltic columns or lying at their base is very marked, and renders the region very attractive to the eye. It is a subject of frequent remark that throughout the Park there is a fine display of gorgeous coloring to be met with on every hand.

BARRONETT'S BRIDGE.

Leaving now the Tower Falls by a singularly steep road (which appears to terminate at the little bridge on which we cross), and, travelling on over a rolling country within half a mile of the cañon of the Yellowstone for about three miles, we come to Jack's Bridge, or, as some call it, Barronett's Bridge—a point of departure for those going to "Fossil Forest," Specimen Mountain, or Amethyst Mountain, and Cooke City. The bridge was built by "Jack" Barronett and his colleagues in order to get to the rich mines of silver and gold at the head of Clarke's Fork of the Yellow-

stone River, some thirty-five miles eastward of the bridge.

The bridge is in itself remarkable, being a well-constructed frame structure built of hewn timber, that has been put together with but few nails or



BARRONETT'S BRIDGE.

iron parts. There it stands, spanning a deep and rapid current, in the midst of which a crib-work pier has been built, filled with stones. The materials for the building of this bridge, save the timber, were packed for more than one hundred miles on the backs of animals, and were put together by rude miners unfamiliar with civil engineering.

The tourist at Jack's Bridge will pay the "two bits" toll again to the solitary toll-keeper, who spends his time at the lonely spot in the shelter of a "Sibley" tent, with no companion save a dog and his book, and with no conversation except an occasional chat with the passing traveller. This man—"Billy"—is a remarkable instance of the pertinacity with which some men cling to life. By the accidental discharge of a blast of Giant Powder in a coal-mine in which he was working, numerous particles of rock and a piece of his felt hat were blown through his forehead and into the

fore part of his brain, and during the long illness that followed pieces of the bony tables of the skull came away; yet that man recovered, and is now in apparent health of both body and mind—a most remarkable case, and one the parallel of which has never been met. The complete record of this case may be found in the medical archives of Fort Ellis.

Looking south from the bridge, we see the steep walls of the Grand Cañon of the Yellowstone River, and to the east stands Junction Butte River. Over the river and up the steep climb along the rocky wall of the cliff, by the wagon-road to Cooke City, cut by the enterprising miners, we reach the top, and thence, passing to the north of Junction Butte, we follow the good road along the east fork of the Yellowstone River through a fine park region of country for five miles, when we reach the north end of Specimen Ridge, so named on account of the abundance of fine specimens of agatized wood and chalcedony found all along its sides. The third stream that is crossed after leaving the bridge is Amethyst Creek, along the banks of which rare specimens are found; and, following up the creek, we come to a point where the creek falls over a perpendicular wall of rock in a beautiful little cascade named Fairies' Fall—another "Fairies' Fall." (It would seem that the early explorers of the Park were "one-idea men," and every object they saw received the same name.) Higher on the mountain the creek has cut through the basaltic rock and left high walls, with perpendicular sides, standing in long rows of massive columns, which have been scratched and carved by the ice-fields of bygone ages.

FOSSIL FORESTS.

To the south-east of Amethyst Creek are the Fossil Forests. The sobriquet is rather an extravagant one for aught the tourist will see of a petrified forest, yet he will find the petrified remains of many a goodly tree standing as a riven shaft upon the side-hills, and by

digging in the ground he will find roots and buried trunks of the fallen trees, now turned to agate and beautifully marked with the grain of the wood. In the cracks and crevices crystals of amethyst and quartz will be found studding the sides.

Here the inquiring mind will be brought to a pause. Over there, on a little hill not fifty yards away, is a grove of evergreen trees growing luxuriantly, the wood soft, springy and in every respect sound and healthy, the trunks some nine inches in diameter; here at our feet and reaching up above our heads are the petrified remains of a tree that had grown where it stands—how long ago? How did it come to be a petrification? Has the whole surface been submerged beneath some vast sheet of water charged with silica and lime, above the height of this tree, so that the cells of its tissues have filled with stone? Can it be possible that these trees, standing as they do over eight thousand eight hundred feet above the sea, were ever under water for such a length of time that they have petrified? or have they been turned into stone by being covered by beds of lava from some mighty volcano that has poured out its melted masses away back in that era when the “morning stars sang,” and when “the earth was fresh and young, and the deluge still had left it green”? When or how this occurred we shall never know; yet it is interesting to examine these monuments to the mighty work of the Creator.

AMETHYST MOUNTAIN.

At the foot of the Fossil Forests the road branches, the left-hand division or road proper going to Cooke City and Clarke's Fork River, the right-hand one, or trail, leading up along the river past Amethyst Mountain, Bison Summit, and thence on to Pelican Hill, Pelican Creek and the Yellowstone Lake.

Amethyst Mountain is so called on account of the specimens of light-purple amethysts that are to be

found on its sides. It rises to a height of nine thousand four hundred and twenty-three feet, and has a commanding view. From this point we can see Mount Norris in the near view, and off on the horizon Index Peak and Pilot Knob, covered with snow.



CHAPTER XVII.

SODA BUTTE SPRING.

RETURNING to the forks of the road at Fossil Forests, we take the wagon-road, and about a mile distant ford the "East Fork" of the Yellowstone River. Crossing a flat, grassy meadow—the horse-ranche for the Clarke's Fork miners—about one mile farther we reach the cabin of "Old Jumps," the gamekeeper. Here we find a trail leading to the right, toward the south, which leads off along the "East Fork" to the Labyrinths of Hoodoo Mountains by a long and circuitous route.

Turning to the left after taking the road, we soon cross Soda Butte Creek, and we are within sight of the Soda Butte, fourteen miles from the bridge—a singular cylindrical pillar or chimney of geyselite, the cone or crater of an extinct geyser or hot spring, which has been built up from the deposit of this mineral to the height of some twenty-five feet, with a broad base spread over the plain. There is no evidence of activity about this crater of the chimney, but at the foot are several very singular springs. In them the water is clear and transparent, and the sides of the pool have a deep leaden hue and taper toward the bottom, filled, for a good part of the way, with a light, flocculent mineral of a black color, through which the water bubbles up, charged with carbonic acid and sparkling in the glass like champagne. The taste is very peculiar and at first repulsive and disagreeable, as the water contains a mixture of sulphur, soda and other minerals of which iron is a constituent; and altogether it is a curious concoction. Yet the appetite for it is soon acquired, and the miners who are accustomed to its

use prefer it to whiskey or beer; and every pack or wagon-train to or from the mines takes a cask of this water along. The resemblance of this water to the soda-water of the shops, and the singular "butte" of pillars of geyselite, have given origin to the name of this spring.

TROUT LAKE.

About a mile or so above Soda Butte Springs, on the left, a fork from the road leads to a little lake surrounded by grassy banks and lying in a deep depression in the hillside, with a small stream of snow-water flowing into it at the north side and a trickling outlet at the south side. This is Trout Lake, and covers a surface of perhaps five acres. To all intents and purposes apparently, this is one of those snow-fed basins filled with clear water so frequently met with in the Park, bereft of all animal life save that of animalcules. But here is another wonder: this lake is literally swarming with fine large trout weighing upward of a pound each, so abundant that they may be scooped out in large numbers with a net, and always in fine condition, none ever having been found to be wormy. The "boys" from the camp at Cooke City in the spring of the year catch hundreds of pounds of these fish by putting a log across the inlet and turning the water out of the channel, and the fish that come up to spawn are left high and dry below, and are then picked up. Now, a singular circumstance connected with this story is that, although this little lake is so full of fish and empties into the Soda Butte Creek, there is not a single fish in that stream, from its headwaters to its mouth, yet the water is sweet and pure. The question why this is so has nonplussed more than one sagacious man. Duck and other water-fowl will be found along the Soda Butte Creek, if the fish are wanting.

CLARKE'S FORK MINES AND COOKE CITY.

Those who wish to visit a genuine frontier mining-camp will find much to interest them at the head of

Clarke's Fork River, at Cooke City, an enterprise started by Mr. Jay Cooke, Mr. Frank Thomson, Dr. S. Weir Mitchell and other enterprising Philadelphians to wrest the precious metals from the grasp of the cold gray volcanic rock that holds them. Some of the mines are very rich, and an active business is doing at the smelting and other establishments in the camp.

The road to Cooke City leads along by the foot of towering cliffs of igneous and sedimentary rocks, and one single band of limestone stretches along the road all the way from Soda Butte Spring. Standing at a great elevation above the road on the mountain's side, itself three hundred feet in thickness, it shows by its position on both sides of the cañon that the present valley has been cut out through it by the creek. On the sides of the cañon, above the limestone, immense slides of *débris* will be seen, the effect of the elements upon the loose basaltic rocks above, from which it has slid down.

SENTINEL OF THE CAÑON.

In one place the colossal statue of a soldier wrapped in his overcoat, with arms folded across his breast, will be seen—a most natural likeness.

Should the tourist meet a black bear in the way—which is very unlikely at this late day—he should ride right along, as “Bruin” will not disturb him if left alone. Those of a scientific turn of mind will thoroughly enjoy the ride up the cañon of Soda Butte Creek, and the inspection of the mines in the vicinity of Clarke's Fork will not be without interest.

INDEX PEAK AND THE VALLEY OF CLARKE'S FORK RIVER.

About two miles above the smelter at Cooke City, by a most abruptly rugged and rocky path, the tourist may climb to the summit of Index Peak, nine thousand eight hundred and seventy-five feet above the level of the sea, and look down upon a picturesque valley spread out at his feet, stretching away to the eastward, dotted

with lakes of clear ice-cold water without a single fish in them, and some of them with an area of many miles. They are walled in by the same cliff of limestone before mentioned, three hundred feet in thickness. Stretching away till it is lost in the horizon, it appears like the embankment for a railroad, so level is its grade. Capping the limestone are huge piles of metamorphic rocks, carved and jagged in outline, a perfect chaos. In these gray sides are streaks of metal-bearing rocks, from whence come the gold and silver.

Here, among the rugged rocks, we find the Rocky Mountain sheep, or Big-horn sheep, or Rocky Mountain goat, as he is sometimes called, travelling in bands up the jagged crest of a mountain, along the ridge and down another, always keeping on the highest possible points and feeding on the short rich grass that grows on the mountains high among the rocks. (It should be noted, however, that the Rocky Mountain sheep, or Big-horn proper, is distinct from the so-called Rocky Mountain goat, or *Aploceras*. The latter is a true antelope, closely akin to the chamois.)

In the high sheltered valleys of Clarke's Fork River basin a few specimens of the mountain-bison are occasionally found, but they are very rare, and it is reported that a small band of moose lives in these inaccessible mountain-fastnesses amid the perpetual snows.

MOUNTAIN-GROUSE.

In this region, more abundantly than in any other part of the Park, will the sportsman find the fool-hen or mountain-grouse, a member of the grouse family with most peculiar characteristics, and so entirely devoid of fear in the presence of man that it may almost be knocked over with a stick; and, as to stones, a flock will rise in a tree when you have flushed them, and sit in the most unconcerned manner while you hurl stones, till you by accident hit one of them, when they will fly out.

Leading the pack through a narrow gorge on

Slough Creek, we were startled by a wild scream and fluttering noise among the bushes at our feet, accompanied by a hissing as of a goose. Thinking it a rattlesnake, or possibly an adder, we threw up the reins and drew our rifles, when presently out of the brush rushed an old fool-hen with wings scraping on the ground and tail spread like that of the turkey-cock, and fluttered up to us. Settling down in a crouching attitude, we "cut loose at him," and had a fine bird for supper. The flesh of these birds is most excellent for the table, the meat being white and as delicious as that of a spring chicken. The alert sportsman travelling through this section of the Park will have no difficulty in keeping the larder of the party well stocked with a variety of choice meats.

A good uniformly graded trail extends from Cooke City across the divide down Clarke's Fork River to Fort Custer, and by way of the river to Young's Point, above Billings, on the Northern Pacific Railroad, a course which the tourist may take in entering or returning from the Park, especially if he has his own pack-outfit.



CHAPTER XVIII.

BLACKTAIL MEADOW AND DIVIDE.

RETRACING our steps again down the Soda Butte Creek and east fork of the Yellowstone, we come again to Jack's Bridge; and now, coming out from the purer air from the mountains, we detect the peculiar sulphur-like odor in the atmosphere. Stopping to drink at the river, we find it strong with sulphur; for more than three miles above the bridge, even to the Tower Falls, the banks of the river are honeycombed in places with sulphur springs; this accounts for the taste and smell. The water of the river at this point is of a fine turquoise blue.

A sharp little pull up the side of the cañon from the bridge lands us on the top of the first terrace, which is without a tree and covered with short grass. Another pull up hill, and we are in the timber, here composed mostly of deciduous trees; and, still climbing by a steep grade, we near the summit of the Blacktail Deer divide, at the foot of the northern slope of Mount Stephens.

DEVIL'S CUT.

Just as the road reaches the summit it passes along the bottom of the "Devil's Cut," as it is called—a depression between walls of earth and rock covered with grass, and in which a single pine tree is growing. This cut extends for some hundred yards, and is the remnant of a cleft or fissure between two ledges of upturned rock.

The road climbs along the south-western wall of this gulch, as we approach the farther end, and finally brings us out on to the beautiful expanse of country, the Blacktail Meadows.

Riding over the upland, the tourist will be impressed with the curious similarity there is at this point with a well-planned landscape-garden. Here is a clump of small evergreen trees, there a group of taller quaking-asp or aspen trees, their leaves fluttering in the breeze. On one hand is a beautiful little lake with a surface like a mirror, surrounded with sedges and reeds, with the mallard ducks or mud-hens floating gracefully on its bosom; on the other, a rill coming down from the mountain-side, a clear, icy-cold stream skirted by shrubs and bushes; while off on the right, or north, is the cañon of the river and the mountains beyond. In places the jutting edge of a stratum of rock breaks through the crust, and here the lichens and ferns are found. Altogether, it is a most delightful country.

Gently rising on this plateau, the road crosses the divide. All along the way the tourist will be more or less bewildered by the numerous trails that branch off of the road to the right; most of them come in to the road again farther on. There is one, however, that leads off northward just as you come to the top of a little hill where are a few scattered trees; this leads down along Geode Creek, and to and crosses Blacktail Deer Creek, thence through dry gulches on the north side of Mount Evarts. Crossing a barren alkali plain of sage-bush, cactus and prickly pear above McCartney's ranch, it strikes the Gardiner River, which it crosses by a log bridge. This trail branches off about six and a half miles from Jack's Bridge. Following the wagon-road we continue on to the westward, and soon reach and cross the lava-beds, cross the Blacktail Deer Creek and turn south-westward, cross the low divide and descend toward the east fork of Gardiner River.

CASCADE FALLS OF EAST GARDINER RIVER.

Just about one mile above where the road strikes the cañon of the east fork, passing a branch that comes in from the south, is the Cascade Falls, a sheet of water falling over a succession of steps of hard basaltic rock, widening as it descends till it finally covers the entire space between the rocky walls. Bounding into the river, it rushes off in its embrace, while the stately pine trees on the sides of the cañon—silent witnesses to the transaction—nod their assent and gracefully bow their pendent branches to the passing current.

The scenery all along this cañon is picturesque. On the north of us rises Mount Evarts, seven thousand six hundred feet high—a pile of basaltic rocks with high cliffs in step-like regularity rising from the plain. Upon each step the *débris* has accumulated, slopping toward the base of the next higher.

GARDINER RIVER FALLS.

Following down the cañon to the point where the road reaches it, we come to the Gardiner River Falls, a cascade of rare beauty. Near the west of the falls is a grove of pine and quaking-asp trees. No tourist will pass this spot unnoticed, for there, at every hand, are the inevitable “eyesores” that accompany civilization—the empty beer-bottles, tin cans, scraps of paper, etc., lying in profusion about on the deadened grass and dusty ground. Still, getting over the disgust engendered by these things, we find a small log bridge crossing the river, and, standing upon it, have a fine view up the stream. There for a long distance we see the sparkling and pearly water struggling over boulders and dashing against the side walls, splashing against trees, bearing down the grass and bushes on the banks, ever hurrying on to gather up momentum for a tremendous leap over the cliff below, down one hundred and forty feet, a shattered and broken column.

Crossing the bridge, we turn to the right and

scramble down the steep hillside, holding on to the trees till we can see over the edge of the chasm and behold the waters in their suicidal leap dashing themselves against the rock with a rage so violent that a cloud of white foam rises unceasingly and is carried along down through the gorge below. The cliff over which the water falls is one of those tremendous steps of basaltic rock we have just mentioned. The view of this fall is very picturesque and enchanting, as the landscape is broken with rocks, trees, shrubs, high rocky cliffs, and, capping all, there is a bright blue sky.

Turning now toward the Mammoth Hot Springs, the view is very pleasing. Away off there on that "apparently" level plain stands the headquarters building, six thousand five hundred feet above the sea-level, with the hotel-buildings beyond it. Near that little clump of trees, to the left of this, is the snow-white mound of the Mammoth Hot Springs, protruding from between those two hillsides, glittering in the afternoon sun, with a column of steam, white and spotless, rising from the many springs that boil up to the surface. In front of us flows the main stream of Gardiner River, with its banks hedged in with long rows of trees and shrubs, and falling upon the whole is a purple haze, adding a peculiar distance-effect to the picture which is very fine. Five miles more down the cañon, and we are once more back at Mammoth Hot Springs, from whence we started out, having made the tour of the "Park."

CONCLUSION.

Now, in concluding the account of our trip, there are some matters of a general nature that deserve a passing notice.

There are, as the tourist will notice, many points laid down on the map which we have not visited. We have purposely omitted many points on the east side of the lake, such as Signal Hills, Brimstone Basin, Lake Butte, Turbid Lake, Convention Cave, Mary's Bay, etc., which it is not possible for the tourist at present to "do" conveniently. Most of these places have hot-spring basins and other matters of interest that are worth seeing, but they require more time than the average tourist can devote to them; and a mention of them would fill many more pages than we have devoted to the entire work. Many places on the north shore of the lake along the valley of Pelican Creek and amidst the Sulphur Hills are of interest and are worthy of description, had we time to spare for them. The same is true of the region along the east fork of the Yellowstone River and in the Labyrinths of Hoodoo, or Goblin, Mountain. So, too, the entire shoreline of the lake might be traversed with pleasure and profit, but up to date the path is obstructed and bewildering, and only the most daring adventurer will toil his way through the tangled mazes off from the beaten road.

In starting out, tourists should pool their expenses and appoint one of their number as treasurer, who should settle all bills. Thus they will avoid much trouble in the "making up" of cash when any little bill is to be settled.

Good camping-places will be found in the Park after leaving the Mammoth Hot Springs, as indicated by the "stars" on the map, at Willow Park, Norris Geyser Basin, Lower Geyser Basin, Upper Geyser Basin (near the Castle Geyser), West Bay (or Thumb of the Yellowstone Lake), outlet of the lake, on the little stream near Lookout Point, below the Lower Falls of the Yellowstone River, Tower Falls, Barronett's (Jack's) Bridge and Soda Butte Springs.

The angler will find good sport in the head-waters of the Yellowstone River and Lake, with a few exceptions; as, for instance, in the Soda Butte Creek, but for that disappointment he is easily compensated by the abundance of fine fish he will find in Trout Lake, near that stream. Almost anywhere on the shore of the Yellowstone Lake where the banks are rocky are good points for angling, and any place where the angler can reach the banks of the Yellowstone River will yield him sport. The angling is especially good at the mouth of the Tower Creek; again, at the mouth of the east fork of Yellowstone River, at the mouth of Blacktail Deer Creek and at the mouth of Gardiner River. All the fish, with the exception of a few sickly ones in the Yellowstone Lake, are fine; and I have known of specimens being caught that weighed ten pounds: this was at Livingston.

No fish will be found in the Gardiner River above its mouth, in the Gibbon River, in the Madison, or Firehole, River, nor in the waters or streams of Shoshone Lake.

The tourist will need to carry no arms as protection against Indians, or against wild animals other than the cinnamon bear. Of these he will rarely meet any; so that practically he will require no firearms at all, but it is as well to have some description of firearms as it affords a feeling of security, which their absence will not do.

Make your marches as early in the day as possible, as it is less fatiguing to both man and beast and allows

ample time to "rustle up a camp" and enjoy the sights before the long twilight (which lasts till after nine o'clock in the evening) has closed in.

Observe carefully that every camp-fire is extinguished before you leave it, and you will not, like some of the "army-men," have the mortification of destroying hundreds of acres of timber and meadow-hay.

So time your excursion so that you will reach the Park between July 1st and September 1st; but August will be found the most pleasant month. In that month the author's trip was made, and no more delightful weather or other circumstances could be wished. There was no rain, except for an hour in one afternoon.

Do not make your parties larger than ten, exclusive of the guide and cook, as they are hard to manage; and the guides are generally unwilling to go with a greater party. Six is the most pleasant number.

Take with you heavy, thick, warm clothes and a good heavy overcoat, for you will need them before the trip is finished.

Trusting future tourists to the Yellowstone National Park may enjoy as pleasant a trip as it was the author's privilege to make in August of last year (1882) with a choice party of five, and that this little book may serve as a valuable aid and companion, and contribute to the comfort and pleasure of the trip, we cease.

In the preparation of this work I have been much assisted by the set of admirable and artistic photographs sent me by H. B. Calfee, an expert photographer at Bozeman, whom the tourist should see before leaving the Park region.

APPENDICES.

APPENDIX A.

SECTION 1.

RAILROAD FARES.

As the tourist will wish to know how much he must spend in the way of railroad fares to and from the Park, we append a list of prices for first-class tickets from the principal parts in the East, which is, of course, subject to a monthly revision. Still, it will be approximately correct. The expense of the Pullman and Wagner coaches may be set down at three dollars per diem. The Northern Pacific Railroad will run dining-room cars from St. Paul on all through trains to the Park during the summer months, and meals will be served *à la carte*, with a *ménu* fully up to that of the best hotels in the East.

We make St. Paul and Duluth the initial points for the present, as rates by the Northern Pacific Railroad from the West have not been fixed at this moment, and no railroad runs to the National Park except this one.

St. Paul to Yellowstone National Park and return...	\$90.00
Duluth " " " " " ...	90.00
Chicago " " " " " ...	111.00
Portland, Oregon, to " " " ...	
Tacoma, Washington Ty., " " " ...	
Helena, Montana Ty., " " " ...	
Bozeman, " " " " " ...	
Akron, O., to St. Paul, or the reverse, single fare ...	24.80
Albany, N. Y., "	34.15
Allentown, Pa., "	37.60
Alliance, O., "	28.58
Altoona, Pa., "	31.50
Amherst, Mass., "	37.60
Ashtabula, O., "	25.65
Atchison, Kan., "	18.00
Athens, Ga., "	40.80
Augusta, Me., <i>via</i> Montreal.....	45.35
" " " Albany, N. Y., to St. Paul.....	43.15
Augusta, Ga., "	41.50

Augusta, Ga., <i>viâ</i> Washington, D. C., to St. Paul.....	\$63.85
Baltimore, Md. (according to the route selected),	“ \$36.50 to 38.75
Bangor, Me., <i>viâ</i> Montreal or Albany	“ 47.50
Baton Rouge, La.,	“ 41.50
Bellefontaine, O.,	“ 21.90
Bethlehem, Pa.,	“ 37.70
Bloomington, Ill., to St. Paul, according to route,	\$15.12 to 17.80
Boston, Mass., “ “ “	\$39.15 to 50.00
Bridgeport, Conn., “ “ “	..... 39.30
Buffalo, N. Y., all rail to St. Paul.....	28.00
“ “ by Lake Superior Transit Company's Steamer to Duluth.....	27.00
Cape May, N. J., to St. Paul.....	40.25
Cedar Keys (and return) to St. Paul.....	73.45
Cedar Rapids, Ia., “ “	8.90
Charleston, S. C. (and return), to St. Paul.....	62.25
Charlotte, N. C., “ “	46.05
Charlottesville, Va., “ “	40.50
Chatham, N. B., “ “	47.85
Chattanooga, Tenn., “ “	33.05
Chautauqua Lake, N. Y., “ “	28.00
Chicago, Ill., to St. Paul (look out for cut rates).....	16.00
Cincinnati, O., to St. Paul, according to route, \$22.85 to	28.15
Cleveland, O., “ “	24.00
“ “ by the Lakes to Duluth.....	23.00
Columbus, O., to St. Paul.....	23.35
Concord, N. H., to St. Paul, Minn.....	40.50
Council Bluffs, Ia., “ “	13.25
Denver, Col., “ “	38.75
Detroit, Mich., “ “	22.00
“ “ by the Lakes to Duluth.....	20.00
Dubuque, Ia., to St. Paul, Minn.....	9.82
Easton, Pa., “ “	37.75
Elmira, N. Y., “ “	31.30
Erie, Pa., “ “	26.75
“ “ by the Lakes to Duluth.....	25.00
Frederick, Md., to St. Paul, Minn.....	36.75
Galveston, Texas, and return to St. Paul, Minn.....	67.00
Halifax, N. S., <i>viâ</i> Montreal, “ “	53.05
Harrisburg, Pa., to St. Paul, Minn.....	\$35.40 to 36.65
Havana, Cuba, and return, to St. Paul, Minn.....	120.00
Jacksonville, Fla., and return, <i>viâ</i> Pittsburg and Washington, to St. Paul, Minn.....	66.95
Lynchburg, Va., “ “	.....\$39.95 to 47.50
Marquette, Mich., “ “	..... 18.85
“ “ by the lake to Duluth.....	12.00
Newark, N. J., to St. Paul, Minn.....	37.25
New York, N. Y., “ “	..... 37.25

New Orleans, La., and return (until June 1, 1883), to	
St. Paul, Minn.....	\$49.00
Norfolk, Va., to St. Paul, Minn.....	43.00
Omaha, Neb., " "	13.75
Ottawa, Can., " "	36.10
Philadelphia, Pa., " "	38.00
Portland, Me., " "	41.65
Providence, R. I., " "	39.15
Richmond, Va., " "	39.25
San Francisco, Cal., (<i>vid</i> Omaha), to St. Paul, Minn...	113.75
St. John, N. B., to St. Paul, Minn.....	51.30
St. Louis, Mo., " "	\$18.15 to 25.50
Victoria, B. C. (<i>vid</i> Omaha), to St. Paul, Minn.....	133.75
Washington, D. C., to St. Paul, Minn., according to route.....	\$36.50 to 43.65
White Sulphur Springs, West Va., to St. Paul, Minn., according to route.....	\$34.95 to 48.80

SECTION 2.

EXPENSES.

A list of expenses is here given for those things which may be procured at Bozeman certainly, and possibly at Livingston, and does not include incidentals (which the tourist must allow for according to his peculiarities). Some of them will be disposed of on the return, which will lessen the expense; but here we give the average as an index of the probable expense. The amount of provisions necessary for each individual to carry is given, and a multiplication of this amount by the number in the party will give the required amount.

SECTION A.—WAGON-TRIP.

To make a round trip in a wagon that will carry comfortably four, or six crowded, and moving slowly with the stuff inside, the cost will be:

Team of horses.....	\$300.00
Harness, new.....	75.00
Harness, old.....	50.00
Wagon, new.....	\$100.00 to 140.00
Tent.....	\$10.00 to 15.00

Total.....\$580.00

PROVISIONS PER MAN FOR A TRIP OF TWENTY DAYS.

20 pounds of flour at 4½ cents per pound.....	\$.90
10 " loaf sugar at 18 cents per pound....	1.80
10 " bacon 25 " "	2.50
2 " ground coffee 30 " " .....	.60
2 " tea	2.00

Carry forward, \$7.80

	Brought forward, \$7.80	
2 pounds of salt.....		.15
$\frac{1}{4}$ " pepper.....		.20
1 " baking-powder.....		.55
$\frac{1}{2}$ gallon maple syrup.....		2.00
1 quart pickles.....		.50
1 box matches.....		.10
1 box condensed milk.....		.35
2 pounds cheese at 25 cents per pound.....		.50
4 " butter 50 " ".....		2.00
1 " soap.....		.10
1 box mustard.....		.25
6 boxes sardines at 25 cents per box.....		1.50
3 cans pears 50 " can.....		1.50
3 cans peaches 50 " ".....		1.50
3 cans turkey 60 " ".....		1.80
4 pounds of ham 55 " pound.....		2.20
1 sack.....		.25
1 axe.....		1.75
1 frying-pan.....		.50
1 broiler.....		.65
1 teapot.....		.50
2 camp-kettles at \$1.25 each.....		2.50
2 knives and forks at 25 cents each.....		.50
2 teaspoons at 5 cents each.....		.10
1 large spoon.....		.20
2 tin plates at 10 cents each.....		.20
2 tin cups 15 " ".....		.30
1 pound of fresh meat,* if the tourist be unsuccessful in hunting.....		.20
		\$30.55

If a guide is considered necessary, which is not the case with a wagon-party using this guide-book (and every party should have a copy), the sum of from \$3.00 to \$5.00 per day must be added, with cook, if necessary, at \$2.00 per day. Sometimes the guide will cook—usually not, however.

The above were Bozeman prices in 1882, before the Northern Pacific Railroad reached that point; now prices should be lower, so that the above is a safe estimate.

SECTION B.—PACK-TRAIN FROM BOZEMAN, WITH GUIDE.

The expense per man, going from Bozeman by pack-train

* In regard to fresh meat, it may be remarked that if it is washed free from blood at a spring of fresh water, and hung up to dry for a few hours, it will keep for weeks without spoiling.

and hiring guide and cook and outfit, except "grub-stake," for a twenty days' trip, is as follows:*

Grub-stake (same as above, less cooking-utensils)...	\$23.15
Guide, including packing, per day \$5.00.....	100.00
Cook, per day, \$2.00.....	40.00
Pack-animal and saddle, per day, \$1.00	20.00
Riding-animal, saddle and bridle, per day, \$1.50...	30.00
	\$213.15

SECTION C.—PACK-TRAIN FROM BOZEMAN, WITHOUT GUIDE.

To outfit and do your own cooking, buy your cayuses, ponies, and with this guide-book go it alone, the expense would be:

Grub-stake (as above, Section A).....	\$30.55
Two cayuses (one to ride, one to pack).....	100.00
Tent.....	15.00
Saddle-riding, \$15.00; pack, \$6.00; rope, \$2.00; bridle, \$2.00.....	25.00
	\$170.55

In all these estimates, it must be remembered that the pony, saddle, etc., may be sold on the return at nearly their original prices, or purchased at the start at a reduced rate from a return party.

SECTION D.—AS TO PERSONAL NECESSARIES AND REQUISITES.

Two pair of heavy blankets (per pair), from \$5.00 to.....	\$10.00
Rubber poncho.....	1.50
Rubber pillow.....	2.50
Heavy overcoat (any kind; duck ones such as miners use) that costs.....	18.00
Thick-soled shoes.....	—
Cork helmet hat (not absolutely necessary).....	3.00
Buffalo robe †.....	\$8.00 to 12.00
Haupt's <i>Guide-book</i>	1.50
Perseverance and pluck.....	<i>pro re nata</i> .
	\$48.50

* Of these items, that of guide and cook will be derivable from the number in the party, in getting at the individual expense. If the number exceeds ten, special terms must be made. The guide will furnish much of the stuff *gratis*, as tent, saddle, etc., which go with the outfit; but in hiring the guide you must stipulate for this and for the number of days you are to be out, and where you are to camp each day. Have everything arranged before you start.

† This will be found most comfortable, and might be duplicated without disadvantage.

APPENDIX B.

LOCATION, POSITION, TIME OF ERUPTION, AND DURATION OF THE ACTION, ETC., OF THE PRINCIPAL GEYSERS OF THE NATIONAL PARK.

GIBBON OR NORRIS GEYSER BASIN (Elevation, 7098 feet.)

Name.	Location.	Time of Eruptions.	Duration of Action.	Height of Column.	Diameter of Column.
Constant	South-west of basin. Near Constant. Near Constant. On the roadside. Against bluff, east of Minute-Man.	Twice in every min. Incessantly. Once in 20 minutes. Every minute. Once in 24 hours.	Few seconds. 8 minutes. 10 to 20 sec. 20 to 25 min.	10 to 15 ft. 10 to 20 ft. 10 feet. 35 feet. 125 feet.	Few inches. " " 4 inches. The eruption takes place through 3 orifices: one 2 X 12, another 3 X 11, and a third 5 X 6 feet.
Fountain					
Mud Geyser.....					
Minute-Man.....					
Mammoth.....					
New Crater.....	Near the Minute-Man.	Two kinds of eruptions: one every half hour, 50 feet; the other once in 24 hours, 100 feet. No eruption has been observed.		40 to 50 ft.	
Emerald	Near the Minute-Man.				
Vixen.....	Same region.	Every 2 or 3 hours.			
MONUMENT GEYSER BASIN.					
All these Geysers are extinct, the steam-vents still active.					
LOWER GEYSER BASIN, (Elevation, 6921).					
Fountain	Centre of the basin.	Six hours; sometimes but once a day; generally in the afternoon.	10 to 65 min.	60 to 90 ft.	25 feet.

Thud	North of Fountain. East of Fountain.	Uncertain. Boiling constantly.	30 to 60 ft.	30 feet.
Mud Geyser, or Paint-Pots.				
	MIDWAY GEYSER BASIN.			
Excelsior, or Sheridan.....	On west bank of Firehole River.	Once in 3 hours; irregularly.	50 to 300 ft.	60 to 75 feet.
	(No other geyser known in this basin).			
	UPPER GEYSER BASIN (Elevation, 7000 feet).			
Bee-Hive.....	North-east of Castle, about 2000 yards from river.	Every day; sometimes once in 12 hours.	200 feet.	20 inches.
Black Sand.....	South-west of Castle, on Iron Spring Creek.	Extinct as to geyser; a fine boiling spring.		
Castle	At camping-point, from which all the geysers will be located.	Once in 24 hours; but frequently only once in 48 hours.	100 feet.	4 feet.
Catfish	Near the Giant, north-west.	Irregular.	20 feet.	Few inches.
Comet.....	North-west from Castle, near Giant.	Once in 6 hours.	50 feet.	Five small orifices.
Fan, or Fantail.....	North side of river, near Giant.	3 to 4 times a day.	60 to 100 ft.	7 feet in diameter.
Giant.....	North-west of Castle, south side of river.	Once in 4 days; irregularly.	250 feet.	
Giantess.....	North of Castle, near the Bee-Hive.	Once in a long time; stated at 14 days.	80 to 250 ft.	18 by 25 feet in diameter.
Grand	North, and a little west of Castle, north side of river.	Twice in 24 hours.	200 feet.	10 feet in diameter, with from 7 to 11 impulses.
Grotto.....	Near Giant, by the roadside.	About once in 3 hours.	40 feet.	Irregular.
Lion.....	North-east of Castle, near Bee-Hive.	Irregular.	20 to 30 ft.	Several inches.
Old Faithful.....	East end of basin.	Every 54 minutes.	175 feet.	6 feet.
Pyramid. See <i>Splendid</i> .				
Riverside.....	Near Fan, on north side river.	3 to 4 times a day.	60 feet.	Several inches.
Saw-Mill	North from Castle, near the Grand.	In action about half the time.	20 feet.	6 inches.
Soda, or Soda Fountain.....	East end of the basin.	Every 10 minutes.	25 to 30 ft.	Several inches.
Splendid, or Pyramid.....	West of Castle, near "Black Sand" Geyser.	Once in from 1½ hours to 3 hours.	200 feet.	Several inches.

APPENDIX C.

RULES AND REGULATIONS OF THE YELLOW-
STONE NATIONAL PARK.

DEPARTMENT OF THE INTERIOR,
Washington, D. C., May 4, 1881. }

1. The cutting or spoliation of timber within the Park is strictly forbidden by law. Also the removing of mineral deposits, natural curiosities or wonders, or the displacement of the same from their natural condition.

2. Permission to use the necessary timber for purposes of fuel and such temporary buildings as may be required for shelter and like uses, and for the collection of such specimens of natural curiosities as can be removed without injury to the natural features or beauty of the grounds, must be obtained from the superintendent, and must be subject at all times to his supervision and control.

3. Fires shall be kindled only when actually necessary, and shall be immediately extinguished when no longer required. Under no circumstances must they be left burning when the place where they have been kindled shall be vacated by the party requiring their use.

4. Hunting, trapping and fishing, except for purposes of procuring food for visitors or actual residents, are prohibited by law; and no sales of game or fish taken inside the Park shall be made for purposes of profit within its boundaries or elsewhere.

5. No person will be permitted to reside permanently within the Park without permission from the Department of the Interior; and any person residing therein, except under lease, as provided in section 2475 of the Revised Statutes, shall vacate the premises within thirty days after being notified in writing so to do by the person in charge, notice to be served upon him in person or left at his place of residence.

6. *The sale of intoxicating liquors is strictly prohibited.*

7. All persons trespassing within the domain of said Park, or violating any of the foregoing rules, will be summarily removed therefrom by the superintendent and his authorized employes, who are, by direction of the Secretary of the Interior, specially designated to carry into effect all necessary regulations for the protection and preservation of the Park, as required by the statute, which expressly provides that the same "shall be under the exclusive control of the Secretary of the Interior, whose duty it shall be to make and publish such rules and regulations as he shall deem necessary or proper," and who, "generally, shall be authorized to take all such measures as shall be necessary or proper to fully carry out the object and purposes of this act."

Resistance to the authority of the superintendent, or repetition of any offence against the foregoing regulations, shall subject the outfits of such offenders and all prohibited articles to seizure, at the discretion of the superintendent or his assistant in charge.

P. W. NORRIS,
Superintendent.

Approved :

S. J. KIRKWOOD,
Secretary.

The rules of 1881 are still enforced by the present superintendent, Mr. Conger.

APPENDIX D.

LIST OF THE MINERALS AND THEIR LOCALITIES AS FOUND BY PROF. HAYDEN'S ENGINEER CORPS IN THE NATIONAL PARK.

- Agate*, as pebbles, on the shore of Yellowstone Lake and in the bed of the south branch of the east fork of Yellowstone River. (Also amethyst on Amethyst Creek and on the side of Mount Washburn.) (*Author.*)
- Amethyst*, at Amethyst Mountain, east fork of Yellowstone River.
- Azurite* (blue carbonate of copper), from the Peacock mine, Cooke City, head of Clarke's Fork River.
- Calcite*, as *Rhomb spar*, valley of Yellowstone River, at Promontory Point, Yellowstone Lake. Crystals of calcite in volcanic rock at Gardiner River, near Mammoth Hot Springs.
- Chalcedony*, pebbles on the shore of Yellowstone Lake; in geodes with agate, opal and quartz on the south branch of the east fork of Yellowstone River; in geodes with quartz and calcite near Gardiner River, at the foot of Mount Washburn.
- Coal* (lignite), near Fort Ellis.
- Felspar*, or *Sanidine*, in trachyte in Grand Cañon of the Yellowstone River and about Yellowstone Lake.
- Flint* (black), on south branch of Yellowstone River.
- Garnets*, in hornblende schist, in cañon of the Yellowstone River.
- Galena* (sulphide of lead), argentiferous, at and about Cooke City (*Author.*)
- Geyselite* (siliceous sinter), about almost all the geysers and hot springs of the National Park (*Author.*)
- Gold*, Emigrant Gulch, Yellowstone River, in placer and quartz-diggings (*Author.*)
- Halite* (common salt), in cold springs or Turbid Lake, near Yellowstone Lake (among the camp-outfits).

- Hornblende*, in gneissic rocks in Yellowstone River Cañon; in acicular crystals in trachyte on the summit of Mount Washburn, near Great Fall, Yellowstone River, on Mount Stephenson; in a red volcanic rock, with calcite, at Promontory Point, Yellowstone Lake.
- Jasper*, green variety on south branch of east fork of Yellowstone River.
- Leucite*, in volcanic rocks near Yellowstone Lake.
- Malachite* (green carbonate copper), with chalcedony, near Mount Washburn.
- Opal* (wood-opal), at the south-east arm of Yellowstone Lake; semi-opal in centre of quartz geodes on the south branch of the east fork of Yellowstone River; geysericite in the geyser-basin of Firehole River.
- Obsidian* (volcanic glass), in the valley of Yellowstone River, in chips; in volcanic rocks in Grand Cañon of the Yellowstone; massive in the Obsidian Cliff, in Gardiner River; porphyritic, near Madison Lake.
- Pumice*, Emigrant Gulch, near Yellowstone Lake.
- Quartz*, in geodes, with chalcedony, near Gardiner River, south branch of east fork of Yellowstone River; crystals, near Virginia City, Montana.
- Serpentine* (compact resinous), west of the Park, near Virginia City.
- Silicified wood*, at Tower Creek, at the foot of Tower Falls, near the Mammoth Hot Springs, on the south-east shore of the Yellowstone Lake; handsome black specimens, with veins of blue chalcedony, on the south branch of the east fork of Yellowstone River.
- Silver*, in galena, with lead, at the mines of Cooke City, head of Clarke Fork River, New World Mining District.
- Spherulite*, at the Grand Cañon of the Yellowstone River, at the south end of Yellowstone Lake.
- Sulphur*, at Mammoth Hot Springs, at Tower Creek, at foot of Mount Washburn, at Sulphur Mountain (Crater Hills); in beautiful crystals, on east fork of Madison River and in many other places.

FOSSILS

Of deciduous tree-leaves, on the backbone of the continent, near Two-Ocean Pond.

APPENDIX E.

TABLE of distances and elevations of some of the principal objects of interest and camping-points, the Mammoth Hot Springs being the initial point for places in the National Park,

and Bozeman and Livingston the objective points by rail from St. Paul in the East and Portland, Oregon, in the West.

	Miles.	Elevation above sea-level. Feet.
Chicago to St. Paul.....	409	
St. Paul to Bozeman.....	1,055	
St. Paul to Livingston.....	1,030	
Bozeman to Mountain House.....	17	
To Fridley's.....	18 miles; from Bozeman, 35	
“ Yankee Jim's (toll-gate) 20 “ “ “	55	
“ Mammoth Hot Springs, 20 “ “ “	75	
(Livingston to Fridley's, Yankee Jim's and Hot Springs, about the same as from Bozeman.)		
Mammoth Hot Springs to Trail to Rustic Falls....	3	6,500
	Miles from Springs.	
To Swan (or Annie's) Lake.....	1;	4
“ To crossing of Gardiner River.....	3;	7
“ Obsidian Cliffs.....	4½;	11½
“ Beaver Lake.....	½;	12
“ Lake of the Woods.....	2;	14
Norris or Gibbon Geyser Basin (Mail Station)..	4;	18
From junction of roads at Lower Basin to Mary's Lake.....	11½;	
To crossing of Alum Creek.....	2½;	14
“ Forks of road on Yellowstone River near Mud Geyser.....	7;	21
“ Monument Geyser Basin.....	5;	23
“ Falls of Gibbon River.....	5;	28
“ First forks of road to Henry's Lake.....	1½;	29½
“ Second “ “ “ “	2;	31½
“ Lower Geyser Basin at junction of the roads 1; (From Junction to Queen's Laundry and Springs, 2½)	32½;	6,921
To Midway Geyser Basin, Excelsior Geyser....	5;	37½
“ Upper Geyser Basin, Camping-point, near Castle Geyser.....	3;	40½ 7,000
“ Forks of trail to Yellowstone Lake.....	1½;	41½
(To Shoshone Lake, from trail <i>via</i> Madison Lake.....)	11½).	
To Falls of Firehole River.....	1½;	43
“ Summit of Rocky Mountains, Norris Pass...5;	48	
“ “ “ “ Two-Ocean Pond 5;	53	
“ Camp at West Bay or Thumb of Yellowstone Lake, Hot Springs Camp.....	3;	56 7,788
“ Forks of trail to Flat Finger Mountain.....	2½;	
“ Flat Finger Mountain.....	7½;	10
“ Summit of Rocky Mountains from forks of trail	3;	
“ Hot Springs on Hart Lake and Mount Sheridan.....	8;	11

	Miles.	Elevation from above Springs. sea-level. Feet.
To Bluff Point, Yellowstone Lake, from Hot Springs Camp.....	3;	59
" Natural Bridge.....	9;	68
" Outlet of Yellowstone Lake.....	5½;	73½ 7,788
" Mud Geyser and Giant's Caldron.....	5½;	79 7,438
" Forks of the road to Lower Geyser Basin...2;		81
" Sulphur Mountain (Crater Hills).....	2;	83 7,435
" Upper Falls of Yellowstone River.....	4;	87
" Lower or Great Falls, Yellowstone River...1;		88
" Look-out Point, Yellowstone River.....	1;	89
" Twin Falls and Cascade, Yellowstone River 3;		92
" Hot Sulphur Creek.....	1;	93
" Forks of trail up Mount Washburn.....	3;	96
" Summit of Mount Washburn.....	1;	10,340
" Forks of trail to Mount Washburn at Antelope Creek.....	3½;	99½
" Tower Creek, at Falls.....	3;	102½ 6,188
" Barronett's (Jack's) Bridge, Yellowstone River.....	3;	105½
" Soda Butte Springs from Jack's Bridge...13;		
" Trout Lake.....	2;	15
" Cooke City P. O.....	.10;	25
" Black-Tail Deer Creek.....	10;	115½
" Gardiner River Falls.....	3½;	119
" Mammoth Hot Springs.....	3½;	121½

NOTE.—These distances may not be absolutely correct, but they approximate the truth very nearly. Minor and intermediate distances may be taken from the map; a scale of miles will be found on it.

Tourist taking the Southern Route (in contradistinction to the above, the Northern Route) the distances are as follows:

	Miles.
Chicago to Omaha.....	493
To Ogden, Union Pacific Railroad.....	1,031 1,524
" Camas, <i>via</i> Utah Northern Railroad.....	241 1,765
" Henry's Lake.....	65 1,830
" Junction of roads to Mammoth Hot Springs. (Lower Geyser Basin).....	28 1,858
Taking the Northern Route from Chicago, <i>via</i> St. Paul to this junction point at Lower Geyser Basin, the distance is.....	1,137½
Taking the Western Route, starting from San Francisco, the distance is—	
To Portland (approximately).....	712
" Missoula.....	515 1,227
" Bozeman.....	238 1,465

The altitudes of almost all mountain-peaks and other points of interest are indicated on the map accompanying this Guide.

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THE END.

TOURIST'S MEMORANDA.

1883							1883								
	Sunday.	Monday.	Tuesday.	Wed'day	Thursday	Friday.	Saturday		Sunday.	Monday.	Tuesday.	Wed'day	Thursday	Friday.	Saturday
JAN.	...	1	2	3	4	5	6	JULY	1	2	3	4	5	6	7
	7	8	9	10	11	12	13		8	9	10	11	12	13	14
	14	15	16	17	18	19	20		15	16	17	18	19	20	21
	21	22	23	24	25	26	27		22	23	24	25	26	27	28
	28	29	30	31	...	...	...		29	30	31	...	...	...	...
FEB.	...	...	...	...	1	2	3	AUG.	...	...	...	1	2	3	4
	4	5	6	7	8	9	10		5	6	7	8	9	10	11
	11	12	13	14	15	16	17		12	13	14	15	16	17	18
	18	19	20	21	22	23	24		19	20	21	22	23	24	25
	25	26	27	28	...	...	...		26	27	28	29	30	31	...
MAR.	...	...	...	...	1	2	3	SEP.	...	...	...	...	...	...	...
	4	5	6	7	8	9	10		2	3	4	5	6	7	8
	11	12	13	14	15	16	17		9	10	11	12	13	14	15
	18	19	20	21	22	23	24		16	17	18	19	20	21	22
	25	26	27	28	29	30	31		23	24	25	26	27	28	29
	...	...	...	...	...	...	...		30	...	...	...	...	...	...
APR.	1	2	3	4	5	6	7	OCT.	...	1	2	3	4	5	6
	8	9	10	11	12	13	14		7	8	9	10	11	12	13
	15	16	17	18	19	20	21		14	15	16	17	18	19	20
	22	23	24	25	26	27	28		21	22	23	24	25	26	27
	29	30	...	...	...	...	...		28	29	30	31	...	...
MAY	...	...	1	2	3	4	5	NOV.	...	...	...	...	1	2	3
	6	7	8	9	10	11	12		4	5	6	7	8	9	10
	13	14	15	16	17	18	19		11	12	13	14	15	16	17
	20	21	22	23	24	25	26		18	19	20	21	22	23	24
	27	28	29	30	31	...	...		25	26	27	28	29	30	...
JUNE	...	...	...	...	...	1	2	DEC.	...	...	...	...	...	...	1
	3	4	5	6	7	8	9		2	3	4	5	6	7	8
	10	11	12	13	14	15	16		9	10	11	12	13	14	15
	17	18	19	20	21	22	23		16	17	18	19	20	21	22
	24	25	26	27	28	29	30		23	24	25	26	27	28	29
		30	31

TOURIST'S MEMORANDA

July

August

September

Sunday

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The image shows a large, faint calendar grid for the month of August. The grid is organized into two columns, likely representing the first and second halves of the month. Each column contains a header for the days of the week (S, M, Tu, W, Th, F, S) and a series of dates. The text is very light and difficult to read, but the structure of a calendar is visible. The grid is centered on the page, below the month and day labels.

Monday

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July

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September

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TOURIST'S MEMORANDA.

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TOURIST'S MEMORANDA

July

August

September

Sunday

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Monday

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July

August

September

Sunday,

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Monday

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From the Mammoth Hot Springs a fine Concord Stage line, with reliable steady drivers, connects with all points of interest within the Park, setting passengers down at Lower Geyser Basin, Upper Geyser Basin, outlet of the Yellowstone Lake and Great Falls of the Yellowstone River, at which point first-class Hotels are found. All the Hotels are furnished with Bath Houses and all the modern conveniences.

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Excursion tickets from St. Paul or Duluth to Mammoth Hot Springs and return, good until September 30th, 1883.

Parties of 1 to	5,	- - -	\$ 90.00 each.
“	5 “	15, - - -	85.00 “
“	15 “	25, - - -	80.00 “
“	25 “	50, - - -	75.00 “
“	50 “	75, - - -	70.00 “
“	75 “	100, - - -	65.00 “
“	100 and over,	-	60.00 “

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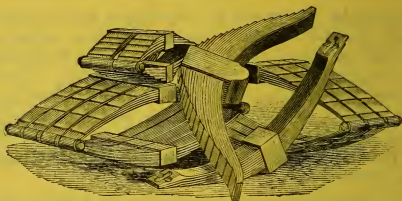
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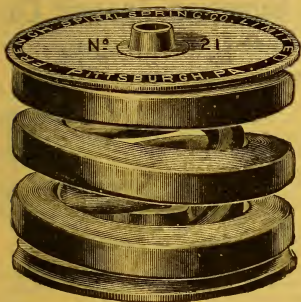
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St. Louis, 209 North Third St., M. M. Buck & Co.

Boston, 52 Mason Building, John Kent.



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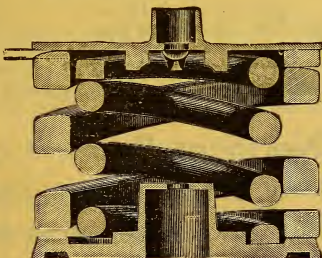
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Third St. Boston—John Kent, 52 Mason Building.

*Top line of
Outer Coil
at rest.*

*Top line of
Inner Coil
at rest.*



Pat. Dec. 27, 1870.

Pat. Oct. 10, 1882.

Pat. Mar. 13, 1883.

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