OFFICIAL GUIDE
TO THE
Yellowstone National Park
A MANUAL FOR TOURISTS.
BEING A DESCRIPTION OF THE MAMMOTH HOT SPRINGS, THE
GEYSER BASINS, THE CATARACTS, THE CAÑONS,
AND OTHER FEATURES OF THE
NEW WONDERLAND,
With Nineteen Illustrations, a Plan of the Upper
Geyser Basin and Route Maps;
ALSO
AN APPENDIX,
Containing Railroad Rates, as well as Other Miscellaneous Information.

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RULES AND REGULATIONS
OF THE
Yellowstone National Park

DEPARTMENT OF THE INTERIOR,
WASHINGTON, July 1, 1888.

1. It is forbidden to remove or injure the sediments or incrustations around the geysers, hot springs, or steam vents; or to deface the same by written inscription or otherwise; or to throw any substance into the springs or geyser vents; or to injure or disturb, in any manner, any of the mineral deposits, natural curiosities, or wonders within the Park.

2. It is forbidden to ride or drive upon any of the geyser or hot spring formations, or to turn loose stock to graze in their vicinity.

3. It is forbidden to cut or injure any growing timber. Camping parties will be allowed to use dead or fallen timber for fuel.

4. Fires shall be lighted only when necessary, and completely extinguished when not longer required. The utmost care should be exercised at all times to avoid setting fire to the timber and grass.

5. Hunting, capturing, injuring, or killing any bird or animal within the Park is prohibited. The outfits of persons found hunting, or in possession of game killed in the Park, will be subject to seizure and confiscation.

6. Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited. Fishing for purposes of merchandise or profit is forbidden by law.

7. No person will be permitted to reside permanently or to engage in any business in the Park, without permission, in writing, from the Department of the Interior. The Superintendent may grant authority to competent persons to act as guides, and revoke the same at his discretion.

8. No drinking saloon or bar-room will be permitted within the limits of the Park.

9. Private notices or advertisements shall not be posted or displayed within the Park, except such as may be necessary for the convenience and guidance of the public, upon buildings on leased ground.

10. Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who violate any of the foregoing rules, will be summarily removed from the Park, under authority of the Statute setting apart the Park "as a pleasure ground for the people," and providing that it "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."

WM. F. VILAS, Secretary of the Interior.
Yellowstone National Park.

THE Yellowstone National Park is situated in the midst of the most elevated part of the erratic Rocky Mountains, and within the shadow of the confused and forbidding peaks by which it is girdled are born the rills which grow into the mightiest rivers of the United States. From the summit of Mount Washburn, the highest point of observation embraced by the Park, may be seen the grim and towering walls which partition a complex of waters, forcing the flow either eastward, by way of the Gulf of Mexico, into the Atlantic, or westward into the Pacific Ocean.

But the fact that here rise the springs of the Missouri-Mississippi system, as well as those of the Columbia and the Colorado, is lost sight of in view of the far more striking features of this remarkable region. Nowhere else in all the wide world are to be seen, so close to the surface, on so grand and varied a scale, undoubted evidences of existing subterranean fires; nowhere else is the opportunity given to note with ease the lingering death throes of the terrible volcanic forces which convulsed the round world to its very centre in ages long ago.

An area of greater value to the student, and of more interest to the tourist, would be hard to find. It was, therefore, a wise and creditable act of the United States Congress of 1872, to withdraw this portion of the public domain from settlement, and devote it in perpetuity to the use and pleasure of the people as a National Park. This measure stands out the more boldly as an instance of commendable foresight, when it is remembered that it was based upon the report of a single official survey, that of Prof. F. V. Hayden in 1871, made at a time when the country was almost inaccessible, and when a lack of proper interest in the subject might have been antici-
pated and excused. But to the zealous advocacy of Prof. Hayden, and to his untiring personal efforts, the favorable action of Congress upon the project was mainly due. The act of dedication was as follows:

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 headwaters 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's 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.

AN ACT making appropriation for sundry civil expenses of the Government, for the fiscal year ending June 30, 1884, and for other purposes:

EXTRACT.

The Secretary of the Interior may lease small portions of ground in the park, not exceeding ten acres in extent for each tract, on which may be erected hotels and the necessary out-buildings, and for a period not exceeding ten years; but such lease shall not include any of the geysers or other objects of curiosity or interest in said park, or exclude the public from the free and convenient approach thereto; or include any ground within one quarter of a mile of any of the geysers or the Yellowstone Falls, nor shall there be leased more than ten acres to any one person or corporation; nor shall any hotel or other buildings be erected within the park until such lease shall be executed by the Secretary of the Interior, and all contracts, agreements, or exclusive privileges heretofore made or given in regard to said park, or any part thereof, are hereby declared to be invalid; nor shall the Secretary of the Interior, in any lease which he may make and execute, grant any exclusive privileges within said park, except upon the ground leased. The Secretary of War, upon the request of the Secretary of the Interior, is hereby authorized and directed to make the
necessary detail of troops to prevent trespassers or intruders from entering the park for the purpose of destroying the game or objects of curiosity therein, or for any other purpose prohibited by law, and to remove such persons from the park, if found therein.

Approved March 3d, 1866.

The tract embraced within the National Park limits lies mainly in northwestern Wyoming, including only a narrow strip of southern Montana and eastern Idaho. No general survey having been made, these boundaries do not describe any natural divisions. They include a region which stretches a few miles east of the meridian of 116° west longitude, and about the same distance west of the meridian of 111°, and a few miles north of the parallel of 45°, and not quite so far south as 44° north latitude. These purely arbitrary lines contain an area fifty-five miles in width from east to west, and sixty-five miles in length from north to south, or about 3,575 square miles. This gives an extent about 200 square miles greater than that of the States of Rhode Island and Delaware combined. Most of the territory is situated east of that portion of the main range of the irregular Rocky Mountain chain in which are the sources of the Madison and Gallatin Rivers, the middle and eastern of the three large streams which unite and form the Missouri.

This region is, in reality, less one large park than a group of smaller ones, partially or wholly isolated on both sides of the Continental Divide. The lowest elevation of any of the narrow valleys of the Park is 6,000 feet above the sea, and several of them are from 1,000 to 2,000 feet higher. Mountain ranges, hemming in these valleys on every side, rear their proud peaks from 10,000 to 12,000 feet. Throughout the year the nights are cool, and seldom free from frost; consequently the Park is entirely unsuited to agriculture. Being of volcanic origin, it would be vain to seek for minerals among its rocks. But though this area has been deprived by Nature of the means of supporting a permanent population, it is endowed with features so curious and remarkable that it must always

attract large numbers of transient visitors. The Park is a region of wonder, terror and delight. Nature puts forth all her powers, and her moods are ever changing from "grave to gay, from lively to severe." Here tremendous geysers shoot up their mighty fountains, causing the earth to groan and tremble by their violence; countless hot springs, indescribable in their strange beauty, show depths as translucent as the ambient air; pools of seething mud, casting up jets of colored paste, bewilder by their curious activity. And, as if these were not sufficient, here, too, is to be seen the most varied and lavish display of picturesque scenery. The Park unfolds a succession of pictures, each more striking than the other. There are serried, snow-mantled mountains, profound canions, mighty cataracts, verdant valleys, beautiful woods, sylvan streams, foaming cascades, and mirror-like lakes. The forests abound in noble game, and the waters of the mountain ranges are alive with fish. The glorious air acts as a tonic upon mind and body. Doubtless the numerous mineral springs are full of health-giving properties for the invalid. In short, the Yellowstone National Park is precisely adapted to be the public pleasuring ground for the benefit and enjoyment of the people, which Congress, in 1872, declared it should forever be.

History and Explorations.—The following brief account of the history of the Park and the explorations of the region is taken from the report made to Dr. Hayden by Henry Gannett, E. M., on the geographical field work of the United States Geological Survey during the season of 1878:

"The first authentic information regarding the great natural wonders of the Park was derived from a prospecting party under the leadership of Capt. W. W. DeLacy, who, in 1863, visited the Lower Geyser Basin. Previous to this time it seems that the region was known to but a few hunters and trappers, and their tales were treated as the wildest of romancing, as, indeed, many of them were, the mind of the trapper being singularly prone to exaggeration. The earliest reference to
THE MAMMOTH HOT SPRINGS.

These remarkable terrace-building springs are situated in a small valley, 1,000 feet above the Gardiner River, into which their flow is discharged. The material deposited by the springs is mainly calcareous, taken up by the hot water as it finds its way to the surface through deep-lying cretaceous strata. The water issues at various elevations on the terraces from many vents, in pulsating waves, which overflow the basins, and deposit thin, corrugated layers of carbonate of lime as travertine. This deposit is moderately hard while wet, but becomes quite soft and friable as it dries. The slow but ceaseless operation of the springs has resulted in building up terrace after terrace of scallop-edged, limpid pools and basins of hot water of varied size, form and temperature.

A fine view of the most active springs and the surrounding mountains is obtained from an eminence upon which have hitherto stood the headquarters of the Park Superintendent, a building the removal of which is now in contemplation and may be effected at any time. Directly in front looms, through floating clouds of steam, the glaring bulk of the principal snow-white terraces, 200 feet above the plateau at their base. This plateau is pitted with numerous caverns of various depths and sizes, which were once the basins of ancient springs, but are now choked with shrubbery. Groups of pines or single trees find sufficient nutrient in the crumbling calcareous deposit to support themselves.

Liberty Cap and Giant's Thumb.—Toward the northwest corner of this plateau rises an isolated shaft, forty-five feet in height and twenty feet in diameter at the base, the cone
of an extinct geyser. "It is composed," says Dr. A. C. Peale, in his report to Dr. Hayden on the thermal springs of the Yellowstone National Park, under date of August 23, 1881, "of overlapping layers of sediment, having evidently been built up by the overflow of the water from the orifice at the top. The deposit is hard, of close, compact structure, and of considerable age. Surrounding this cone are a number of shallow basins, some of which are snowy white, tinted with pink. But few active springs are found here at present." One hundred yards or so further west is another cone of the same character, although much inferior in size. These singular objects at once attract attention. The taller cone, from its shape, is aptly named the "Liberty Cap," the other, which abuts upon the sinister bluff, has been christened the "Giant's Thumb." Both cones show signs of age and decrepitude. Deep fissures yawn in their surfaces, and the weather is gradually crumbling them away. An attempt to restore their original symmetry by conducting streams of water from the hot springs above may succeed. It is hoped that the deposits of lime may gradually fill up the fractures and cavities, and renew the youth of the cones. It would be a pity for these mausoleums of old geysers to crumble into dust.

Climbing the Main Terrace.—The ascent from this point to the main terrace of active springs is not difficult. Stepping upon the first of a series of broad ledges which lead to the base of the terrace, the way is threaded through a maze of rills of hot water, over the low, scalloped rims of limpid, steaming pools, where it seems sacrilege to tread. The novelty and magnificence of the scene are bewildering. Not distance, but proximity, lends enchantment to the view. The brilliance and variety of the coloring matter about the pools, as well as the delicacy and beauty of the formations, are indescribably wonderful. Terrace after terrace is thus surmounted, some of these eight or ten feet high and several yards in width; others are mere ledges. On each of these levels the water collects in a long tier of nearly semicircular basins, of different diameters, lying close together. The higher terraces present an imposing front, the contour of their scalloped margins at once suggesting frozen water-falls. Over the rims of the basins on the topmost level the water gently pours until it finds its way into the reservoirs next below, repeating this process till the bottom of the hill is reached, where the flow is collected, and carried off by several channels to the Gardiner River.

Exquisite Formations and Splendid Colors.—The deposits which result from evaporation at the margin of each basin are exquisite in form and color. The rims are fretted with a delicate frost-work, and the outside of each bowl is beautifully adorned with a honeycomb pattern, while the spaces between the curves are often filled with glistening stalactites. The coating of the sides of the basins and pools takes on every delicate and vivid tint, rich cream and salmon colors predominating, but these deepening near the edges into brilliant shades of red, brown, green and yellow. The largest springs, supplying most of the water to the tiers of bowls on each of the terraces, are situated on a broad, level space covering some acres at the top of the hill. One has a basin forty feet in length by twenty-five in width. Others are nearly as great. The water is a turquoise blue, and so perfectly translucent that the most microscopic fretting deep down upon the sides and bottoms of the pools is plainly visible. This is the case with the hot-spring water everywhere. Its crystal clearness can not be described; it must be seen to be appreciated. The contrast between the springs seems rather treacherous to the foot, and it is impossible to get about without soaking the shoes in hot water. Most of the springs have two centres of ebullition, at which, doubtless, the water is at the boiling point; but at the edges the temperature is much lower. Around the hottest pools, in many cases, there are strung along the rim, like beads
on a necklace, a row of nodules as large as hazel nuts and hard as adamant. The play of the waters as they seethe up from the cavernous throats of the pools and undulate in miniature waves is wonderful. The rays of light are refracted by the agitation upon the surface, and are resolved into all the colors of the prism.

In several places beneath the crust the rush and gurgle of flowing water is distinctly heard. There is one cleft, a foot or more in width, revealing a steaming stream traceable over a hundred yards in its course to the flashing pools below. The hot-water vegetation is a curious feature of all the cooler rills which flow from the boiling springs. There is an abundance of yellow, green, red, white and brown confervae, covered with sulphur, which stream in long threads of silken texture through the gullies. These streaming filaments are very pretty.

Cleopatra Spring.—Among the principal springs is the Cleopatra, so named by some of the earlier visitors. It is the most beautiful in the basin. It is situated on a mound of deposit which is forty feet in height, and covers an area of three-quarters of an acre. Dr. Peale describes it as follows: "The spring has light blue tinted water in a white basin, with light yellowish red edges. A large flat basin surrounds the spring. At the east end are basins lined with reddish tufted material. The greatest overflow escapes at the west end, and the basins here are fringed with stalactitic masses. The basin at the edge of which these stalactites are most prominent is eight feet high. Below it the water flows over an incline, at the base of which are handsome white, red and yellow basins. The whole front of the mass is lined with these basins, and on the west side, where the overflow was in 1871, they are snowy white. The amount of water is very small in comparison with the amount of deposit. It sinks out of sight at the base of the mass. This spring has a temperature of 154° at the edge. As the water escapes, it flows over a ladder that has been placed
against the edge, for the purpose of cutting articles that are
hung on it. The rate of deposition, under favorable circumstances, is about one-sixteenth of an inch in four days (96 hours).
It is almost impossible to describe this mass and the basins
that compose it, in words. The spring is 20 feet below the
terrace immediately back of it.

**Extinct Spring Terraces.**—The distance from the principal
group of active hot springs to the nearest point on Gar-
diner River is about one mile. A hard scramble over the
rough declivities of several intervening extinct spring terraces
and through an occasional belt of timber is the penalty of
making it. Numerous deep pits, now overgrown with bushes
and scrubby pines, show the places which once were pools.
Below the pits the scalloped rims of former basins are distinc
tly seen, and well-rounded geyser cones are also sometimes
noticed. Doubtless in earlier times the chief centre of boiling-
spring activity was about midway between the river and its
present scene. Many of the pines which have grown out of
the ancient deposit are large and stately, perhaps 30 or 100
years of age. Their towering condition is in strong contrast
with that of the trees in the neighborhood of the active springs.
The deposit of travertine has doomed to destruction all the
forest growth that lies in its course. It has already banked
itself around hundreds of trees on the slope of the hill where
the hot springs are now at work, covering them to the depth
of several feet, and its encroachments steadily continue. Num-
bers of these blasted, helpless pines still stand erect, looking
quite, dismal imbedded in snow-white travertine which almost
touches their leafless branches.

This calcareous deposit covers an area of three square miles.
Of this, the recent deposits, on which the springs are at pres-
ent found, occupy about 750 acres. Along the river bank there
are still many active boiling springs. For a mile up the hill-
side there is terrace after terrace of extinct springs. Then
comes the principal point of present activity, which extends
with gradually waning power over a distance of a mile into the
dense woods on the top of the mountain. There are fourteen
well-defined terraces within the bounds mentioned, which are
now, or have been at one time, the scene of boiling-spring
activity.

Although the Mammoth Hot Springs are by far the most im-
portant of the kind now active in the world, they are insignifi-
cant as compared with what they were when they built Terrace
Mountain; or to what other springs were, perhaps, at the same
period, which resulted in the formation of the immense cliffs
along the Yellowstone at Bear Gulch, at Sheep-eater Cliff, and
many other localities where these enormous deposits, now des-
te of active springs, are slowly crumbling away.

Dr. Gillis thus describes these springs:

"The first glimpse of this singular scene, caught from a
crest of the dividing ridge, recalls the termination of a glacier.
A mass of snowy whiteness extends from a lateral pine val-
ley, and presents a steep front to the narrow plain at its base.
The contrast between it and the emerald line of the pines all
round, heightens the resemblance of its form and aspect to a
mass of ice. It is all rock, however, deposited by the hot
water which, issuing from innumerable openings down the val-
ley, has in course of time filled it up with white stones. Col-
umns of steam rising from the mass, bear witness even at a
distance to the nature of the locality. We wandered over this
singular accumulation, each of us searching for a pool of water
too cold to be used as a bath. I found one where the
water, after quitting its conduit, made a circuit round a basin
of sister, and in so doing cooled down sufficiently to let one
sit in it. The top of the mound, and, indeed, those parts of
the deposits generally, from which the water has retreated, and
which are therefore filled and exposed to the weather, are apt
to crack into thin shells, or to crumble into white powder. But
along the steep front from which most of the springs escape,
the water collects in basins at many different levels. Each
of these basins has the most elaborately fretted rim. It is at
their margin that evaporation proceeds most vigorously and deposition takes place most rapidly; hence the rim is being constantly added to. The colors of these wavy, frill-like borders are sometimes remarkably vivid. The contrast between the heat below and the cold above ground at night is sometimes very great. We used to rise about daybreak, and, repairing to the nearest brook or river for ablation, sometimes found a crust of ice on its quiet pools.

**Medicinal.**—The healing qualities of the Gardiner River hot springs have never been fully tested. A complete analysis of the waters has yet to be made. Persons afflicted with rheumatism and eruptive diseases have found relief by bathing in the hot springs near the bank of the Gardiner River. The water is rather agreeable to the taste, and remarkably soft to the touch. It is very pleasant to the skin, and has an invigorating effect on the body. Should investigation prove that these springs possess extraordinary medicinal virtues, it is likely that the place will early become a resort for the afflicted, as well as for the admirers of novel and beautiful scenes. The high and noble mountains which entirely surround the Mammoth Hot Springs give a charming landscape picture to the situation.

**Trout Fishing Extraordinary.**—It has often been said that it is possible to catch trout in the Yellowstone Lake and cook them in a boiling spring close behind the angler, without taking them off the hook. This assertion seems incredible, and it is generally doubted. But this extraordinary feat may certainly be accomplished, not only at the Yellowstone Lake, but also on the Gardiner River, below the Mammoth Hot Springs. The writer performed it at the latter place, in the presence of nine witnesses, at a point not far from a deserted cabin at the foot of the long series of terraces. Selecting a likely pool of the ice-cold stream, with a boiling spring fifteen feet distant from the bank, he stood upon a projecting rock and made a cast. His fly soon tempted a trout to his doom. The fish was small enough to be lifted out of the water without the aid of a landing net, and it was quite easy to drop him into the bubbling hot spring behind. His life must have been extinguished instantly. This procedure was repeated several times, and each of the spectators who had purposely assembled to test the truth of the strange assertion, partook of the fish thus caught and boiled. It required from three to five minutes to thoroughly cook the victims of the experiment, and it was the general verdict that they only needed a little salt to make them quite palatable. This is a “fish story,” without doubt, but a perfectly true one. A feat so extraordinary could nowhere else be practiced. It must be chronicled as one of the marvels of the National Park. There are several other places in this land of wonders besides those named where this fishing extraordinary could be successfully attempted.

**Middle Falls of the Gardiner River.**—The cañon and Middle Falls, about four miles due south from the Mammoth Hot Springs, are reached by a rough trail. The cañon is about forty yards wide at its base, and 300 yards across at its top. Its depth is from 1,200 to 1,500 feet. The falls are of singular grace and beauty. The river seems to rise above the clouds, and rushes down a descent of 300 feet, one-third of which is an unbroken fall. The steep and rugged sides of the cañon, as well as its margin, are densely wooded with a growth of scrub pine. Above the falls the cliffs are like battlements, with here and there a tall spire. At a little distance, so symmetrical are the different outflows of basalt, the columnar formations appear to be the work of art. The cañon is many miles in length, and is scarcely inferior to that of the Yellowstone in wild grandeur. The path, after winding picturequely along the sides of Bunsen’s Peak, leads out into a rolling prairie, interspersed with reed-fringed ponds. From the summit of any hilltop there is seen in every direction the dark forest, which spreads out in terraces to the horizon, its great
mantine perforated in the distance by the protruding peaks of the Shoshone and Madison ranges, while still further southward the three Tetons tower upward like watch-towers.

Sheep-eater Cliffs, which lie eastward, are passed, and three miles from the falls the main road to the Geyser Basins is reached near Swan Lake.

Grand Tour of the Park.

The chief attractions of the grand tour comprise the Golden Gate, the Obsidian Cliffs, the Norris Geyser Basin, Virginia Cañon and Cascades, the Grand Cañon, and Upper and Lower Falls of the Yellowstone River, the view from Mt. Washburn, Tower Falls, thence southward to Yellowstone Lake and Mud Geyser, Crater Hill, and Mary's Mountain road to Firehole or Middle Geyser Basin, the Excelsior and Upper Geyser Basin; and returning, Gibbon Falls, Gibbon Paint Pots, and Mt. Schurz, between the Middle and the Norris Geyser Basins. These places of interest are, with three unimportant exceptions, embraced within the round trip of the stages, which run daily from about June 15 to October 1. The roads, which have been admirably constructed, and are kept in remarkably good condition, considering the small amount annually appropriated by Congress for the maintenance of the Park, have been laid out with a view to rendering it practicable to visit all the points of especial interest without traversing the same road twice. While this desirable end has not yet been fully attained, its accomplishment is proceeding rapidly.

During the summer of 1889, for example, will be commenced a road from the Great Falls by way of the Cañon and Tower Falls to Yancey's, on the Cooke City road. This will save many miles of doubling, and allow a longer time than heretofore at places of transcendent interest.

The starting-point for the grand tour is Mammoth Hot Springs. While stop-over privileges are granted at all points where hotel accommodations are provided, and opportunity is afforded for special excursions to such objects of interest as can not conveniently be embraced within the regular tour, there is nothing to be gained, but, on the contrary, much to be
GRAND TOUR OF THE PARK.

lost; by any material deviation from the route laid down in these pages. That route has many advantages, not the least of them consisting in the fact that the wonders of the Park are visited in such sequence that the interest, astonishment and delight of the traveler increase with each succeeding stage of the tour, until the crowning glory of the entire region is reached in the Grand Cañon of the Yellowstone.

Golden Gate and Kingman's Pass.—After leaving Mammoth Hot Springs, the road, which formerly crossed Terrace Mountain, and was as difficult as it was circuitous, proceeds almost directly southward through a magnificent defile, where the skill employed in its construction, and the substantial character of the work, claim constant admiration. One of the minor objects of interest in this land of wonders is the Rustic Falls, on Glenn Creek, one of the tributaries of the Gardiner River, to the left of the road. The stream is fed by the mountain snows, and takes its course for a mile or so through a sage-brush plain. It then falls fifty or sixty feet into a series of shallow basins, which it has worn out of the moss-covered rock. The fall is very gentle, and the flowers and waving ferns, which cling to the sides of the chasm, are kept fresh and bright by the spray, which lightly touches them. The cañon below the falls rapidly widens and deepens into a gloomy, impassable gorge. In the open valley above, and upon a timbered ledge overhanging the falls, are vestiges of a Sheep-eater Indian camp and a driveway for game. Four miles from Mammoth Hot Springs, the road reaches a pretty little sheet of water, named Swan Lake. The fallen timber on the hill-sides, laid by the wind, forms perfect cètans-de-frise. Two and a half miles beyond, the Middle Fork of the Gardiner River is reached, the valley of which stream is followed to the upper end of Willow Park.

The Obsidian or Volcanic Glass Cliffs.—The Obsidian Cliffs are a mile and a half south of Willow Park. These cliffs
rise like basalt in almost vertical columns from the eastern shores of Beaver Lake, and are probably unequaled in the world. They are from 150 to 250 feet in height, and 1,000 feet in length, although there are cropplings of the same material to be traced as far as the Lake of the Woods, two miles beyond. This volcanic glass glistens like jet, but is quite opaque. Sometimes it is variegated with streaks of red and yellow. Large blocks of it have been, from time to time, detached, forming a sloping barricade at an angle of 45° to the hot springs at the margin of Beaver Lake. It was necessary to build a carriage road over these blocks. This was accomplished by Colonel Norris, late Superintendent of the Park, by building great fires upon the largest masses, which, after they had been sufficiently expanded by the heat, were suddenly cooled by dashing cold water over them. This had the effect of fracturing the blocks into fragments which could be handled, and a glass carriage-way, a quarter of a mile in length, was made. Without doubt, this is the only piece of glass road in the world. Blocks of obsidian are to be found along the Gardiner River for a few miles below the cliffs, and the whole region from Paradise Valley, in the Upper Yellowstone, southward, is strewed with chips and pebbles of this material. On the bays of the Yellowstone Lake, and in many of the clear stream beds, tiny fragments of obsidian are to be seen glittering like gems.

Obsidian is a species of lava, which, according to Pliny, was first found in Ethiopia. The name, however, seems to have been applied by the ancients to Chian marble, and is probably a false spelling of the Greek ὀξίλιανος, signifying to reflect images, because the Chian marble was as hard to cut as the volcanic glass, and was used for mirrors.

The Indians used this glass in making arrow-heads, weapons and tools. Relics of this sort, which tourists find, seem to be made of the superior quality of obsidian which was procured at the cliffs. An impure variety, black with white flecks, is common at other points within the Park, notably near the Great Falls of the Yellowstone, at Crystal Cascades, and near Shoshone Lake on the Continental Divide.

**Beaver Lake.**—This is a beautiful sheet of water, half a mile in width and more than a mile in length. It is of considerable depth, and is the haunt of numbers of wild geese, ducks, cranes and other water fowl. Its swampy margin is covered with lily-pads, and along its borders are to be found many fine specimens of the flora of the Park. Around its wooded, hilly shores, there are numerous hot and cold springs, and at the southern end of the lake is a large flat where Green Creek pours into it. This lake was formed by beavers, which have obstructed the creek and constructed a series of three or four dams, which sweep in graceful curves from side to side, each having a fall of from two to three feet in a distance of two miles. The road flanks the lake for nearly a mile, and then takes a westward sweep, crossing, by a comparatively easy pass, the divide which separates the waters of Gardiner River, flowing into the Yellowstone, from those of the Gibbon, which are tributary to the Madison River. This ridge surmounted, the first active geysers come suddenly into view.

**Norris Geyser Basin.**—This Basin is doubtless the oldest and highest in the Park, revealing much that is wonderful and attractive. It is apt to astonish and bewilder the neophyte in Wonderland, by its spouting geysers, clouds of vapor and overpowering odors of sulphur, it being the first "fire-hole" area encountered on entering the Park. The whole vast Basin is a collection of hot springs and pools varying greatly in color, some being jet black, some white as driven snow on mountain height, and others as sulphurous a yellow as Lucifer could desire. There are numerous fumaroles and solfataras, besides "frying-pans" which sputter and sizzle violently. The earth rumbles and shakes, and the air is hot, and reeks with unpleasant odors. Where the water does not boil over the
crust, it seethes and gurgles beneath, rendering great caution necessary in getting about on the treacherous surface. Numbers of the steam vents are adorned with beautiful sulphur crystals, and masses of this material are heaped in every direction. Some of the springs are "paint pots," which boil incessantly their pasty clay of divers colors, with noisy sputtering. Among the geysers in the plateau toward the southwest are the "Constant," the "Twins" and the "Triplets," which seem to be in perpetual action, obscuring the sun's rays with their steam; and on the highest point of the ridge, a few paces to the right of the road, is a large mud pot, which discharges at frequent intervals a heavy jet of pale-drab spray, eight to ten feet high, which spreads out like a bush of coral. A smoke hole near by, on the verge of the road, sends out, with rumble and awful roar, blasts of superheated steam. This is named "Steamboat Vent." There are two roaring steam holes which, says Dr. Peale, "look as though they had just burst through the surface, and the gully leading toward the ravine to the south is covered with sand that appears to have been poured out during an eruption. Trees standing in the line of this sand-flood are dead, and a number are uprooted, and covered with sand. Everything seems to point to the fact of the recent formation of this vent. There is no deposit marking the opening, although stones surrounding the hole are beginning to have points of geyserite deposited on their upper surfaces."

Colonel Norris says that this vent had no existence in 1875, but that in 1878 it had become a powerful flowing geyser. This promises to be one of the most interesting geysers in the Park, as it will afford most important data as to the building of the deposits and the age of the geysers. On the left of the road, within a rod or two of the mud pot, is the "Emerald Pool," its large, deep bowl brim full of purest water of the bluish green tint of a beryl.

Southeastward a few yards the Fishtail, or New Crater Geyser, throws a shower of glistening drops at short intervals.
To the left, on the road at the foot of the ridge, is the “Minute Man,” who faithfully spurts, once in sixty seconds, a bold stream to the height of twenty-five or thirty feet, from an orifice in the rock about six inches in diameter. To the east, near the bluff, in a small cove, enthroned among rough boulders of gorgeous colors, is the “Monarch.” He spouts in regal splendor, once in twenty-four hours, a stream from 100 to 125 feet high, through three elongated orifices, respectively 2 by 12, 4 by 11, and 5 by 6 feet in dimensions. The eruption continues about twenty minutes, and the flow of hot water is immense. The “Fearless” is next seen, its funnel-shaped crater spouting dark-green water, which shades off at the margin of the Basin into pale-green and violet tints.

**From Norris Geyser Basin to the Great Falls.**—
During the summer of 1886 and 1887 the Virginia Canion road was opened to travel. This enables the tourists to make the journey from the Mammoth Hot Springs to the Grand Cañon between the hours of 8 A.M. and 3 P.M., reaching the Norris Hotel for dinner, and avoiding the tedious ride, before necessary, from Lower Geyser Basin over Mary’s Mountain, a distance of thirty miles, which had to be retraced upon the return trip.

**VIRGINIA CANON ROAD TO THE FALLS.**

Following the Virginia Cañon road some three miles from the Norris Geyser Basin, we enter one of the most charming and picturesque of cañons upon the entire trip. It cannot be compared in point of size and color with its near neighbor of the Yellowstone; but it gives a certain satisfaction, hard to be accounted for. The road leads up the Cañon at a gentle grade. The Cañon narrows and becomes more rugged. High pinnacles of weather-scarred rock tower above us. Fantastic shapes and heavy shadows confront us at every turn. Fitly preparing one for the delightful view of Virginia Cascades. The crystal water rushing and hurrying down over the comparatively smooth incline of dark moss-covered rock, so finely it broken and so rapid is its descent that at first glance it seems to wrought-up imagination, like a huge sheet of frosted and fretted silver, stretched downward from the Cañon head. The fall is about seventy-five feet; but framed as it is by the sombre rock and darker pine, its fitness and completeness is equaled by few of all the sights in this land of wonders.

Climbing a steep grade out of the Cañon, and following up the stream a short distance, we gradually ascend and cross the continental divide. Glimpses of the Yellowstone Valley are occasionally caught as the tourist follows the rapidly descending road. At an elevation of some 7,700 feet, and near the river, the old road is joined. A short distance further through the woods, occasionally within sight of the river, after a drive of about eleven and one-half miles, the tourist reaches the hotel at the falls.

During the summer of 1889 the hotel accommodations will be much improved by the erection of a new and commodious hotel at this point.
THE YELLOWSTONE RIVER AND UPPER FALLS.

The Yellowstone River.—Between the Lake and Upper Fall the river flows for several miles with a strong and steady current through a broad valley, the shores of which are low and grass-clad. The surface of the bright green water is unbroken by rock or rapid, until within about a mile of the place where the river gathers itself together to charge against the phalanx of mountains which oppose its passage northward. The contraction of the valley is quite abrupt, and the river suddenly heaps itself up in its narrow channel, flowing with wild tumult and resistless power, forcing its way over rocks and ledges, and a series of beautiful cascades, until it takes its first mad plunge into the Grand Cañon, which it has carved for over twenty miles through the flanks of the range.

A few hundred yards above the first cataract, three isolated and water-worn rocks tower high above the surge. They are set across the torrent like the piers of an ancient bridge, offering a feeble protest against the progress of the river to its leap of 112 feet at the Upper Fall. These picturesque rocks are partially mantled with stunted and moss-grown shrubs, and upon the tallest towers a thrifty pine.

The Upper Fall.—Long before the Upper Fall reveals itself to the expectant eye, the sullen roar of the water, as it descends into the gorge, is distinctly heard. The cliffs which confine this stream are 200 to 300 feet in height, and the distance from bank to bank, at the edge of the fall, is about eighty feet. Tossing and tearing, fretting and fuming, between these caverned and brightly mottled cliffs, the water churns itself into creamy foam. Reaching the fall, the torrent shoots out into the air far beyond the brink, and drops, in
almost unbroken volume, and with great concussion, upon a partially submerged reef, into the deep-lying horseshoe basin, 112 feet below. Rebounding from the rocks, it darts forward in fan-shaped surges, which spread over the sea-green surface of the pool, and sends up, at the same time, dense clouds of spray and mist, which fully veil the lower third of the cataract, and lodge upon the moss-covered walls of the basin, to return again in countless rills to the stream. The Upper Fall is not so large or so grand as the lower; but, perhaps, from the purely artistic point of view, it is more attractive. It is full of life and action, possessing a beauty peculiar to itself. Set in the midst of savagely romantic scenery, and almost secluséd from view by the sombre pine forest, it presents a picture which the most celebrated of landscape painters would shrink from attempting to put on canvas. What it lacks in size and power is fully made up by the great display of color, and the singular forms of stratification which distinguish its surroundings. A trail leads down to the brink of the cataract, and jutting lava rocks below afford fine opportunities for observation. The height of the Upper Fall has usually been exaggerated, Capt. Jones, U. S. A., in 1873, finding it by barometric measurement to be 150.2. Upon this point, Mr. Gannett, of the U. S. Geological Survey of 1878, reports authoritatively as follows:

"This year I was enabled to make careful direct measurements by means of cords, and have obtained results which may be depended upon. The Upper Fall was measured by dropping a weighted line from the top of the overhanging cliff, immediately adjoining the fall, to the level of the water at its base, thus obtaining as correct a measurement as could be desired. This measurement gave 112 feet as the clear height of the fall. This result, as compared with the height (140 feet) which I obtained in 1872, from barometric measurement, simply gives another illustration of the uncertainty attending such work, even when made under the most favorable circumstances. In this, and in other similar cases, the fact that the

height, as measured by barometer, is greater than the true height, it seems to me, may be explained by the downward rush of air at the lower station, which, of course, would produce an abnormal pressure at that point."

The Falls of Cascade Creek.—Between the Upper and Lower Falls the distance is only half a mile, and, midway of this interval, on the western side, are the Crystal Cascades, three in number, giving a total fall of 129 feet, on Cascade Creek, a small stream which heads in the southern slopes of the Washburn Range. The Creek is crossed by a stout bridge about forty feet above the wonderfully beautiful Grotto Pool, lying between the Upper and Lower Cascades, which are respectively twenty-one and fifty feet in height. Substantial ladders conduct to a grotto. The Falls of Cascade Creek are picturesque in the extreme; but their attractions are overwhelmed by the grandeur to which they are in propinquity. They are simply accessories of the marvelous surroundings. The only opportunity for fishing, in the neighborhood of the Falls, is by descending Cascade Creek to the Yellowstone. The fish are plentiful, and in good condition.

The Great Fall.—Releasing itself from the deep, symmetrical pool at the foot of the Upper Fall, the river turns somewhat abruptly to the left, making its impetuous way through the high bluffs of a wild, pine-clad gorge over low ledges and fragments of rock, until its sea-green water leaps from the brink of the Great Fall into the profound, abysmal solitude of the Grand Canyon, about 350 feet deeper. Think of this amazing plunge! The edge of the Great Fall is not so regular in outline as that of the Upper. Its contour was formerly smooth; but the water is wearing great notches in the rock. One such rock on the jagged verge bears a close resemblance to a colossal human head. The face, as seen from the left bank of the fall, is in profile, the eye sunken under a matted growth of locks, the nose sharply defined, and the lip covered with a long,
drooping mustache, with which the water plays. The scene from the brink of the fall, looking into the profound depth of the cañon, is of strange majesty and is indescribably awe-inspiring. A roomy platform at the edge of the fall, with a stanch railing on the river side, affords a very good view of the river preparing for its leap. The advancing volume of water flows rapidly but solidly to the brink, and falls with a tremendous shock into a large, circular, foaming caldron, bounded by steep cliffs 800 feet high. The masses of water seem to break into fleecy columns and sheets of glistening foam as they descend; but they nevertheless strike the surface of the pool below with a concussion so heavy that they are forced upward in fountains of spray and clouds of mist which wash the sides of the cañon, nourishing a rank growth of mosses and algae of every shade of green, ochre, orange, saffron, red, scarlet and brown.

Recovering from the shock of the plunge, the river finds its outlet through a narrow throat at the foot of the pool, appearing in the distance like a streaming ribbon of satin laid along the depths of the Grand Cañon, behind the winding walls of which it is lost to view.

With respect to the height of the Great Fall, the authority of Mr. Gannett is also quoted. He says:

"My measurement of the Lower Fall was not as simple in method, and allows more room for error, than in the case of the Upper Fall. I found a point, by means of the clinometer, on the eastern wall of the cañon, and very near the fall, at the same level as its top. Thence I stretched the line down the cañon wall to the level of the foot of the fall, reaching it at a point so close that we received a thorough drenching from the spray. Then, with the clinometer, I measured, as accurately as possible, the angle of inclination of the line. This gave as the height 297 feet. Though this result can not be regarded as strictly accurate, still its error must be small, and, in round numbers, 300 feet may be regarded as a close approximation to the true height. Ludlow measured this fall directly by means of a sounding line, obtaining 310 feet as the height,
result agreeing quite closely with mine, especially when one reflects on the difficulty of determining when the weight was at the base of the fall, in the cloud of mist and the rushing river. Most of the other measurements are barometric. Such was that of Captain Jones, who gave a height of 328.7 feet.

Both the Upper and Lower Falls are alike in terrible majesty and power; but each, nevertheless, has its peculiar characteristics. The first is partly veiled by the woods, while the other, imprisoned by rugged walls of basalt, dashes itself in mad frenzy into the depths, where the course of the river is actually hidden for a time by the dense clouds of mist and columns of spray which dart upward from the base of the tremendous cataract. If the sun's rays penetrate those mist clouds at the proper angle, there is at once visible a rainbow not only wider but richer in color than can anywhere else be seen.

A bridle path leads to an eminence one mile below the Great Fall, called Lookout Point. From this bluff the most satisfactory view of the raging torrent and of both faces of the cañon is to be obtained.

The Grand Cañon.—This wonderful gorge displays itself from Lookout Point as a scene of enchantment, surpassing every expectation which the imagination has conjured up ere its remarkable features are witnessed. From the Upper Falls, for a distance of eight miles down the stream, the Grand Cañon of the Yellowstone reveals the most varied and astonishing groupings of crags and rocks which eye ever beheld. Among them are many hot springs, one of which is particularly noticeable as it shoots up clouds of vapor from its vent at the apex of a tall pinnacle. Not alone is the gaze entranced by the great variety in the form of the towering rocks which open up in changing pictures like the shifting scenes of a theatre, but also by the marvelous magnificence of this gorge throughout its vast depth in the brilliant tints of every hue, which the hot springs through long eras have painted upon its steeps. Some of the colors are as bright as those to be found
in a box of paints; indeed, it would be difficult to exaggerate
their brilliancy. These colors often blend in harmonious
shades, especially in the case of reds and yellows, which are
toned down by gradual stages to white of purest beauty.
Riding along the brink of the cañon, a succession of views
present themselves which are awe-inspiring in their grandeur
and sublimity. At our feet, far below us, rise pinnacles and
towers, so lofty as to mock the masonry of man. In some
places the walls of the cañon are vertical; in others they slope
gently from the top, appearing like Gothic arches, with their
apexes on the brow, and flaring down to the water's edge. The
ravines between these arches are filled with growths of pine, which
serve as a background for the masses of color on the inter-
vening rocks, bringing out the varied tints in bold relief.
Here and there are grand walls of structural basalt, each suc-
cessive layer showing the jointing so distinctly as to appear
like the work of Titanic builders. The nests of eagles and
fish-hawks are seen on the pinnacles of the rocks far below,
and the view of these birds soaring between the cañon walls,
and darting into the stream for trout, is in itself very curious.
In addition to all this, there is the silver glimmer of the clear,
swift-flowing waters in the depths of the cañon, the whole unit-
ing to form a scene of enchanting splendor. Such views
repeat themselves in infinite variety.

Of all the descriptions of the Grand Cañon which have been
written, that of the Rev. Dr. Wayland Hoyt may be considered
among the most graphic and beautiful. He says:

"Well, we have reached Cascade Creek at last; and a beau-
tiful grove of trees, beneath whose shade sparkles a clear
stream, whose waters are free from the nauseous taste of
alkali, furnishes a delightful place in which to camp. Now—
dismounting, and seeing that your horse is well cared for,
while the men are unloading the pack-mules and pitching the
tents—walk up that trail winding up that hillside; follow it for
a little among the solemn pines, and then pass out from the
tree shadows, and take your stand upon that jutting rock,—
clinging to it well meanwhile, and being very sure of your
footing, for your head will surely grow dizzy,—and there opens
before you one of the most stupendous scenes of Nature,—THE
LOWER FALLS AND THE AWFUL CAÑON OF THE YELLOWSTONE.

"And now, where shall I begin? and how shall I, in any wise,
describe this tremendous sight,—its overpowering grandeur,
and, at the same time, its inexpressible beauty?

"Look yonder—those are the Lower Falls of the Yellow-
stone. They are not the grandest in the world; but there are
none more beautiful. There is not the breadth and dash of
Niagara, nor is there the enormous depth of leap of some of
the waterfalls of the Yosemite. But here is majesty of its own
kind, and beauty too. On either side are vast pinnacles of
sculptured rock. There, where the rock opens for the river,
its waters are compressed from a width of 200 feet between
the upper and lower falls to 100 feet where it takes the
plunge. The shelf of rock over which it leaps is absolutely
level. The water seems to wait a moment on its verge; then
it passes with a single bound of 300 feet into the gorge below.
It is a sheer, unbroken, compact, shining mass of silver foam.
But your eyes are all the time distracted from the fall itself,
great and beautiful as it is, to its marvelous setting,—to the
surprising, overpowering cañon into which the river leaps, and
through which it flows, dwindling to but a foamy ribbon there
in its appalling depths. As you cling here to this jutting rock
the falls are already many hundred feet below you. The falls
unroll their whiteness down amid the cañon glooms. * * *
These rocky sides are almost perpendicular; indeed, in many
places the boiling springs have gouged them out so as to leave
overhanging cliffs and tables at the top. Take a stone and
throw it over,—you must wait long before you hear it strike.
Nothing more awful have I ever seen than the yawning of that
chasm. And the stillness, solemn as midnight, profound as
death! The water dashing there, as in a kind of agony,
against those rocks, you can not hear. The mighty distance
lays the finger of silence on its white lips. You are op-
pressed with a sense of danger. It is as though the vastness
would soon force you from the rock to which you cling. The
silence, the sheer depth, the gloom, burden you. It is a relief
to feel the firm earth beneath your feet again, as you carefully
crawl back from your perching place.

"But this is not all, nor is the half yet told. As soon as you
can stand it, go out on that jutting rock again and mark the
sculpturing of God upon those vast and solemn walls. By
dash of wind and wave, by forces of the frost, by file of snow
plunge and glacier and mountain torrent, by the hot breath
of boiling springs, those walls have been cut into the most
various and surprising shapes. I have seen the middle age
castles along the Rhine; there those castles are reproduced
exactly. I have seen the soaring summits of the great cathedrals
in the country beyond the sea: there they stand in prototype,
only loftier and sublimiter.

"And then, of course, and almost beyond all else, you are
fascinated by the magnificence and utter opulence of color.
Those are not simply gray and hoary depths and reaches and
domes and pinnacles of sullen rock. The whole gorge flames.
It is as though rainbows had fallen out of the sky and hung
themselves there like glorious banners. The underling color
is the clearest yellow; this flushes onward into orange. Down
at the base the deepest mosses unroll their draperies of the
most vivid green; browns, sweet and soft, do their blending;
white rocks stand spectral; turrets of rock shoot up as crimson
as though they were drenched through with blood. It is a
wilderness of color. It is impossible that even the pencil of
an artist can tell it. What you would call, accustomed to the
softer tints of nature, a great exaggeration, would be the utmost
plainness compared with the reality. It is as though the most
glorious sunset you ever saw had been caught and held upon
that resplendent, awful gorge.

"Through nearly all the hours of that afternoon until the
sunset shadows came, and afterward, amid the moonbeams,
I waited there, clinging to that rock, jutting out into that overpowering, gorgeous chasm. I was appalled and fascinated,
afraid and yet compelled to cling there. It was an epoch in
my life."

The Painted Cliffs.—About four miles below the Great
Falls, at the eastern end of an open meadow, is a trail which
diverges from the new bridle-path to Tower Falls, and leads
two miles beyond to a part of the cañon which is well worth
visiting. The object of attraction is the beautiful coloring of
the cliffs in this locality, the result of hot spring deposits.

"The yellows," says Dr. Peale, "which are so brilliant and
widespread, are due to sulphur, and the reds to the oxidation
of iron." Looking up the river to the left, the walls of the
cañon have been undermined by the springs, and slipped across
the bed of the stream. The enormous slopes of talus are
mainly covered with pines; but there are many great patches
of brown and white. To the right, and upon a high hill in
the foreground, the coloring is in strong and brilliant contrast
to that on the left. The broad, precipitous slope from the
brow of the cañon to the river appears like a gorgeous flag
spread out with stripes of red, white and yellow. From the
foot of a tall tower, half way up the slope, broad streams of
red and white open out like a fan and trail down to the silver
river, sifting in dazzling brightness through the trees. The
red is of the deepest tint, blending into shades of scarlet and
orange. So wonderful a display of color is only to be looked
for in the sunset heavens. Giant cliffs hem in the river at the
foot of the steep slopes; the rugged and eroded faces of which
are "grand, gloomy and peculiar." The view altogether is
weird and appalling, while the profound solitude and absolute
silence impress the beholder with an overwhelming sense of his
own insignificance.

On the depth of the Grand Cañon Mr. Gannett's report is
again quoted as that of the most trustworthy investigator.
He says:

"Commencing at the falls, the Grand Cañon extends down
easily to the mouth of the East Fork, a distance, as the river
flows, of twenty-four miles. Indeed, from the falls to the

YELLOWSTONE NATIONAL PARK.
mouth of Gardiner's River, the Yellowstone is in a continuous cañon; but the partial break at the mouth of the East Fork separates it into two parts, known as the Grand and the Third Cañons. The former occupies the line of greatest depression in a volcanic plateau, which slopes to the northward and southward from the Washburn group of mountains, and to the westward from the Amethyst Ridge of the Yellowstone Range. Its course is northeasterly, being at the extremity of the Washburn group, and, after passing that, it turns north, with a very slight inclination west. The height of the plateau at the falls is about 7,800 feet. It increases slightly northeasterly, until, in passing the mountains, it has an elevation of about 8,000 feet. Hence northward it decreases in height rapidly, and at the mouth of Tower Creek it reaches but 7,200 feet. At the head of the Upper Fall the river level is but a few feet below the top of the plateau. This fall adds 112, and the Lower Fall 500, feet to the depth of the chasm. From the foot of this fall to the mouth of East Fork the total fall is 1,304 feet in a distance of 24 miles, being an average of 54.3 feet per mile. As far as the extremity of the Washburn Mountains, a distance of twelve miles, the cañon continues to increase in depth, both by the fall of the stream and the rise of the plateau, and the extreme depth, 1,200 feet, is attained at this point. Thence the depth decreases rapidly, and at the mouth of Tower Creek it is but 500 or 600 feet deep on the west side, and about 1,000 feet on the east side. The width of the cañon at the top ranges from one-fourth of a mile to one mile, and the angle of slope of the walls from the top to the water's edge ranges from 45° to 75° with a horizontal line.

The Yellowstone receives several tributaries from each side in its progress down the cañon. From the east, Jasper, Agate, Broad and Orange Creeks come in, and from the west a number of small streams, heading in the Washburn Mountains. As is usually the case in a land of cañons, these branches have much less erosive power than the main stream, and consequently reach it at a much higher level, necessitating a very rapid slope at the end or an abrupt fall. Many of these streams make very fine falls in reaching the cañon walls. This is particularly the case with the little streams on the west. They flow on the surface of the plateau, with a very gentle current, and have to make the whole descent to the bed of the cañon in a small fraction of a mile. The streams from the east, which head high up in the Amethyst Ridge, have long courses, and drain large areas. These streams cut cañons of considerable depth before they reach the main stream.

There are two good bridle-paths leading over Mount Washburn and past Tower Falls to Baronette's Bridge, connecting at that point with the wagon road from Cooke City to Mammoth Hot Springs. This is a favorite route with tourists accustomed to the saddle. It affords, from the summit of Mount Washburn, one of the most extensive and magnificent views in the Rocky Mountains, and is entirely free from difficulty or danger.
ROAD TO THE LAKE.

Retracing our road a short distance we follow up the Yellowstone River along the hill-side and through the timber. From several points, as we look back, a fine view of Mt. Washburn and the Yellowstone River may be had. The vivid reflections of the mountain upon the swift-flowing river, and the distinctness with which it may be seen in this clear atmosphere, lead one to believe that the mountain is but a mile away. At any time trout of wondrous size may be seen as we look down into the crystal waters, and every pebble upon the river’s bottom is seen with surprising distinctness. Ducks and geese may be seen at any time along the gravelly bars, and pelican, as they lazily swim away from us, seem more than content with their dinner of Yellowstone trout. The road crosses Alum and Sour creeks, tributaries of the Yellowstone, and three miles from the Upper Falls we come to Sulphur Mountain.

Crater Hills.—These hills, sometimes known as Sulphur Mountain, consist of a group of detached hills or buttes, each about 150 feet in height, composed of the usual calcareous matter, largely impregnated with sulphur and iron. There are numerous sulphur springs at the foot of these hillocks, and also spouting from the pine-fringed plateau of a few acres in extent immediately about them. The deposits of sulphur are very pure, and there are great heaps of it in bright yellow crystals, amounting to hundreds of tons. The fumes are quite powerful and disagreeable. Much caution is to be advised in passing between the jets of steam which dart out of the ground near the verge of the seething caldrons. A horseman recently rode too near one of the pools, and the animal, in his terror, broke the crust, releasing a column of sulphur vapor which was almost overpowering. The escape of horse and rider from a horrible death was very narrow. No better description of these remarkable mounds could be given than that made by Lieut. Gustavus C. Doane, U. S. A., in his report of the Yellowstone Expedition of 1870. He said:

“I climbed to the summit of the two loftiest of these hills. Their formation is identical, all being composed of calcareous matter, solid within, but shelly on the exterior, and when decomposed, of a snowy whiteness. The slopes were covered with shales, slid down from above. On the summits were ruins of craters of great size and former solidity, now choked up with debris. From hydrostatic pressure all the springs had burst out below at the foot of the slopes; but through innumerable small vents all over the surface of the hills hot sulphur vapor escaped, subliming around the vents in splendid crystals of large size. The rocks were everywhere warm, and in some places hot to the touch; wherever the horses’ feet broke through the crust, hot vapor escaped. Everywhere the rocks gave forth a hollow sound beneath our tread, and in many places the intense heat caused them to bulge out in a scaly formation, which broke through on the slightest pressure of the foot, whereupon scalding vapor poured out in such volumes as to cause a hasty retreat. The greatest spring in appearance lies at the base of the highest hill, and is intensely sulphurous, great clouds of vapor constantly escaping. It measures fifteen by twenty feet on the inside; the water boils up constantly from three to seven feet in height, the whole surface rising and falling occasionally with a flux and reflux of four feet additional, overflowing its basin and receding every few minutes. The basin is built up with a solid rim or lining of pure crystalline sulphur, four feet in width all round the edge, probably amounting to forty tons in weight. The water is clear, but of a whitish cast, and above the boiling point, steam being evolved from its surface. The basin can not be approached nearer than 10 feet distant on account of the scalding vapors. A small channel leads down the slope, and for several hundred feet its bed is crusted with a sulphur deposit, showing that the spring occasionally flows a considerable quantity of water. This deposit is from three to ten inches deep. Further along the base of the same hill is a sulphurous cavern of twenty feet...
in visible depth and eight feet in diameter, out of which issued jets of vapor with a sound like the puffing of a high-pressure steamboat. These jets pulsate regularly, and the vapor is intensely hot. Scattered along the bases of the next hills near by were great numbers of small sulphur springs of the same character and deposits as the larger one, any one of which would be counted a great curiosity in any district but this. About one hundred yards below is a spring of slate-colored water, seventy by thirty feet, an immense caldron, boiling constantly. Still farther on is a basin of perhaps four acres, containing from twenty to thirty mud springs, varying from two to twenty feet in diameter, and of depths below the surface from three to eight feet. The mud ejected is of different degrees of consistency, but generally about the thickness of common mortar, and mostly of an iron-brown color. It boils slowly, like mush, with bubbles of gas escaping, and is spouted to various heights from two to forty feet, falling with dull splashes around the edges of the craters, which are being built up continually, and continually caving in, to be worked over and ejected as before. Some of the springs throw up yellow mud, others white, and a few pink. The different springs of all classes had no apparent connection with each other, though often but a few feet apart, the mud being of different colors, the basins having different levels, and the pulsations being independent, one being frequently in violent ebullition, while another near by was quiescent. A plasterer would go into ecstasies over this mortar, which is worked to such a degree of fineness that it can be dried in large lumps, either in the sun or in a fire, without a sign of cracking, and when once dry is a soft, finely ground stone, resembling clay slate when dark, or meerschaum when white. Mortar might well be good after being constantly worked for, perhaps, ten thousand years. In a ravine near by was a large flowing spring of alum water, and several of sulphate of copper. Springs of this latter class are always clear and deep, with beautiful basins, raised slightly at the rim, and lined with encrustations of brilliant colors. Scattered over the whole area of one-fourth of a mile in diameter, in addition to the above, were hundreds of small spouts of vapor, water and mud. In a basin by itself was a black mud spring, twenty by forty feet, throwing mortar a distance of seventy feet; this substance was so strongly impregnated with sulphuric acid as to burn the tongue like fire in its intense sourness. All the mud springs are double, and most of the water springs also, each one having, in addition to its crater, and generally in the margin thereof, or near it, a honeycomb vent in the ground, or rock, through which the sulphur vapor escapes with a frying sound,—doubtless a vent for the internal fires below. This rule applies in all localities in the basin. The amount of pure crystalline sulphur deposited in this locality is very great; probably 100 tons could be gathered in sight on the surface. The continuous supply will one day be turned to account in the manufacture of acids on a large scale."

The principal mud spring in this sub-group, the "Blue Mud Pot," is graphically described by Dr. Hayden, as follows:

"One of them has a basin 20 feet in diameter, nearly circular in form, and the contents have almost the consistency of thick hasty pudding. The surface is covered all over with puffs of mud, which, as they burst, give off a thunder-like noise, and then the fine mud recedes from the centre of the puffs in the most perfect rings to the side. This mud-pot presents this beautiful picture; and, although there are hundreds of them, yet it is very rare that the mud is in just the condition to admit of these peculiar rings. The kind of mud is, of course, produced by the escape of the sulphured hydrogen gas through the mud. Indeed, there is no comparison that can bring before the mind a clearer picture of such a mud volcano than a huge caldron of thick mush. The mud is so fine as to have no visible or sensible grain, and is very strongly impregnated with alum. For 300 yards in length and 25 yards in width the valley of this little branch of Alam Creek is perforated with these mud-vents of all sizes, and the contents are of all degrees of consistency, from merely turbid water to a thick mortar. The entire surface is perfectly bare of vegetation, and hot; yielding in many places to a slight pressure."
YELLOWSTONE LAKE ROAD.

Two miles from Sulphur Mountain the forks of the road are reached. The course of the river is continuously followed southward from the forks of the road for eight miles, through a beautiful valley, with picturesque views of small islands in the stream, of high mountains and long stretches of woodland. On the way there are also many hot springs to be seen. These are always pleasant to look upon, as constantly presenting new instances of Nature's wayward moods.

**Mud Geyser and Belching Spring.**—These are situated in a wooded ravine a short distance to the right of the road, attracting attention by their noisiness and columns of vapor. The most terrible geyser in this group has been inactive for a few years past. Its crater, forty-five by seventy-five feet, is still to be seen. But there are several wonderful objects of interest left, an inspection of which ought not to be omitted. The most curious is the Mud Geyser. This is a cavern on the slope of the hill. It has a crater thirty feet in diameter at the verge, which is slightly elevated at the lower side, and hemmed in by the hill on the upper. This yawning crater narrows as it deepens to about fifteen feet at the lowest visible point, thirty feet below. Great volumes of steam escape, ascending high into the air. There is a rumbling sound in regular beats of a few seconds' interval, and a jarring of the earth for some distance around, after which comes a great surging of the slate-colored mud horizontally out of the orifice under the cliff, beating itself furiously into spray against the walls of the deep crater, which soon fills nearly to the top. The pasty mud is then sucked back with horrible groanings into the vent, utterly disappearing from sight, only to be again belched forth with renewed rumblings and earth vibrations, perhaps in greater volume than at first. This is an appalling sight; but it is very fascinating, nevertheless. The spectator is constantly in expectation that these violent throes of the volcano will be increased to that degree that the tall trees on the hillside will be splashed by the mud. Indeed, they are coated with it; but upon this point Dr. Peale reports:

"Last year, when at this locality, we noticed that the trees had their branches coated with mud, and the question was raised as to how the mud got there; we concluded that the geyser sometimes ejected its contents. This year, however, investigation seemed to prove that the mud is carried up mechanically, mixed with the steam that is constantly rising from the caldron, and that the spring never has any eruptions. We were led to this opinion first by noticing that it was only the under side of the branches that held the mud. Mr. Holmes then placed some dead branches in such a position that the steam came upon them, and in a few hours they had a coating of mud. Again, some of the trees of which the branches are coated are living, which would hardly be the case had they received the mud from an eruption. Again, reason also is found in the fact that the surface of the spring is constantly agitated, which is rarely or never the case with a true geyser. Still, in the past it may have been a geyser, and had regular eruptions."

About twenty rods distant northward from the Mud Geyser is another large boiling spring of crystalline water, called the
“Grotto,” sending off volumes of sulphurous vapor. It is very curious in its operation, erupting at intervals with a loud belch, filling its basin to the brim, its pulsations shaking the ground. It then suddenly draws the water in again with a tremendous gurgle, repeating the process ad infinitum. The opening is three feet high, eight feet wide and about twenty feet deep. The entrance is somewhat like a Gothic arch, and the walls within and without are stained in various shades of bright green by the mineral constituents of the water. Near this point in 1877 the Nez Perce Indians crossed the river, hotly pursued by the gallant Howard and his troops. It has since been known as the Nez Perce ford. Remains of the breastworks behind which Chief Joseph entrenched himself for a time are still visible.

The Yellowstone Lake.—This large and beautiful sheet of water lies in the lap of snow-capped mountains at an elevation of 7,788 feet above the sea. Its peculiar shape, rudely representing that of the opened palm of the right hand, particularly when looked down upon from an adjacent height, has fixed the name of the Thumb and Fingers upon the bays, separated by long and narrow peninsulas, which indent its southern and western sides. Its dimensions are about twenty miles north and south, and fifteen miles across the thumb and palm, its area being 150 square miles. Its depth is so great that soundings a short distance from its banks have not been reached with 225 feet of line. It is the largest lake at a great elevation in North America, although many lakes in Colorado are from 2,000 to 3,000 feet higher. Even Shoshone Lake, in the Park, exceeds the elevation of its grander neighbor by eighty feet, and Lake Carpenter, in the Big Horn Mountains, is at least 3,000 feet higher. That the elevation of the Yellowstone Lake is, however, enormous, may be illustrated by the fact that if Mount Washington, in New Hampshire, the highest peak in the Eastern States, could be sunk in this large body
of water, with its base at the sea level, its apex would be nearly half a mile below the surface of the lake. The sources of the Yellowstone River are in the Yellowstone Mountains, perhaps fifty miles distant from the lake, and the latter is only a widening of this stream, which enters the extremity of the little finger at the south, and discharges at the wrist at the north. The lake receives few tributaries of great size. By far the largest are Beaver Dam Creek and Pelican Creek, both on the eastern side. Besides these, there are a score of small streams from the encircling mountains, some of which are strongly charged with minerals. This fact, in connection with the sulphur, alum and alkali springs which not only dot the shores of the lake, but boil up from its depths at many points, renders the water at some places near the banks warm and murky. But, as a general statement, the lake is of crystal clearness, the average temperature being 60° F., and the purity and sweetness of the water leave nothing to be desired. Strong westerly winds prevail every afternoon, ruffling the surface of the water, and sometimes causing a heavy surf to dash upon the beach.

As to the enchanting loveliness of the lake, there can only be one opinion. Its varied charms surpass those of the famous inland seas of the Alps. Toward the east and south the mountains, rugged, gray and cold, with snowy peaks and grand crags sharply outlined against the sky, come down abruptly to the flood, by which they are reflected as in a mirror. On the west are low bluffs fringed with timber, and an occasional densely wooded island, upon which the eye rests gratefully as it takes in the dazzling glories of the scene. Stephenson's, Frank's, and some of the other islands are only slightly elevated above the surface of the lake, the shores of which are broken by bays and inlets, the strand glistening and flashing in the sunlight with bright pebbles and crystals and bits of obsidian. Especially is this the case on the north-eastern shore. In one locality, called Concretion Cove, which is a prolongation of Mary's Bay, between the mouth of Pelican Creek and Steamboat Point, the beach is shingled with the most curious specimens of indurated clays and shales and fossils. The concretions are remarkable for the brilliancy of their colors, and the singularity of their forms. Some resemble shoe soles, stockings, pot-lids, rolling pins, pestles, ladles, cups, pitchers, lather-boxes and divers other things. The lather-boxes are very uniform in color, size, shape and banding, at first glance seeming like lathe-work, and they may be easily split along the lines of stratification. One of the peculiarities of the Yellowstone Lake country, and one which it shares with the Hoodoo Region, hereafter described, consists in the low rumbling sounds that are frequently heard immediately overhead. This remarkable phenomenon, entitled to rank among the greatest wonders of this world of marvels, appears entirely to have escaped the notice of the scientific men who have visited the Park. It is probably due to an atmospheric disturbance caused by the violent eruptions and the liberation of gases constantly going on in the Park; but it is impossible to overlook the fact that it occurs only in localities far removed from the most violent manifestations of energy.

Yellowstone Lake Trout.—The lake is entirely destitute of all fish save trout. These, however, are so plentiful at almost every point along the shores, that there is little sport afforded in capturing them. They are large, and voracious in the extreme, particularly for grasshoppers, and two men could catch them faster than six men could get them ready for the cook. In a number of localities it is quite easy for the angler to land his fish and drop it in a boiling pool behind him, without changing his position or even unhooking his victim. Whether he will eat his trout after it is cooked is somewhat questionable. Unfortunately, most of these fish, as well as
those caught in the river above the Upper Falls, are infested with long, slender white worms, which not only breed in the intestines, but burrow into the flesh. Col. Norris, late Superintendent of the Park, in writing of this peculiarity, affirms that all the trout of the cold-water tributaries of the river below the lake to the first rapids contain these parasites. This point he has fully established by experiment, indicating that the cause of the presence of the worms exists in the lake. Beyond this no theory to account for the phenomenon is hazarded. Col. Norris thinks it can not be due to the quantities of minute vegetable substances which are often thrown up in windrows along the rocky shores, and discolor the otherwise clear water, because several other lakes, famous for excellent trout, are not only excessively weedy, but are impregnated with minerals to a far greater degree than the Yellowstone Lake; besides, nowhere else is the trout in finer condition than in the main Yellowstone near Tower Falls, and thence beyond to its confluence with the East Fork, and up the latter where the sulphur fumes arising from the water are so powerful as to be almost unendurable. Nor are the fish found to be affected injuriously which are taken in Soda Butte and Cache Creeks, branches of the East Fork, although they frequent waters the rocky channels of which are coated with the sulphur deposits of many boiling springs. Prof. Leidy calls this worm *Dibothrium cordiceps*, and says it is found in little sacs imbedded in the flesh. He considers it entirely different from the worms found in the European salmon. But it is not a constant parasite of the trout, as perfectly healthy specimens are often caught, which show on their scarred bodies the places where their tormentors have burrowed through. The infested trout are notably plentiful in the lake at the locality where the Shoshone trail leaves it, and where the water bubbles with hot gases.

Hot Springs on Yellowstone Lake.—This place is
called Hot Spring Camp. Here is to be seen a large and most interesting system of boiling springs, which no visitor should fail to examine. There are small geysers, steam jets, paint pots, and an infinite variety of hot springs. This remarkable locality may well be regarded as the Park museum, where specimens of all the various kinds of formation to be found may be seen. In amazement at these wonders, the magnificent and romantic scenery of the lake is apt to be disregarded. The first most noticeable object is the high crater of a calcareous spring, situated on the very verge of the water. From this a boiling stream is poured into the cold and limpid flood. There are other craters, built partly in and partly out of the lake; while at some distance from the strand the eye rests upon deep, dark caverns, easily distinguishable from the surrounding shallows, out of the depths of which streams of gas-bubbles are constantly rushing to the surface. On a gentle slope extending along the shore of the lake for over a mile and reaching far back into the woods, are flowing springs of all sizes, shapes and colors. Some of the pools are from thirty to seventy feet in length, and from fifteen to forty feet in width. The water is apparently fathomless, and of indescribable translucency. Convulsive throbings, accompanied by clouds of vapor, are constant. The largest springs are a turquoise blue, others are emerald; still others are pure white, while some are red and other hues. The craters of all these various fountains are lined with a silvery white deposit which illuminates, by reflection, the perpendicular but irregular walls to an immense depth. Indeed, it would seem that objects hundreds of feet down in the crystalline abysses are distinctly visible. An anomalous feature of this wonderful hot spring system is that pools of different colors lie in closest proximity, each spring being independent of the other, having varying levels at the surface, as well as varying temperatures and pulsations. While some of the pools are in halecyon repose, others are angrily boiling. The fretwork formations on the sides and rims of the craters are exquisitely beautiful. No possible description could convey the faintest idea of the opulence of coloring, nor of the variety and delicacy of the deposits. Some of the latter seem to be as fragile as the down on a butterfly's wing, and as evanescent to the touch; while others, particularly the silicious, are as hard as adamant. Seldom are the water and deposits of any two springs alike. There are coral, honeycomb, brainstone, pebble, scale and crystal formations, the whole making kaleidoscopic groupings of color and design. Down in the limpid depths of many of the springs are grottoes and arch-like structures. One dazzling white pool, the very type of purity, entrances the visitor, who stands with wondering eyes to look far down below upon what may only be likened to a resplendent fairy grotto of frosted silver encrusted with pearls. Another crystal-clear and colorless basin has a rim blazing with hues of sapphire, opal, ruby and emerald. Still another pool, full to the brim, has the corrugated sides of its profound deeps adorned with tints of reddish gold. Several basins of unknown depth are mantled with a saffron scum of the consistency of calf's leather. This undulates sluggishly with the water, giving the pools the appearance of a tanner's vat. This leathery substance is not of a vegetable nature, but is deposited by the mineral constituents of the springs. It forms in layers, which are brightly mottled with red, yellow, green and black on the under surface, and the lowermost strata are solidified into pure, finely grained sheets resembling alabaster. There are hundreds of springs in this system, each, if possible, more wonderful than the other. The shallow channels by which their overflow is carried off to the lake are gorgeously tinted, and even the shale of the beach is mottled red, yellow, green and black. These bright colors are, however, only on the surface of the rock, soon fading away when the specimens
become dry. The marvels of this hot spring area amaze and confound the beholder, the reality surpassing the most vivid imagination of scenes of enchantment.

A terrace of calcareous stalagmite, from twenty to fifty feet in depth, runs along the shore of the lake for a considerable distance, the edges of which are worn to a bluff bank by the action of the water. In riding along, other springs as remarkable as those which have been left, are seen near the trail. Some of them are noticed in the lake itself, a few rods from the shore, the dark depths of the craters showing in striking contrast with the shallow water on the shelving beach.

**Paint Pots on the Lake.**—Not far beyond is a very fine collection of paint pots. These are situated about 400 yards from the shore, covering a space not more than half an acre in extent, but forming a system of themselves. Attention is at first attracted by irregular mounds of pink earth as high as the breast-works of rifle pits. Approaching nearer, a group of small conical craters, surrounding a seething basin of pink slime, is found. Most of the small craters are in violent activity, spitting up clots of mud. These paint pots are noticeable for the exceedingly soft tints of their paste-like contents. The shades of color embrace pearl gray, lavender, pale pink, glowing crimson, green, orange, pure white and white with a tint of blue. Some of the throats of the craters are as smooth as those of porcelain pitchers, and have lips as finely curved. The deposit hardens into a firm, laminated claystone of fine texture, though here, as elsewhere in the Park, the colors lose their brilliancy as the substance cools and dries.

**Other Hot Spring Groups.**—There are numerous other groups of springs on the shores of the lake, among which may be named Sulphur Hill Springs, on the north side, consisting of a mass of deposit 600 feet along the shore, and 400 feet in thickness. These springs are mainly extinct. A very large group of all sizes and varieties of springs is found at Turbid Lake, two miles from Steamboat Point. The name Steamboat Point was suggested by the fact that on the point of the bluff, which here extends into the northeastern corner of the lake, there is a powerful vent, from which the steam escapes in a vast column with a continuous roar similar to the noise made by a steamship when blowing off steam. At the northeast corner of Mary's Bay, about two miles from Steamboat Point, is another chain of springs, most of them bubbling, and depositing a lead-colored substance. Near the shore on the east side of the beautiful bay, south of Steamboat Point, at Lake Butte, is still another group of hot springs and steam jets. On the northwestern slope of the ridge that extends southwest from Mount Stevenson, about a mile east of the lake, is an area of spring deposits about three miles in extent. This is called Brimstone Basin. It is easily seen from a distance, the white deposits on the slopes rendering it conspicuous, the sulphurous odors greeting the visitor long before he reaches the place. But all these springs, interesting as they doubtless are, would scarcely repay the tourist for the time and trouble necessary to reach them, particularly as they present no special peculiarities in comparison with the various groups that lie within the range of routes that are more accessible.

Should Congress grant the necessary appropriation, it is proposed to construct a road from Upper Geyser Basin via Shoshone Lake to the West Thumb of Yellowstone Lake, and thence to the outlet of Yellowstone Lake; also to construct a road from Grand Canyon over Mount Washburn to Mammoth Hot Springs, thus completing the circuit of the Park, and enabling tourists to traverse it from one end to the other, without doubling back over the same road. This will add greatly to the attractiveness of the trip throughout.

At present, unless the tourist wishes to cross the Shoshone trail to the Upper Geyser Basin, he must retrace the route to the forks of the road. Following the left-hand road for some
seven miles brings him to Trout and Alum creeks. Alum Creek and Violet Creek, one of its small branches, have their origin in two important groups of hot springs in the water-shed between the Madison and Yellowstone rivers. The head of Violet Creek is a semicircular basin, bounded by a low hill, bare on the sides and wooded at the summit. To look down into this basin from the top of the hill is like looking into a volcanic crater. All through it there are scattered fumaroles, solfatari, and mud springs, some of the latter showing blue and violet colors.

**Sulphur Lake and Alum Creek.**—Ascending the Eastern slope of the divide, the odor of sulphur gives warning that another group of springs is near. There are numerous hot springs at intervals, and jets of steam force their way with a hissing and rumbling sound through the glaring white masses of deposit, while the animals are compelled to pick their steps gingerly over the frequent rivulets of scalding water which cross the road in their flow into Alum Creek, an important tributary of the Yellowstone, the banks of which are riddled by hundreds of boiling and bubbling springs of varied character, and the water of the stream is so highly impregnated that animals will not touch it.

Following the road up over the divide, past Mary’s Lake and over Mary’s Mountain, we come rather abruptly to the Westward slope. From the mountain-side a panorama of beautiful forest and mountain scenery is unfolded, the view from the highest point being so extended that the great part of the Western mountain ranges, which bound the spacious Park, may be seen in all their magnificence and majesty.

Descending the divide we follow down the valley of the East Fork of the Firehole River. This large stream, fed by hot springs, presents peculiar and interesting features of its own. It heads in the divide between the Yellowstone and Madison rivers, opposite Alum Creek. It has many branches, with short, steep courses, which collect in a basin at the foot of the divide, whence the stream pursues a course nearly West, down a narrow valley, between high walls. Heavy pine grow along its banks, and here and there a little meadow in its numerous bends. After fording the river a number of times the valley widens and we come to the Lower Geyser Basin.
astonishing beauty of which, with respect to the color, depth and transluency of the water, and the wonderful delicacy, variety, and richness of the silicious crystallizations, are not to be described. Geysers exist, it is true, in Iceland and New Zealand; but there are none to be found in groups so magnificent as here, nor are they likely to be reproduced elsewhere on so grand a scale.

In the following more detailed description of the chief geysers and springs of the various basins, the writer has drawn largely for valuable data upon the report recently published by the Department of the Interior of the United States Geological Survey, made under the direction of Dr. F. V. Hayden, in 1878, and especially upon that part of the volume which contains the description, by Dr. A. C. Peale, of the “Thermal Springs of the National Park.”

Old Faithful.—This geyser is one of the most interesting in the Park because of the great regularity with which eruptions occur, thus affording excellent opportunities for observation. Its crater, an oblong opening, two by six feet on the inside and four by eight feet on the outside, is situated on a mound of geyserite, measuring at the base 145 by 215 feet, and at the top twenty by fifty-four feet, and rising eleven feet eleven inches above the surrounding level. This mound is composed of layers of deposit in a succession of terraces, which are full of shallow basins. The water in these basins is crystal clear, and the edges of the pools are exquisitely beaded and fretted, their bottoms showing delicate tints of rose, white, saffron, orange, brown and gray. The north end of the crater has large globular masses of beaded pearly deposit, and its throat is of a dark yellow or rusty color. Lieutenant Duane thus describes the deposits around Old Faithful:

"Close around the opening are built up walls eight feet in height, of spherical nodules from six inches to three feet in diameter. These, in turn, are covered on the surface with minute
globules of calcareous [silicious] stalagmite [?], encrusted with a thin glazing of silica. The rock at a distance appears the color of ashes of roses, but near at hand shows a metallic gray, with pink and yellow margins of the utmost delicacy. Being constantly wet, the colors are brilliant beyond description. Sloping gently from this rim of the crater in every direction, the rocks are full of cavities, in successive terraces, forming little pools, with margins of silica the color of silver, the cavities being of irregular shape, constantly full of hot water, and precipitating delicate, coral-like beads of a bright saffron. These cavities are also fringed with rock around the edges in meshes as delicate as the finest lace. Diminutive yellow columns rise from their depths, capped with small tablets of rock, and resembling flowers growing in the water. Some of them are filled with oval pebbles of a brilliant white color, and others with a yellowish frost work which builds up gradually in solid stalagmites [?]. Receding still farther from the crater, the cavities become gradually larger and the water cooler, causing changes in the brilliant colorings, and also in the formations of the deposits. * * * The deposits are apparently as delicate as the down on the butterfly’s wing, both in texture and coloring, yet are firm and solid beneath the tread. * * * One instinctively touches the hot ledges with his hands, and sounds with a stick the depths of the cavities in the slope, in utter doubt of the evidence of his own eyes.”

The eruption of Old Faithful begins with some preliminary splashes or spouts, from three to a dozen or more, which appear like abortive attempts at eruption. These continue for about four minutes, becoming more and more powerful, when they are followed by a rapid succession of jets, which escape with a roar, and soon attain the maximum height. Clouds of steam accompany the water, and reach a much greater height. In a few seconds after the maximum is attained the column dies down, with occasional vigorous spouts. The water eruption is followed by steam, which soon comes out very gently, and finally dies away, leaving the crater empty. The water eruption lasts from four to five minutes, and the steam period is indefinite. The wind causes a great variation in the appear-
ance of the column. The eruption takes place at intervals ranging from fifty-five to seventy minutes, the column of water varying in height from 100 to 150 feet. The temperature of the water in the crater, a few minutes before an eruption, is 200° F., and that of the pools, just after, 170° F. The theoretical boiling point here is 199°, and the temperature above the boiling point is probably caused by the heating of the water during the escape of the superheated steam from far down in the tube of the geyser. Old Faithful is sometimes degraded by being made a laundry. Garments placed in the crater during quiescence are ejected thoroughly washed when the eruption takes place. Gen. Sheridan's men, in 1882, found that linen and cotton fabrics were uninjured by the action of the water, but woolen clothes were torn to shreds.

The Bee Hive.—This geyser is situated about 100 feet from the right bank of the river, near the foot-bridge. It is easily distinguished by its cone, from the resemblance of which to an old-fashioned straw bee hive it was named by the Washburn party in 1870. The crater is three feet in height, and almost circular, measuring three by four feet at top, and having a circumference of twenty feet at the base. It is beautifully coated with beaded silica. There is no surrounding terraced deposit, as there is about most of the craters. This is probably due to the fact that very little water falls around it. The orifice on the summit of the cone measures two feet by three feet, and a line dropped into the tube reaches a depth of twenty-one feet. Just outside of the cone are several vents or steam-holes, one of which acts as a sort of preliminary vent or signal for the eruption of the geyser. The eruption of the Bee Hive is very fine, and peculiar to itself, no other geyser in the basin acting in the same manner. It is preceded by a slight escape of steam, which is soon followed by a column of steam and water, which escapes in a steady stream with great force, much as water is projected from the nozzle of hose used with
From the Mammoth Hot Springs to Yancey's, for twenty miles there is an excellent wagon-road. Several miles of good trail bring the tourist to Tower Falls. The country traversed is wonderfully diversified. For a short space the valley of the main Gardiner is followed. Then the road leads by the grand canyon of the East Gardiner, affording an opportunity to see the very beautiful falls of this stream, situated something over four miles from the starting point. Leaving the East Fork to the right hand, the road passes over the grassy plateaus and lava beds of the valleys of Black-tail Deer and other creeks, beside the yawning fissures fronting Hell-roaring Creek, through the wild gorge known as Dry Canon, and down the mountain slopes 2,000 feet to Pleasant Valley and Baronette's Bridge at the Forks of the Yellowstone River. This bridge is over the main stream, not far from its confluence with the East Fork. It was constructed for the benefit of the miners at Cooke City, on the Clark's Fork, about fifty miles distant, in the Big Horn Mountains. Its proprietor, Jack Baronette, is one of the most famous guides and hunters in the country. Leaving the bridge, the trail follows the west side of the Yellowstone, at first quite near the stream, but gradually bearing to the west until Tower Creek is reached.

Tower Falls. — About three miles south of this bridge, Tower Creek, which is a rapid, snow-fed brook, twelve or fifteen feet wide and one or two feet deep, joins the Yellowstone. The creek flows for about ten miles through a narrow, rugged, and precipitous canyon, enclosed by walls 300 to 400 feet high. Two hundred yards above its entrance into the
Yellowstone the stream pours over an abrupt descent of 132 feet into a deep, gloomy gorge, so narrow that the sun's rays scarcely penetrate it. The Falls are not unlike those of "Minnehaha," inasmuch as there is a clear, safe passage between them and the wall behind them; but they have eight or ten times the mass of water, and are three or four times as high. These falls are surrounded by columns of volcanic breccia, rising fifty feet above them, standing like the towers upon some medieval fortress. Describing these columns, Mr. N. P. Langford, first Superintendent of the Park, said:

"Some resemble towers, others the spires of churches, and others still shoot up little and slender as the minarets of a mosque. Some of the loftiest of these formations, standing upon the very brink of the Falls, are accessible to an expert and adventurous climber. The position attained on one of these narrow summits, amid the uproar of waters, at the height of 200 feet above the boiling chasm, as the writer can affirm, requires a steady head and strong nerves, yet the view which rewards the temerity of the exploit is full of compensations. Below the fall the stream descends in numerous rapids with frightful velocity through a gloomy gorge to its union with the Yellowstone. Its bed is filled with enormous boulders, against which the rushing waters break with great fury. Many of the capricious formations wrought from the shale excite merriment as well as wonder. Of this kind especially is the huge mass, sixty feet in height, which, from its supposed resemblance to the proverbial foot of his Satanic Majesty, is called the Devil's Hoof. The scenery of mountain, rock and forest surrounding the Falls, is very beautiful. The name of Tower Falls was, of course, suggested by some of the most conspicuous features of the scenery."

The following is an extract from the report of Lieut. Doane, U. S. A., who escorted Mr. Langford's party:

"The sides of the chasm are worn into caverns lined with various tinted mosses nourished by clouds of spray which rise from the cataract; while above and to the left a spur from the great plateau rises over all with a perpendicular front of 400
feet. Nothing can be more chastely beautiful than this lovely cascade, hidden away in the dim light of overshadowing rocks and woods, its very voice hushed to a low murmur, unheard at the distance of a few hundred yards. Thousands might pass within a half-mile, and not dream of its existence; but once seen, it passes to the list of most pleasant memories."

An excellent view of these falls may be had by ascending the cliff above them. But by far the best and most satisfactory prospect is obtained by walking down to the mouth of Tower Creek, and following the stream upward through the majestic gateway to the foot of the cataract.

The bridle-road to Mount Washburn crosses Tower Creek just above the Falls. Then it ascends, by a very easy grade, the long spur which separates Antelope from Tower Creek. Passing the shoulder of the spur, where it turns to the southward, the trail begins a general descent toward the gorge of Carnelian Creek. For several miles it continues this course on the side of the mountain, crossing the sharp gulches of two or three mountain torrents, and finally reaches the bed of the cañon a short distance below the head of the creek. Then it goes up a steep ascent to the divide, which has an elevation of 8,867 feet. On the summit is a spring, the water from which drains either way. Mount Washburn may be ascended to its very summit on horseback without greatly distressing the animals. South of the Washburn Divide, the trail skirts the base of the mountains westward, gradually descending to the valley of Cascade Creek. It then follows this valley down to the neighborhood of the Falls of the Yellowstone, crossing Cascade Creek just above Crystal Falls.

Another, and in some respects a better, bridle path from Tower Falls to the Falls of the Yellowstone than that described, has been recently opened. This route avoids several steep ascents, ascending by easy grades the upland meadows of Antelope Creek to the summit of Rowland's Pass to Mount Washburn, thence descending this elevation by a moderate dip to the brink of the Grand Cañon. An accessible peak, about half a mile east of Rowland's Pass, near the verge of the Grand Cañon, affords a commanding view of the entire length of the latter, in all its windings from the Forks to the Great Falls. By a short and not difficult ascent, west from the summit of the Pass, an open spur is reached, which in less than two miles of gradual upward travel, leads to the highest point of Mount Washburn. This new road then skirts the eastern base of Mount Washburn, crossing Glade Creek, passing by a group of hot springs, and, a mile and a half beyond, strikes Meadow Camp and the forks of the Painted Cliff trail, below the Great Falls.

**View from Mount Washburn.**—The Rev. Wayland Hoyt, D. D., of Brooklyn, who visited the Park in 1878, thus gives his impression of the view from Mount Washburn:

"Let us take our stand for a little now upon Mount Washburn. Its rounded crest is more than 10,000 feet above the level of the sea, and perhaps 5,000 feet above the level of the valley out of which it springs. Its smooth slopes are easy of ascent. You need not dismount from your horse to gain its summit. Standing there, you look down upon the whole grand panorama as does that eagle yonder, holding himself aloft upon almost motionless wings. I doubt if there is another view at once so majestic and so beautiful in the whole world. Your vision darts through the spaces for 150 miles on some sides. You are standing upon a mountain lifting itself out of a vast saucer-shaped depression. Away yonder, where the sky seems to meet the earth on every side around the whole circumference of your sight, are lines and ranges of snow-capped peaks shutting your glances in. Yonder shoots upward the serrated peak of Pilot Mountain, in the Clark's Fork Range. Joined to that, sweep on around you in the dim distance the snowy lines of the Madison Range. Yonder join hands with these the Stinking Water Mountains, and so on and on and around. Do you see that sharp pinnacle-pointed mountain away off at the southwest, shining in its garments of
white against the blue of the summer sky? That is Mount Evaert, named after the poor lost wanderer who for thirty-seven days of deadly peril and starvation sought a way of escape from these frowning mountain barriers which shut him in so remorselessly, and it marks the divide of the Continent.

"Take now a closer view for a moment. Mark the lower hills folded in their thick draperies of pine and spruce, like dark green velvet of the softest and the deepest; notice, too, those beautiful park-like spaces where the trees refuse to grow, and where the prairie-spreads its smooth sward freely toward the sunlight. And those spots of steam breaking into the vision every now and then, and floating off like the whitest clouds that ever graced the summer sky,—those are the signals of the geysers at their strange duty, yonder in the geyser basins, thirty miles away. And those bits of silver flashing hither and thither on the hillsides amid the dense green of the forests,—these are water-falls and fragments of ice glaciers, which for ages have been at their duty of sculpturing these mountains, and have not yet completed it. And that lovely deep blue sheet of water, of such a dainty shape, running its arms out toward the hills, and bearing on its serene bosom emeralds of islands,—that is the sweetest sheet of water in the world,—that is the Yellowstone Lake. And that exquisite broad sheet of silver, winding through the green of the trees and the brown of the prairie,—that is the Yellowstone River, starting on its wonderful journey to the Missouri, and thence downward to the Gulf, between 6,000 and 7,000 miles away. But, nearer to us, almost at our feet, as we trace this broad line of silver, the eye encounters a frightful chasm, as if the earth had suddenly sunk away; and into its gloomy depths the brightness and beauty of the shining river leaps, and is thenceforward lost altogether to the view. That is the tremendous cañon or gorge of the Yellowstone."

FOSSIL FORESTS AND HOODOO REGION.

Although the Grand Tour, with such extra excursions as have been noted, covers the roads, bridle-paths and trails which are used by the great majority of visitors, it by no means exhausts the possibilities of travel within the Park limits. The road from Baronette's Bridge to the Clark's Fork Mines, for example, leads through magnificent mountain scenery, and also traverses one of the principal fossil forest regions in the Park. The bridle-path, leaving this road near Soda Butte Springs, and following the south bank of the East Fork, conducts, twenty-nine miles from Soda Butte and about forty-five miles from Baronette's Bridge, to the Hoodoo or Goblin Mountains, without a brief description of whose wonders this little volume would be incomplete.

Petrified Forests.—The basins of the East Fork of the Yellowstone, and of Pelican, Tower and Black Tail Creeks, constitute an area of petrified forest growths on a scale hitherto unknown. One of the most easily accessible of the fossilized forest areas is situated to the southwest of Pleasant Valley, about four miles from Baronette's Bridge. There are not so many petrified tree trunks standing here as are to be seen at some other points; but the tourist will, nevertheless, be fully repaid by turning off from the road and examining these curious objects. On the south side of the Third Cañon, also, nearly opposite Hell-roaring Creek, is a massive promontory, composed of conglomerates, in which are numerous beds of sandstones and shales. The greater part of these strata is filled with the silicified remains of successive forest growths, which often appear in relief upon the face of the height, the trees
sometimes standing upright just as they grew, rising in vertical layers one above the other, with the roots of each succeeding forest showing above the tops of the previous one. On the north face of Amethyst Mountain, which is on the East Fork of the Yellowstone River, is a section of these strata, upward of 2,000 feet in height. The bed of the river is at an elevation of 6,700 feet above the sea, and the summit of Amethyst Mountain 9,423. The view from this peak is wonderfully grand. Specimens found in the mountain are mainly impure amethysts and forms of quartz chalcedony. Here the ground is strewn with trunks and limbs of trees which have been petrified into solid, clear white agate. In the steeper middle portion of the mountain's face, rows of upright trunks stand out on the ledges like the columns of a ruined temple. Farther down the slope the petrified tree trunks fairly cover the surface, and were at first supposed to be the shattered remains of a recent forest. Prostrate trunks fifty and sixty feet in length are of frequent occurrence, not a few of them being as much as five or six feet in diameter. The strata which inclose these trunks are composed chiefly of fine-grained greenish sandstones, indurated clays, and moderately coarse conglomerates. These strata contain many animal and vegetable remains; snakes, toads and fishes, branches, rootlets and fruits. Digging down among the petrified roots, are to be found large clusters of the most beautiful crystallizations of all shades, from delicate pink to deep cherry. In most cases the woody structure of the trees is well preserved, and, where the trunks have broken into sections, the exposed ends the lines of growth, from centre to circumference, can be counted with ease. In many cases the wood is completely opalized or agatized, and such cavities as exist in the decayed trunks are filled with beautiful crystals of quartz and calcite. Nearly all the crystals that occur so plentifully in this region have been formed in the hollows of silicified trees.

Hoodoo Region, or Goblin Land.—The Hoodoo Region is the mountaineer term for the eroded portion of the Sierra Shoshone Mountains, which lies outside the eastern boundary of the Park, between the Passamarias or Stinking-water Fork of the Big Horn, and the head branches of the East Fork of the Yellowstone River. This strange locality is situated about forty-five miles southeast of Barone'tte's Bridge. It was discovered in 1870 by a party of miners prospecting for gold, and has been visited thus far by only a few tourists. Colonel Norris reached this region by ascending the valley of the East Fork of the Yellowstone in 1870, having been driven back by Indians two years before while endeavoring to explore in this direction. These Indians were encamped upon an elevated plateau, screened by firs, commanding a fine view of all the approaches. In 1880, when this old camp was visited, there was abundant evidence that it had been frequently occupied by the red men during the summer season after border raids and massacres, the ground being strewn with remnants of clothing, blankets and china-ware. The Hoodoo region is high up the mountain, and the trail leading to it is over a wild and rough country, the difficulties of which only the most enterprising tourists are willing to encounter. The Hoodoo or Goblin Mountain is 10,700 feet in height, and about one mile in length. Glacial action has worn an extensive labyrinth in the conglomerate breccia and the volcanic rocks. Upon the southern face of the mountain, extending from 500 to 1,500 feet below the summit, the frosts and storms of ages have worn numberless deep, narrow, crooked channels amid the slender tottering pillars, shafts, mounds and pyramids which form this singular maze. The formations are totally unlike in shape those seen in other eroded districts. They are not symmetrical, but assume every curious and fantastic form, among which may be seen gigantic figures of beasts, birds and reptiles. One mound is described as looking like a large altar pyre, 125 feet in height, resting on a pyramidal base, the sacrificial victim
lying on the top. Two monumental blocks, thirty feet in height, appear to be surmounted by great recumbent birds. Some of the enormous columns take the shape of petrified bears sitting upon their haunches. One tall pillar, almost a perfect obelisk in form, resting upon a massive rectangular pedestal, has a large sandstone boulder adhering to its side, about one-third distant from its base, as if fixed there by magnetic attraction. There is a cone-shaped monument, 100 feet high, which poises most deftly upon one of two slender points at its apex an immense boulder. Near by is a bulky, dome-like formation, which supports upon its summit what appears to be a mammoth mushroom. Indeed, there is no end to the strange and spectral shapes which are met in these weird labyrinths at every turn. The rocks are of all shades of color, and, in many places, among the winding passages between them, are tunnels in the ice and snow which afford safe hiding places for the mountain sheep. Mysterious undulating sounds, heard over-hand in this region, only serve to intensify the by no means agreeable feeling excited in the traveler by its weird and preternatural appearance. According to Colonel Norris, eagles hover in large numbers over the Hoodoo Mountain, finding subsistence upon the carcasses of the lambs which they make their prey, by hurling the animals from the crags upon the jagged rocks hundreds of feet below. Sometimes the feasts of these crafty birds are terminated by the appearance of the cougar or the sneaking wolverine upon the scene.

During the summer of 1888, Mr. W. H. Weed of the United States Geological Survey, discovered a new point of interest on Cache Creek, a mile above the trail leading into the Hoodoo Basin. The place has been named Death Gulch. It is a narrow ravine running up the mountain from the Cache Creek some 250 feet, and ending, or rather beginning, in a "soo" or basin. In this soo or ravine were found the remains of five bears, an elk, and numerous small animals. The strong smell of sulphur, and a choking sensation of the lungs, indicated the presence of noxious gases, which had certainly asphyxiated many victims; for of these remains one silver-tip grizzly was perfectly fresh. And it seems probable that the floods of early spring wash everything from the gulch each season.

Wild animals exist in large numbers and in great variety. The killing of any kind of game is, however, prohibited, and a heavy fine and imprisonment are the penalty attached to any violation of this ordinance. The Park is admirably suited to the purpose of preserving many species of the fauna of the United States from extinction, which, without protection, are certain at no distant day to disappear before the advance of settlement and civilization. The elevated plateau which is included by the mountain chain, extending from the southeastern arm of the Yellowstone Lake to Slough Creek and Tower Creek, affords a fine pasture ground for bison, elk, big-horn, moose, and other noble game. Here, at least, in the interest of natural history, specimens of our largest game animals should be carefully preserved. Bison, differing in many features from the buffalo of the plains, roam in scattered bands in the valleys of the Crevice, Hell-roaring and Slough Creeks, and also on the elevation extending from the Hoodoo region to the Grand Canyon, and from Amethyst Mountain to Pelican Creek, near the foot of Yellowstone Lake. They also pasture upon the Madison Plateau and Little Madison River. Elk are found all through the Park, and more especially in the numerous grassy openings on the mountain sides, which are admirably adapted for their haunts. Herds of two and three hundred are often seen at a time. Between the Mammoth Hot Springs and Cooke City, near the northeast corner of the Park, just outside the limits, there are said to be at least 5,000 elk, of which the yearly increase, at a very low estimate, may be placed at 1,000. Moose are sometimes seen near the Lake of the Woods, but generally rove in heavily timbered and
marshy regions. Their main haunts are in the thickly wooded and swampy places around the fingers and thumb of the Yellowstone Lake, and in the willow and beaver swamps. They keep also in the boggy inlets of Shoshone, Lewis and Heart Lakes, and the Snake River region, to the Tetons. Black-tail and white-tail deer feed in the densely timbered valleys and foot-hills, and also along the creeks. Antelope, though not numerous, still make their haunts in the valleys of the Upper Gardiner River, and up the East Fork to Soda Butte, and in the Madison Valley. They frequent many of the creeks, but keep mainly in the open regions. Big-horn sheep are in abundance all through the Park. They choose the mountain crests as well as the craggy spurs, and are also found near the foot-hills. Within the limits of the Park, but usually confined to the main range of the Rocky Mountains, are various species of the bear tribe. Wolverine, or long-tailed mud-bear, frequent the foot-hills, and the densely timbered spots in the valleys, ready to steal and carry away what the bear, wolf or lion slaughters. Wolves have become quite scarce. They still, however, rove in many portions of the Park. Foxes, red, gray, and black, are numerous. There are also to be found coyotes, badgers, otters, beavers, minks, martens, sables, ermines, rabbits, hares, moles, mice, rats, muskrats, porcupines, rock dogs, squirrels, chipmunks and skunks. There are numbers of birds, comprising many varieties of ducks, grouse, owls and hawks; several varieties of eagles and vultures; also cranes, blackbirds, jackdaws and bluejays, geese, brant, pelicans, swans, crows and ravens. The waters of the Park are well stocked with trout and grayling of excellent quality, except in the Yellowstone Lake, where the trout are infested with worms. No reason can be given for this peculiarity in this special locality, for everywhere else the fish are very fine. There seem to be but few reptiles in the Park. The rattlesnake has been found only in the Yellowstone Valley below the Mammoth Hot Springs.

FLORA OF THE PARK

Of the area of the Park—3,575 square miles—no less than 2,751 square miles, seventy-seven per cent., are covered with dense forests. The principal varieties are the black or bastard fir, black spruce, white pine, red fir and balsam fir. The black fir is the most plentiful, often growing from three to five feet in diameter and 150 feet in height. It is usually found on elevated terraces and near the Mammoth Hot Springs, Tower Falls and the Upper Yellowstone. Black spruce equals the black fir in height, though not in diameter. It is much more majestic, and is preferable for lumbering purposes. It grows on sheltered slopes of the mountains and in moist places. White pine is marked for its symmetrical beauty, and is generally found in valleys, near creeks and cañon passes of the mountains. It grows very dense, rendering traveling among it difficult and fatiguing, and proving a great impediment in exploring and cutting bridle-paths and roads. Red fir is abundant throughout the Park, and comes first in value, standing unrivalled as timber for building culverts, bridges, terraces, etc. Balsam fir is also plentifully found within this region, growing in beautiful groves, or scattered here and there over grassy slopes, and dotting the foot-hills of the mountains. Of the smaller kinds of trees, there are an abundance of red or spotted cedar, poplar or aspen, dwarf maple and innumerable dense thickets of willow. It is very much to be regretted that immense tracts of woodland have been burned over. As a consequence it is not uncommon, in going through the Park, to be compelled to pass by mile after mile of charred and blackened tree trunks, instead of riding in the refreshing shade of
the woods. In addition to the forest growths, there are many kinds of shrubs, flowers and grasses. The choke cherry, the gooseberry, the buffalo-berry, the bull-berry, and black and red currants are found along the streams and in moist places of the middle and lower altitudes. The meadows and hillsides are spangled with bright-colored flowers, among which may be noted the bee-larkspur, the columbine, the harebell, the lupin, the evening primrose, the aster, the painted cup, the gentian, and various kinds of euphorbia. It is not uncommon to find daisies, buttercups, forget-me-nots, white ground phlox and other field flowers flourishing in profusion near the melting snow banks during the month of August. A lady who crossed Mount Washburn, in the summer of 1885, gathered no fewer than fifty-two varieties of flowers on the heights of that mountain. Scarcely a night throughout the year passes without frost, even though the temperature by day is over 80° F., so that all forms of vegetation in the Park grow and bloom under somewhat unusual conditions. Indeed, when ice forms during the night, as often happens, and the petals of the flowers become crisp with frost, even then the blooms are not harmed, but thaw out bright and fresh when the hot sun touches them. The pasturage on the many open spaces is excellent, the mountain meadows being covered with a mat of nutritious grasses. The predominating variety is the bunch grass, upon which horses subsist without the need of oats. Among the other kinds are the blue-joint, fescue and beard grasses, as well as Alpine timothy, all of which grow luxuriantly.

APPENDIX.

Distances in National Park.—The following are the distances between various points of interest embraced in the grand tour:

<table>
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<th>Distance</th>
<th>Continuous Trip</th>
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<td>MILES</td>
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- Mammoth Hot Springs to Falls of the West Gardner (Golden Gate) 4 4
- Crossing of Middle Fork of Gardner River 3 7
- Willow Park (upper end) 3 10
- Obsidian Cliffs, Beaver Lake 2 12
- Norris Geyser Basin 7 19
- Head of Gibbon Canon (about) 5 24
- Falls of the Gibbon River 5 25
- Forks of the Firehole River (Lower Geyser Basin) 8 36
- Excelsior Geyser (in midway Geyser Basin) 4 40
- Old Faithful (in Upper Geyser Basin) 5 45

ROAD ON EAST SIDE OF RIVER:

- Forks of the Firehole River to Fountain Geyser 3
- Excelsior Geyser 2 5
- Old Faithful 5 19
- Lower Geyser Basin to Junction of roads (return) leading to Yellowstone Lake and Great Falls 5 56
- Sulphur Mountain 2 27
- Upper Falls of the Yellowstone 5 32
- Great Falls of the Yellowstone 1 33
- Lookout Point 1 34
- Inspiration Point 1 35
- Great Falls to Norris Geyser Basin by Virginia Calfon road 11 102
- Mammoth Hot Springs 19 102
- Old Faithful to Kepler's Cascades 19 12
- Old Faithful to Shoshone Lake and Geyser Basin 19 12
- Yellowstone Lake 6
- Great Falls to Mt. Washburn 9
- Tower Falls 6 15
- Yancey's 3 15
- Black-tail Deer Creek 11 29
- East Fork Gardner River 4 33
- Mammoth Hot Springs 2 35
- Yancey's to Soda Butte 16
- Goblin Mountain in Hoodoo Region 29 45
- Lower Geyser Basin on Madison Calfon road to west boundary of Park 29 45