

J.H. Schoelkopf Del.

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J.D. Stout Sc! N.York.

SCENES
AND
ADVENTURES
IN THE
Semi-Alpine Region
OF THE
OZARK MOUNTAINS OF MISSOURI .
AND ARKANSAS,

WHICH WERE FIRST TRAVERSED BY DE SOTO, IN 1541.

BY HENRY ROWE SCHOOLCRAFT.

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Dedication.

To the Memory

OF

DE WITT CLINTON,

LATE GOVERNOR OF THE STATE OF NEW YORK, &c. &c. &c.,
AN EARLY FRIEND, DURING THE YEARS DEVOTED TO THESE EXCURSIONS
INTO THE GREAT AREA OF THE WEST;—

A MAN WHO WAS EMINENT IN VARIOUS WALKS OF LIFE;—
WHO, BY HIS EXALTED FORECAST, WISE COUNSELS, AND STEADY POLICY,
CONTRIBUTED TO THE HIGHEST BENEFITS AND RENOWN OF HIS
NATIVE STATE;—

THESE RECORDS OF INCIDENTS OF EXPLORATORY TRAVEL,
ARE DEDICATED WITH THE SINCEREST SENTIMENTS OF RESPECT AND REGARD
FOR HIS CHARACTER AND NAME,
WHICH I EVER ENTERTAINED FOR HIM WHILE LIVING,
AND CONTINUE TO CHERISH NOW THAT HE IS DEAD.

HENRY R. SCHOOLCRAFT.

PREFACE.

THESE early adventures in the Ozarks comprehend my first exploratory effort in the great area of the West. To traverse the plains and mountain elevations west of the Mississippi, which had once echoed the tramp of the squadrons of De Soto—to range over hills, and through rugged defiles, which he had once searched in the hope of finding mines of gold and silver rivalling those of Mexico and Peru; and this, too, coming as a climax to the panorama of a long, long journey from the East—constituted an attainment of youthful exultation and self-felicitation, which might have been forgotten with its termination. But the incidents are perceived to have had a value of a different kind. They supply the first attempt to trace the track of the Spanish cavaliers west of the Mississippi. The name of De Soto is inseparably connected with the territorial area of Missouri and Arkansas, which he was the first European to penetrate, and in the latter of which he died.

Four-and-thirty years have passed away, since the travels here brought to view, were terminated. They comprise a period of exciting and startling events in our history, social and political. With the occupancy of Oregon, the annexation

of Texas, the discoveries in California, and the acquisition of New Mexico, the very ends of the Union appear to have been turned about. And the lone scenes and adventures of a man on a then remote frontier, may be thought to have lost their interest. But they are believed to possess a more permanent character. It is the first and *only* attempt to identify De Soto's march west of the Mississippi; and it recalls reminiscences of scenes and observations which belong to the history of the discovery and settlement of the country.

Little, it is conceived, need be said, to enable the reader to determine the author's position on the frontiers of Missouri and Arkansas in 1818. He had passed the summer and fall of that year in investigating the geological structure and mineral resources of the lead-mine district of Missouri. He had discovered the isolated primitive tract on the sources of the St. Francis and Grand rivers—the “Coligoa” of the Spanish adventurer—and he felt a strong impulse to explore the regions west of it, to determine the extent of this formation, and fix its geological relations between the primitive ranges of the Alleghany and Rocky mountains.

Reports represented it as an alpine tract, abounding in picturesque valleys and caves, and replete with varied mineral resources, but difficult to penetrate on account of the hostile character of the Osage and Pawnee Indians. He recrossed the Mississippi to the American bottom of Illinois, to lay his plan before a friend and fellow-traveller in an earlier part of his explorations, Mr. Ebenezer Brigham, of Massachusetts, who agreed to unite in the enterprise. He then proceeded to St. Louis, where Mr. Pettibone, a Connecticut man, and a fellow-voyager on the Alleghany river, determined also to unite in this interior journey. The place of rendezvous was appointed

at Potosi, about forty miles west of the Mississippi. Each one was to share in the preparations, and some experienced hunters and frontiersmen were to join in the expedition. But it turned out, when the day of starting arrived, that each one of the latter persons found some easy and good excuse for declining to go, principally on the ground that they were poor men, and could not leave supplies for their families during so long a period of absence. Both the other gentlemen came promptly to the point, though one of them was compelled by sickness to return; and my remaining companion and myself plunged into the wilderness with a gust of adventure and determination, which made amends for whatever else we lacked.

It is only necessary to add, that the following journal narrates the incidents of the tour. The narrative is drawn up from the original manuscript journal in my possession. Outlines of parts of it, were inserted in the pages of the *Belles-lettres Repository*, by Mr. Van Winkle, soon after my return to New York, in 1819; from whence they were transferred by Sir Richard Phillips to his collection of *Voyages and Travels*, London, 1821. This latter work has never been republished in the United States.

In preparing the present volume, after so considerable a lapse of time, it has been thought proper to omit all such topics as are not deemed of permanent or historical value. The scientific facts embraced in the appendix, on the mines and mineralogy of Missouri, are taken from my publication on these subjects. In making selections and revisions from a work which was at first hastily prepared, I have availed myself of the advantage of subsequent observation on the spot, as well as of the suggestions and critical remarks made by men of judgment and science.

A single further remark may be made : The term Ozark is applied to a broad, elevated district of highlands, running from north to south, centrally, through the States of Missouri and Arkansas. It has on its east the striking and deep alluvial tract of the Mississippi river, and, on its west, the woodless buffalo plains or deserts which stretch below the Rocky Mountains. The Osage Indians, who probably furnish origin for the term, have occupied all its most remarkable gorges and eminences, north of the Arkansas, from the earliest historical times ; and this tribe, with the Pawnees ("Apana"), are supposed to have held this position ever since the days of De Soto.

WASHINGTON, January 20, 1853.

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INTRODUCTION.

DE SOTO, in 1541, was the true discoverer of the Mississippi river, and the first person who crossed it, who has left a narrative of that fact; although it is evident that Cabaca de Vaca, the noted survivor of the ill-fated expedition of Narvaez in 1528, must, in his extraordinary pilgrimage between Florida and the eastern coasts of the gulf of California, have crossed this river, perhaps before him; but he has not distinctly mentioned it in his memoir. Narvaez himself was not the discoverer of the mouth of the Mississippi, as some persons have conjectured, inasmuch as he was blown off the coast and lost, east of that point. The most careful tracing of the narrative of his voyage in boats along the Florida shore, as given by De Vaca, does not carry him beyond Mobile bay, or, at farthest, Perdido bay.*

De Soto's death frustrated his plan of founding a colony of Spain in the Mississippi valley; and that stream was allowed to roll its vast volume into the gulf a hundred and thirty-two years longer, before it attracted practical notice. Precisely at the end of this time, namely, in 1673, Mons. Jolliet, accompanied by James Marquette, the celebrated enterprising missionary of New France, entered the stream at the confluence of the Wisconsin, in accordance with the policy, and a plan of exploration, of the able, brave, and efficient governor-general of Canada, the Count Frontenac. Marquette and his companion, who was the chief of the expedition, but whose

* Vide Narr. of Cabaca de Vaca, Smith's Tr., 1851.

name has become secondary to his own, descended it to the mouth of the Arkansas, the identical spot of De Soto's demise. La Salle, some five or six years later, continued the discovery to the gulf; and Hennepin extended it upward, from the point where Marquette had entered it, to the falls of St. Anthony, and the river St. Francis. And it is from this era of La Salle, the narrators of whose enlarged plans, civic and ecclesiastical, recognised the Indian geographical terminology, that it has retained its Algonquin name of MISSISSIPPI.

It is by no means intended to follow these initial facts by recitals of the progress of the subsequent local discoveries in the Mississippi valley, which were made respectively under French, British, and American rule. Sufficient is it, for the present purpose, to say, that the thread of the discovery of the Mississippi, north and west of the points named, was not taken up effectively, till the acquisition of Louisiana. Mr. Jefferson determined to explore the newly acquired territories, and directed the several expeditions of discovery under Lewis and Clark, and Lieut. Z. M. Pike. The former traced out the Missouri to its sources, and followed the Columbia to the Pacific; while the latter continued the discovery of the Mississippi river above St. Anthony's falls, where Hennepin, and perhaps Carver, had respectively left it. The map which Pike published in 1810 contained, however, an error of a capital geographical point, in regard to the actual source of the Mississippi. He placed it in Turtle lake, at the source of Turtle river of upper *Lac Cedre Rouge*, or Cass lake, which lies in the portage to Red lake of the great Red River of the North, being in the ordinary route of the fur trade to that region.

In 1820, Mr. Calhoun, who determined to erect a cordon of military posts to cover the remotest of the western settlements, at the same time that he despatched Major Long to ascend to the Yellowstone of the Missouri, directed the extreme upper Mississippi to be examined and traced out to its source. This expedition, led by Gov. Cass, through the upper lakes, reached the mouth of Turtle river of the large lake beyond the upper cataract of the Mississippi, which has since borne the name of the intrepid leader of the party. It was

satisfactorily determined that Turtle lake was not the source, nor even one of the main sources, of the Mississippi; but that this river was discharged, in the integrity of its volume, into the western end of Cass lake. To determine this point more positively, and trace the river to its source, another expedition was organized by the Department of War in 1832, and committed to me. Taking up the line of discovery where it had been left in 1820, the river was ascended up a series of rapids about forty miles north, to a large lake called the Amigegoma; a few miles above which, it is constituted by two forks, having a southern and western origin, the largest and longest of which was found* to originate in Itasca lake, in north latitude $37^{\circ} 13'$ — a position not far north of Ottertail lake, in the highlands of HAUTEUR DES TERRES.

So far as the fact of De Soto's exploration of the country west of the Mississippi, in the present area of Missouri and Arkansas, is concerned, it is apprehended that the author of these incidents of travel has been the first person to identify and explore this hitherto confused part of the celebrated Spanish explorer's route. This has been traced from the narrative, with the aid of the Indian lexicography, in the third volume of his Indian History (p. 50), just published, accompanied by a map of the entire route, from his first landing on the western head of Tampa bay. Prior to the recital of these personal incidents, it may serve a useful purpose to recall the state of geographical information at this period.

The enlarged and improved map of the British colonies, with the geographical and historical analysis, accompanying it, of Lewis Evans, which was published by B. Franklin in 1754, had a controlling effect on all geographers and statesmen of the day, and was an important element in diffusing a correct geographical knowledge of the colonies at large, and particularly of the great valley of the Mississippi, agreeably to modern ideas of its physical extent. It was a great work for the time, and for many years remained the standard of reference. In some of its features, it was never excelled. Mr. Jefferson

* 291 years after De Soto's discovery, and 159 after Marquette's.

quotes it, in his Notes on Virginia, and draws from it some interesting opinions concerning Indian history, as in the allusion to the locality and place of final refuge of the Eries. It was from the period of the publication of this memoir that the plan of an "Ohio colony," in which Dr. Franklin had an active agency, appears to have had its origin.

Lewis Evans was not only an eminent geographer himself, but his map and memoir, as will appear on reference to them, embrace the discoveries of his predecessors and contemporary explorers, as Conrad Wiser and others, in the West. The adventurous military reconnoissance of Washington to fort Le Bœuf, on lake Erie, was subsequent to this publication.

Evans's map and analysis, being the best extant, served as the basis of the published materials used for the topographical guidance of General Braddock on his march over the Alleghany mountains. Washington, himself an eminent geographer, was present in that memorable march; and so judicious and well selected were its movements, through defiles and over eminences, found to be, that the best results of engineering skill, when the commissioners came to lay out the great Cumberland road, could not mend them. Such continued also to be the basis of our general geographical knowledge of the West, at the period of the final capture of fort Du Quesne by General Forbes, and the change of its name in compliment to the eminent British statesman, Pitt.

The massacre of the British garrison of Michilimackinac in 1763, the investment of the fort of Detroit in the same year by a combined force of Indian tribes, and the development of an extensive conspiracy, as it has been termed, against the western British posts under Pontiac, constituted a new feature in American history; and the military expeditions of Cols. Bouquet and Bradstreet, towards the West and North-west, were the consequence. These movements became the means of a more perfect geographical knowledge respecting the West than had before prevailed. Hutchinson's astronomical observations, which were made under the auspices of Bouquet, fixed accurately many important points in the Mississippi valley, and furnished a framework for the military narrative of the expedition. In

fact, the triumphant march of Bouquet into the very strongholds of the Indians west of the Ohio, first brought them effectually to terms; and this expedition had the effect to open the region to private enterprise.

The defeat of the Indians by Major Gladwyn at Detroit had tended to the same end; and the more formal march of Colonel Bradstreet, in 1764, still further contributed to show the aborigines the impossibility of their recovering the rule in the West. Both these expeditions, at distant points, had a very decided tendency to enlarge the boundaries of geographical discovery in the West, and to stimulate commercial enterprise.

The Indian trade had been carried to fort Pitt the very year of its capture by the English forces; and it may serve to give an idea of the commercial daring and enterprise of the colonists to add, that, so early as 1766, only two years after Bouquet's expedition, the leading house of Baynton, Wharton & Morgan, of Philadelphia, had carried that branch of trade through the immense lines of forest and river wilderness to fort Chartres, the military capital of the Illinois, on the Mississippi.* Its fertile lands were even then an object of scarcely less avidity.† Mr. Alexander Henry had, even a year or two earlier, carried this trade to Michilimackinac; and the English flag, the symbol of authority with the tribes, soon began to succeed that of France, far and wide. The Indians, finding the French flag had really been struck finally, submitted, and the trade soon fell, in every quarter, into English hands.

The American revolution, beginning within ten years of this time, was chiefly confined to the regions east of the Alleghanies. The war for territory west of this line was principally carried on by Virginia, whose royal governors had more than once marched to maintain her chartered rights on the Ohio. Her blood had often freely flowed on this border, and, while the great and vital contest still raged in the Atlantic colonies, she ceased not with a high hand to defend it, attacked as it was by the fiercest and most deadly onsets of the Indians.

* MS. Journal of Matthew Clarkson, in the possession of Wm. Duane, Esq., Philadelphia.

† Ibid.

In 1780, General George Rogers Clark, the commander of the Virginia forces, visited the vicinity of the mouth of the Ohio, by order of the governor of Virginia, for the purpose of selecting the site for a fort, which resulted in the erection of fort Jefferson, some few miles (I think) below the influx of the Ohio, on the eastern bank of the Mississippi. The United States were then in the fifth year of the war of independence. All its energies were taxed to the utmost extent in this contest; and not the least of its cares arose from the Indian tribes who hovered with deadly hostility on its western borders. It fell to the lot of Clark, who was a man of the greatest energy of character, chivalric courage, and sound judgment, to capture the posts of Kaskaskia and Vincennes, in the Illinois, with inadequate forces at his command, and through a series of almost superhuman toils. And we are indebted to these conquests for the enlarged western boundary inserted in the definitive treaty of peace, signed at Paris in 1783. Dr. Franklin, who was the ablest geographer among the commissioners, made a triumphant use of these conquests; and we are thus indebted to George Rogers Clark for the acquisition of the Mississippi valley.

American enterprise in exploring the country may be said to date from the time of the building of fort Jefferson; but it was not till the close of the revolutionary war, in 1783, that the West became the favorite theatre of action of a class of bold, energetic, and patriotic men, whose biographies would form a very interesting addition to our literature. It is to be hoped that such a work may be undertaken and completed before the materials for it, are beyond our reach. How numerous this class of men were, and how quickly they were followed by a hardy and enterprising population, who pressed westward from the Atlantic borders, may be inferred from the fact that the first State formed west of the Ohio river, required but twenty years from the treaty of peace for its complete organization. Local histories and cyclical memoirs have been published in some parts of the West, which, though scarcely known beyond the precincts of their origin, possess their chief value as affording a species of historical material for this investigation.

Pioneer life in the West must, indeed, hereafter constitute a prolific source of American reminiscence; but it may be doubted whether any comprehensive work on the subject will be effectively undertaken, while any of this noble band of public benefactors are yet on the stage of life.

The acquisition of Louisiana, in 1803, became the period from which may be dated the first efforts of the United States' government to explore the public domain. The great extent of the territory purchased from France, stretching west to the Pacific ocean—its unknown boundaries on the south, west, and north—and the importance and variety of its reputed resources, furnished the subjects which led the Executive, Mr. Jefferson, to direct its early exploration. The expeditions named of Lewis and Clark to Oregon, and of Pike to the sources of the Mississippi, were the consequence. Pike did not publish the results of his search till 1810. Owing to the death of Governor Meriwether Lewis, a still greater delay attended the publication of the details of the former expedition, which did not appear till 1814. No books had been before published, which diffused so much local geographical knowledge. The United States were then engaged in the second war with Great Britain, during which the hostility of the western tribes precluded explorations, except such as could be made under arms. The treaty of Ghent brought the belligerent parties to terms; but the intelligence did not reach the country in season to prevent the battle of New Orleans, which occurred in January 1815.

Letters from correspondents in the West, which were often published by the diurnal press, and the lectures of Mr. W. Darby on western and general geography, together with verbal accounts and local publications, now poured a flood of information respecting the fertility and resources of that region, and produced an extensive current of emigration. Thousands were congregated at single points, waiting to embark on its waters. The successful termination of the war had taken away all fear of Indian hostility. The tribes had suffered a total defeat at all points, their great leader Tecumseh had fallen, and there was no longer a basis for any new combinations to oppose the

advances of civilization. Military posts were erected to cover the vast line of frontiers on the west and north, and thus fully to occupy the lines originally secured by the treaty of 1783. In 1816, Mr. J. J. Astor, having purchased the North-west Company's posts, lying south of latitude 49°, established the central point of his trade at Michilimackinac. A military post was erected by the government at the falls of St. Anthony, and another at Council Bluffs on the Missouri. The knowledge of the geography and resources of the western country was thus practically extended, although no publication, so far as I am aware, was made on this subject.

In the fall of 1816, I determined to visit the Mississippi valley—a resolution which brought me into the situations narrated in the succeeding volume. In the three ensuing years I visited a large part of the West, and explored a considerable portion of Missouri and Arkansas, in which De Soto alone, I believe, had, in 1542, preceded me. My first publication on the results of these explorations was made at New York, in 1819. De Witt Clinton was then on the stage of action, and Mr. Calhoun, with his grasping intellect, directed the energies of the government in exploring the western domain, which, he foresaw, as he told me, must exercise a controlling influence on the destinies of America.

In the spring of 1818, Major S. H. Long, U. S. A., was selected by the War Office to explore the Missouri as high as the Yellowstone, and, accompanied by a corps of naturalists from Philadelphia, set out from Pittsburgh in a small steamer. The results of this expedition were in the highest degree auspicious to our knowledge of the actual topography and natural history of the far West, and mark a period in their progress. It was about this time that Colonel H. Leavenworth was directed to ascend the Mississippi, and establish a garrison at the mouth of the St. Peter's or Minnesota river. Early in 1820, the War Department directed an exploratory expedition to be organized at Detroit, under the direction of Lewis Cass, Esq., Governor of Michigan Territory, for the purpose of surveying the upper lakes, and determining the area at the sources of the Mississippi—its physical character, topography,

and Indian population. In the scientific corps of this expedition, I received from the Secretary of War the situation of mineralogist and geologist, and published a narrative of it. This species of public employment was repeated in 1821, during which I explored the Miami of the Lakes, and the Wabash and Illinois; and my position assumed a permanent form, in another department of the service, in 1822, when I took up my residence in the great area of the upper lakes.

It is unnecessary to the purposes of this sketch to pursue these details further than to say, that the position I occupied was favorable to the investigation of the mineral constitution and natural history of the country, and also of the history, antiquities, and languages and customs, of the Indian tribes. For a series of years, the name of the author has been connected with the progress of discovery and research on these subjects. Events controlled him in the publication of separate volumes of travels, some of which were, confessedly, incomplete in their character, and hasty in their preparation. Had he never trespassed on public attention in this manner, he would not venture, with his present years, and more matured conceptions of a species of labor, where the difficulties are very great, the chances of applause doubtful, and the rewards, under the most favorable auspices, very slender. As it is, there is a natural desire that what has been done, and may be quoted when he has left this feverish scene and gone to his account, should be put in the least exceptionable form. Hence the revision of these travels.

INCIDENTS OF TRAVEL.

CHAPTER I.

JUNCTION OF THE OHIO WITH THE MISSISSIPPI—DIFFICULTY OF ASCENDING THE LATTER WITH A BARGE—ITS TURBID AND RAPID CHARACTER—INCIDENTS OF THE VOYAGE—PHYSICAL IMPEDIMENTS TO ITS NAVIGATION—FALLING-IN BANKS—TIA-WAPATI—ANIMALS—FLOATING TREES—RIVER AT NIGHT—NEEDLESS AND LAUGHABLE ALARM—CHARACTER OF THE SHORES—MEN GIVE OUT—REACH THE FIRST FAST LANDS—MINERAL PRODUCTS—CAPE GIRARDEAU—MOCCASIN SPRING—NON-POETIC GEOGRAPHICAL NAMES—GRAND TOWER—STRUGGLE TO PASS CAPE GARLIC.

I REACHED the junction of the Ohio with the Mississippi on the last day of June, 1818, with feelings somewhat akin to those of one who performs a pilgrimage;—for that Algonquin name of Mississippi had been floating through my mind ever since boyhood, as if it had been invested with a talismanic power.

The reading of books of geography, however, makes but a feeble impression on the mind, compared to the actual objects. Born on one of the tributaries of the Hudson—a stream whose whole length, from the junction of the Mohawk, is less than two hundred miles—I had never figured to myself rivers of such magnificent length and velocity. I had now followed down the Ohio, in all its windings, one thousand miles; it was not only the longest, but the most beautiful river which I had

ever seen ; and I felt something like regret to find it at last swallowed up, as it were, by the turbid and repulsive Mississippi. The latter was at its summer flood, and rushed by like a torrent, which seemed to be overcharged with the broken-down materials of half a continent.

De Soto had been the first European to gaze upon this heady mass of waters, urging downward everything that comes within their influence, and threatening to carry even their own banks into the gulf. We came, in a large, heavily-manned barge, to the very point of the influx of the Ohio, where Cairo is now located. It was early in the afternoon ; but the captain of our craft, who was a stout-hearted fellow, of decision of character and a full-toned voice, deemed it best to come to here, and wait till morning to grapple with the Mississippi. There were some old arks on the point, which had been landed in high water, and were now used as houses ; but I retained my berth in the barge, and, after looking around the vicinity, amused myself by angling from the sides of the vessel. The only fish I caught was a gar—that almost single variety of the voracious species in these waters, which has a long bill, with sharp teeth, for arousing its prey, apparently, from a muddy bottom. The junction of two such streams as the Ohio and Mississippi, exhibits a remarkable struggle. For miles, along the eastern shores of the Mississippi, the clear blue waters of the Ohio are crowded to the banks ; while the furious current of the former, like some monster, finally gulps it down, though the mastery is not obtained, I am told, till near the Chickasaw bluffs.

Early in the morning (1st July), the voice of the captain was heard, and the men paraded the sides of the deck, with their long poles shod with iron ; and we were soon in the gurgling, muddy channel, struggling along its eastern shore. The men plied their poles with the skill of veterans, planting them as near the margin of the channel as possible, and placing the head of the pole against the shoulder, while they kept their footing by means of slats nailed across the footway. With every exertion, we made but five miles the first day. This slowness of ascent was, however, very favorable to observation. I was the only passenger on board, except two adventurers

from the Youghioghany, in Western Pennsylvania, who had freighted the barge, and were in the position of supercargoes. Such tugging and toiling I had never before seen. It seemed to me that no set of men could long stand it. The current ran as if it were charged with power to sweep everything down its course. Its banks were not proof against this impetuosity, and frequently fell in, with a noise and power which threatened to overwhelm us. This danger was often increased by the floating trees, which had fallen into the stream at higher points. And when, after a severe day's toil, the captain ordered the boat to be moored for the night, we felt an insecurity from the fear that the bank itself might prove treacherous before morning.

Nothing in the structure of the country appeared to present a very fixed character. The banks of the river were elevated from ten to fifteen feet above the water, and consisted of a dark alluvium, bearing a dense forest. When they became too precipitous, which was an indication that the water at these points was too deep for the men to reach bottom with their poles, they took their oars, and crossed to the other bank. When night came on, in these damp alluvions, and darkness was added to our danger, the scene was indeed gloomy. I remember, this evening, we tried most perseveringly to drink our tea by a feeble light, which appeared to be a signal for the collection of insects far and near, who, by their numbers and the fierceness of their attacks, made it impossible to bring our cups to our mouths without stopping to brush away the fierce and greedy hordes of mosquitoes. Amongst the growth, cane and cotton-wood were most conspicuous.

I had a specimen of boatman manners to-day, which should not certainly be a subject of surprise, considering the rough-and-ready life and character of that class. Having laid down on the top deck of the barge a mineralogical specimen to which I attached value, and gone temporarily away, I found, on my return, that it had been knocked to pieces by one of the men, who acted, probably, like the boy who broke the fiddle, "to get the music out" of it. On expressing my disapproval of this, to one who evidently had not the most distant idea of the

scientific value of "a stone," he made some trite remark, that "there was more where this came from," and then, stretching himself up at his full length of six feet, with sinews which had plainly become tense and hard from the use of the setting-pole, he exclaimed, "Help yourself!"

July 2d. The toils of this day were similar to those of the last. It was a perpetual struggle to overcome the force of the current by poles placed in the bed, and, when that became too deep, we sought for shallower shores. We encountered the same growth of trees along the banks. The land became somewhat more elevated. The insects were in such hordes, that it was amazing. We proceeded but about six miles to-day, and they were miles of incessant toil.

July 3d. To the ordinary dangers and efforts of this day, were added the frequent occurrence of snags and sawyers, or planters—terms which denote some of the peculiar impediments of Mississippi navigation. The captain of our craft, who was a courageous and vigilant man, was continually on the look-out to avoid these dangers, and put-to, at night, at the foot of a large cane-covered island, by which he avoided, in some measure, the sweep of the current, but was yet in jeopardy from falling-in banks. He requested me, in this exigency, to take a pole, and, from the bow, sound for bottom, as we crossed the river, to avoid shoals. This I did successfully. We estimated our ascent this day at seven miles.

July 4th. The perils and toils of the crew did not prevent their remembrance of the national anniversary; and the captain acknowledged their appeal in the morning by an extra measure of "old Monongahela." We then set forward against the wild, raging current. From the appearance of the wild turkey and large grey squirrel ashore, it is probable that we are passing out of the inundated region. In other respects, the face of the country and its productions appear the same. After ascending about six miles, when the time approached for looking out for a place to moor for the night, a storm of wind

suddenly arose, which dashed the water into the barge. We put ashore in haste, at a precipitous bank of an island, which fell in during the night very near to us, and put us in momentary peril. To leave our position in the dark, would be to take the risk of running afoul of snags, or encountering floating trees; but as early as the light appeared on the morning of the 5th, we left the spot immediately, crossing to the western bank. By diligence we made eight miles this day, which brought us to the first settlement at Tiawapeta bottom, on the Missouri shore. This is the first land that appears sufficiently elevated for cultivation. The settlement consists of six or eight farms, where corn, flax, hemp, potatoes, and tobacco, are abundantly raised. The peach and apple-tree also thrive. I observed the papaw and persimmon among the wild fruits.

July 6th. The downward movement of the water, and its gurgling and rush as it meets with obstacles, is very audible after the barge has been fastened to the shore for the night, when its fearful impetuosity, surcharged as it is with floating wrecks of forest life, is impressive to the listener, while night has thrown her dark pall over the scene.

Early in the morning, the oarsmen and polemen were at their masculine toils. I had feared that such intense application of muscle, in pushing forward the boat, would exhaust their strength; and we had not gone over three miles this day, when we were obliged to lay-by for the want of more competent hands. The complaining men were promptly paid, and furnished with provisions to return. While detained by this circumstance, we were passed by a boat of similar construction to our own, laden with planks from Olean, on the sources of the Alleghany river, in New York. This article had been transported already more than thirteen hundred miles, on its way to a market at St. Louis, where it was estimated to be worth sixty dollars per thousand feet.

While moored along this coast, the day after we had thus escaped from the treacherous island, we seemed to have taken shelter along a shore infested by wild beasts. "Grizzly bear!" was the cry at night. We were all alarmed by a snorting and

disturbance at the water's edge, a short distance below us, which, it was soon evident, proceeded from a *large*, light-colored, and furious animal. So far, all agreed. One of our Pennsylvanians, who had a choice rifle, prepared himself for the attack. The captain, who had no lack of resolution, and would, at any rate, have become bold by battling the Mississippi river for six or seven days, had some missiles; and all prepared to be useful on the occasion. As I carried nothing more deadly than a silver crucible and some acids, I remained on the upper deck of the barge. From this elevation I soon saw, by the dim moonlight, the whole party return, without having fired a gun. It turned out that the cause of this unusual disturbance was a large white hog, which had been shot in the head and snout with swan-shot, by some cruel fellows, the preceding day, and came at night to mitigate its burning and festering wounds by bathing in the river.

July 7th. Having procured some additional hands, our invincible captain pressed stoutly forward, and, at an early hour, we reached the head of Tiawapeta bottom, where a short stop was made. At this point, the bed of the Mississippi appears to be crossed by a chain of rocks, which oppose, however, no obstruction to its navigation. Such masses of it as appear on shore, are silico-carbonates of lime, and seem to belong to the metalliferous system of Missouri. About half a mile above the commencement of this chain, I observed, at the foot of an elevation near the water's edge, a remarkable stratum of white aluminous earth, of a rather dry and friable character, resembling chalk, and which, I afterwards observed, was extensively used by mechanics in Missouri as a substitute for that article. Masses, and in some instances nodules, of hornstone, resembling true flint, are found imbedded in it; yet it is not to be confounded with the chalk formation. It yields no effervescence with nitric, and is wholly destitute of carbonic acid. Portions of the stratum are colored deeply by the red oxide of iron. Scattered along the shores of the river at this place, I observed large, angular masses of pudding-stone, consisting chiefly of silicious pebbles and sand, cemented by oxide of iron.

I now began to breathe more freely. For seven days we had been passing through such a nascent region, down which the Mississippi swept at so furious a rate, that I never felt sure, at night, that I should behold another day. Had the barge, any day, lost her heading and got athwart the stream, nothing could have prevented the water from rushing over her gunwales, and sweeping her to destruction. And the whole district of the alluvial banks was subject to be momentarily undermined, and frequently tumbled in, with the noise and fury of an avalanche, threatening destruction to whatever was in the vicinity.

Owing to the increased firmness of the shore, and the reinforcement of hands, we ascended this day ten miles. We began to feel in better spirits.

July 8th. The calcareous and elevated formation of rocks, covered with geological drift, continued constantly along the Missouri shore; for it was this shore, and not the Illinois side, that we generally hugged. This drift, on ascending the elevations, consisted of a hard and reddish loam, or marly clay, filled with pebble-stones of various kinds, and fragments and chips of hornstone, chert, common jasper, argillaceous oxide of iron, radiated quartz, and quartz materials, betokening the disruption, in ancient eras, of prior formations. The trees observed on the diluvial elevations were oaks, sassafras, and, on the best lands, walnut, but of sparse growth; with a dense forest of cotton-wood, sycamore, and elm, on the alluvions. On ascending the river five miles, we came to the town of Cape Girardeau, consisting of about fifty wooden buildings of all sorts, with a post-office and two stores. We were now at the computed distance of fifty miles above the influx of the Ohio. We went no farther that day. This gave me an opportunity to explore the vicinity.

I had not yet put my foot ashore, when a fellow-passenger brought me a message from one of the principal merchants of the place, desiring me to call at his store, and aid him in the examination of some drugs and medicines which he had newly received. On reaching his store, I was politely ushered into

a back room, where some refreshments were handsomely set out. The whole thing was, in fact, designed as a friendly welcome to a professional man, who came neither to sell nor buy, but simply to inquire into the resources and natural history of the country. At this trait of hospitality and appreciation in a stranger, I took courage, and began to perceive that the West might be relied on.

I found the town of Cape Girardeau situated on an elevation of rich, red, marly soil, highly charged with oxide of iron, which is characteristic of the best arable soils of the mine country. This soil appears to be very readily dissolved in water, and carried off rapidly by rains, which furnishes a solution to the deep gulfs and gorges that disfigure many parts of the cultivated high grounds. If such places were sown with the seeds of grass, it would give fixity to the soil, and add much to the beauty of the landscape.

July 9th. We resumed our journey up the rapid stream betimes, but, with every exertion, ascended only seven miles. The river, in this distance, preserves its general character; the Missouri shores being rocky and elevated, while the vast alluvial tracts of the Illinois banks spread out in densely wooded bottoms. But, while the Missouri shores create the idea of greater security by their fixity, and freedom from treacherous alluvions, this very fixity of rocky banks creates jets of strong currents, setting around points, which require the greatest exertions of the bargemen to overcome. To aid them in these exigencies, the *cordelle* is employed. This consists of a stout rope fastened to a block in the bow of the barge, which is then passed over the shoulders of the men, who each at the same time grasp it, and lean hard forward.

July 10th. To me, the tardiness of our ascent, after reaching the rock formations, was extremely favorable, as it facilitated my examinations. Every day the mineralogy of the western banks became more interesting, and I was enabled daily to add something to my collection. This day, I picked up a large fragment of the pseudo pumice which is brought

down the Missouri by its summer freshets. This mineral appears to have been completely melted; and its superficies is so much enlarged by vesicles filled with air, and its specific gravity thereby so much reduced, as to permit it to float in water. We encamped this evening, after an ascent of seven miles, at a spot called the Moccasin Spring, which is contained in a crevice in a depressed part of the limestone formation.

July 11th. This day was signalized by our being passed by a small steamer of forty tons burden, called the Harriet, laden with merchandise for St. Louis. Viewed from our stand-point, she seemed often nearly stationary, and sometimes receded, in her efforts to stem the fierce current; but she finally ascended, slowly and with labor. The pressure of the stream, before mentioned, against the rocky barrier of the western banks, was found, to-day, to be very strong. With much ado, with poles and cordelle, we made but five miles.

July 12th. We passed the mouth of Great Muddy river, on the Illinois shore, this morning. This stream, it is said, affords valuable beds of coal. The name of the river does not appear to be very poetic, nor very characteristic, in a region where every tributary stream is muddy; the Mississippi itself being muddy above all others. But, thanks to the Indians, they have not embodied that idea in the name of the Father of rivers; its greatness, with them, being justly deemed by far its most characteristic trait.

About two miles above this locality, we came to one of the geological wonders of the Mississippi, called the Grand Tower. It is a pile of limestone rocks, rising precipitously from the bed of the river in a circular form, resembling a massive castle. The height of this geological monument may be about one hundred feet. It is capped by some straggling cedars, which have caught a footing in the crevices. It might, with as much propriety as one of the Alps, be called the Jungfrau (Virgin); for it seems impossible that any human being should ever have ascended it. The main channel of the river passes east of it. There is a narrower channel on the west, which is apparently

more dangerous. We crossed the river below this isolated cliff, and landed at some cavernous rocks on the Illinois side, which the boatmen, with the usual propensity of unlettered men, called the Devil's Oven. We then recrossed the river, and, after ascending a distance along the western shore, were repulsed in an attempt, with the cordelle, to pass Garlic Point. The captain then made elaborate preparations for a second attempt, but again failed. A third effort, with all our appliances, was resolved on, but with no better success; and we came-to, finally, for the night, in an eddy below the point, having advanced, during the day, seven miles. If we did not make rapid progress, I had good opportunities of seeing the country, and of contemplating this majestic river in one of its most characteristic phases—namely, its summer flood. I pleased myself by fancying, as I gazed upon its rushing eddies of mud and turbid matter, that I at least beheld a part of the Rocky mountains, passing along *in the liquid state!* It was a sight that would have delighted the eyes of Hutton; for methinks the quantity of detritus and broken-down strata would not have required, in his mind, many cycles to upbuild a continent.

Mountains to chaos are by waters hurled,
And re-create the geologic world.

CHAPTER II.

PASS CAPE GARLIC—OBRAZO RIVER—CLIFFS—EMIGRANTS—CAPE ST. COMB—BOIS BRULE BOTTOM—PAROQUET—FORT CHARTRES—KASKASKIA—ST. GENEVIEVE—M. BRETON—THE MISSISSIPPI DEFICIENT IN FISH—ANTIQUITIES—GEOLOGY—STEAMER—HERCULANEUM—M. AUSTIN, ESQ., THE PIONEER TO TEXAS—JOURNEY ON FOOT TO ST. LOUIS—MISADVENTURES ON THE MARAMEC—ITS INDIAN NAME—CARONDELET—ST. LOUIS, ITS FINE SITE AND PROBABLE FUTURE IMPORTANCE—ST. LOUIS MOUNDS NOT ARTIFICIAL—DOWNWARD PRESSURE OF THE DILUVIAL DRIFT OF THE MISSISSIPPI.

JULY 13th. We renewed the attempt to pass Cape Garlic at an early hour, and succeeded after a protracted and severe trial. But two of our best men immediately declared their unwillingness to proceed farther in these severe labors, in which they were obliged to pull like oxen; and they were promptly paid off by the captain, and permitted to return. The crew, thus diminished, went on a short distance further with the barge, and came to at the mouth of the Obrazo river, to await the effort of our commander to procure additional hands. We had not now advanced more than two miles, which constituted the sum of this day's progress. While moored here, we were passed by four boats filled with emigrants from Vermont and Western New York, destined for Boon's Lick, on the Missouri. I embraced the occasion of this delay to make some excursions in the vicinity.

July 14th. Having been successful in obtaining a reinforcement of hands from the interior, we pursued the ascent, and made six miles along the Missouri shore. The next day (15th)

we ascended seven miles. This leisurely tracing of the coast revealed to me some of the minutest features of its geological structure. The cliffs consist of horizontal strata of limestone, resting on granular crystalline sandstone. Nothing can equal the beauty of the varying landscape presented for the last two days. There has appeared a succession of the most novel and interesting objects. Whatever pleasure can be derived from the contemplation of natural objects, presented in surprising and picturesque groups, can here be enjoyed in the highest degree. Even art may be challenged to contrast, with more effect, the bleak and rugged cliff with the verdant forest, the cultivated field, or the wide-extended surface of the Mississippi, interspersed with its beautiful islands, and winding majestically through a country, which only requires the improvements of civilized and refined society, to render it one of the most delightful residences of man. Nor is it possible to contemplate the vast extent, fertility, resources, and increasing population of this immeasurable valley, without feeling a desire that our lives could be prolonged to an unusual period, that we might survey, an hundred years hence, the improved social and political condition of the country, and live to participate in its advantages, improvements, and power.

All the emigrants whom we have passed seem to be buoyed up by a hopeful and enterprising character; and, although most of them are manifestly from the poorest classes, and are from twelve to fifteen hundred miles on their adventurous search for a new home, from none have I heard a word of despondency.

July 16th. I observed to-day, at Cape St. Comb, large angular fragments of a species of coarse granular sandstone rock, which appear to be *disjecta membra* of a much more recent formation than that underlying the prevalent surface formation.

The gay and noisy paroquet was frequently seen, this day, wheeling in flocks over the river; and at one point, which was revealed suddenly, we beheld a large flock of pelicans standing along a low, sandy peninsula. Either the current, during

to-day's voyage, was less furious, or the bargemen exerted more strength or skill; for we ascended ten miles, and encamped at the foot of *Bois Brule* (Burnt-wood) bottom. The term "bottom" is applied, in the West, to extensive tracts of level and arable alluvial soil, whether covered by, or denuded of, native forest trees. We found it the commencement of a comparatively populous and flourishing settlement, having on the next day (17th) passed along its margin for seven miles. Its entire length is twelve miles.

July 18th. The most prominent incidents of this day were the passing, on the Illinois shore, of the celebrated site of fort Chartres, and the influx of the Kaskaskia (or, as it is abbreviated by the men, *Ocau* or *Caw*) river—a large stream on the eastern shore. These names will recall some of the earliest and most stirring scenes of Illinois history. The town of Kaskaskia, which is the present seat of the territorial government, is seated seven miles above its mouth.

Fort Chartres is now a ruin, and, owing to the capricious channel of the Mississippi, is rapidly tumbling into it. It had been a regular work, built of stone, according to the principles of military art. Its walls formerly contained not only the chief element of military power in French Illinois, but also sheltered the ecclesiastics and traders of the time. In an old manuscript journal of that fort which I have seen, a singular custom of the Osages is mentioned, on the authority of one Mons. Jeredot. He says (Dec. 22, 1766) that they have a feast, which they generally celebrate about the month of March, when they bake a large (corn) cake of about three or four feet diameter, and of two or three inches thickness. This is cut into pieces, from the centre to the circumference; and the principal chief or warrior arises and advances to the cake, when he declares his valor, and recounts his noble actions. If he is not contradicted, or none has aught to allege against him, he takes a piece of the cake, and distributes it among the boys of the nation, repeating to them his noble exploits, and exhorting them to imitate them. Another then approaches, and in the same manner recounts his achievements, and proceeds as be-

fore. Should any one attempt to take of the cake, to whose character there is the least exception, he is stigmatized and set aside as a poltroon.

It is said by some of the oldest and most intelligent inhabitants of St. Louis, that about 1768, when the British had obtained possession of fort Chartres, a very nefarious transaction took place in that vicinity, in the assassination of the celebrated Indian chief Pontiac. Tradition tells us that this man had exercised great influence in the North and West, and that he resisted the transfer of authority from the French to the English, on the fall of Canada. Carver has a story on this subject, detailing the siege of Detroit in 1763, which has been generally read. The version of Pontiac's death in Illinois, is this:—While encamped in this vicinity, an Illinois Indian, who had given in his adherence to the new dynasty of the English, was hired by the promise of rum, by some English traders, to assassinate the chief, while the latter was reposing on his pallet at night, still vainly dreaming, perhaps, of driving the English out of America, and of restoring his favorite Indo-Gallic empire in the West.

July 19th. We ascended the Mississippi seven miles yesterday, to which, by all appliances, we added eleven miles to-day, which is our maximum ascent in one day. Five miles of this distance, along the Missouri shore, consists of the great public field of St. Genevieve. This field is a monument of early French policy in the days of Indian supremacy, when the agricultural population of a village was brought to labor in proximity, so that any sudden and capricious attack of the natives could be effectively repelled. We landed at the mouth of the Gabarie, a small stream which passes through the town. St. Genevieve lies on higher ground, above the reach of the inundations, about a mile west of the landing. It consists of some three hundred wooden houses, including several stores, a post-office, court-house, Roman Catholic church, and a branch of the Missouri Bank, having a capital of fifty thousand dollars. The town is one of the principal markets and places of shipment for the Missouri lead-mines. Heavy stacks of lead in

pigs, are one of the chief characteristics which I saw in, and often piled up in front of, its storehouses; and they give one the idea of a considerable export in this article.

July 20th. I devoted this day to a reconnoissance of St. Genevieve and its environs. The style of building reminds one of the ancient Belgic and Dutch settlements on the banks of the Hudson and Mohawk—high-pointed roofs to low one-story-buildings, and large stone chimneys out-doors. The streets are narrow, and the whole village as compact as if built to sustain a siege. The water of the Mississippi is falling rapidly, and leaves on the shores a deposit of mud, varying from a foot to two feet in depth. This recent deposit appears to consist essentially of silex and alumine, in a state of very intimate mixture. An opinion is prevalent throughout this country, that the water of the Mississippi, with every impurity, is healthful as a common drink; and accordingly the boatmen, and many of the inhabitants on the banks of the river, make use of no other water. An expedient resorted to at first, perhaps, from necessity, may be continued from an impression of the benefits resulting from it. I am not well enough acquainted with the chemical properties of the water, or the method in which it operates on the human system, to deny its utility; but, to my palate, clear spring-water is far preferable. A simple method is pursued for clarifying it: a handful of Indian meal is sprinkled on the surface of a vessel of water, precipitating the mud to the bottom, and the superincumbent water is left in a tolerable state of purity.

July 21st. We again set forward this morning. On ascending three miles, we came to Little Rock ferry—a noted point of crossing from the east to the west of the Mississippi. The most remarkable incident in the history of this place is the residence of an old French soldier, of an age gone by, who has left his name in the géography of the surrounding country. *M. Breton*, the person alluded to, is stated to be, at this time, one hundred and nine years of age. Tradition says that he was at Braddock's defeat—at the siege of Louisbourg—at the

building of fort Chartres, in the Illinois—and at the siege of Bergen-op-Zoom, in Flanders. While wandering as a hunter, after his military services had ended, in the country about forty miles west of the Mississippi, he discovered the extensive lead-mines which continue to bear his name.

We ascended this day twelve miles, which is the utmost stretch of our exertions against the turbid and heavy tide of this stream. Our captain (Ensminger) looked in the evening as if he had been struggling all day in a battle, and his men took to their pallets as if exhausted to the last degree.

July 22d. I have seen very little, thus far, in the Mississippi, in the shape of fish. The only species noticed has been the gar; one of which I caught, as described, from the side of the boat, while lying at the mouth of the Ohio. Of all rivers in the West, I should think it the least favorable to this form of organized matter. Of the coarse species of the catfish and buffalo-fish which are found in its waters, I suppose the freshet has deprived us of a sight.

Of antiquities, I have seen nothing since leaving the Ohio valley till this day, when I picked up, in my rambles on shore, an ancient Indian dart, of chert. The Indian antiquities on the Illinois shore, however, are stated to be very extensive. Near the Kaskaskia river are numerous mounds and earth-works, which denote a heavy ancient population.

The limestone cliffs, at the place called Dormant Rocks, assume a very imposing appearance. These precipitous walls bear the marks of attrition in water-lines, very plainly impressed, at great heights above the present water-level; creating the idea that they may have served as barriers to some ancient ocean resting on the grand prairies of Illinois.

We were passed, near evening, by the little steamer Harriet, on her descent from St. Louis. This vessel is the same that was noticed on the 11th, on her ascent, and is the only representative of steam-power that we have observed.* Our ascent this day was estimated at thirteen miles.

* I found fifty steamers of all sizes on the Mississippi and its tributaries, of which a list is published in the Appendix.

July 23d. Passing the Platten creek, the prominence called Cornice Rock, and the promontory of Joachim creek, an ascent of five miles brought us to the town of Herculaneum. This name of a Roman city buried for ages, gives, at least, a moral savor of antiquity to a country whose institutions are all new and nascent. It was bestowed, I believe, by Mr. Austin, who is one of the principal proprietors of the place. It consists of between thirty and forty houses, including three stores, a post-office, court-house, and school. There are three shot-towers on the adjoining cliffs, and some mills, with a tan-yard and a distillery, in the vicinity. It is also a mart for the lead-mine country.

I had now ascended one hundred and seventy miles from the junction of the Ohio. This had required over twenty-two days, which gives an average ascent of between seven and eight miles per day, and sufficiently denotes the difficulty of propelling boats up this stream by manual labor.

At Herculaneum I was introduced to M. Austin, Esq.—a gentleman who had been extensively engaged in the mining business while the country was yet under Spanish jurisdiction, and who was favorably known, a few years after, as the prime mover of the incipient steps to colonize Texas. Verbal information, from him and others, appeared to make this a favorable point from which to proceed into the interior, for the purpose of examining its mineral structure and peculiarities. I therefore determined to leave my baggage here until I had visited the territorial capital, St. Louis. This was still thirty miles distant, and, after making the necessary preparations, I set out, on the 26th of the month, on foot. In this journey I was joined by my two *compagnons de voyage* from Pennsylvania and Maryland. We began our march at an early hour. The summer had now assumed all its fervor, and power of relaxation and lassitude on the muscles of northern constitutions. We set out on foot early, but, as the day advanced, the sun beat down powerfully, and the air seemed to owe all its pater-nity to tropical regions. It was in vain we reached the summit land. There was no breeze, and the forest trees were too few and widely scattered to afford any appreciable shade.

The soil of the Missouri uplands appears to possess a uniform character, although it is better developed in some localities than in others. It is the red mineral clay, which, in some of its conditions, yields beds of galena throughout the mine country, bearing fragments of quartz in some of its numerous varieties. In these uplands, its character is not so well marked as in the districts further west; geologically considered, however, it is identical in age and relative position. The *gullied* character of the soil, and its liability to crumble under the effect of rain, and to be carried off, which was first noticed at Cape Girardeau, is observed along this portion of the river, and is most obvious in the gully state of the roads.

What added greatly to our fatigue in crossing this tract, was the having taken a too westerly path, which gave us a round-about tramp. On returning to the main track, we forded Cold river, a rapid and clear brook; a little beyond which, we reached a fine, large, crystal spring, the waters of which bubbled up briskly and bright, and ran off from their point of outbreak to the river we had just crossed, leaving a white deposit of sulphur. The water is pretty strongly impregnated with this mineral, and is supposed to have a beneficial effect in bilious complaints. The scenery in the vicinity of the spring is highly picturesque, and the place is capable of being made a delightful resort.

Five miles more brought us to the banks of the Maramec river, where we arrived at dark, and prevailed with the ferryman to take us across, notwithstanding the darkness of the night, and the rain, which, after having threatened a shower all the afternoon, now began to fall. The Maramec is the principal stream of the mine country, and is the recipient of affluents, spreading over a large area. The aboriginal name of this stream, Mr. Austin informed me, should be written "Marameg." The ferryman seemed in no hurry to put us over this wide river, at so late an hour, and with so portentous a sky as hung over us, threatening every moment to pour down floods upon us. By the time we had descended from his house into the valley, and he had put us across to the opposite shore, it was dark. We took his directions for finding the house at

which we expected to lodge; but it soon became so intensely dark, that we pursued a wrong track, which led us away from the shelter we sought. Satisfied at length that we had erred, we knew not what to do. It then began to pour down rain. We groped about a while, but finally stood still. In this position, we had not remained long, when the faint tinkling of a cow-bell, repeated leisurely, as if the animal were housed, fell on our ears. The direction of the sound was contrary to that we had been taking; but we determined to grope our way cautiously toward it, guided at intervals by flashes of lightning which lit up the woods, and standing still in the meanwhile to listen. At length we came to a fence. This was a guide, and by keeping along one side of it, it led us to the house of which we were in search. We found that, deducting our misadventure in the morning, we had advanced on our way, directly, but about fifteen miles.

July 27th. We were again on our path at a seasonable hour, and soon passed out of the fertile and heavily timbered valley of the Maramec. There now commenced a gentle ridge, running parallel to the Mississippi river for twelve miles. In this distance there was not a single house, nor any trace that man had bestowed any permanent labor. It was sparsely covered with oaks, standing at long distances apart, with the intervening spaces profusely covered with prairie grass and flowers. We frequently saw the deer bounding before us; and the views, in which we sometimes caught glimpses of the river, were of a highly sylvan character. But the heat of the day was intense, and we sweltered beneath it. About half-way, we encountered a standing spring, in a sort of open cavern at the foot of a hill, and stooped down and drank. We then went on, still "faint and wearily," to the old French village of Carondelet, which bears the soubriquet of *Vede-pouche* (empty sack). It contains about sixty wooden buildings, arranged mostly in a single street. Here we took breakfast.

Being now within six miles of the place of our destination, and recruited and refreshed, we pushed on with more alacrity. The first three miles led through a kind of brushy heath, which

had the appearance of having once been covered with large trees that had all been cut away for firing, with here and there a dry trunk, denuded and white, looking like ghosts of a departed forest. Patches of cultivation, with a few buildings, then supervened. These tokens of a better state of things increased in frequency and value till we reached the skirts of the town, which we entered about four o'clock in the afternoon.

St. Louis impressed me as a geographical position of superlative advantages for a city. It now contains about five hundred and fifty houses, and five thousand inhabitants. It has forty stores, a post-office, a land-office, two chartered banks, a court-house, jail, theatre, three churches, one brewery, two distilleries, two water-mills, a steam flouring-mill, and other improvements. These elements of prosperity are but indications of what it is destined to become. The site is unsurpassed for its beauty and permanency; a limestone formation rising from the shores of the Mississippi, and extending gradually to the upper plain. It is in north latitude $38^{\circ} 36'$, nearly equidistant from the Alleghany and the Rocky mountains. It is twelve hundred miles above New Orleans, and about one thousand below St. Anthony's falls.

No place in the world, situated so far from the ocean, can at all compare with St. Louis for commercial advantages. It is so situated with regard to the surrounding country, as to become the key to its commerce, and the storehouse of its wealth; and if the whole western region be surveyed with a geographical eye, it must rest with unequalled interest on that peninsula of land formed by the junction of the Missouri with the Mississippi—a point occupied by the town of St. Louis. Standing near the confluence of two such mighty streams, an almost immeasurable extent of back country must flow to it with its produce, and be supplied from it with merchandise. The main branch of the Missouri is navigable two thousand five hundred miles, and the most inconsiderable of its tributary streams will vie with the largest rivers of the Atlantic States. The Mississippi, on the other hand, is navigable without interruption for one thousand miles above St. Louis. Its affluents, the De Corbeau, Iowa, Wisconsin, St. Pierre, Rock river, Salt

river, and Desmoines, are all streams of the first magnitude, and navigable for many hundred miles. The Illinois is navigable three hundred miles; and when the communication between it and the lakes, and between the Mississippi and lake Superior, and the lake of the Woods—between the Missouri and the Columbia valley—shall be effected; communications not only pointed out, but, in some instances, almost completed by nature; what a chain of connected navigation shall we behold! And by looking upon the map, we shall find St. Louis the focus where all these streams are destined to be discharged—the point where all this vast commerce must centre, and where the wealth flowing from these prolific sources must pre-eminently crown her the queen of the west.

My attention was called to two large mounds, on the western bank of the Mississippi, a short distance above St. Louis. I have no hesitation in expressing the opinion that they are geological, and not artificial. Indian bodies have been buried in their sides, precisely as they are often buried by the natives in other elevated grounds, for which they have a preference. But the mounds themselves consist of sand, boulders, pebbles, and other drift materials, such as are common to undisturbed positions in the Mississippi valley generally.

Another subject in the physical geography of the country attracted my notice, the moment the river fell low enough to expose its inferior shores, spits, and sand-bars. It is the progressive diffusion of its detritus from superior to inferior positions in its length. Among this transported material I observed numerous small fragments of those agates, and other silicious minerals of the quartz family, which characterize the broad diluvial tracts about its sources and upper portions.

CHAPTER III.

RESOLVE TO PROCEED FURTHER WEST—NIGHT VOYAGE ON THE MISSISSIPPI IN A SKIFF—AN ADVENTURE—PROCEED ON FOOT WEST TO THE MISSOURI MINES—INCIDENTS BY THE WAY—MINERS' VILLAGE OF SHIBBOLETH—COMPELLED BY A STORM TO PASS THE NIGHT AT OLD MINES—REACH POTOSI—FAVORABLE RECEPTION BY THE MINING GENTRY—PASS SEVERAL MONTHS IN EXAMINING THE MINES—ORGANIZE AN EXPEDITION TO EXPLORE WESTWARD—ITS COMPOSITION—DISCOURAGEMENTS ON SETTING OUT—PROCEED, NOTWITHSTANDING—INCIDENTS OF THE JOURNEY TO THE VALLEY OF LEAVES.

I WAS kindly received by some persons I had before known, particularly by a professional gentleman with whom I had descended the Alleghany river in the preceding month of March, who invited me to remain at his house. I had now proceeded about seventeen hundred miles from my starting-point in Western New York; and after passing a few days in examining the vicinity, and comparing facts, I resolved on the course it would be proper to pursue, in extending my journey further west and south-west. I had felt, for many years, an interest in the character and resources of the mineralogy of this part of what I better knew as Upper Louisiana, and its reported mines of lead, silver, copper, salt, and other natural productions. I had a desire to see the country which De Soto had visited, west of the Mississippi, and I wished to trace its connection with the true Cordillera of the United States—the Stony or Rocky mountains. My means for undertaking this were rather slender. I had already drawn heavily on these in my outward trip. But I felt (I believe from early reading) an irrepressible desire to explore this region. I was a good

draughtsman, mapper, and geographer, a ready penman, a rapid sketcher, and a naturalist devoted to mineralogy and geology, with some readiness as an assayer and experimental chemist; and I relied on these as both aids and recommendations—as, in short, the incipient means of success.

When ready to embark on the Mississippi, I was joined by my two former companions in the ascent from the mouth of the Ohio. It was late in the afternoon of one of the hottest summer days, when we took our seats together in a light skiff at St. Louis, and pushed out into the Mississippi, which was still in flood, but rapidly falling, intending to reach Cahokia that night. But the atmosphere soon became overcast, and, when night came on, it was so intensely dark that we could not discriminate objects at much distance. Floating, in a light pine skiff, in the centre of such a stream, on a very dark night, our fate seemed suspended by a thread. The downward pressure of the current was such, that we needed not to move an oar; and every eye was strained, by holding it down parallel to the water, to discover contiguous snags, or floating bodies. It became, at the same time, quite cold. We at length made a shoal covered with willows, or a low sandy islet, on the left, or Illinois shore. Here, one of my Youghioghany friends, who had not yet got over his *penchant* for grizzly bears, returned from reconnoitering the bushes, with the cry of this prairie monster with a cub. It was too dark to scrutinize, and, as we had no arms, we pushed on hurriedly about a mile further, and laid down, rather than slept, on the shore, without victuals or fire. At daylight, for which we waited anxiously, we found ourselves nearly opposite Carondelet, to which we rowed, and where we obtained a warm breakfast. Before we had finished eating, our French landlady called for pay. Whether anything on our part had awakened her suspicions, or the deception of others had rendered the precaution necessary, I cannot say. Recruited in spirits by this meal, and by the opening of a fine, clear day, we pursued our way, without further misadventure, about eighteen miles, and landed at Herculeum.

The next day, which was the last of July, I set out on foot for the mines, having directed my trunks to follow me by the

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first returning lead-teams. My course led through an open, rolling country, covered with grass, shrubs, and prairie flowers, and having but few trees. There was consequently little or no shade, and, the weather being sultry, I suffered much from heat and thirst. For the space of about twelve miles, the road ran over an elevated ridge, destitute of streams or springs. I did not meet an individual, nor see anything of the animal creation larger than a solitary wild turkey, which, during the hottest part of the day, came to contest with me for, or rather had previously reached, some water standing in a wagon-rut. I gained the head of the Joachim creek before nightfall, and, having taken lodgings, hastened down to a sheltered part of the channel to bathe, after which I enjoyed a refreshing night's sleep. The aboriginal name of this stream was "Zwashau," meaning pin-oak, as I was told by an old hunter whom I met.

The next day I was early on my way; and I soon began to discover, in the face of the country, evidences of its metalliferous character. Twelve miles brought me to the valley of Grand or Big river, one of the principal tributaries of the Maramec. In descending the high grounds, I observed numerous specimens of the brown oxide of iron; and after crossing the ferry, the mineral locally called mineral blossom, (radiated quartz,) of which I had noticed slight traces before, developed itself in fine specimens. The first mining village I came to, bore the name of Shibboleth. At this place there was a smelting furnace, of the kind called a log-furnace. Here I first saw heaps of the ore of lead commonly found. It is the sulphuret, of a broad glittering grain, and cubical fracture. It is readily smelted, being piled on logs of equal length, and adjusted in the before-named furnace, where it is roasted till the sulphur is driven off; when desulphurated, it melts, and the metal is received on an inclined plane and conducted into an orifice, from which it is ladled into moulds. From fifty to sixty per cent. is obtained in this way. Shibboleth is the property of John Smith T.; a man whose saturnine temper and disposition have brought him into collision with many persons, and given him a wide-spread notoriety both in Missouri and Tennessee.

I lingered along so leisurely, and stopped so often to examine objects by the way, that my progress was not rapid. I obtained some corn-bread and milk at a house, and pursued my journey to Old Mines, where a heavy storm of rain arose. I took shelter at a neighboring house, where I remained during the night. The next morning I walked into Potosi, and took lodgings at Mr. William Ficklin's. This gentleman was a native of Kentucky, where most of his life had been passed in the perils and adventures attending the early settlement of that State. His conversation was replete with anecdotes of perilous adventures which he had experienced; and I was indebted to him for some necessary practical points of knowledge in forest life, and precautions in travelling in an Indian country.

The day after my arrival was a local election day, for a representative from the county in the territorial legislature, to which Mr. Austin the younger was returned. This brought together the principal mining and agricultural gentlemen of the region, and was a circumstance of some advantage to me, in extending my acquaintance, and making known the objects of my visit. In this, the Austins, father and son, were most kind and obliging. Indeed, the spirit with which I was received by the landed proprietors of the country generally, and the frankness and urbanity of their manners and sentiments, inspired me with high hopes of success in making a mineralogical survey of the country.

I found the geological structure of the country, embracing the mines, to be very uniform. It consists of a metalliferous limestone, in horizontal strata, which have not been lifted up or disturbed from their horizontality by volcanic forces; but they have been exposed to the laws of disintegration and elemental action in a very singular manner. By this action, the surface of the formation has been divided into ridges, valleys, and hills, producing inequalities of the most striking and picturesque character.

There are some forty principal mines, in an area of about seventy miles by thirty or forty in breadth. The chief ore of lead smelted is galena. The associated minerals of most pro-

minence are sulphate of barytes, sulphuret of zinc, calcareous spar, and crystallized quartz, chiefly in radiated crystals. I spent upwards of three months in a survey of the mines of chief consequence, noting their peculiarities and geological features. By far the most remarkable feature in the general structure of the country, consists of the existence of a granitic tract at the sources of the river St. Francis. This I particularly examined. The principal elevations consist of red sienite and greenstone, lying in their usual forms of mountain masses. The geological upheavals which have brought these masses to their present elevations, appear to have been of the most ancient character; for the limestones and crystalline sandstones have been deposited, in perfectly horizontal beds, against their sides.

Feeling a desire to compare this formation with the structure of the country west and south of it, extending to the Rocky mountains, and satisfied at the same time that these primary peaks constituted the mineral region of De Soto's most northerly explorations, I determined to extend my explorations south-westwardly. The term "Ozark mountains" is popularly applied to the broad and elevated highlands which stretch in this direction, reaching from the Maramec to the Arkansas. Having obtained the best information accessible from hunters and others who had gone farthest in that direction, I determined to proceed, as early as I could complete my arrangements for that purpose, to explore those elevations.

Colonel W. H. Ashley, who had penetrated into this region, together with several enterprising hunters and woodsmen, represented it as metalliferous, and abounding in scenes of varied interest. It had been the ancient hunting-ground of the Osages, a wild and predatory tribe, who yet infested its fastnesses; and it was represented as subject to severe risks from this cause. Two or three of the woodsmen, who were best acquainted with this tract, expressed a willingness to accompany me on a tour of exploration. I therefore, in the month of October, revisited St. Louis and Illinois, for the purpose of making final arrangements for the tour, and obtained the consent of Mr. Brigham and Mr. Pettibone, previously

mentioned, to accompany me. A day was appointed for our assembling at Potosi. I then returned to complete my arrangements. I purchased a stout, low-priced horse, to carry such supplies as were requisite, made his pack-saddle with my own hands, and had it properly riveted by a smith. A pair of blankets for sleeping; a small, short-handled frying-pan; a new axe, a tin coffee-pot, three tin cups, and the same number of tin plates; a couple of hunting-knives; a supply of lead, shot, ball, powder, and flints; a small smith's hammer, and nails for setting a horseshoe; a horse-bell and strap; a pocket compass; a gun, shot-pouch, and appendages, containing a space for my diary; a mineral-hammer, constructed under my own directions, so as to embrace a small mortar on one face, and capable of unscrewing at the handle, which could be used as a pestle; a supply of stout clothing, a bear-skin and oil-cloth, some bacon, tea, sugar, salt, hard bread, &c., constituted the chief articles of outfit. The man of whom I purchased the horse called him by the unpoetic name of "Butcher."

It was the beginning of November before my friends arrived, and on the sixth of that month we packed the horse, and took our way over the mineral hills that surround Potosi, making our first encampment in a little valley, on the margin of a stream called Bates's creek.

It was fine autumn weather; the leaves of the forest were mostly sere, and the winds scattered them about us with an agreeable movement, as we wound among the hills. We were evidently following an old Indian trail, and, finding a rather tenable old wigwam, constructed of poles and bark, we pitched upon it as our first place of encampment. My kind host from Kentucky, with whom I had been staying, accompanied us thus far, to see us safely in the woods, and taught me the art of hobbling a horse, and tying on his night-bell. The hunters, who had talked rather vaingloriously of their prowess among wild animals and Osages, one by one found obstacles to impede their going. Finally, one of my companions was compelled to return, owing to a continued attack of fever and ague. I determined, nevertheless, to proceed, thinking that a hunter could be found to join us before quitting the verge of civiliza-

tion. Having unpacked Butcher, prepared him for the night, stowed away the baggage, and built a fire, I took my gun and sallied out into the forest, while my companion prepared things for our supper. I found the greatest abundance of large black and grey squirrels in a neighboring wood, and returned with a number of the finest of them in season to add to our evening's meal.

A man's first night in the wilderness is impressive. Our friends had left us, and returned to Potosi. Gradually all sounds of animated nature ceased. When darkness closed around us, the civilized world seemed to have drawn its curtains, and excluded us. We put fresh sticks on the fire, which threw a rich flash of light on our camp, and finally wrapped ourselves in our blankets, and, amidst ruminations on the peculiarities of our position, our hopes, and our dangers, we sank to sleep.

Nov. 7th. The first thing listened for this morning was the tinkle of our horse's bell. But Butcher was gone. All my precautions had been in vain. The poor beast appeared to have had a presentiment of the hard fare that was before him, and, although his fore-feet were tethered, and he must lift up both together to jump, yet, having a strong recollection of the corn-fodder and juicy blades left behind him, he had made his way back to the mines. I immediately went in pursuit of him. He was easily tracked until he got to a space of rank herbage, where I lost the track; and hearing, at the same moment, a bell to the left, I pursued the sound over hill and through dale, till I came out at a farm-yard on Mine creek, four miles below Potosi, where I found the bell whose sound I had followed attached to the neck of a stately penned ox. The owner told me that Butcher had reached the mines, and been sent back to my camp by his former owner. I had nothing left but to retrace my steps, which, luckily, were but the shorter line of an acute triangle. I found him at the camp. It was, however, ten o'clock before our breakfast was despatched, and the horse repacked ready for starting. We took the labor of leading the horse, and carrying the compass and guiding, day

about, so as to equalize these duties, and leave no cause for dissatisfaction. Our trail carried us across the succession of elevated and arid ridges called the Pinery. Not a habitation of any kind, nor the vestiges of one, was passed; neither did we observe any animal, or even bird. The soil was sterile, hard, and flinty, bearing yellow pines, with some oaks. Our general course was west-south-west. The day was mild and pleasant for the season. For a computed distance of fourteen miles, we encountered a succession of ascents and descents, which made us rejoice, as evening approached, to see a tilled valley before us. It proved to be the location of a small branch of the Maramec river, called by its original French name of *Fourche à Courtois*. The sun sank below the hills as we entered this valley. Some woodcock flew up as we reached the low ground; but as we had a cabin in view, and the day was far gone, we moved on toward our principal object. Presently the loud barking of dogs announced our approach; they seemed, by their clamor, as pertinacious as if two wolves or panthers were stealing on the tenement, till they were silenced by the loud commands of their master. It was a small log building, of the usual construction on the frontiers, and afforded the usual hospitality, and ready accommodations. They gave us warm cakes of corn-bread, and fine rich milk; and, spreading our blankets before the fire, we enjoyed sound slumbers. Butcher, here, had his last meal of corn, and made no attempt to escape.

Nov. 8th. With the earliest streaks of daylight we adjusted our pack for the horse, and again set forward on the trail. In the course of two miles' travel, we forded a stream called Law's Fork, and also the branch of the Maramec on which we had lodged the previous night. We soon after descried a hunter's cabin, a small and newly erected hut in the midst of the forest, occupied by a man named Alexander Roberts. This proved the last house we encountered, and was estimated to be twenty miles from Potosi. Some trees had been felled and laid around, partially burned; but not a spot of ground was in cultivation. Dogs, lean and hungry, heralded our approach, as

in the former instance; and they barked loud and long. On reaching the cabin, we found that the man was not at home, having left it, his wife said, with his rifle, at an early hour, in search of game. She thought he would be back before noon, and that he would accompany us. We decided to await his return, and in the meanwhile prepared our frugal breakfast. In a short time, Roberts returned; he was a chunky, sinister-looking fellow, and reminded me of Ali Baba, in the "Forty Thieves." He had a short, greasy buckskin frock, and a pointed old hat. His wife, who peeped out of the door, looked queer, and had at least one resemblance to Cogia, which seemed to be "starvation." The hunter had killed nothing, and agreed to accompany us, immediately beginning his preparations. He at the same time informed us of the fear entertained of the Osages, and other matters connected with our journey in the contemplated direction. About ten o'clock he was ready, and, leading a stout little compact horse from a pen, he clapped a saddle on, seized his rifle, announced himself as ready, and led off. The trail led up a long ridge, which appeared to be the dividing ground between the two principal forks of the Maramec. It consisted of a stiff loam, filled with geological drift, which, having been burned over for ages by the Indians, to fit it for hunting in the fall of the year, had little carbonaceous soil left, and exhibited a hard and arid surface. Our general course was still west-south-west. After proceeding about four miles, our path came to the summit of an eminence, from which we descried the valley of the Ozau, or Ozark fork. This valley consisted entirely of prairie. Scarcely a tree was visible in it. The path wound down the declivity, and across the valley. The soil appeared to be fertile. Occupying one bank of the stream, nearly in the centre of the valley, we passed a cluster of Indian wigwams, inhabited alone by the old men, women, and children; the young men being absent, hunting. We found them to be Lenno-Lenapees, or, in other words, Delawares; being descendants of the Indians whom William Penn found, in 1682, in the pleasant forest village of Coacquannok, where Philadelphia now stands. Strange, but not extraordinary history! They

have been shoved back by civilization, in the course of a hundred and thirty-six years' mutations, over the Alleghanies — over the Mississippi — into the spurs of these mountains. Where they will be after the lapse of a similar period, no one can say. But this *can* be said—that the hunting of deer will give out; and if they do not betake themselves to some other means of subsistence, they will be numbered among the nations that were.

Roberts informed me that four or five miles lower down the valley was a village of Shawnees, and, higher up, another village of Delawares.

On reaching the uplands on the west side of the valley, we pursued the trail up its banks about four or five miles, and encamped by daylight near a clump of bushes at a spring. As I was expert in striking and kindling a fire, this became a duty to which I devoted myself during the entire journey, while my companion busied himself in preparations for our repast. Roberts reconnoitred the vicinity, and came in with a report that we had reached a game country.

We were now fairly beyond the line of all settlements, even the most remote, and had entered on that broad highland tract to which, for geographical distinction, the name of Ozark mountains is applied. This tract reaches through Missouri and Arkansas, from the Maramec to the Wachita, and embraces the middle high lands between the plains at the foot of the Rocky mountains, and the rapids of the Maramec, St. Francis, Osage, White, Arkansas, and other principal streams; these traverse a belt of about two hundred miles east and west, by seven hundred miles north and south. It is a sort of Rheingau, through which the rivers burst.

Nov. 9th. Early in the morning, Roberts brought in the carcase of a fine deer; and we made our first meal on wild venison, cut fresh smoking from the tenderest parts, and roasted on sticks to suit our tastes. This put every one in the best of spirits, and we packed a supply of the meat for our evening's repast. Seeing that Roberts was more at home among the game, and that he had but a sorry knife for the

business, I loaned him a fine new belt and knife, with its sheath, for the day. We now travelled up the Ozark fork about eighteen miles. The weather was exhilarating, and the winds were careering with the leaves of the forest, and casting them in profusion in our track. As we came near the sources of the river, we entered a wide prairie, perfectly covered for miles with these leaves, brought from neighboring forests. At every step the light masses were kicked or brushed away before us. This plain, or rather level vale, was crowned in the distance by elevations fringed with tall trees which still held some of their leafy honors, giving a very picturesque character to the landscape. I booked the scene at night, in my diary, as CLIOLA, or the Valley of Leaves. We held our way over the distant eminences, and at length found a spring by which we encamped, at a rather late hour. It had been a hazy and smoky day, like the Indian summer in Atlantic latitudes. We were in a region teeming with the deer and elk, which frequently bounded across our path. The crack of Roberts's rifle, also, added to the animation of the day's travel; though we might have known, from his unsteady bandit-eye, that he meditated something to our damage.

CHAPTER IV.

HORSES ELOPE—DESERTION OF OUR GUIDE—ENCAMP ON ONE OF THE SOURCES OF BLACK RIVER—HEAD-WATERS OF THE RIVER CURRENTS—ENTER A ROMANTIC SUB-VALLEY—SALTPETRE CAVES—DESCRIPTION OF ASHLEY'S CAVE—ENCAMPMENT THERE—ENTER AN ELEVATED SUMMIT—CALAMARCA, AN UNKNOWN STREAM—ENCOUNTER FOUR BEARS—NORTH FORK OF WHITE RIVER.

Nov. 10th. While we laid on our pallets last night, the trampling of hoofs was frequently heard; but at length the practised ear of the hunter detected that these were the sounds of wild animals' hoofs, and not of our horses. This man's eye had shown an unwonted degree of restlessness and uneasiness during the afternoon of the preceding day, while witnessing the abundant signs of deer and elk in the country; but this excited no suspicions. He was restless during the night, and was disturbed at a very early hour, long before light, by this trampling of animals. These sounds, he said to me, did not proceed from the horses, which were hobbled. He got up, and found both animals missing. Butcher's memory of corn and corn-fodder, at his old master's at Potosi, had not yet deserted him, and he carried the hunter's horse along with him. I immediately jumped up, and accompanied him in their pursuit. There was some moonlight, with clouds rapidly passing. We pursued our back-track, anxiously looking from every eminence, and stopping to listen for the sound of the bells. Roberts occasionally took up a handful of leaves, which were thickly strewn around, and held them up in the moonlight, to see whether the corks of the horses' shoes had not penetrated them. When he finally found this sign, he was sure we were in the

right way. At length, when we had gone several miles, and reached an eminence that overlooked the broad plain of the Valley of Leaves, we plainly descried the fugitives, jumping on as fast as possible on the way back. We soon overhauled them, and brought them to camp by daybreak, before my companion had yet awaked.

Roberts now sallied out, and in a few minutes fired at and killed a fat doe, which he brought in, and we made a breakfast by roasting steaks. Roberts had expressed no dissatisfaction or desire to return, but, sallying out again among the deer on horseback, said he would rejoin us presently, at a future point. We travelled on, expecting at every turn to see him reappear. But we saw no more of him. The rascal had not only deserted us at a difficult point, but he carried off my best new hunting-knife—a loss not to be repaired in such a place.

We at length came to a point where the trail forked. This put us to a stand. Which to take, we knew not; and the result was of immense consequence to our journey, as we afterwards found; for, had we taken the right-hand fork, we should have been conducted in a more direct line to the portions of country we sought to explore. We took the left-hand fork, which we followed diligently, crossing several streams running to the north-west, which were probably tributary to the Missouri through the Gasconade. It was after dark before we came to a spot having the requisites for an encampment, particularly water. It was an opening on the margin of a small lake, having an outlet south-east, which we finally determined to be either one of the sources of the Black river, or of the river Currents.

We had now travelled about twenty miles from our last camp, in a southerly direction. We did not entirely relinquish the idea of being rejoined by Roberts, nor become fully satisfied of his treachery, till late in the evening. We had relied on his guidance till we should be able to reach some hunters' camps on the White or Arkansas rivers; but this idea was henceforth abandoned. Left thus, on the commencement of our journey, in the wilderness, without a guide or hunter, we were consigned to a doubtful fate; our extrication from which

depended wholly upon a decision and self-reliance, which he only knows how to value, who is first called to grapple with the hardships of western life.

It was the edge of a prairie where we had halted. Wood was rather scarce; but we made shift to build a good fire, and went to sleep with no object near us, to excite sympathy, but our horse, who was securely belled and tethered. When we awoke in the morning, the fire was out, and a pack of wolves were howling within a few hundred yards of our camp. Whether the horse feared them, I know not; but he had taken his position near the embers of the fire, where he stood quite still.

Nov. 11th. In passing two miles, we crossed a small stream running south-east, which evidently had its source in the little lake at our last night's encampment. The trail beyond this was often faint; in the course of eight or ten miles, we began to ascend elevations covered with pines, but of so sterile and hard a soil, that we lost all trace of it. We wound about among these desolate pine ridges a mile or two, till, from one of the higher points, we descried a river in a deep valley, having a dense forest of hard wood, and every indication of animal life. Overjoyed at this, we mended our pace, and, by dint of great caution, led our pack-horse into it. It proved to be the river Currents, a fine stream, with fertile banks, and clear sparkling waters. The grey-squirrel was seen sporting on its shady margin, and, as night approached, the wild turkey came in from the plains to drink, and make its nightly abode. After fording the river, we soon found our lost trail, which we followed a while up the stream, then across a high ridge which constituted its southern banks, and through dense thickets to the summits of a narrow, deep, and dark limestone valley, which appeared to be an abyss. Daylight left us as we wound down a gorge into its dreary precincts; and we no sooner found it traversed by a clear brook, than we determined to encamp. As the fire flashed up, it revealed on either side steep and frowning cliffs, which might gratify the wildest spirit of romance. This stream, with its impending cavernous cliffs, I designated the Wall-cave or Onónda valley.

We had advanced this day about eighteen or twenty miles. We had an opportunity, while on the skirts of the high prairie lands, to fire at some elk, and to observe their stately motions; but, being still supplied with venison, we were not willing to waste the time in pursuing them. Our course varied from south to south-west.

Nov. 12th. Daylight fully revealed our position. We were in a valley, often not more than six hundred feet wide, with walls of high precipitous limestone rock. These cliffs were remarkable for nothing so much as their caverns, seated uniformly at a height of forty or fifty feet above the ground, in inaccessible positions. I do not know the number of these caves, as we did not count them; but they existed on either side of the valley as far as we explored it. Most of them were too high to reach. A tree had fallen against the cliff near one of them, by climbing which I reached a small ledge of the rock that afforded a little footing, and, by cautiously groping along, the orifice was finally reached and entered. It proved interesting, although of no great extent; but it contained stalactites depending in clusters from the walls. Of these, I secured a number which were translucent. Slender crystals of nitrate of potash, of perfect whiteness and crystalline beauty, were found in some of the crevices. Having secured specimens of these, I again got out on the ledge of rock, and, reaching the tree, descended in safety.

About half a mile higher up the valley, on its south side, we discovered a cavern of gigantic dimensions. The opening in the face of the rock appeared to be about eighty or ninety feet wide, and about thirty high. A projection of rock on one side enabled us to enter it. A vast and gloomy rotundo opened before us. It very soon, after the entry, increases in height to sixty or seventy feet, and in width to one hundred and fifty or two hundred feet, forming an immense hall. This hall has another opening or corridor, leading to a precipitous part of the cliff. It extends into the rock, southerly, an unexplored distance, branching off in lateral avenues from the main trunk. We explored the main gallery five or six hun-

dred yards, when we found obstructions. The roof has been blackened by the carbonaceous effect of fires, kindled by Indians or white men, who have visited it, in former years, in search of nitrous earth. In some parts of it, compact bodies of pebbles and reddish clay, very similar to that found on the cliffs, are seen, which creates an idea that the cavern must have been an open orifice at the geological era of the diluvial deposits. This earth, by being lixiviated with common house-ashes, produces a liquid which, on evaporation, yields saltpetre. The cave, I was informed at Potosi, has been visited for this purpose by Colonel Ashley, and it appropriately bears his name. Finding it a perfect "rock-house," and being dry, and affording advantages for some necessary repairs to our gear, and arrangements for the further continuation of our explorations, we, about four o'clock in the afternoon, removed our camp up the valley, and encamped within it. We could shelter ourselves completely in its capacious chambers in case of rain, of which there were indications, and take a calm view of the course it seemed now expedient to pursue. Thus far, we had had a trail, however slight, to follow; but from this point there was none—we were to plunge into the pathless woods, and to trust ourselves alone to the compass, and the best judgment we could form of courses, distances, and probabilities. A wilderness lay before us, behind us, and around us. We had "taken our lives in our hands," and we were well satisfied that our success must depend on our vigilance, energy, and determination. In addition to the exertion of providing food, and repairing our clothing, which, as we urged our way, was paying tribute to every sharp bush we pressed through, we had to exercise a constant vigilance to prevent Indian surprises; for experience had already taught us that, in the wilderness, where there is no law to impose restraint but the moral law of the heart, man is the greatest enemy of man.

Nov. 13th. The threatening appearance of the atmosphere induced us to remain most of the day in our rock-house, which was devoted to devising a more safe and compact mode of carrying specimens, to repairs of our pack-saddles, a reconstruc-

tion of the mode of packing, &c. We then made a further reconnoissance of the cavern, and its vicinity and productions. I had paid particular attention to the subject of the occurrence of animal bones in our western caves, as those of Europe had recently excited attention; but never found any, in a single instance, except the species of existing weasels, and other very small quadrupeds, which are to be traced about these castellated and cavernous cliffs. As evening approached, a flock of turkeys, coming in from the plain to the top of the cliff above the cavern, flew down on to the trees directly in front of us, sheltered as we were from their sight, and afforded a fine opportunity for the exercise of our sportsmanship.

Nov. 14th. The rain which had threatened to fall yesterday, poured down this morning, and continued with more or less violence all day. Our packages, clothing, arms and accoutrements, were thoroughly overhauled and examined. We had still supplies of everything essential to our comfort. Our bacon had not been seriously trenched on, while the forest had amply supplied us with venison, and our groceries bade fair to last us till we should strike some of the main southern streams, or till our increasing powers of endurance and forest skill should enable us to do without them.

Nov. 15th. This morning, the sky being clear and bright, we left our rock abode in the Wall-cave valley. We ascended this valley a short distance, but, as it led us too far west, and the brush proved so thick as to retard our progress, we soon left it. With some ado, the horse was led to the top of the cliff. A number of lateral valleys, covered with thick brush, made this a labor by no means light. The surface of the ground was rough, vegetation sere and dry, and every thicket which spread before us presented an obstacle which was to be overcome. We could have penetrated many of these, which the horse could not be forced through. Such parts of our clothing as did not consist of buckskin, paid frequent tribute to these brambles.

At length we got clear of these spurs, and entered on a

high table-land, where travelling became comparatively easy. The first view of this vista of highland plains was magnificent. It was covered with moderate-sized sere grass and dry seed-pods, which rustled as we passed. There was scarcely an object deserving the name of a tree, except now and then a solitary trunk of a dead pine or oak, which had been scathed by the lightning. The bleached bones of an elk, a deer, or a bison, were sometimes met. Occasionally we passed a copse of oak, or cluster of saplings. The deer often bounded before us, and we sometimes disturbed the hare from its sheltering bush, or put to flight the quail and the prairie-hen. There was no prominent feature in the distance for the eye to rest on. The unvaried prospect at length produced satiety. We felt, in a peculiar manner, the solitariness of the wilderness. We travelled silently and diligently. It was a dry and wave-like prairie. From morning till sunset, we did not encounter a drop of water. This became the absorbing object. Hill after hill, and vale after vale, were patiently ascended, and diligently footed, without bringing the expected boon. At last we came, suddenly and unexpectedly, to a small running stream in the plain, where we gladly encamped. I quickly struck up a cheerful fire, and we soon had a cup of tea with our evening's repast. Nor was Butcher neglected. There was a patch of short green grass on the margin of the brook, to which he did ample justice. We were not long after supper in yielding ourselves to a sound sleep.

While we were in the act of encamping, I had placed my powder-flask on the ground, and, on lighting the fire, neglected to remove it. As the plain was covered with dry leaves, they soon took fire, and burned over a considerable space, including the spot occupied by myself and the flask. The latter was a brass-mounted shooting-flask, of translucent horn, having a flaw through which grains of powder sometimes escaped. Yet no explosion took place. I looked and beheld the flask, which the fire had thus run over, very near me, with amazement.

Nov. 16th. We were now on an elevated summit of table-land or water-shed, which threw its waters off alternately to

the Missouri and Mississippi. It was covered with high, coarse, prairie grass, and its occasional nodding clusters of prairie flowers run to seed. In depressed places, the greenbriar occasionally became entangled with the horse's feet, and required time to extricate him. We very frequently passed the head and thigh-bones of the buffalo, proving that the animal had been freely hunted on these plains. In the course of about eight miles' travel, we passed two small streams running to the north-west, which led us to think that we were diverging too far towards the Missouri side of this vast highland plateau. It was still some hours to sunset, and we had gone about four miles farther when we reached a large, broad stream, also flowing towards the north-west. It had a rapid and deep current, on each side of which was a wide space of shallow water, and boulders of limestone and sandstone. It required some skill to cross this river, as it was too deep to ford. The horse was led into the edge of the stream and driven over, coming out with his pack safely on the other side. The shallow parts offered no obstacle; and we bridged the deeper portion of the channel with limbs and trunks of trees, which had been brought down by the stream when in flood and left upon its banks, and, being denuded of their bark, were light and dry, and as white as bleached bones.

I had crossed the channel safely, after my companion; but he disturbed the bridge on stepping from it, and caused me to slip from the stick. Having my gun in my right hand, I naturally extended it, to break my fall. Each end of it, as it reached the stream, rested on a stone, and, my whole weight being in the centre, the barrel was slightly sprung. This bridge, for the purpose of reference, I called Calamarca. After crossing the stream, we came to a stand, and, on consultation, explored it downward, to determine its general course; but, finding it to incline toward the north-west, we returned up its southern bank two or three miles above our rustic bridge, and encamped.

Nov. 17th. In the morning we proceeded in a south-south-westerly direction, which, after keeping up the valley from the

camp of Calamarca for a few miles, carried us up an elevated range of hills, covered with large oaks bearing acorns. We had reached the top of a ridge which commanded a view of a valley beyond it, when we observed, far below us in the valley, four bears on an oak, eating sweet acorns. The descent was steep and rough, with loose stones, which made it impossible to lead the horse down without disturbing them. We therefore tied him to a staddle, and, after looking to our priming, we began to descend the height. But, as the leaves had all fallen, concealment was impossible; and when the animals became alarmed, and began to come down the tree, we ran at our utmost speed to reach its foot first. In this effort, my companion fell on the loose stones, and sprained his ankle; I kept on, but did not reach the foot of the tree in time to prevent their escape, and I followed them some distance. When my companion's absence led me back to him, I found him badly hurt; he limped along with the utmost difficulty. I soon mounted him on the pack-horse, and led up the little valley; but the pain of his ankle became so intense, that he could not bear the motion, and, after proceeding a mile or two, we determined to halt and encamp. We had not travelled from our morning's encampment more than five or six miles. I accordingly unpacked the horse, prepared a pallet for my companion, and built a fire. I then bathed his ankle with salt and warm water. This done, I took my gun, and sauntered along the thickets in the hope of starting some game. Nothing, however, was found. The shrill and unmusical cry of the blue-jay, which was the largest bird I saw, reminded me of other latitudes. Thoughtful, and full of apprehension at this untoward accident, I returned to our little camp, and diligently renewed my antalgic applications.

Nov. 18th. A night's rest, and the little remedies in my power to employ, had so far abated the pain of my companion's ankle, that he again consented to mount the pack-horse, and we pursued our way up the little valley in which we had encamped. We had not, however, travelled far, when we saw two large black bears playing in the grass before us, and so

intently engaged in their sport that they did not observe us. My companion, with my aid, quickly dismounted. We examined our arms, tied the horse, and, having determined to fire together, had reached our several stations before the animals noticed our approach. They at first ran a few yards, but then turned and sat up in the high, sere grass, to see what had disturbed them. We fired at the same moment, each having singled out his mark. Both animals fled, but on reaching the spot where the one I fired at had sat, blood was copiously found on the grass. I pursued him and his mate over an adjoining ridge, where I lost sight of them; but discovering, on crossing the ridge, a hollow oak, into which I judged they had crept, I went back for the axe to fell it. While engaged at this, my companion hobbled up, and relieved me at the axe. The tree at length came down with a thundering crash, partially splitting in its fall, and I stood ready with my gun to receive the discomfited inmates; but, after gazing intently for a time, none appeared. It was now evident they had eluded us, and that we had lost the track. The excitement had almost cured my companion's lameness; but it returned when the pursuit was over, and, resuming his position on the horse, we proceeded over a succession of high, oak-covered ridges. In crossing one of these, a large and stately elk offered another object for our notice. He had an enormous pair of horns, which it seemed he must find it difficult to balance in browsing; but the moment he became aware of our propinquity, he lifted his head, and, throwing back the antlers, they seemed to form shields for his shoulders and sides while plunging forward through the thickets. We stood a moment to admire his splendid leaps.

These incidents had carried us a few miles out of our course. We were on high broken summits, which resembled, in their surface, what may be conceived of the tossing waves of a sea suddenly congealed. On descending from these towards the south, we came to clumps of bushes, with gravelly areas between, and an occasional standing pool of pure water. It was very evident to our minds, as we advanced, that these pools must communicate with each other through the gravel, and

that there were seasons when there was more water washed from the hills. On following down this formation about six miles, the connection became more evident, and the sources of an important river developed themselves. We were, in fact, on the extreme head-waters of the Great North Fork of White river; the Unica of the Cherokees, and the *Riviere au Blanc* of the French. The manner in which the waters develop themselves on descending the southern slope of these highlands, is remarkable. They proceed in plateaux or steps, on each of which the stream deploys in a kind of lake, or elongated basin, connected with the next succeeding one by a narrow rapid. The rock is a grey sandstone in the lower situations, capped with limestone. In some places the water wholly disappears, and seems to permeate the rock. We came to a place where the river, being some four feet deep, is entirely absorbed by the rock, and does not again appear till a mile below, where it suddenly issues from the rock, in its original volume.

CHAPTER V.

DESCEND THE VALLEY—ITS DIFFICULTIES—HORSE ROLLS DOWN A PRECIPICE—PURITY OF THE WATER—ACCIDENT CAUSED THEREBY—ELKHORN SPRING—TOWER CREEK—HORSE PLUNGES OVER HIS DEPTH IN FORDING, AND DESTROYS WHATEVER IS DELIQUESCENT IN HIS PACK—ABSENCE OF ANTIQUITIES, OR EVIDENCES OF ANCIENT HABITATION—A REMARKABLE CAVERN—PINCHED FOR FOOD—OLD INDIAN LODGES—THE BEAVER—A DESERTED PIONEER'S CAMP—INCIDENT OF THE PUMPKIN.

Nov. 19th. Daylight put us in motion. It was determined to follow the valley down in its involutions, which led us, generally, south. We passed over some fertile, heavily timbered bottoms, where I observed the elm, oak, beech, maple, ash, and sycamore. We had not left our camp more than a mile, when we came to the first appearance of the *C. arundinacea*, or cane, and we soon after reached the locality of the greenbrier. Travelling in these rich forests is attended with great fatigue and exertion from the underbrush, particularly from the thick growth of cane and greenbrier; the latter of which often binds masses of the fields of cane together, and makes it next to impossible to force a horse through the matted vegetation. Our horse, indeed, while he relieved us from the burden of carrying packs, became the greatest impediment to our getting forward, while in this valley. To find an easier path, we took one of the summit ranges of the valley. But a horse, it seems, must have no climbing to do, when he is under a pack-saddle. We had not gone far on this ridge, when the animal slipped, or stumbled. The impetus of his load was more than he could resist. The declivity was steep, but not precipitous. He rolled over and over for perhaps two hundred feet, until he reached the foot of the ridge. We looked with dismay as he

went, and thought that every bone in his body must have been broken. When we reached him, however, he was not dead, but, with our aid, got up. How he escaped we could not divine, but he looked pleased when he saw us come to his relief, and busy ourselves in extricating him. We unloosed his pack, and did all we could to restore him. We could not find any outward bruise; there was no cut, and no blood was started. Even a horse loves sympathy. After a time, we repacked him, and slowly continued our route. The delay caused by this accident, made this a short day's journey; we did not suppose ourselves to have advanced, in a direct line, over twelve miles. The valley is very serpentine, redoubling on itself.

Nov. 20th. We found the stream made up entirely of pure springs, gushing from the gravel, or rocks. Nothing can exceed the crystal purity of its waters. These springs are often very large. We came to one, in the course of this day, which we judged to be fifty feet wide. It rushes out of an aperture in the rock, and joins the main branch of the river about six hundred yards below, in a volume quite equal to that of the main fork. I found an enormous pair of elk's horns lying on one side of the spring, which I lifted up and hung in the forks of a young oak, and from this incident named it the Elkhorn Spring.

In forcing my way through the rank vines, weeds, and brush, which encumber the valley below this point, I lost my small farrier's hammer from my belt; a loss which was irreparable, as it was the only means we had of setting a shoe on our horse, and had also served on ordinary occasions as a mineral-hammer, instead of the heavier implement in the pack.

We often disturbed the black bear from his lair in the thick canebrakes, but travelled with too much noise to overtake him. The deer frequently bounded across the valley, while turkey, squirrel, duck, and smaller game, were also abundant.

Nov. 21st. The bottom-lands continued to improve in extent and fertility as we descended. The stream, as it wears

its way into deeper levels of the stratification of the country, presents, on either side, high cliffs of rock. These cliffs, which consist of horizontal limestone, resting on sandstone, frequently present prominent pinnacles, resembling ruinous castellated walls. In some places they rise to an astonishing height, and they are uniformly crowned with yellow pines. A remarkable formation of this description appeared to-day, at the entrance of a tributary stream through these walled cliffs, on the left bank, which I called Tower Creek; it impressed one with the idea of the high walls of a ruined battlement.

The purity and transparency of the water are so remarkable, that it is often difficult to estimate its depth in the river. A striking instance of this occurred after passing this point. I was leading the horse. In crossing from the east to the west bank, I had led Butcher to a spot which I thought he could easily ford, without reaching above his knees. He plunged in, however, over his depth, and, swimming across with his pack, came to elevated shores on the other side, which kept him so long in the water, and we were detained so long in searching for a suitable point for him to mount, that almost everything of a soluble character in his pack was either lost or damaged. Our salt and sugar were mostly spoiled; our tea and Indian meal damaged; our skins, blankets, and clothing, saturated. This mishap caused us a world of trouble. Though early in the day, we at once encamped. I immediately built a fire, the horse was speedily unpacked, and each particular article was examined, and such as permitted it, carefully dried. This labor occupied us till a late hour in the night.

Nov. 22d. Up to this point we had seen no Osages, of whose predatory acts we had heard so much at Potosi, and on the sources of the Maramec; nor any signs of their having been in this section of the country during a twelvemonth, certainly not since spring. All the deserted camps, and the evidences of encampment, were old. The bones of animals eaten, found on the high plains east of Calamarca, and at the Elkhorn spring, were bleached and dry. Not a vestige had appeared, since leaving the Wall-cliffs, of a human being

having recently visited the country. The silence and desolateness of the wilderness reigned around. And when we looked for evidences of an ancient permanent occupation of the region by man, there were none—not a hillock raised by human hands, nor the smallest object that could be deemed antiquarian. The only evidences of ancient action were those of a geological kind—caverns, valleys of denudation, beds of drift, boulders, water-lines and markings on the faces of cliffs, which betokened oceanic overflow at very antique or primary periods.

The difficulties attending our progress down the valley, induced us to strike out into the open prairie, where travelling was free, and unimpeded by shrubbery or vines. Nothing but illimitable fields of grass, with clumps of trees here and there, met the eye. We travelled steadily, without diverging to the right or left. We sometimes disturbed covies of prairie birds; the rabbit started from his sheltering bush, or the deer enlivened the prospect. We had laid our course south-south-west, and travelled about twenty miles. As evening approached, we searched in vain for water, to encamp. In quest of it, we finally entered a desolate gorge, which seemed, at some seasons, to have been traversed by floods, as it disclosed boulders and piles of rubbish. Daylight departed as we wound our way down this dry gorge, which was found to be flanked, as we descended, with towering cliffs. In the meantime, the heavens became overcast with dense black clouds, and rain soon began to fall. We scanned these lofty cliffs closely, as we were in a cavernous limestone country, for evidences of some practicable opening which might give us shelter for the night. At length, after daylight had gone, the dark mouth of a large cavern appeared on our left, at some twenty or thirty feet elevation. The horse could not be led up this steep, but, by unpacking him, we carried the baggage up, and then hobbled and belled the poor beast, and left him to pick a meal as best he could in this desolate valley. It was the best, and indeed the only thing, we could do for him.

It was not long before I had a fire in the cave, which threw its red rays upon the outlines of the cavern, in a manner which would have formed a study for Michael Angelo. It seemed

that internal waters had flowed out of this cavern for ages, carrying particle by particle of the yielding rock, by which vast masses had been scooped out, or hung still in threatening pendants. Its width was some forty feet, its height perhaps double that space, and its depth illimitable. A small stream of pure water glided along its bottom, and went trickling down the cliff.

The accident in crossing the stream had saturated, but not ruined our tea; and we soon had an infusion of it, to accompany our evening's frugal repast—for *frugal* indeed it became, in meats and bread, after our irreparable loss of the day previous. Nothing is more refreshing than a draught of tea in the wilderness, and one soon experiences that this effect is due neither to milk nor sugar. The next thing to be done after supper, was to light a torch and explore the recesses of the cave, lest it should be occupied by some carnivorous beasts, who might fancy a sleeping traveller for a night's meal. Sallying into its dark recesses, gun and torch in hand, we passed up a steep ascent, which made it difficult to keep our feet. This passage, at first, turned to the right, then narrowed, and finally terminated in a low gallery, growing smaller and smaller towards its apparent close. This passage became too low to admit walking, but by the light of our torch, which threw its rays far into its recesses, there appeared no possibility of our proceeding further. We then retraced our steps to our fire in the front of the cave, where there were evidences of Indian camp-fires. We then replenished our fire with fuel, and spread down our pallets for the night. My companion soon adjusted himself in a concave part of the rock, and went to sleep. I looked out from the front of the cave to endeavor to see the horse; but although I caught a sound of his bell, nothing could be seen but intense darkness. The rain had been slight, and had abated; but the cliffs in front, and the clouds above the narrow valley, rendered it impossible to see anything beyond the reach of the flickering rays of our fire. To its precincts I returned, and entered up my journal of the events of the day. Our situation, and the peculiarities of the scenery around us, led me to reflect on that mysterious fate which, in

every hazard, attends human actions, and, by the light of the fire, I pencilled the annexed lines, and clapt down the cavern in my journal as the Cave of Tula.*

LINES WRITTEN IN A CAVE IN THE WILDERNESS OF ARKANSAS.

O! thou, who, clothed in magic spell,
Delight'st in lonely wilds to dwell,
Resting in rift, or wrapped in air,
Remote from mortal ken, or care :
Genius of caverns drear and wild,
Hear a suppliant wandering child—
One, who nor a wanton calls,
Or intruder in thy walls :
One, who spills not on the plain,
Blood for sport, or worldly gain,
Like his red barbarian kin,
Deep in murder—foul in sin ;
Or, with high, horrific yells,
Rends thy dark and silent cells ;
But, a devious traveller nigh,
Weary, hungry, parched, and dry ;
One, who seeks thy shelter blest,
Not to riot, but to rest.

Grant me, from thy crystal rill,
Oft my glittering cup to fill ;
Let thy dwelling, rude and high,
Make my nightly canopy,
And, by superhuman walls,
Ward the dew that nightly falls.
Guard me from the ills that creep
On the houseless traveller's sleep—
From the ravenous panther's spring,
From the scorpion's poisoned sting,
From the serpent—reptile curst—
And the Indian's midnight thrust.
Grant me this, aerial sprite,
And a balmy rest by night,
Blest by visions of delight !
Let me dream of friendship true,
And that human ills are few ;
Let me dream that boyhood's schemes
Are not, what I've found them, dreams ;

And his hopes, however gay,
Have not flitted fast away.
Let me dream, I ne'er have felt,
Ease that pleases, joys that melt;
Or that I shall ever find
Honor fair, or fortune kind;
Dream that time shall sweetly fling,
In my path, perpetual spring.
Let me dream my bosom never
Felt the pang from friends to sever;
Or that life is not replete,
Or with loss, pain, wo, deceit.
Let me dream, misfortune's smart
Ne'er hath wrung my bleeding heart;
Nor its potent, galling sway,
Forced me far, O! far away;
Let me dream it—for I know,
When I wake, *it is not so!**

Nov. 23d. My first care this morning was to find Butcher, who had been left, last night, with a sorry prospect. He was not to be found. I followed our back track to the plains, whither he had gone for his night's meal. By the time I returned with him, the forenoon was wellnigh gone. We then travelled to the south-east. This brought us, in due time, again into the valley of the North Fork. We found it less encumbered with vines and thickets, and very much widened in its expansion between bluff and bluff. We forded it, and found, on its eastern margin, extensive open oak plains. On one of the most conspicuous trees were marks and letters, which proved that it had been visited and singled out for settlement by some enterprising pioneer. From the open character of the country, we could not get near to large game; and we now found that our supply of ball and shot was near its close. We passed down the valley about ten miles, and encamped. Since the loss of our corn-meal, we had had nothing in the shape of bread, and our provisions were now reduced to a very small quantity of dried meat. We had expected, for some

* These lines were published in the Belles-Lettres Repository in 1821, and shortly after, with a commendation, in the New York Statesman.

days, to have reached either Indian or white hunters' camps. Our anxiety on this head now became intense. Prudence required, however, that, small as our stores were, they should be divided with strict reference to the probability of our not meeting with hunters, or getting relief, for two or three days.

Nov. 24th. The stick frames, without bark, of several Indian lodges, were passed to-day, denoting that they had not been recently occupied. Travelling down the opposite side of the vale from that taken by my companion, who had charge of the horse, I came to a point on the bank of the river, where I discovered two grown beavers sporting in the stream. The tail of this animal, which appears clumsy and unwieldy in the dead specimen, gives the animal a graceful appearance in the water, where it makes him appear to have a very elongated body. After diving about for some time, they came to the shore, and sat in front of their *wauzh*, as it is termed by the Algonquins, or lodge, which in this case was a fissure in the rock. I was perfectly screened by a point of the rock from their view, and sat with my gun cocked, reserving my fire, a few moments, the more perfectly to observe them, when both animals, at the same instant, darted into their holes.

Under the influence of a keen appetite, and a tolerably open forest, we pressed on, this day, about fifteen miles; the horse being, as usual, our chief hindrance.

Nov. 25th. I took the horse's bridle over my arm this morning, and had proceeded through open woods about ten miles, when we descried, from a little summit, a hut in the distance, which had some traits of the labor of white men. This gave animation to our steps, in the hope of finding it occupied. But, as we approached, we could discern no smoke rising up as the sign of occupancy, and were disappointed to find it an abortive effort of some pioneer, and, at the moment, called it Camp No. We afterwards learned that it had been constructed by one Martin, who, as there was not a foot of land in cultivation, had probably aimed to subsist by the chase alone. The location was well chosen. A large cane-

brake flanked the river, sufficient to give range to horses and cattle. A little tributary stream bounded a fertile piece of upland, east of this. The hut was built of puncheons, supported on one side by a rude ridge-pole, leaving the front of it open, forming a shed which had a roof and floor. But the stream had now dried up. We found a plant of cotton, bolted out, among the adjacent weeds, which proved the soil and climate suitable to its culture. We were now well within the probable limits of Arkansas.

It was determined to encamp at this spot, turn the horse into the adjacent canebrake, where the leaves were green, to deposit our baggage and camp apparatus in one corner of the hut, and, after making light packs, to take our arms, and proceed in search of settlements. This required a little time. To reach a point where civilization had once tried to get a foothold, however, was something; and we consoled ourselves with the reflection that we could not be remote from its skirts.

The next day (26th) I made an excursion west of the river, from our position, about five miles, to determine satisfactorily our situation. I found, on the opposite side of the valley, a little higher up, at the foot of the cliff, another small (white man's) hut, which had also been abandoned. In a small patch of ground, which had once been cleared, there grew a pumpkin vine, which then had three pumpkins. This was a treasure, which I at once secured. I found that one of them had been partially eaten by some wild animal, and determined to give it to my horse, but could not resist the inclination first to cut off a few slices, which I ate raw with the greatest appetite. The taste seemed delicious. I had not before been aware that my appetite had become so keen by fasting; for we had had but little to eat for many days. Between the horse and myself, we finished it, and had quite a sociable time of it. With the other two, which were the largest, I rode back to camp, where, having a small camp-kettle, we boiled and despatched them, without meat or bread, for supper. It does not require much to make one happy; for, in this instance, our little luck put us in the best of humor.

CHAPTER VI.

ABANDON OUR CAMP AND HORSE IN SEARCH OF SETTLEMENTS — INCIDENTS OF THE FIRST DAY — HEAR A SHOT — CAMP IN AN OLD INDIAN LODGE — ACORNS FOR SUPPER — KILL A WOODPECKER — INCIDENTS OF THE SECOND DAY — STERILE RIDGES — WANT OF WATER — CAMP AT NIGHT IN A DEEP GORGE — INCIDENTS OF THE THIRD DAY — FIND A HORSE-PATH, AND PURSUE IT — DISCOVER A MAN ON HORSEBACK — REACH A HUNTER'S CABIN — INCIDENTS THERE — HE CONDUCTS US BACK TO OUR OLD CAMP — DESERTED THERE WITHOUT PROVISIONS — DEPLORABLE STATE — SHIFTS — TAKING OF A TURKEY.

Nov. 27th. Action is the price of safety in the woods. Neither dreams nor poetic visions kept us on our pallets a moment longer than it was light enough to see the grey tints of morning. Each of us prepared a compact knapsack, containing a blanket and a few absolute necessities, and gave our belts an extra jerk before lifting our guns to our shoulders; then, secretly wishing our friend Butcher a good time in the canebrake, we set out with a light pace towards the south. My companion Bonee* was much attached to tea, and, as the article of a small tin pot was indispensable to the enjoyment of this beverage, he burthened himself with this appendage by strapping it on his back with a green sash. This was not a very military sort of accoutrement; but as he did not pride himself in that way, and had not, in fact, the least notion of the ridiculous figure he cut with it, I was alone in my unexpressed sense of the Fridayishness of his looks on the march, day by day, across the prairies and through the woods, with this not very glittering culinary appendage dangling at his back.

* Elision of Pettibone.

Hope gave animation to our steps. We struck out from the valley southerly, which brought us to an elevated open tract, partially wooded, in which the walking was good. After travelling about six miles, we heard the report of a gun on our left. Supposing it to proceed from some white hunter, we tried to get into communication with him, and hallooed stoutly. This was answered. I withdrew the ball from my gun, and fired. We then followed the course of the shot and halloo. But, although a whoop was once heard, which seemed from its intonation to be Indian, we were unsuccessful in gaining an interview, and, after losing a good deal of time in the effort, were obliged to give it up, and proceed. We had now lost some hours.

Much of our way lay through open oak forests, with a thick bed of fallen leaves, and we several times searched under these for sweet acorns; but we uniformly found that the wild turkeys had been too quick for us — every sweet acorn had been scratched up and eaten, and none remained but such as were bitter and distasteful. On descending an eminence, we found the sassafras plentifully, and, breaking off branches of it, chewed them, which took away the astringent and bad taste of the acorns.

As night approached, we searched in vain for water on the elevated grounds, and were compelled to seek the river valley, where we encamped in an old Indian wigwam of bark, and found the night chilly and cold. We turned restlessly on our pallets, waiting for day.

Nov. 28th. Daylight was most welcome. I built a fire against the stump of a dead tree, which had been broken off by lightning at a height of some thirty or forty feet from the ground. We here boiled our tea, and accurately divided about half an ounce of dried meat, being the last morsel we had. While thus engaged, a red-headed woodpecker lit on the tree, some fifteen or twenty feet above our heads, and began pecking. The visit was a most untimely one for the bird. In a few more moments, he lay dead at the foot of the tree, and, being plucked, roasted, and divided, furnished out our repast.

We then gave the straps of our accoutrements a tight jerk, by way of preventing a flaccid stomach—an Indian habit—and set forward with renewed strength and hope. We travelled this day over a rolling country of hill and dale, with little to relieve the eye or demand observation, and laid down at night, fatigued, in the edge of a canebrake.

Nov. 29th. A dense fog, which overhung the whole valley, prevented our quitting camp at a very early hour. When it arose, and the atmosphere became sufficiently clear to discern our way, we ascended the hills to our left, and took a west-south-west course.

Nothing can exceed the roughness and sterility of the country we have to-day traversed, and the endless succession of steep declivities, and broken, rocky precipices, surmounted. Our line of march, as soon as we left the low grounds of the river valley, led over moderately elevated ridges of oak-openings. We came at length to some hickory trees. Beneath one of them, the nuts laid in quantities on the ground. We sat down, and diligently commenced cracking them; but this was soon determined to be too slow a process to satisfy hungry men, and, gathering a quantity for our night's encampment, we pushed forward diligently. Tramp! tramp! tramp! we walked resolutely on, in a straight line, over hill and dale. Trees, rocks, prairie-grass, the jumping squirrel, the whirring quail—we gave them a glance, and passed on. We finally saw the sun set; evening threw its shades around; night presented its sombre hue; and, as it grew dark, it became cloudy and cold. Still, no water to encamp by was found, and it finally became so dark that we were forced to grope our way. By groping in the darkness, we at length stood on the brink of a precipice, and could distinctly hear the gurgling sound of running water in the gulf below. It was a pleasing sound; for we had not tasted a drop since early dawn. Had we still had our horse, we should not have been able to get him down in the darkness; but, by seizing hold of bushes, and feeling our way continually, we reached the bottom, and encamped immediately by the stream. It was a small run of pure mountain

water. Soon a fire arose on its banks. We cracked a few of the nuts. We drank our accustomed tin-cup of tea. We wrapped ourselves in our blankets upon its immediate margin, and knew no more till early daylight, when a cold air had quite chilled us.

Nov. 30th. We were happy to get out of this gulf at the earliest dawn. After travelling a couple of miles, we stepped suddenly into a well-beaten horse-path, running transversely to our course, with fresh horse-tracks leading both ways. We stopped to deliberate which end of the path to take. I thought the right-hand would conduct us to the mouth of the river which we had been pursuing down, where it could hardly fail there should be hunters or pioneer settlers located. My companion thought the left hand should be taken, without offering any satisfactory reason for it. I determined, in an instant, to rise above him mentally, by yielding the point, and set out with a firm and ready pace to the left. We travelled diligently about three miles without meeting anything to note, but were evidently going back into the wilderness we had just left, by a wider circuit, when my companion relented, and we turned about on our tracks toward the mouth of the river. We had not gone far, and had not yet reached the point of our original issue from the forest, when we descried a man on horseback, coming toward us. Joy flashed in our eyes. When he came up, he told us that there was a hunter located at the mouth of the river, and another, named Wells, nearly equidistant on the path he was pursuing; and that, if we would follow him, he would guide us to the latter. This we immediately determined to do, and, after travelling about seven miles, came in sight of the cabin.

Our approach was announced by a loud and long-continued barking of dogs, who required frequent bidding from their master before they could be pacified. The first object worthy of remark that presented itself on our emerging from the forest, was a number of deer, bear, and other skins, fastened to a kind of rude frame, supported by poles, which occupied the area about the house. These trophies of skill in the chase were regarded

with great complacency by our conductor, as he pointed them out, and he remarked that Wells was "a great hunter, and a forehanded man." There were a number of acres of ground, from which he had gathered a crop of corn. The house was a substantial, new-built log tenement, of one room. The family consisted of the hunter and his wife, and four or five children, two of whom were men grown, and the youngest a boy of about sixteen. All, males and females, were dressed in leather prepared from deer-skins. The host himself was a middle-sized, light-limbed, sharp-faced man. Around the walls of the room hung horns of the deer and buffalo, with a rifle, shot-pouches, leather coats, dried meats, and other articles, giving unmistakeable signs of the vocation of our host. The furniture was of his own fabrication. On one side hung a deerskin, sewed up in somewhat the shape of the living animal, containing bears' oil. In another place hung a similar vessel, filled with wild honey.

All the members of the family seemed erudite in the knowledge of woodcraft, the ranges and signs of animals, and their food and habits; and while the wife busied herself in preparing our meal, she occasionally stopped to interrogate us, or take part in the conversation. When she had finished her preparations, she invited us to sit down to a delicious meal of warm corn-bread and butter, honey and milk, to which we did ample justice. A more satisfactory meal I never made.

It was late in the afternoon when our supper was prepared, and we spent the evening in giving and receiving information of the highest practical interest to each party. Wells recited a number of anecdotes of hunting, and of his domestic life. We repaid him with full accounts of our adventures. What appeared to interest him most, was the accounts of the bears and other wild animals we had seen. When the hour for rest arrived, we opened our sacks, and, spreading our blankets on a bearskin which he furnished, laid down before the fire, and enjoyed a sound night's repose.

Dec. 1st. We were up with the earliest dawning of light, and determined to regain our position at Camp No, on the

Great North Fork, with all possible despatch, and pursue our tour westward. We had understood from the conversation of the hunters among themselves, that they designed forthwith to proceed on a hunting excursion into the region we had passed, on the Great North Fork, and determined to avail ourselves of their guidance to our deposits and horse. We understood that our course from that point had been circuitous, and that the place could be reached by a direct line of twenty miles' travel due north-west. We purchased from our host a dressed deerskin for moccasins, a small quantity of Indian corn, some wild honey, and a little lead. The corn required pounding to convert it into meal. This we accomplished by a pestle, fixed to a loaded swing-pole, playing into a mortar burned into an oak stump. The payment for these articles, being made in money, excited the man's cupidity; for, although he had previously determined on going in that direction, he now refused to guide us to Camp No. unless paid for it. This was also assented to, with the agreement to furnish us with the carcass of a deer.

By eleven o'clock, A. M., all was ready, and, shouldering our knapsacks and guns, we set forward, accompanied by our host, his three sons, and a neighbor, making our party to consist of seven men, all mounted on horses but ourselves, and followed by a pack of hungry, yelping dogs. Our course was due north-west. As we were heavily laden and sore-footed, our shoes being literally worn from our feet by the stony tracts we had passed over, the cavalcade were occasionally obliged to halt till we came up. This proved such a cause of delay to them, that they finally agreed to let us ride and walk, alternately, with the young men. In this way we passed over an undulating tract, not heavily timbered, until about ten o'clock at night, when we reached our abandoned camp, where we found our baggage safe. A couple of the men had been detached from the party, early in the morning, to hunt the stipulated deer; but they did not succeed in finding any, and came in long before us, with a pair of turkeys. One of these we despatched for supper, and then all betook themselves to repose.

Dec. 2d. One of the first objects that presented itself this morning was our horse Butcher, from the neighboring cane-brake, who did not seem to have well relished his fare on cane leaves, and stood doggedly in front of our cabin, with a pertinacity which seemed to say, "Give me my portion of corn." Poor animal! he had not thriven on the sere grass and scanty water of the Ozarks, where he had once tumbled down the sides of a cliff with a pack on, been once plunged in the river beyond his depth, and often struggled with the tangled green-briar of the valleys, which held him by the foot. With every attention, he had fallen away; and he seemed to anticipate that he was yet destined to become wolf's-meat on the prairies.

The hunters were up with the earliest dawn, and several of them went out in quest of game, recollecting their promise to us on that head; but they all returned after an absence of a couple of hours, unsuccessful. By this time we had cooked the other turkey for breakfast, which just sufficed for the occasion. The five men passed a few moments about the fire, then suddenly caught and saddled their horses, and, mounting together, bid us good morning, and rode off. We were taken quite aback by this movement, supposing that they would have felt under obligation, as they had been paid for it, to furnish us some provisions. We looked intently after them, as they rode up the long sloping eminence to the north of us. They brought forcibly to my mind the theatrical representation, in the background, of the march of the Forty Thieves, as they wind down the mountain, before they present themselves at the front of the cave, with its charmed gates. But there was no "open sesame!" for us. Cast once more on our own resources in the wilderness, the alternative seemed to be pressed upon our minds, very forcibly, "hunt or starve." Serious as the circumstances appeared, yet, when we reflected upon their manners and conversation, their obtuseness to just obligation, their avarice, and their insensibility to our actual wants, we could not help rejoicing that they were gone.

Dec. 3d. Left alone, we began to reflect closely on our situation, and the means of extricating ourselves from this

position. If we had called it camp "No" from our disappointment at not finding it inhabited on our first arrival, it was now again appropriately camp "No," from not obtaining adequate relief from the hunters. We had procured a dressed buckskin for making moccasins. We had a little pounded corn, in a shape to make hunters' bread. We had not a mouthful of meat. I devoted part of the day to making a pair of Indian shoes. We had not a single charge of shot left. We had procured lead enough to mould just five bullets. This I carefully did. I then sallied out in search of game, scanning cautiously the neighboring canebrake, and fired, at different times, three balls, unsuccessfully, at turkeys. It was evident, as I had the birds within range, that my gun had been sprung in the heavy fall I had had, as before related, in the crossing Calamarca. My companion then took *his* gun, and also made an unsuccessful shot. When evening approached, a flock of turkeys came to roost near by. We had now just *one* ball left; everything depended on *that*. I took it to the large and firm stump of an oak, and cut it into exactly thirty-two pieces, with geometrical precision. I then beat the angular edges of each, until they assumed a sufficiently globular shape to admit of their being rolled on a hard surface, under a pressure. This completed their globular form. I then cleansed my companion's gun, and carefully loaded it with the thirty-two shot. We then proceeded to the roost, which was on some large oaks, in a contiguous valley. I carried a torch, which I had carefully made at the camp. My companion took the loaded gun, and I, holding the torch near the sights at the same time, so that its rays fell directly on the birds, he selected one, and fired. It proved to be one of the largest and heaviest, and fell to the earth with a sound. We now returned to camp, and prepared a part of it for supper, determining to husband the remainder so as to last till we should reach settlements by holding a due west course.

Dec. 4th. We had prepared ourselves to start west this day; but it rained from early dawn to dark, which confined us

closely to our cabin. Rain is one of the greatest annoyances to the woodsman. Generally, he has no shelter against it, and must sit in it, ride in it, or walk in it. Where there is no shelter, the two latter are preferable. But, as we had a split-board roof, we kept close, and busied ourselves with more perfect preparations for our next sally. I had some minerals that admitted of being more closely and securely packed, and gladly availed myself of the opportunity to accomplish it. Our foot and leg gear, also, required renovating. Experience had been our best teacher from the first; and hunger and danger kept us perpetually on the *qui vive*, and made us wise in little expedients.

CHAPTER VII.

PROCEED WEST — BOG OUR HORSE — CROSS THE KNIFE HILLS —
REACH THE UNICA, OR WHITE RIVER — ABANDON THE HORSE
AT A HUNTER'S, AND PROCEED WITH PACKS — OBJECTS OF PITY
— SUGAR-LOAF PRAIRIE — CAMP UNDER A CLIFF — FORD THE
UNICA TWICE — DESCEND INTO A CAVERN — REACH BEAVER
RIVER, THE HIGHEST POINT OF OCCUPANCY BY A HUNTER
POPULATION.

DEC. 5th. The rain ceased during the night, and left us a clear atmosphere in the morning. At an early hour we completed the package of the horse, and, taking the reins, I led him to the brink of the river, and with difficulty effected a passage. The cliffs which formed the western side of the valley, presented an obstacle not easily surmounted. By leading the animal in a zigzag course, however, this height was finally attained. The prospect, as far as the eye could reach, was discouraging. Hill on hill rose before us, with little timber, it is true, to impede us, but implying a continual necessity of crossing steeps and depressions. After encountering this rough surface about two miles, we came into a valley having a stream tributary to the Great North Fork of White river, which we had quitted that morning, but at a higher point. In this sub-valley we found our way impeded by another difficulty — namely, the brush and small canes that grew near the brook. To avoid this impediment, I took the horse across a low piece of ground, having a thicket, but which appeared to be firm. In this I was mistaken; for the animal's feet soon began to sink, and ere long he stuck fast. The effort to extricate him but served to sink him deeper, and, by pawing to get out, he continually widened the slough in which he had sunk. We

then obtained poles, and endeavored to pry him up; but our own footing was continually giving way, and we at length beheld him in a perfect slough of soft black mud. After getting his pack off, we decided to leave him to his fate. We carried the pack to dry ground, on one side of the valley, and spread the articles out, not without deeply regretting the poor beast's plight. But then it occurred to us that, if the horse were abandoned, we must also abandon our camp-kettle, large axe, beds, and most of our camp apparatus; and another and concentrated effort was finally resolved on. To begin, we cut down two tall saplings, by means of which the horse was pried up from the bottom of the slough. He was then grasped by the legs and turned over, which brought his feet in contact with the more solid part of the ground. A determined effort, both of horse and help, now brought him to his feet. He raised himself up, and, by pulling with all our might, we brought him on dry ground. I then led him gently to our place of deposit, and, by means of bunches of sere grass, we both busied ourselves first to rub off the mud and wet, and afterwards to groom him, and rub him dry. When he was properly restored, it was found that he was able to carry his pack-saddle and pack; and he was led slowly up the valley about three miles, where we encamped. The grass in this little valley was of a nourishing quality, and by stopping early we allowed him to recruit himself. We did not estimate our whole distance this day at more than nine miles.

Dec. 6th. Butcher had improved his time well in the tender grass during the night, and presented a more spirited appearance in the morning. We were now near the head of Bogbrook, which we had been following; and as we quitted its sides, long to be remembered for our mishap, we began to ascend an elevated and bleak tract of the Mocama or Knife hills, so called, over which the winds rushed strongly as we urged our way. Few large trees were seen on these eminences, which were often bare, with a hard cherty footing, replaced sometimes by clusters of brambles and thickets. In one of these, a valuable *couteau de chasse* was swept from its sheath at my side, and

lost. I was now reduced to a single knife, of the kind fabricated for the Indians, under the name of scalper. For a distance of sixteen miles we held on our way, in a west-south-west course, turning neither to the right nor left. As night approached, we found ourselves descending into a considerable valley, caused by a river. The shrubbery and grass of its banks had been swept by fire in the fall, and a new crop of grass was just rising. We formed our encampment in this fire-swept area, which afforded Butcher another benefit, and made some amends for his scanty fare among the bleak eminences of the Ozarks. This stream proved to be the Little North Fork of White river. We here despatched the last morsel of our turkey.

Dec. 7th. The ascent of the hills which bounded the valley on the south-west was found to be very difficult; and when the summit was reached, there spread before us an extensive prairie, of varied surface. Trees occasionally appeared, but were in no place so thickly diffused as to prevent the growth of a beautiful carpet of prairie grass. When we had gone about six miles, a bold mound-like hill rose on our left, which seemed a favorable spot for getting a view of the surrounding country. We had been told by the hunters that in travelling fifteen miles about west, we should reach a settlement at Sugar-loaf Prairie, on the main channel of the Unica or White river. But on reaching the summit of this natural lookout, we could descry nothing that betokened human habitation. As far as the eye could reach, prairies and groves filled the undulating vista. On reaching its foot again, where our horse was tied, we changed our course to the south, believing that our directions had been vague. We had gone about a mile in this direction, when we entered a faint and old horse-path. This gave animation to our steps. We pursued it about three miles, when it fell into another and plainer path, having the fresh tracks of horses. We were now on elevated ground, which commanded views of the country all around. Suddenly the opposite side of a wide valley appeared to open far beneath us, and, stepping forward the better to scan it, the river of

which we were in search presented its bright, broad, and placid surface to our view, at several hundred feet below. We stood admiringly on the top of a high, rocky, and precipitous cliff. Instinctively to shout, was my first impulse. My companion, as he came up, also shouted. We had reached the object of our search.

Pursuing the brow of the precipice about a mile, a log building and some fields were discovered on the opposite bank. On descending the path whose traces we had followed, it brought us to a ford. We at once prepared to cross the river, which was four or five hundred yards wide, reaching, in some places, half-leg high. On ascending the opposite bank, we came to the house of a Mr. M'Garey, who received us with an air of hospitality, and made us welcome to his abode. He had several grown sons, who were present, and who, as we found by their costume and conversation, were hunters. Mrs. M'G. was engaged in trying bears' fat, and in due time she invited us to sit down to a meal of these scraps, with excellent corn-bread and sassafras tea, with sugar and milk, served in cups.

M'Garey had a bluff frankness of manner, with an air of independence in the means of living, and an individuality of character, which impressed us favorably. He told us that we were eight hundred miles west of the Mississippi by the stream, that White river was navigable by keel-boats for this distance, and that there were several settlements on its banks. He had several acres in cultivation in Indian corn, possessed horses, cows, and hogs, and, as we observed at the door, a hand-mill. At a convenient distance was a smoke-house, where meats were preserved. I observed a couple of odd volumes of books on a shelf. He was evidently a pioneer on the Indian land. He said that the Cherokees had been improperly located along the western bank of White river, extending to the Arkansas, and that the effect was to retard and prevent the purchase and settlement of the country by the United States. He complained of this, as adverse to the scattered hunters, who were anxious to get titles for their lands. He did not represent the Cherokees as being hostile, or as having committed any depredations. But he depicted the Osages as the scourge and

terror of the country. They roamed from the Arkansas to the Missouri frontier, and pillaged whoever fell in their way. He detailed the particulars of a robbery committed in the very house we were sitting in, when they took away horses, clothes, and whatever they fancied. They had visited him in this way twice, and recently stole from him eight beaver-skins; and during their last foray in the valley, they had robbed one of his neighbors, called Teen Friend, of all his arms, traps, and skins, and detained him a prisoner. This tribe felt hostile to all the settlers on the outskirts of Missouri and Arkansas, and were open robbers and plunderers of all the whites who fell defenceless into their hands. They were, he thought, particularly to be dreaded in the region which we proposed to explore. He also said that the Osages were hostile to the newly-arrived Cherokees, who had migrated from the east side of the Mississippi, and had settled in the country between the Red river and Arkansas, and that these tribes were daily committing trespasses upon each other. Having myself, but a short time before, noticed the conclusion of a peace between the western Cherokees and Osages at St. Louis, before General Clark, I was surprised to hear this; but he added, as an illustration of this want of faith, that when the Cherokees returned from that treaty, they pursued a party of Osages near the banks of White river, and stole twenty horses from them.

Dec. 8th. On comparing opinions, for which purpose we had an interview outside the premises, it seemed that these statements were to be received with some grains of allowance. They were natural enough for a victim of Indian robberies, and doubtless true; but the events had not been recent, and they were not deemed sufficient to deter us from proceeding in our contemplated tour to the higher Ozarks at the sources of the river. It was evident that we had erred a good deal from our stick bridge at Calamarca, from the proper track; but we were nevertheless determined not to relinquish our object.

Having obtained the necessary information, we determined to pursue our way, for which purpose we turned the horse to graze with M'Garey's, rid ourselves of all our heavy baggage

by depositing it with him, and prepared our knapsacks for this new essay. When ready, our host refused to take any pay for his hospitalities, but, conducting us to his smokehouse, opened the door, and then, drawing his knife from its sheath, placed it, with an air of pomposity, in my hand, offering the handle-end, and said, "Go in and cut." I did so, taking what appeared to be sufficient to last us to our next expected point of meeting hunters. The place was well filled with buffalo and bear meat, both smoked and fresh, hanging on cross-bars.

At nine o'clock we bade our kind entertainer adieu, and, taking directions to reach Sugar-loaf Prairie, crossed over the river by the same ford which we had taken in our outward track from Camp No, in the valley of the Great North Fork. Relieved from the toilsome task of leading the horse, we ascended the opposite cliffs with alacrity, and vigorously pursued our course, over elevated ground, for about sixteen miles. The path then became obscure; the ground was so flinty and hard, that it was in vain we searched for tracks of horses' feet. Some time was lost in this search, and we finally encamped in a cane bottom in the river valley.

My companion had again charged himself with the coffee-pot, which he carried in a similar manner at his back; and when I came to open my pack, told me he thought I had not cut deep enough into the dried bear's meat of M'Garey's smokehouse. To a man who refused all pay, and had been invariably kind, I felt that moderation, in this respect, was due. I was, besides, myself to be the carrier of it; and we, indeed, never had cause to regret the carefulness of my selection.

Dec. 9th. Finding ourselves in the river's bottom, we forced our way, with no small effort, through the thick growth of cane and vines. We had, perhaps, advanced seven miles through this dense vegetation, when we suddenly burst into a small cleared space. Here, in a little, incomplete shanty, we found a woman and her young child. She had not a morsel to eat, and looked half famished. Her husband had gone into the forest to hunt something to eat. The child looked feeble. We were touched at the sight, and did all we could to relieve

them. They had been in that position of new-comers about two weeks, having come up from the lower parts of the river.

From this point, we ascended the river hills eastwardly, and pursued our journey along an elevated range to the Sugar-loaf Prairie—a name which is derived from the striking effects of denudation on the limestone cliffs, which occupy the most elevated positions along this valley. We were received with blunt hospitality by a tall man in leather, called Coker, whose manner appears to be characteristic of the hunter. Our approach was heralded by the usual loud and long barking of dogs, and we found the premises surrounded by the invariable indications of a successful hunter—skins of the bear and other animals, stretched out on frames to dry.

We were no sooner at home with our entertainer, than he began to corroborate what we had before heard of the hostility of the Osages. He considered the journey at this season hazardous, as he thought they had not yet broke up their fall hunting-camps, and retired to their villages on the Grand Osaw (Osage). He also thought it a poor season for game, and presented a rather discouraging prospect to our view. My gun having proved useless, we tried to obtain a rifle which he possessed, and seemed willing to part with, but not at a reasonable price.

Mr. Coker represented the settlers of Sugar-loaf Prairie to consist of four families, situated within the distance of eight miles, including both banks of the river. This was exclusive of two families living at Beaver creek, the highest point yet occupied.

Dec. 10th. It was noon before we were prepared to depart from Coker's. The old man refused to take anything for our meals and lodging; and we bade him adieu, after taking his directions as to the best route to pursue to reach Beaver creek, our next point. We travelled through a lightly-timbered, hilly, barren country, about eight miles, when the skies became overcast, and some rain fell. It was still an early hour to encamp, but we came at this time into a small ravine, with running water, which had on one bank a shelving cave in the limestone

rock, forming a protection from the rain. We built a fire from red cedar, which emitted a strong aromatic odor. The weather begins to assume a wintry character; this is the first day we have been troubled with cold fingers.

Dec. 11th. We left our camp at the cave on Cedar brook, and resumed our march at an early hour, and found the face of the country still rough and undulating, but covered, to a great extent, with brush. My companion thought we had gone far enough to have struck the waters of the Beaver, and, as he carried the compass this day, he deviated westward from the intended course. This brought us to the banks of a river, which he insisted, contrary to my opinion, must be the Beaver. To me this did not seem probable, but, yielding the point to him, we forded the stream at waist deep. We then ascended a lofty and difficult range of river hills, and, finding ourselves now at the level of the country, we held on in a westerly course, till it became clearly evident, even to my companion, that we were considerably west of the White river. We then retraced our steps, descended the river hills to the bank of the stream, and followed up its immediate margin, in search of a convenient spot for encampment; for, by this time, night approached rapidly. We were soon arrested by a precipitous cliff, against the base of which the river washed. As the sun sank lower, we felt a keen and cold wind, but could not find a stick of wood on the western bank with which to kindle a fire. The alternative presented to us was, either to remain here all night without a fire, exposed to the chilling blast, or cross a deep stream to the opposite shore, where there was an extensive alluvial plain, covered with trees and the cane plant, and promising an abundance of fuel.

Night had already closed around us, when we decided to cross the river. We found it to be four or five feet deep, and some two hundred yards wide. When we got over, it was with great difficulty that we succeeded in collecting a sufficiency of dry materials to kindle a fire; and by the time we had accomplished it, our wet clothes had become stiff and cold, the wind at the same time blowing very fiercely. Our utmost

efforts were required to dry and warm ourselves, nor did we attain these points in a sufficient degree to secure a comfortable night's rest.

Dec. 12th. The ground this morning was covered with white hoar-frost, with a keen and cold air, and a wintry sky. Early daylight found us treading our way across the low grounds to the cliffs. We soon ascended on an elevated rocky shore, bordering the river, which was completely denuded of trees and shrubbery. It was early, the sun not having yet risen, when we beheld before us, rising out of the ground, a column of air which appeared to be of a warmer temperature. Its appearance was like that of smoke from a chimney on a frosty morning. On reaching it, the phenomenon was found to be caused by a small orifice in the earth, from which rarefied air issued. On looking down intently, and partially excluding the light, it was seen to be a fissure in the limestone rock, with jagged, narrow sides, leading down into a cavern. I determined to try the descent, and found the opening large enough to admit my body. Feeling for a protuberance on which to rest my feet, and closely pressing the sides of the orifice, I slowly descended. My fear was that the crevice would suddenly enlarge, and let me drop. But I descended in safety. I thus let myself down directly about twenty feet, and came to the level floor of a gallery which led in several directions. The light from above was sufficient to reveal the dark outlines of a ramified cavern, and to guide my footsteps for a distance. I went as far in the largest gallery as the light cast any direct rays, but found nothing at all on the floor or walls to reward my adventure. It was a notable fissure in a carbonate of lime, entirely dry, and without stalactites. What I most feared in these dim recesses, was some carnivorous animal, for whose residence it appeared to be well adapted. Having explored it as far as I could command any light to retrace my steps, I returned to the foot of the original orifice. I found no difficulty, by pressing on each side, in ascending to the surface, bringing along a fragment of the limestone rock. I afterwards observed, while descending the river, that this cavern was in a

high, precipitous part of the coast, of calcareous rock, the foot of which was washed by the main channel of White river.

We now resumed our march, and, at the distance of about six miles, reached Beaver creek, a mile or two above its mouth. It is a beautiful, clear stream, of sixty yards wide, with a depth of two feet, and a hard, gravelly bottom. We forded it, and, keeping down the bank, soon fell into a horse-path, which led us, in following it about a mile and a half, to a hunter's dwelling, occupied by a man named Fisher. He received us in a friendly manner, and we took up our abode with him. Six or eight hundred yards higher, there was another cabin, occupied by a man named Holt. Both had been but a short time located at this place; they had not cleared any ground, nor even finished the log houses they occupied. Both buildings were on the bank of the river, on the edge of a large and very fertile bottom, well wooded, and with a very picturesque coast of limestone opposite, whose denuded pinnacles had received the name of the Little Tower.

CHAPTER VIII.

OBSTACLE PRODUCED BY THE FEAR OF OSAGE HOSTILITY—MEANS PURSUED TO OVERCOME IT—NATURAL MONUMENTS OF DENUDATION IN THE LIMESTONE CLIFFS—PURITY OF THE WATER—PEBBLES OF YELLOW JASPER—COMPLETE THE HUNTERS' CABINS—A JOB IN JEWELLERY—CONSTRUCT A BLOWPIPE FROM CANE—WHAT IS THOUGHT OF RELIGION.

DEC. 13th. Holt and Fisher were the highest occupants of the White river valley. They had reached this spot about four months before, and had brought their effects partly on pack-horses, and partly in canoes. The site was judiciously chosen. A finer tract of rich river bottom could not have been found, while the site commanded an illimitable region, above and around it, for hunting the deer, buffalo, elk, and other species, besides the beaver, otter, and small furred animals, which are taken in traps. We tried, at first vainly, to persuade them to accompany us in our further explorations. To this they replied that it was Osage hunting-ground, and that that tribe never failed to plunder and rob all who fell in their power, particularly hunters and trappers. And besides, they were but recent settlers, and had not yet completed their houses and improvements.

As we were neither hunters nor trappers, we had no fears of Osage hostility; for this was, in a measure, the just retribution of that tribe for an intrusion on their lands, and the destruction of its game, which constituted its chief value to them. Nor did we anticipate encountering them at all, at this season, as they must have withdrawn, long ere this, to their villages on the river Osage.

Dec. 14th. There appears no other way to induce the hunters to go with us, but to aid them in completing their cottages and improvements. This we resolved to do. Holt then agreed to accompany us as a guide and huntsman, with the further stipulation that he was to have the horse which had been left at M'Gary's, and a small sum of money, with liberty also to undertake a journey to the settlements below for corn. Hereupon, Fisher also consented to accompany us.

Dec. 15th. This obstacle to our movements being overcome, we busied ourselves in rendering to the hunters all the assistance in our power, and made it an object to show them that we could do this effectively. We began by taking hold of the frow and axe, and aiding Holt to split boards for covering a portion of the roof of his house. I doubt whether my companion had ever done the like work before; I am sure I never had; but having thrown myself on this adventure, I most cheerfully submitted to all its adverse incidents.

Dec. 16th. This morning, Holt and Fisher—the latter accompanied by his son, with three horses—set out on their journey to purchase corn, leaving us, in the interim, to provide fuel for their families; a labor by no means light, as the cold was now severe, and was daily growing more intense. To-day, for the first time, we observed floating ice in the river; and, even within the cabins, water exposed in vessels for a few moments, acquired a thin coating of ice.

Dec. 17th. At daybreak we built a substantial, rousing fire in the cabin, of logs several feet long; we then pounded the quantity of corn necessary for the family's daily use. This process brings the article into the condition of coarse grits, which are boiled soft, and it then bears the name of homony. Of this nutritious dish our meals generally consist, with boiled or fried bear's bacon, and a decoction of sassafras tea. The fat of the bear is very white and delicate, and appears to be more digestible than fresh pork, which is apt to cloy in the

stomach. After breakfast, wishing to give the hunters evidence of our capacity of being useful, we took our axes and sallied out into the adjoining wood, and began to fell the trees, cut them into proper lengths for firewood, and pile the brush. About five o'clock, we were summoned to our second meal, which is made to serve as dinner and supper. We then carried up the quantity of firewood necessary for the night. This consumed the remainder of the short December day; and, before lying down for the night, we replenished the ample fire. This sketch may serve as an outline of our daily industry, during the eleven days we tarried with the hunters.

Dec. 18th. I have mentioned the fondness of my companion for tea. This afternoon he thought to produce an agreeable surprise in our hostess's mind, by preparing a dish of young hyson. But she sipped it as she would have done the decoction of some bitter herb, and frankly confessed that she did not like it as well as the forest substitutes, namely, sassafras, dittany, and spicewood. And the manner in which she alluded to it as "store tea," plainly denoted the article not to be numbered among the wants of a hunter's life.

Dec. 19th. The river having been closed with ice within the last two days, we crossed it this afternoon to visit the two pyramidal monuments of geological denudation which mark the limestone range of the opposite shore. I determined, if possible, to ascend one of them. The ascent lies through a defile of rocks. By means of projections, which could sometimes be reached by cedar roots, and now and then a leap or a scramble, I succeeded in ascending one of them to near its apex, which gave me a fine view of the windings of the river. The monuments consist of stratified limestone, which has, all but these existing peaks, crumbled under the effects of disintegration. I observed no traces of organic remains. It appeared to be of the same general character with the metaliferous beds of Missouri, and is, viewed in extenso, like that, based on grey or cream-colored sand-rock. I found this limestone rock cavernous, about seven miles below.

In crossing the river, I was impressed with the extreme purity of the water. The ice near the cliffs having been formed during a calm night, presented the crystalline purity of glass, through which every inequality, pebble, and stone in its bed, could be plainly perceived. The surface on which we stood was about an inch thick, bending as we walked. The depth of water appeared to be five or six feet; but I was told that it was fully twenty. The pebbles at this place are often a small, pear-shaped, opaque, yellow jasper. They appear to have been disengaged from some mineral bed at a higher point on the stream.

Dec. 20th. Observed as a day of rest, it being the Sabbath. The atmosphere is sensibly milder, and attended with haziness, which appears to betoken rain.

Dec. 21st. We employed ourselves till three o'clock in hewing and splitting planks for Holt's cabin floor, when rain compelled us to desist.

The following circumstance recently occurred here: Two hunters had a dispute about a horse, which it was alleged one had stolen from the other; the person aggrieved, meeting the other some days after in the woods, shot him dead. He immediately fled, keeping the woods for several weeks; when the neighboring hunters, aroused by so glaring an outrage, assembled and set out in quest of him. Being an expert woodsman, the offender eluded them for some time; but at last they obtained a glimpse of him as he passed through a thicket, when one of his pursuers shot him through the shoulder, but did not kill him. This event happened a few days before our arrival in this region. It will probably be the cause of several murders, before the feud is ended.

Dec. 22d. The rain having ceased, we resumed and completed our job of yesterday at Holt's. The atmosphere is hazy, damp, and warm.

My medical skill had not been called on since the affair at the Four Bear creek, where my companion sprained his ankle.

The child of Mrs. Holt was taken ill with a complaint so manifestly bilious, that I gave it relief by administering a few grains of calomel. This success led to an application from her neighbor, Mrs. F., whose delicate situation made the responsibility of a prescription greater. This also proved favorable, and I soon had other applicants.

Dec. 23d. About ten o'clock this morning, Holt and Fisher returned, laden with corn. The day was mild and pleasant, the severity of the atmosphere having moderated, and the sky become clear and bright. They appeared to be pleased with the evidences of our thrift and industry during their absence, and we now anticipated with pleasure an early resumption of our journey. To this end, we were resolved that nothing should be wanting on our part. We had already faithfully devoted seven days to every species of labor that was necessary to advance their improvements.

Dec. 24th. I had yesterday commenced hewing out a table for Holt's domicile, from a fine, solid block of white-ash. I finished the task to-day, to the entire admiration of all. We now removed our lodgings from Fisher's to Holt's, and employed the remainder of the day in chinking and daubing his log house.

Of these two men, who had pushed themselves to the very verge of western civilization, it will be pertinent to say, that their characters were quite different. Holt was the better hunter, and more social and ready man. He was quick with the rifle, and suffered no animal to escape him. Fisher was of a more deliberative temperament, and more inclined to surround himself with the reliances of agriculture. He was also the better mechanic, and more inclined to labor. Holt hated labor like an Indian, and, like an Indian, relied for subsistence on the chase exclusively. Fisher was very superstitious, and a believer in witchcraft. Holt was scarcely a believer in anything, but was ever ready for action. He could talk a little Chickasaw, and had several of their chansons, which he sung. Both men had kept for years moving along on the

outer frontiers, ever ready for a new remove; and it was plain enough, to the listener to their tales of wild adventure, that they had not been impelled, thus far, on the ever advancing line of border life, from the observance of any of the sterner virtues or qualities of civilized society. There were occasions in their career, if we may venture an opinion, when to shoot a deer, or to shoot a man, were operations that could be performed "agreeably to circumstances." To us, however, they were uniformly kind, frank, friendly; for, indeed, there was no possible light in which our interests were brought in conflict. We were no professed hunters, and our journey into the Ozark hunting-grounds was an advantage to them, by making them better acquainted with the geography of their position.

They could not quit home on such a journey, however, without leaving some meat for their families; and they both set out to-day for this purpose. It appeared that they had, some days before, killed on a river bottom, about twelve miles above this point in the river valley, a buffalo, a bear, and a panther; but, not having horses with them, had scaffolded the carcasses of the two former. Notwithstanding this precaution, the wolves had succeeded in reaching the buffalo meat, and had partly destroyed it. The carcase of the bear was safe. They returned in the afternoon with their trophies. They also brought down some of the leg-bones of the buffalo, for the sake of their marrow. They are boiled in water, to cook the marrow, and then cracked open. The quantity of marrow is immense. It is eaten while hot, with salt. We thought it delicious.

We learn by conversing with the hunters that a high value is set upon the dog, and that they are sought with great avidity. We heard of one instance where a cow was given for a good hunting dog.

Dec. 25th, Christmas day. At our suggestion, the hunters went out to shoot some turkeys for a Christmas dinner, and, after a couple of hours' absence, returned with fourteen. In the meantime, we continued our labors in completing the house.

I prevailed on our hostess, to-day, to undertake a turkey-pie, with a crust of Indian meal; and, the weather being mild, we partook of it under the shade of a tree, on the banks of the river.

Dec. 26th. Having now obviated every objection, and convinced the hunters that no dangers were to be apprehended at this late season from the Osages, and having completed the preparations for the tour, to-morrow is fixed on as the time of starting.

Our hostess mentioned to me that she had a brass ring, which she had worn for many years, and declared it to be an infallible remedy for the cramp, with which she had been much afflicted before putting it on, but had not had the slightest return of it since. She was now much distressed on account of having lately broken it; and, observing the care I bestowed on my mineralogical packages, she thought I must possess skill in such affairs, and solicited me to mend it. It was in vain that I represented that I had no blowpipe or other necessary apparatus for the purpose. She was convinced I could do it, and I was unwilling to show a disobliging disposition by refusing to make the attempt. I therefore contrived to make a blowpipe by cutting several small pieces of cane, and fitting one into the other until the aperture was drawn down to the required degree of fineness. A hollow cut in a billet of wood, and filled with live hickory coals, answered instead of a lamp; and with a small bit of silver money, and a little borax applied to the broken ring, with my wooden blowpipe, I soon soldered it, and afterwards filed off the redundant silver with a small file. I must remark that the little file and bit of borax, without which the job could not have been accomplished, was produced from the miscellaneous housewife of my hostess.

Dec. 27th. Rain, which began at night, rendered it impossible to think of starting to-day. It was the Sabbath, and was improved as a time of rest and reflection. I took the occasion to make some allusions, in a gentle and unobtrusive way, to the subject, and, in connection with some remarks

which one of my entertainers had made a few days previously, on the subject of religion generally, condense the following observations:—He said that while living on the banks of the Mississippi, a few years ago, he occasionally attended religious meetings, and thought them a very good thing; but he had found one of the preachers guilty of a gross fraud, and determined never to go again. He thought that a man might be as good without going to church as with it, and that it seemed to him to be a useless expenditure, &c.; very nearly, indeed, the same kind of objections which are made by careless and unbelieving persons everywhere, I fancy, *in* the woods or *out* of them.

The hardships of the hunter's life fall heavily on females. Mrs. Holt tells me that she has not lived in a floored cabin for several years—that during this period they have changed their abode many times—and that she has lost four children, who all died under two years.

CHAPTER IX.

PROCEED INTO THE HUNTING-COUNTRY OF THE OSAGES—DILUVIAL HILLS AND PLAINS—BALD HILL—SWAN CREEK—OSAGE ENCAMPMENTS—FORM OF THE OSAGE LODGE—THE HABITS OF THE BEAVER—DISCOVER A REMARKABLE CAVERN IN THE LIMESTONE ROCK, HAVING NATURAL VASES OF PURE WATER—ITS GEOLOGICAL AND METALLIFEROUS CHARACTER—REACH THE SUMMIT OF THE OZARK RANGE, WHICH IS FOUND TO DISPLAY A BROAD REGION OF FERTILE SOIL, OVERLYING A MINERAL DEPOSIT.

My stay, which I regarded in the light of a pilgrimage, at the hunters' cabins, was now drawing to a close. I had originally reached their camps after a fatiguing and devious march through some of the most sterile and rough passages of the Ozarks, guided only by a pocket compass, and had thrown myself on their friendship and hospitality to further my progress. Without their friendly guidance, it was felt that no higher point in this elevation could be reached. Every objection raised by them had now been surmounted. I had waited their preliminary journey for corn for their families, and my companion and myself had made ourselves useful by helping, in the mean time, to complete their cabins and improvements. While thus engaged, I had become tolerably familiar with their character, physical and moral, and may add something more respecting them. Holt, as I have before indicated, was a pure hunter, expert with the rifle, and capable of the periodical exertion and activity which hunting requires, but prone to take his ease when there was meat in the cabin, and averse to all work beside. He was of an easy, good-natured temper, and would submit to a great deal of inconvenience and want, before he would rouse himself. But when out in the woods, or on the

prairies, he was quite at home. He knew the habits and range of animals, their time for being out of their coverts, the kind of food they sought, and the places where it was likely to be found. He had a quick eye and a sure aim, and quadruped or bird that escaped him, must be nimble. He was about five feet eight inches in height, stout and full faced, and was particular in his gear and dress, but in nothing so much as the skin wrapper that secured his rifle-lock. This was always in perfect order.

Fisher was two or three inches taller, more slender, lank of features, and sterner. He was a great believer in the bewitching of guns, seemed often to want a good place to fire from, had more deliberation in what he did, and was not so successful a sportsman. He had, too, when in the cabin, more notions of comfort, built a larger dwelling, worked more on it, and had some desires for cultivation. When on the prairie, he dismounted from his horse with some deliberation; but, before he was well on terra firma, Holt had slid off and killed his game. The shots of both were true, and, between them, we ran no danger of wanting a meal.

It was the twenty-eighth day of December before every objection to their guiding us was obviated, and, although neither of them had been relieved from the fear of Osage hostility, they mounted their horses in the morning, and announced themselves ready to proceed. Our course now lay toward the north-west, and the weather was still mild and favorable. We ascended through the heavily-timbered bottom-lands of the valley for a mile or two, and then passed by an easy route through the valley cliffs, to the prairie uplands north of them. After getting fairly out of the gorge we had followed, we entered on a rolling highland prairie, with some clumps of small forest trees, and covered, as far as the eye could reach, with coarse wild grass, and the seed-pods of autumnal flowers, nodding in the breeze. It was a waving surface. Sometimes the elevations assumed a conical shape. Sometimes we crossed a depression with trees. Often the deer bounded before us, and frequently the sharp crack of the rifle was the first intimation to me that game was near. Holt told me that the

error of the young or inexperienced hunters was in looking too far for their game. The plan to hunt successfully was, to raise the eye slowly from the spot just before you, for the game is often close by, and not to set it on distant objects at first. We moved on leisurely, with eyes and ears alert for every sight and sound. A bird, a quadruped, a track—these were important themes.

When night approached, we encamped near the foot of an eminence, called, from its appearance, the Bald Hill. An incident occurred early in our march, which gave us no little concern. A fine young horse of one of the neighboring hunters, which had been turned out to range, followed our track from White river valley, and, notwithstanding all the efforts of our guides, could not be driven back. At length they fired the dry prairie-grass behind us, the wind serving, deeming this the most effectual way of driving him back. The expedient did not, however, prove eventually successful; for, after a while, the animal again made his appearance. We lost some time in these efforts. It was thought better, at length, that I should ride him, which was accomplished by placing a deerskin upon his back by way of saddle, with a kind of bridle, &c. The animal was spirited, and, thus mounted, I kept up with the foremost.

We travelled to-day about ten miles. The day was clear, but chilly, with a north-westerly wind, which we had to face. Holt had killed a young doe during the day, which was quickly skinned, and he took along the choice parts of it for our evening's repast. Part of the carcase was left behind as wolf's meat.

Dec. 20th. Little change appeared in the country. For about six miles we travelled over hill and dale, meeting nothing new, but constantly expecting something. We then descended into the valley of Swan creek—a clear stream of thirty yards wide, a tributary of White river. Its banks present a rich alluvial bottom, well wooded with maple, hickory, ash, haggerberry, elm, and sycamore. We followed up this valley about five miles, when it commenced raining, and we were compelled

to encamp. Protection from the rain, however, was impossible. We gained some little shelter under the broad roots of a clump of fallen trees and limbs, and passed a most comfortless night, being wet, and without a fire.

The next morning, (Dec. 30th,) at the earliest dawn, we were in motion. After ascending the Swan creek valley about nine miles, through a most fertile tract, we fell into the Osage trail, a well-beaten horse-path, and passed successively three of their deserted camps, which had apparently been unoccupied for a month or more. The poles and frames of each lodge were left standing, and made a most formidable show. The paths, hacked trees, and old stumps of firebrands, showed that they had been deserted in the fall. The fear of this tribe now appeared to have left the minds of our guides. These encampments were all very large, and could probably each have accommodated several hundred persons.

The form of the Osage lodge may be compared to a hemisphere, or an inverted bird's-nest, with a small aperture left in the top for the escape of smoke, and an elongated opening at the side, by way of door, to pass and repass. It is constructed by cutting a number of flexible green poles, sharpened at one end, and stuck firmly in the ground. The corresponding tops are then bent over and tied, and the framework covered with linden bark. These wigwams are arranged in circles, one line of lodges within another. In the centre is a scaffolding for meat. The chief's tent is conspicuously situated at the head of each encampment. It is different from the rest, resembling an inverted half cylinder. The whole is arranged with much order and neatness, and evinces that they move in large parties, that the chiefs exercise a good deal of authority.

The Osages are a tribe who have from early times been prominent in the south-west, between the Arkansas and Missouri. The term Osage is of French origin; it seems to be a translation of the Algonquin term Assengigun, or Bone Indians. Why? They call themselves Was-ba-shaw, and have a curious allegory of their having originated from a beaver and a snail. They are divided into two bands, the Little and Great Osages, the latter of whom make their permanent encampments on the

river Osage of the Missouri. The Ozarks appear from early days to have been their hunting-grounds for the valuable furred animals, and its deep glens and gorges have served as nurseries for the bear. They are one of the great prairie stock of tribes, who call God Wacondah. They are physically a fine tribe of men, of good stature and courage, but have had the reputation, among white and red men, of being thieves and plunderers. Certainly, among the hunter population of this quarter, they are regarded as little short of ogres and giants; and they tell most extravagant tales of their doings. Luckily, it was so late in the season that we were not likely to encounter many of them.

In searching the precincts of the old camps, my guides pointed out a place where the Indians had formerly pinioned down Teen Friend, one of the most successful of the white trappers in this quarter, whom they had found trapping their beaver in the Swan creek valley. I thought it was an evidence of some restraining fear of our authorities at St. Louis, that they had not taken the enterprising old fellow's scalp, as well as his beaver packs.

Life in the wilderness is dependent on contingencies, which are equally hard to be foreseen or controlled. We are, at all events, clearly out of the jurisdiction of a justice of the peace. And the maxim that we have carefully conned over in childhood, "No man may put off the law of God," is but a feeble reliance when urged against the Osages or Pawnees.

Deeming themselves now high enough up the Swan creek valley, my guides determined to leave it, and turned their horses' heads up a gorge that led to the open plains. We now steered our course north-west, over an elevated plain, or prairie, covered, as usual, with ripe grass. We followed across this tract for about twenty miles, with no general deviation of our course, but without finding water. In search of this, we pushed on vigorously till night set in, when it became intensely dark, and we were in danger of being precipitated, at every step, into some hole, or down some precipice. Darkness, in a prairie, places the traveller in the position of a ship at sea, without a compass; to go on, or to stop, seems equally perilous. For

some two hours we groped our way in this manner, when one of the guides shouted that he had found a standing pool. Meantime, it had become excessively dark. The atmosphere was clouded over, and threatened rain. On reaching the pool, there was no wood to be found, and we were compelled to encamp without a fire, and laid down supperless, tired, and cold.

My guides were hardy, rough fellows, and did not mind these omissions of meals for a day together, and had often, as now, slept without camp-fires at night. As the object seemed to be a trial of endurance, I resolved not to compromit myself by appearing a whit less hardy than they did, and uttered not a word that might even shadow forth complaint. This was, however, a cold and cheerless spot at best, with the wide prairie for a pillow, and black clouds, dropping rain, for a covering.

The next morning, as soon as it was at all light, we followed down the dry gorge in which we had lain, to Findley's Fork—a rich and well-timbered valley, which we descended about five miles. As we rode along through an open forest, soon after entering this valley, we observed the traces of the work of the beaver, and stopped to view a stately tree, of the walnut species, which had been partially gnawed off by these animals. This tree was probably eighteen or twenty inches in diameter, and fifty feet high. The animals had gnawed a ring around it, but abandoned their work. It had afterwards been undermined by the freshets of the stream, and had fallen. Was it too hard a work? If so, it would seem that some instinct akin to reason came to their aid, in leading them to give up their essay.

There was now every appearance of a change of weather. It was cold, and a wintry breeze chilled our limbs. I thought my blood was as warm as that of my guides, however, and rode on cheerfully. At length, Holt and Fisher, of their own motion, stopped to kindle a fire, and take breakfast. We had still plenty of fresh venison, which we roasted, as each liked, on spits. Thus warmed and refreshed, we continued down the valley, evidently in a better philosophical mood; for a man always reasons better, and looks more beneficently about him, this side of starvation.

I observed a small stream of pure water coming in on the north side, which issued through an opening in the hills; and as this ran in the general direction we were pursuing, the guides led up it. We were soon enclosed in a lateral valley, with high corresponding hills, as if, in remote ages, they had been united. Very soon it became evident that this defile was closed across and in front of us. As we came near this barrier, it was found that it blocked up the whole valley, with the exception of the mouth of a gigantic cave. The great width and height of this cave, and its precipitous face, gave it very much the appearance of some ruinous arch, out of proportion. It stretched from hill to hill. The limpid brook we had been following, ran from its mouth. On entering it, the first feeling was that of being in "a large place." There was no measure for the eye to compute height or width. We seemed suddenly to be beholding some secret of the great works of nature, which had been hid from the foundation of the world. The impulse, on these occasions, is to shout. I called it Winoca.* On advancing, we beheld an immense natural vase, filled with pure water. This vase was formed from concretions of carbonate of lime, of the nature of stalagmite, or, rather, stalactite. It was greyish-white and translucent, filling the entire breadth of the cave. But, what was still more imposing, another vase, of similar construction, was formed on the next ascending plateau of the floor of the cave. The water flowed over the lips of this vase into the one below. The calcareous deposit seems to have commenced at the surface of the water, which, continually flowing over the rims of each vase, increases the deposit.

The height of the lower vase is about five feet, which is inferable by our standing by it, and looking over the rim into the limpid basin. The rim is about two and a half inches thick. Etruscan artists could not have formed a more singular set of capacious vases.

The stream of water that supplies these curious tanks, rushes with velocity from the upper part of the cavern. The bottom

* From the Osage word for an underground spirit.

of the cave is strewed with small and round calcareous concretions, about the size of ounce balls, of the same nature with the vases. They are in the condition of stalagmites. These concretions are opaque, and appear to have been formed from the impregnated waters percolating from the roof of the cavern. There are evidences of nitric salts in small crevices. Geologically, the cavern is in the horizontal limestone, which is evidently metalliferous. It is the same calcareous formation which characterizes the whole Ozark range. Ores of lead (the sulphurets) were found in the stratum in the bed of a stream, at no great distance north of this cave; and its exploration for its mineral wealth is believed to be an object of practical importance.

I had now followed the geological formation of the country far south-westwardly. The relative position of the calcareous, lead-bearing stratum, had everywhere been the same, when not disturbed or displaced. Wide areas on the sources of the Maramec, Gasconade, and Osage, and also of the Currents, Spring river, and Elevenpoints and Strawberry, were found covered by heavy drift, which concealed the rock; but wherever valleys had been cut through the formation by the stream, and the strata laid bare, they disclosed the same horizontality of deposit, and the same relative position of limestone and sandstone rock.

Jan. 10th. 1819.

CHAPTER X.

DEPART FROM THE CAVE—CHARACTER OF THE HUNTERS WHO GUIDED THE AUTHOR—INCIDENTS OF THE ROUTE—A BEAUTIFUL AND FERTILE COUNTRY, ABOUNDING IN GAME—REACH THE EXTREME NORTH-WESTERN SOURCE OF WHITE RIVER—DISCOVERIES OF LEAD-ORE IN A PART OF ITS BED—ENCAMP AND INVESTIGATE ITS MINERALOGY—CHARACTER, VALUE, AND HISTORY OF THE COUNTRY—PROBABILITY OF ITS HAVING BEEN TRAVERSED BY DE SOTO IN 1541.

It was the last day of the year 1818, when we reached the cave of Winoca, as described in the preceding chapter, on the Ozark summit. An inspection of the country had shown the fact that the mineral developments of its underlying rocks were of a valuable character, while the surface assumed the most pleasing aspect, and the soil, wherever examined, appeared to be of the very richest quality. The bold, rough hunters, who accompanied me, thought of the country only as an attractive game country, which it was a great pity, they said, that the Indians alone should occupy; and they had very little curiosity about anything that did not minister to their immediate wants. They had lived for so long a time by the rifle, that they had a philosophy of the rifle. It was the ready arbiter between themselves, and the animal creation, and the Indians, and even other hunters. Neither the striking agricultural or mineral resources of the country, arrested much attention on their part. And as soon as I was ready to relinquish my examinations at the cave and proceed, they were ready to resume their horses and lead forward. Unfortunately, it was now severely cold, and everything in the heavens prognosticated its increasing severity.

On leaving the Valley of the Cave, and ascending the hills that environed it, we passed over a gently sloping surface of hill and vale, partly covered with forest trees, and partly in prairies. I have seldom seen a more beautiful prospect. The various species of oaks and hickories had strewed the woods with their fruits, on which the bear and wild turkey revelled, while the red deer was scarcely ever out of sight. Long before the hour of encampment had arrived, the hunters had secured the means of our making a sumptuous evening meal on wild viands; and when, at an early hour, we pitched our camp on the borders of a small brook, Holt, who was ever ready with the rifle, added a fat brandt from this brook to our stores. We had not travelled more than twelve miles, but we had a sharp wind to face, the day being severe; and nothing was so agreeable, when we halted, as the fire, around which we enjoyed ourselves, as we each displayed our skill in forest cookery. There was cutting, and carving, and roasting, in the true prairie style. We then prepared our couches and night-fires, and slept. At the earliest peep of light, we were again in motion.

The 1st of January, 1819, opened with a degree of cold unusual in these regions. Their elevation is, indeed, considerable; but the wind swept with a cutting force across the open prairies. We were now on the principal north-western source of White river, the channel of which we forded in the distance of two miles. The western banks presented a naked prairie, covered with dry grass and autumnal weeds, with here and there a tree. We pushed on towards the north-east. The prairie-hen, notwithstanding the cold, rose up in flocks before us, as we intruded upon their low-couched positions in the grass. Of these, Holt, whose hunting propensities no cold could restrain, obtained a specimen; he also fired at and killed a wild goose from the channel of the river. On passing about four miles up the western banks of the stream, we observed a lead of lead-ore, glittering through the water in the bed of the river, and determined to encamp at this spot, for the purpose of investigating the mineral appearances. The weather was piercingly cold. We found some old Indian camps near at hand,

and procured from them pieces of bark to sheath a few poles and stakes, hastily put up, to form a shelter from the wind. A fire was soon kindled, and, while we cooked and partook of a forest breakfast, we recounted the incidents of the morning, not omitting the untoward state of the weather. When the labor of building the shanty was completed, I hastened to explore the geological indications of the vicinity.

The ore which had attracted our notice in the bed of the stream, existed in lumps, which presented bright surfaces where the force of the current had impelled its loose stony materials over them. It was a pure sulphuret of lead, breaking in cubical lines. I also observed some pieces of hornblende. It was not easy to determine the original width of the bed of ore. Its course is across the stream, into the banks of red marly clay on which we had encamped. Its geological position is in every respect similar to the metalliferous deposits at Potosi, except that there were no spars, calcareous or barytic, in sight. I gathered, in a few minutes, a sufficient number of specimens of the ore for examination, and employed myself in erecting, on the banks of the river, a small furnace, of the kind called "log-furnace" in Missouri, to test its fusibility. In the meantime, my New England companion took a survey of the surrounding country, which he pronounced one of the most fertile, and admirably adapted to every purpose of agriculture. Much of the land consists of prairie, into which the plough can be immediately put. The forests and groves, which are interspersed with a park-like beauty through these prairies, consist of various species of oaks, maple, white and black walnut, elm, mulberry, hackberry, and sycamore.

Holt and Fisher scanned the country for game, and returned to camp with six turkeys and a wolf. Their fear of the Osages had been only apparently subdued. They had been constantly on the look-out for signs of Indian enemies, and had their minds always filled with notions of hovering Osages and Pawnees. The day was wintry, and the weather variable. It commenced snowing at daylight, and continued till about eight o'clock, A. M. It then became clear, and remained so, with occasional flickerings, until two o'clock, when a fixed snow-

storm sat in, and drove me from my little unfinished furnace, bringing in the hunters also from the prairies, and confining us strictly to our camp. This storm continued, without mitigation, nearly all night.

Jan. 3d. The snow ceased before sunrise, leaving the country wrapped in a white mantle. The morning was cold; the river began to freeze about nine o'clock, and continued till it was closed. The weather afforded an opportunity for continuing the explorations and examinations commenced yesterday. I found that the red clay afforded a good material for laying the stones of my lead-furnace, and continued working at it for a part of the day. The hunters came in with the carcasses of two deer, and the skin of a black wolf. Except in its color, I could not distinguish any permanent characteristics in the latter differing from the large grey wolf, or coyote. Its claws, snout, and ears, were the same—its tail, perhaps, a little more bushy. The size of this animal, judging from the skin, must have been double that of the little prairie-wolf, or *myeengun* of the Indians of the North.

I found the bed of the stream, where it permitted examination, to be non-crystalline limestone, in horizontal beds, corresponding to the formation observed in the cave of Winoca. Its mineral constituents were much the same. The country is one that must be valuable hereafter for its fertility and resources. The prairies which extend west of the river are the most extensive, rich, and beautiful, of any which I have yet seen west of the Mississippi. They are covered with a most vigorous growth of grass. The deer and elk abound in this quarter, and the buffalo is yet occasionally seen. The soil in the river valley is a rich black alluvion. The trees are often of an immense height, denoting strength of soil. It will probably be found adapted to corn, flax, hemp, wheat, oats, and potatoes; while its mining resources must come in as one of the elements of its future prosperity.

I planted some peach-stones in a fertile spot near our camp, where the growth of the sumac denoted unusual fertility. And it is worthy of remark that even Holt, who had the antipathy

of an Indian to agriculture, actually cut some bushes in a certain spot, near a spring, and piled them into a heap, by way of securing a pre-emption right to the soil.

The region of the Ozark range of mountain-development is one of singular features, and no small attractions. It exhibits a vast and elevated tract of horizontal and sedimentary strata, extending for hundreds of miles north and south. This range is broken up into high cliffs, often wonderful to behold, which form the enclosing walls of river valleys. The Arkansas itself forces its way through, about the centre of the range. The Washita marks its southern boundary. The St. Francis and the Maramec, at the mouth of the former of which De Soto landed, constitute its northern limits. The junction of the Missouri with the Mississippi may be said to be its extreme northern development. The Missouri, from the influx of the Osage, is pushed northward by the Ozark range. It rests, on the south, upon the primitive granites, slates, and quartz rock, of Washita. The celebrated Hot Springs issue from it. The long-noted mines of Missouri, which once set opinion in France in a blaze, extend from its north-eastern flanks. The primitive sienites and hornblende rock of the sources of the St. Francis and Grand rivers, support it. The Unica or White river, the Strawberry, Spring river, Currents and Black rivers, descend from it, and join the Mississippi. The Great and Little Osage, and the Gasconage, flow into the Missouri. The great plains, and sand-desert, which stretches at the eastern foot of the Rocky mountains, lie west of it. It is not less than two hundred miles in breadth. No part of the central regions of the Mississippi valley exhibits such a variety in its geological constituents, or such a striking mineralogical development. Its bodies of the ore of iron called iron-glance, are unparalleled. These are particularly developed in the locality called Iron Mountain, or the sources of the St. Francis. Its ores of lead, zinc, antimony, and manganese, are remarkable. Its limestones abound in caves yielding nitre. Salt and gypsum are found in the plains on its western borders. Its large blocks of quartz rock, which are found north of the Arkansas river, particularly scattered over the formations crossing the Little

Red, Buffalo, and White rivers, about the Buffalo shoals, furnish indications of the diluvial gold deposit, which would justify future examination.

Through these alpine ranges De Soto roved, with his chivalrous and untiring army, making an outward and inward expedition into regions which must have presented unwonted hardships and discouragements to the march of troops. To add to these natural obstacles, he found himself opposed by fierce savage tribes, who rushed upon him from every glen and defile, and met him in the open grounds with the most savage energy, His own health finally sank under these fatigues; and it is certain that, after his death, his successor in the command, Moscoso, once more marched entirely through the southern Ozarks, and reached the buffalo plains beyond them. Such energy and feats of daring had never before been displayed in North America; and the wonder is at its highest, after beholding the wild and rough mountains, cliffs, glens, and torrents, over which the actual marches must have laid.

Some of the names of the Indian tribes encountered by him, furnish conclusive evidence that the principal tribes of the country, although they have changed their particular locations since the year 1542, still occupy the region. Thus, the Kapa-has, who then lived on the Mississippi, above the St. Francis, are identical with the Quappas, the Cayas with the Kansas, and the Quipana with the Pawnees.

CHAPTER XI.

SEVERE WINTER WEATHER ON THE SUMMIT OF THE OZARKS—
FALSE ALARM OF INDIANS—DANGER OF MY FURNACE, ETC.,
BEING HEREAFTER TAKEN FOR ANTIQUITIES—PROCEED SOUTH
—ANIMAL TRACKS IN THE SNOW—WINOCA OR SPIRIT VALLEY
—HONEY AND THE HONEY-BEE—BUFFALO-BULL CREEK—ROBE
OF SNOW—MEHAUSCA VALLEY—SUPERSTITIOUS EXPERIMENT OF
THE HUNTERS—ARRIVE AT BEAVER CREEK.

THE indications of severe weather, noticed during the last day of December, and the beginning of January, were not deceptive; every day served to realize them. We had no thermometer; but our feelings denoted an intense degree of cold. The winds were fierce and sharp, and snow fell during a part of each day and night that we remained on these elevations. We wrapped our garments closely about us at night, in front of large fires, and ran alternately the risk of being frozen and burnt. One night my overcoat was in a blaze from lying too near the fire. This severity served to increase the labor of our examinations; but it did not, that I am aware, prevent anything essential.

On the fourth day of my sojourn here, a snow-storm began, a little before one o'clock in the morning; it ceased, or, as the local phrase is, "held up," at daybreak. The ground was now covered, to a depth of from two to three inches, with a white mantle. Such severity had never been known by the hunters. The winds whistled over the bleak prairies with a rigor which would have been remarkable in high northern latitudes. The river froze entirely over. The sun, however, shone out clearly as the day advanced, and enabled me to complete my examina-

tions, as fully as it was practicable to do, under the existing state of the weather.

It happened, on this day, that my companion had walked a mile or two west, over the smooth prairie, to get a better view of the conformation of the land, returning to camp before the hunters, who had also gone in the same general direction. On their coming back, one of them, whose head was always full of hostile Osages, fell on his returning track in the snow, and carefully traced it to our camp. He came in breathless, and declared that the Osages were upon us, and that not a moment was to be lost in breaking up our camp, and flying to a place of security. When informed of the origin of the tracks, he still seemed incredulous, and could not be pacified without some difficulty. We then prepared, by collecting fuel, and increasing our bark defences against the wind and snow, to pass another night at the camp.

I had now followed the Ozarks as far as it seemed practicable, and reached their western summit, notwithstanding every discouragement thrown in my way by the reports of the hunters, from the first moment of my striking the White river; having visited the source of nearly every river which flows from it, both into the Missouri and the Mississippi. I had fully satisfied myself of its physical character and resources, and now determined to return to the camps of my guides at Beaver creek, and continue the exploration south.

It was the 5th of January, 1819, when we prepared our last meal at that camp, and I carefully put up my packages in such portable shape as might be necessary. Some time was spent in looking up the horses, which had been turned into a neighboring canebrake. The interval was employed in cutting our names, with the date of our visit, on a contiguous oak, which had been previously blazed for the purpose. These evidences of our visit were left, with the pit dug in search of ore, and the small smelting-furnace, which, it is hoped, no zealous antiquarian will hereafter mistake for monuments of an elder period of civilization in the Mississippi valley. When this was accomplished, and the horses brought up, we set out with alacrity. The snow still formed a thin covering on the ground,

and, being a little softened by the sun, the whole surface of the country exhibited a singular map of the tracks of quadrupeds and birds. In these, deer, elk, bears, wolves, and turkeys, were prominent—the first and last species, conspicuously so. In some places, the dry spots on the leaves showed where the deer had lain during the storm. These resting-spots were uniformly on declivities, which sheltered the animal from the force of the wind. Frequently we crossed wolf-trails in the snow, and, in one or two instances, observed places where they had played or fought with each other, like a pack of dogs—the snow being tramped down in a circle of great extent. We also passed tracts of many acres, where the turkeys had scratched up the snow, in search of acorns. We frequently saw the deer fly before us, in droves of twenty or thirty. They will bound twenty feet at a leap, as measured, on a gentle declivity. This animal is impelled by a fatal curiosity to stop and turn round to look at the cause of its disturbance, after running a distance. It is at this moment that the hunter generally fires.

About noon, we reached and crossed Findley's Fork, or the Winoca valley—the locality of the cave. Two miles south of it, in ascending an elevation, our ears were saluted by a murmuring sound in the air, which the hunters declared to be single bees, flying in a line. I observed one of them directing its flight to the top of a large oak, which was thus indicated as the repository of their honey. My companion and myself proceeded to chop it down, while the hunters stood by. It was of the white-oak species, and was judged to be two feet and a half across. When it fell, a hollow limb was fractured, disclosing a large deposit of most beautiful white honeycombs. We ate without stint, sometimes dipping cooked pieces of venison (we had no bread) in the fluid part. The remainder was then wrapped up in a freshly flayed deerskin, and firmly tied, to be carried to the hunters' cabins at Beaver creek on one of the horses.

We now resumed our route. As evening approached, we entered the head of a valley formed out of the plain, toward our right. It turned out to be a stream known to them, in

their buffalo hunts, as Bull creek. Here we encamped, having travelled about twenty miles. The weather continued moderately cold during the day, the sun not having attained sufficient power to melt the snow. A single deer was the trophy of this day's hunt.

Morning found us, as we arose from our couches, in a small, brushy, and tangled valley, through which it was not easy to make our way. The weather was raw, cold, and lowering, and the hunters did not seem inclined to make an early start. It was determined to replenish our fire, and breakfast, first. It was a rough region, and cost some exertion and fatigue to get out of its tangled defiles, and ascend the plains south of it. These impediments consumed so much time, that we made but slow progress. The atmosphere was so obscure, that it was difficult to determine the proper course; and it was evident that the guides did not know exactly where they were. At length they entered one of the lateral valleys of Swan creek, the Mehausca of the Osages. In this, after following it down some distance, we encamped. The atmosphere was clouded up, and betokened falling weather.

The next morning, (Jan. 7th), when I awoke, I felt an extra pressure of something on my blanket, which had the effect to keep off the wind, and produce warmth; and on opening its folds, I threw off a stratum of an inch or two of snow. We had been fatigued by the day's march, and slept soundly.

Some eight miles' travel brought us to the junction of this little tributary with the Mehausca, where our guides, by recognizing known objects, reassured themselves of their true position. It was, however, still hazy and obscure, and doubts soon again arose in their minds as to the proper course. After travelling some miles in this perplexity, they were at length relieved by observing a known landmark in the peak of Bald hill. This mark was, however, soon lost sight of, and, the atmosphere still continuing overclouded, dark, and hazy, they speedily became again bewildered. I was surprised at this; it denoted a want of precision of observation, which an Indian certainly could not have been charged with. He is able, in the worst weather, to distinguish the *north* from the *south* face

of a mature and weathered tree—a species of knowledge, of the utmost consequence to him in his forest wanderings.

An experiment, of letting a certain horse take his course homeward, by throwing the reins upon his neck, was adopted by our guides; but after trying it for some time, it was found necessary to give it up. It was clear that the animal was going directly from home; and Fisher, who believed in bewitched guns, was obliged to yield the point. Not long after resuming the reins, Holt announced, in the dense atmosphere which enveloped us, that we were ascending the valley hills that border the main channel of White river. As soon as this was verified, and we had reached the highest point, the guides both fired their rifles, to advertise their families, on the bottom-lands below, of their approach; and we were soon welcomed, at the hunters' cabins at the mouth of Beaver creek, "by dogs, women, and children, all greasy and glad."

During this trip, I had listened to frequent recitals of the details of hunting the bear, beaver, deer, and other animals, the quality of dogs, the secret of baits, &c.—a species of forest lectures, the details of which, at the moment, were new to me, and had the charm of novelty, and the merit of information; but which it is unimportant, at this length of time, to repeat.*

* Vide Journal of a Tour into the Interior of Missouri and Arkansas. London, 1821.

CHAPTER XII.

DESCEND WHITE RIVER IN A CANOE—ITS PURE WATER, CHARACTER, AND SCENERY—PLACES OF STOPPING—BEAR CREEK—SUGAR-LOAF PRAIRIE—BIG CREEK—A RIVER PEDLAR—POT SHOALS—MOUTH OF LITTLE NORTH FORK—DESCEND FORMIDABLE RAPIDS, CALLED THE BULL SHOALS—STRANDED ON ROCKS—A PATRIARCH PIONEER—MINERALOGY—ANTIQUE POTTERY AND BONES—SOME TRACE OF DE SOTO—A TRIP BY LAND—REACH THE MOUTH OF THE GREAT NORTH FORK.

I DETERMINED to descend the river from the hunters' cabins at Beaver creek, being the highest location to which a pioneer hunting population had pushed, and with this view purchased a large and new canoe, of about twenty feet in length, from the enterprising hunters. Putting into this such articles from our former packs as were deemed necessary, and some provisions, I took the bow, with a long and smooth pole to guide it in rapids and shoals, and gave the stern to my companion, with a steering-paddle. It was now the 9th of January. Bidding adieu to our rough, but kind and friendly guides, we pushed into the stream, and found ourselves floating, with little exertion, at the rate of from three to four miles per hour. The very change from traversing weary plains and prairies, and ascending steep cliffs, was exhilarating and delightful.

White river is one of the most beautiful and enchanting streams, and by far the most transparent, which discharge their waters into the Mississippi. To a width and depth which entitle it to be classed as a river of the third magnitude in Western America, it unites a current which possesses the purity of crystal, with a smooth and gentle flow, and the most imposing, diversified, and delightful scenery. Objects can be clearly

seen in it, through the water, at the greatest depths. Every pebble, rock, fish, or shell, even the minutest body which occupies the bottom of the stream, is seen with the most perfect distinctness; and the canoe, when looking under it, seemed, from the remarkable transparency of the water, to be suspended in air. The Indians, observing this peculiarity, called it *Unica*, which is the transitive form of *white*. The French of Louisiana merely translated this term to *la riviere au Blanc*. It is, in fact, composed of tributaries which gush up in large crystal springs out of the Ozark range of mountains, and it does not receive a discoloured tributary in all its upper course. These gigantic springs, which are themselves a curiosity, originate in the calcareous or sandstone strata of that remarkable chain, and are overlaid by a heavy oceanic deposit of limestone, quartz, hornstone, and chert pebbles, which serve as a filtering-bed to the upspringing waters. Sometimes these pebbles are found to be jasper, of a beautiful quality.

The scenery of its shores is also peculiar. Most frequently the limestone, which has been subjected to the destructive power of the elements, is worn into pinnacles of curious spiral shapes. Where the river washes the base of these formations, a high and precipitous wall of rock casts its shadow over the water. On the shores opposite to such precipices, there is invariably a rich diluvial plain, covered by a vigorous forest of trees, clothed in all the graceful luxuriance of a summer foliage.

If the shores be examined to any distance inland, the calcareous rock is found to exhibit frequent caverns, where the percolation of the waters has produced stalactites of beautiful forms, or the concretions are spread upon the floors of these caves in curious masses.

Often, upon the shores, we observed the graceful doe. At early hours in the morning, the wild turkeys appeared in large flocks, with their plumage glistening in the light. The duck, goose, and brant, often rose up before us, and lighted in the stream again below us; and we thus drove them, without intending it, for miles. Sometimes, perched on some high pinnacle or towering tree, the eagle, hawk, or heron, surveyed

our descent, as if it were an intrusion upon their long undisturbed domain.

A few miles below our point of embarkation, we passed, on the left shore, a precipitous wall of calcareous rock, on the summit of which I observed the location of the cavern, into the mouth of which I descended some twenty or thirty feet, on my outward journey; and it now seemed probable that the ramifications which I saw by the dim light admitted, were of an extensive character.

As the shades of night overtook us, a hunter's cabin was descried on the left shore, where a landing was made. It proved to be occupied by a person of the name of Yochem, who readily gave us permission to remain for the night. He told us we had descended thirty miles. He regaled us hospitably with wild viands, and, among other meats, the beaver's tail—a dish for epicures.

Resuming the descent at an early hour, a couple of miles brought us to the inlet of Bear creek—a stream coming in on the right side, which is described as long, narrow, and crooked. Nothing denoted that man had ever made his residence along this part of the stream. We floated on charmingly. At every turn, some novel combination of scenery presented itself. As evening drew near, a hunter's cabin appeared on our right, and, a couple of miles further, another on our left, near one of those natural monuments of denudation common to the limestone of this river, which is called the Sugar-loaf. We stopped for the night at this habitation, and found it to be occupied by a Mr. Coker. The old man received us with the usual frank and friendly air and manner of a hunter. More than fifty years must have marked his frontier pilgrimage on its constantly shifting boundary. He stood some six feet three in height, was erect and thin, and looked like one of the patriarchs of the woods, who, cherishing his personal independence and his rifle, had ever relied upon his own arm for a support, and distrusted nothing on earth half so much as Indians. In his view, the Osages were the perfection of robbers; and he congratulated us on getting out of their country with our scalps safely on our heads, and our “plunder” (a common word here

for baggage) untouched. It appeared from his estimates that we had descended the river twenty-five miles.

Rain fell copiously during the night; but it ceased before daylight (11th), by the earliest gleams of which we were again in motion, descending the pellucid river. At the computed distance of sixteen miles, we passed the mouth of Big river, a considerable stream on the left banks, where I halted a few moments to see a new location which had just been commenced. A small clearing had been made in the dense canebrake, and a log house commenced. Shortly below this spot, we encountered a river pedlar, ascending the stream with his commodities in a canoe. On conversing with him, I found his knowledge of affairs very local and partial. Of the outer world, and of its news, he knew nothing.

At every stage of our progress, the river was increasing in its volume; and, soon after this occurrence, we observed its velocity accelerated, and almost imperceptibly found ourselves gliding rapidly over the Pot Shoals. This rapid appeared less formidable than had been anticipated. I rose up to observe the draught of the current, and, by a few strokes of the pole, kept the canoe in the force of the stream. About seven miles below these shoals, and just as evening closed in, a house appeared on the left shore. It proved to be M'Garey's, at whose domicile we had originally struck on crossing the wilderness from Potosi. He was glad to hail our return from a region, against the Indian occupants of which, he had decidedly warned us on our outward trip, but from whom we had fortunately received no injury. He informed us that we had this day descended the river forty miles, that being the received distance to Sugar-loaf Prairie.

We were indeed cordially received as old acquaintances, and congratulated on our perseverance in visiting a region where Indian hostility was so much to be dreaded. On learning that the Osages had retired west, and that the country abounded in game, one of the sons of our host prepared to push into that region. M'Garey told us that he had delivered "Butcher," agreeably to our order, to Holt; but the latter, on travelling a day's journey toward Beaver creek, had found him too feeble

to proceed, and, after taking off his shoes, had abandoned him to the wolves. Sad emblem of the fate of persons who have served great men, till they have reached some pinnacle where the service is forgotten, because no longer necessary!

Nearly opposite, but a little below this cabin, we passed, on the 12th, the mouth of the Little North Fork; a stream originating in a broken region on the left bank, and having some alluvions at its mouth. Evidences of habitation became more frequent below the Little North Fork, which caused me to cease noting their succession in my journal.

Nothing of special interest occurred to mark the day's progress, till we reached, at an advanced hour in the afternoon, the Bull shoals. At this formidable rapid, the river probably sinks its level fifteen or twenty feet in the space of half a mile. Masses of limestone rock stand up in the bed of the river, and create several channels. Between these the river foams and roars. When I arose in the canoe to take a view of the rapid into which we were about to plunge, the bed of the stream appeared to be a perfect sheet of foam, whirling and rushing with great force and tumult. As I knew not the proper channel, and it was too late to withdraw, the only step left was to keep the canoe headed, and down we went most rapidly. Very soon the canoe leaped on a round rock, driving on it with great force, and veered about crosswise. In an instant I jumped into the water at the bows, while my companion did the same at the stern, and, by main force, we lifted it over the ledge, got in quickly, and again headed it properly. We were, emphatically, in the midst of roaring rapids; their very noise was deafening. The canoe had probably got down six hundred yards, when a similar difficulty occurred, at the head of a second chute or bench of rocks, reaching across the river. In an instant, it again struck. It was obviated by getting into the water, in the same way as on the first occasion; only, however, to put our strength and skill to the test a third time, after which we shot down to the foot of the rapids safely. We had managed neither to ship water, nor to lose a piece of baggage. We were, however, thoroughly wetted, but kept our position in the canoe for five miles below the rapid,

bringing us to the head of Friend's settlement. We landed, at a rather early hour in the evening, at a log building on the left shore, where we were hospitably received by Teen Friend, a man of mature age and stately air, the patriarch of the settlement. It was of him that we had heard stories of Osage captivity and cruelty, having visited one of the very valleys where he was kept in "durance vile."

The antiquities and mineral appearances in that vicinity were represented as worthy of examination; in consequence of which, I devoted a part of the next day (13th) to these objects. The neighboring hills consist of stratified limestone. The surface of the soil exhibits some fragments of hornstone and radiated quartz, with indications of iron-ore. At the shoals, traces of galena and calcareous spar occur.

Mr. Friend, being familiar from personal observation with the geography and resources of the country at large, states that rock-salt is found between the south fork of White river and the Arkansas, where the Pawnees and Osages make use of it. It is presumed that this salt consists of crystalline masses from the evaporation of saline water. He represents the lead-ores on its north-western source, which we had partially explored, as very extensive.

If, as is probable, De Soto ranged over these regions in his extensive marches between the St. Francis and Arkansas, his exploratory parties may have reached the locality of crystalline salt referred to, and he would have found the buffalo in several positions east of that place.

The antiquarian objects to which my attention was called, afforded the greatest degree of interest. They consisted of pieces of earthenware, some antique fragments of bone, and a metallic alloy, resting in a substance resembling ashes, and also arrow-heads. The metallic alloy, of which Mr. F. gave me a specimen, resembles a combination of lead and tin. But what adds to the interest attending the discovery of these articles, is the fact, that they lie, apparently, below the diluvial deposits, bearing a heavy forest, and at the geological line of intersection with the consolidated rocks.

From the apparent vestiges in this quarter, I am of opinion

that De Soto's "Tanico" must be located in this vicinity, and that he crossed the White river near this place. A march west of this point, over a hilly country, would bring him into the fertile valley of the Little Red river, or Buffalo creek — his probable Tula, where his people first tasted the flesh of this animal, and where he recruited his army for a new effort.

These inquiries occupied the morning. It was late before we embarked, and, at some four miles below, we landed on the right shore, at a Mr. Zadock Lee's, being the first New Englander whom we had met in this region. With him we took dinner. He appeared pleased to see us, and conducted me to see some antique, white, lime-like masses, in the earth, near the bank of the river, which had the appearance of decayed bones. Rumor speaks of some other antiquities in this quarter of the country, in the shape of bricks, concealed by the undisturbed soil; but I saw nothing of this kind. While here, Mr. Lee's son returned from the forest with the flesh of the bear and buffalo, the fruits of his own prowess in the chase, and amused us with an account of his recent exhibition of skill in these departments. We embarked and descended the river six miles, to a Mr. Jacob Yochem's, who received us with hospitality, and added no little, by his conversation, to our local lore.

It was determined, the next morning, (14th,) to loan our canoe, which was a capacious, new, and clean vessel, made from white-ash, to our host, to enable him to transport his hunter products to a market at the mouth of the Great North Fork, leaving our baggage to be brought that way. The distance by water is thirty-five miles; by land, probably not more than eighteen or twenty. By this step, we avoided the dangers of navigating two formidable rapids, called the Crooked Creek and Buffalo Shoals; the former situated fifteen, and the latter twenty miles below Yochem's.

We left our host's at a seasonable hour in the morning, taking a good horse-path; and we walked diligently till near dusk, before reaching our destination. We then had the whole volume of White river between us and our purposed place of lodgment, which was at the residence of a man named Mat-

ney. It was the only house within a considerable distance at which shelter for the night could be obtained; and we did not hesitate long between the two alternatives presented to us—either of lying out in the woods all night, or of fording the river, with the depth of which we were not acquainted. We chose the latter, and accordingly prepared for the attempt. At the shallowest part we could find, it was about four feet deep in the channel; but we struggled through, and reached the house just at nightfall, wet and chilly. We were hospitably received, and speedily made ourselves comfortable. We had been told that the distance was fifteen miles; but to us, who had diligently footed it, it seemed more than twenty.

CHAPTER XIII.

DETENTION AT THE MOUTH OF THE GREAT NORTH FORK—NATURAL HISTORY OF THE VICINITY—GREAT BLOCKS OF QUARTZ—IMPOSING PRECIPICES OF THE CALICO ROCK—A CHARACTERISTIC OF AMERICAN SCENERY—CHEROKEE OCCUPANCY OF THE COUNTRY BETWEEN THE WHITE AND ARKANSAS RIVERS—ITS EFFECTS ON THE PIONEERS—QUESTION OF THE FATE OF THE INDIAN RACES—IRON-ORE—DESCENT TO THE ARKANSAS FERRIES—LEAVE THE RIVER AT THIS POINT—REMARKS ON ITS CHARACTER AND PRODUCTIONS.

THE canoe had not yet arrived, nor was there any tidings of it the next morning; so that there was no alternative, in our present situation, but to wait patiently. I determined to improve the delay by exploring the neighborhood. It is a geographical point of some importance, being the head of the navigation of White river for all large craft ascending from the Mississippi. As yet, nothing but keel-boats have ascended. Between the point of our embarkation at Beaver creek and this spot, the river has a fall of about sixty feet, at four rapids, which do not probably extend over a mile or two in the aggregate. The stream, during the rest of the way, has a fine, lively current, seldom of great velocity, and never stagnates. The Great North Fork, the scene of our former ramblings, enters a short distance below the foot of the Buffalo Shoals, rendering the draught of water practicable, it is believed, for steamboats at all seasons.

I found the pebble-stones and boulders on the margin and bed of the river, which I leisurely examined, to afford a true representation of the formations which had been observed in traversing the elevated and broken surface of the Ozarks.

They consist of the various limestones and sandstones of the region, with a partial mixture of quartz rock, red sienite, hornstone, argillaceous rock, and the peculiar, egg-shaped, coarse yellow jasper, which appears to have been imbedded in some of its strata. On ascending the cliffs west of the valley, they were observed to consist of the characteristic limestone of the region, in horizontal layers, the upper strata containing impressions of shells. Very large angular masses of quartz rock lie near the bases of these cliffs. Some of the angles of these masses would probably measure fourteen feet. Their position here appears to be quite anomalous, as, from the absence of attrition, they are clearly not of the erratic block group. They appear to indicate a primitive formation near.

The half hunter, half farmer, to whom we had loaned our canoe, came with a number of his companions in the evening, and entered on a scene of merriment, to which, as the cabin had but one room, we were compelled to be unwilling spectators during the livelong night, though, from its character, not participating at all therein. As soon as there was light sufficient to discern objects (16th), we embarked, rejoiced to get clear of this extraordinary nocturnal scene. About half a mile below, we passed the mouth of the Great North Fork, and, some five or six miles further, entered and descended a swift channel, called the Crooked rapids, where there probably has been some slight geological disturbance in the bed of the river, observable in very low stages of water.

At the distance of ten miles more, a sudden turn of the river brought us in full sight of the picturesque, elevated, and precipitous shore, called the Calico Rock. This presents a most imposing façade, on which are observable the imitative forms of fantastic architectural devices. The wall is quite precipitous throughout. It is the calcareous rock of the region. Its summit is overlaid with ochreous clays of various colors, which, through the action of the elements, have imparted their fanciful hues to portions of the cliff. This abrupt species of scenery is quite peculiar to the American landscape. A still more imposing section of it is presented in the Pictured Rocks of Lake Superior. Nothing of this kind marks the banks of

the Rhine, so much eulogized by travellers; for all its formations partake of the parabolic, or curved lines of the primitive, and the eye is relieved by these gradations; but, in the brusque scenes of the West, the precipices are as marked as if they had been hewn down by some gigantic broad-axe. There are some sections, in keeping with these harsh landscapes, on the Mississippi, along the Missouri shores—less prominently along the Illinois borders, near Alton—and at places in Iowa and Wisconsin; but more characteristic in Minnesota, as the river escapes from its primitive plains, and plunges over the falls of St. Anthony. We descended about thirty miles this day, and found lodgment, at night, at a house on the left bank, occupied by a Mr. Jeffery.

The next morning (17th), on descending five miles, we stopped at a Mr. Williams's to prepare breakfast, where some persons were gathering to hear an itinerant preacher. Twenty miles lower, we stopped for the night, at a widow Lafferty's.

From the remarks made at the places where we have been entertained by the hunters and settlers on this river, there is considerable dissatisfaction with a treaty* made with the Cherokee Indians, by which a part of that nation are assigned a location between the north banks of the Arkansas and the south bank of White river. Many of them, including our hostess to-night, and the M'Gareys, Lees, and Matneys above, have lands in cultivation, with dwelling-houses, stock, and improvements, of more or less value, on the south banks of the river; which, as they apprehend, under the operation of this treaty, they are to relinquish to the Cherokees.

The truth is, the first white occupants of the frontiers, though generally rough men, and without a title to the lands they settle on, are the pioneers of civilization; and by thus taking their lives in their hands, and encountering the perils of the wilderness and of Indian hostility, they lay the government under a strong obligation to protect them. The natural hatred of races is such, that they are everlastingly on ill terms

* Treaty of 8th July, 1817. Vide Indian Treaties, p. 209.

with the Indians, and the Indians with them. It is difficult to say which of the two races, during this period of contact, is most suspicious of the other.

The Indians, also, look up to the government with strong claims for justice and protection. The frontier, at the beginning of the sixteenth century, was on and near the Atlantic borders, from Maine to Georgia, and long continued east of the Alleghany mountains. It is already west of the Mississippi river, that mighty geographical highway, which, like a longitudinal line, stretches across seventeen degrees of latitude, every mile of which will, ere long, be settled and cultivated by the Anglo-American race. As the population presses first on the Indian's hunting-grounds, and next on his cornfields, he flies before the irresistible tide, and takes shelter at some more remote western point. But he is hardly well seated on his new hunting-grounds—he has hardly begun to reap his new cornfields—when the pioneers of the same race that disturbed him before, are upon him; and again, and again he must fly before the resistless—the uncontrollable tide of migration. It is a providential reflux in the wave of races. It is something to be observed, rather than to be apprehended and understood. It seems to say, that the surface of the habitable earth was not formed for the permanent occupancy of races who rely on the pleasing and exciting uses of the bow and arrow; and that labor, which was, at the first, declared to be the proper condition of man, is destined to sweep away, if it cannot merge in its on-rush, these erratic and picturesque tribes. Where their frontiers will be found, a hundred years hence, the voice of history, looking to the past, may only tell; but this appears more appreciable and clear—that the perpetuation of the race as one of the elements of mankind, must depend, in the sequel, however long that sequel be postponed, on his substantial adoption of the principles of industry, letters, and Christianity. The “tents of Shem,” however we may read the prediction, are still to be occupied, if they are not now, by a broad philanthropy, to be merged into those of the higher civilization of Japhet. For, the civilization and the moral elevation of man is the great object of revelation; and it appears clear, and conformable to

reason, that, where future history is taught in the Pentateuch by figures, it should be figuratively, and not dogmatically, explained.

On leaving Mrs. Lafferty's, in the morning of the 18th, we descended about five miles, and stopped to breakfast at a Mr. Jones's. Rumor had pointed out this place as the locality of a tin-mine. The frontiersmen are greatly disposed to excite each other's imaginations by reports of mines and discoveries, every one of which is fancied to be some new Potosi or El Dorado. Our host was not backward in bringing to me some specimens of his supposed treasure. It consisted of several heavy lumps of the ore called, by mineralogists, iron glance. It had the usual color, great weight, and high metallic lustre. He represented it as occurring, in large bodies, about eight or ten miles north of his house, on high lands, at the surface.

We had proceeded some miles on our way, when a large black bear was discovered on the shore. It appeared to be about to plunge in for the purpose of crossing the river, when our presence alarmed it, and the animal, with its usual clumsy gait, betook himself to the woods again. The clumsiness of this animal's motions seems to be owing to the bluntness of its hind paws, which appear as if, we should suppose, it arose from re-curved legs. The Indians laugh at the gait of bruin. We had encountered this species several times before, and always, as on this occasion, found it disposed to flee.

Fifteen miles below Jones's cabin, we passed Harden's ferry, the house being on the right bank; and, two miles further on, we passed Morrison's ferry. Continuing our descent eight miles lower, we landed at a place called Poke Bayou, where we were hospitably received by a Mr. Robert Bean. The river had now become a magnificent body of water, still clear and beautiful. We were here within the boundaries of the Mississippi alluvions. No highlands are visible for some distance before reaching Harden's. The river winds through broad, fertile plains, bearing a most vigorous growth of forest trees. The banks are elevated some thirty feet above the water, and, as the stream increases in depth and strength, they become

subject to be undermined by the flood. The cane, which is common to the river in its entire length, even to the highest elevations of the Ozarks, is here of a tall and most vigorous growth. It is this plant, I apprehend, more than any other feature, which gives an oriental cast to these alluvial tracts; and I was almost ready, at some points, where the growth concealed the trunks of the heavy forest, to see the hippopotamus and elephant display their clumsy forms. For these, however, we had the buffalo, the cougar, and the bear, whose crackling strength, as they passed through these reedy mazes, had, on more than one occasion during our rambles, reminded us of the great muscular power of these boasted objects of hunter skill and enterprise. Often had a fine dog, in the narrations of the hunters, paid the penalty of coming within the stroke of the latter; and we could sympathise with the loss of an animal, which is of the highest value in his pursuits. It is due to this class of men to say, that, however rough they are in their manners, we were uniformly received by them with a frank hospitality, which appears to be always a point of honor with them; nor did any of the number, to whom reward was proffered for entertainment, ever condescend to receive a cent for anything in the shape of food or lodging.

The point of our landing was at the crossing of the lower Arkansas road. About twelve or fourteen buildings of all sorts were clustered together, forming a small village, which is now called Batesville; being the only one which had been encountered since leaving Potosi.

CHAPTER XIV.

ANCIENT SPOT OF DE SOTO'S CROSSING WHITE RIVER IN 1542 —
LAMENESS PRODUCED BY A FORMER INJURY—INCIDENTS OF THE
JOURNEY TO THE ST. FRANCIS RIVER—DE SOTO'S ANCIENT
MARCHES AND ADVENTURES ON THIS RIVER IN THE SEARCH
AFTER GOLD—FOSSIL SALT—COPPER—THE ANCIENT RANGES OF
THE BUFFALO.

I DETERMINED to quit the river at this point, and, after a night's rest, made the necessary arrangements.

There is almost a moral certainty that De Soto must have crossed the river above this place. The make of the land, and the custom of the Indians in choosing the best ground for a path to travel from village to village, would determine this. His position, after crossing the Mississippi at the mouth of the St. Francis, and reaching the high grounds of the latter, would lead the natives who were his guides to keep the elevated and dry ranges leading to the buffalo country, west; and he must have crossed the affluents of the Black and Currents rivers at a high point towards the Ozarks. The dry and open woods afforded the best ground for the march of his cavalry; and when he attempted to reach the salt and buffalo country from the region east of White river, the roughness of the country would lead him to the central points of that stream. It would be interesting, as a point of antiquarian interest, to know where the old Indian paths were located. The roads, in all parts of the country, were based on these. They led to the most practicable fords of rivers, they avoided swamps and boggy grounds, and evinced a thorough geographical knowledge of the conformation of the country.

To travel where De Soto had travelled, and where he had performed some of his heroic feats, had something pleasing, at least, in the association. Doubtless, had the first occupants of Upper Louisiana been as mindful of historical reminiscences as they were set on repeating his search for gold and silver mines, they might have been rewarded by finding some of the straggling bones of his broken-down Andalusian cavalry. The fragments of broken arms and trappings were yet, perhaps, concealed by the accumulated rank vegetable soil of Arkansas and Southern Missouri, whence the plough may at no distant day reveal them.

It was ten o'clock on the morning of the 19th, when, having made every necessary preparation, we left Mr. Bean's. I regretted the necessity of making a selection from my collection of minerals and geological specimens. We set out with great alacrity. For the first five miles, we passed over a level, fertile tract, with several plantations; the remaining thirteen miles were comparatively sterile and uneven, without settlements. We had passed about seventeen miles of the distance, when my right foot and ankle began to flinch. I was not sensible of any slip or sprain in walking, but rather believe it resulted from too much ardour and anxiety to get forward. I had, about four years previously, dislocated and injured the same ankle in leaping down a precipice in the Green mountains, having mistaken a granitical shelf of rock at its base, which was covered with autumnal leaves, for soft soil. I believe the suddenness and alacrity of this day's travel, after leaving the quietude of the canoe, had awakened a sympathy in the injured nerves. In a short time, the pain was unendurable. With great effort I walked a mile further, and reached a double log house, the mistress of which bathed the ankle with salt and water, and made other applications. Some alleviation, but no permanent relief, was obtained. I then laid down under the hope of being better, but awoke on the morning of the 20th with little or no abatement of the pain, and inflammation. A traveller on horseback, coming along that morning on a fine animal, agreed, for a small compensation, to let me ride to the south fork of Strawberry river, while he went afoot.

This helped me over twelve miles of the road, where his path diverged; and I felt so much relieved by it, on dismounting, that I managed, by easy stages, to walk four miles farther, which brought us to the main river. The afternoon was not yet spent; but the pain of my ankle had returned before reaching the river, and I found it in vain to press forward, without adequate repose.

The next morning (21st), my travelling companion, who cared nothing for natural history or antiquities, and was urgent to push on, left me, and returned to St. Louis. Left alone, I felt, for a few moments, a sense of isolation; but I was now in a region where there was no longer any danger to be apprehended for the want of the first necessities of life. My lameness required nothing, indeed, but perfect repose. The people were kind, and, when I ascertained that my hostess was a sister of one of the hunters who had guided me in the most remote parts of my wanderings in the Ozarks, there was a manifest point of sympathy.

I found by inquiry that there were appearances of a mineral deposit in this vicinity, which seemed to connect the hilly grounds of Strawberry river with similar indications which have been noticed near the Bull shoals, on White river. Appearances denote the existence of sulphuret of lead in the vicinity. The sulphate of barytes, calcareous spar, and white crystalline masses of quartz, characterize the uplands. When my foot and ankle would bear it, I proceeded by easy paces northward, going, the first day after leaving the Strawberry valley, ten miles, which brought me to a place called Dogwood Springs, so named from the *cornus florida*. The next day I went ten miles further, when I came to the banks of Spring river, where I was entertained by Major Haynes. Here I first saw cotton in the fields, being the unpulled bolls of the autumn crop, which had not been thought worth gathering.

Feeling no injury to result from these easy marches, which gave me time to examine the appearances of the surface, I ventured a little farther on the recovery of my ankle, and, the third day, went nineteen miles. In this distance I crossed the

stream called Elevenpoints, a tributary to Spring river, and came, at a rather late hour in the evening, into a small valley called Foosh-e-da-maw, a popular corruption of the French *Fourche à Thomas*. It was quite dark when I applied for a night's lodging at a small cabin, being the only one I had encountered for many miles. The man and his wife, who were its only occupants, were manifestly not blessed with much of this world's goods; but they were kind, and, though they had already gone to bed, and had but one room, they permitted me to occupy a part of the floor. Spare bed they had none; but, had they possessed ever so many, I did not require one. Camping out under the open heavens so long, had created a habit which made it impossible for me to rest in a soft bed. I had declined one the night before, at Spring river, and thrown myself on a single blanket, on the hard puncheons. I wished to keep my nerves up to this tense state, and the hardy habits of the woodman, while I was compelled to foot my way, and take my chances for rough fare, for some time.

With the earliest gleams of light I was up, and walked four miles to breakfast. Twelve more brought me to Hicks's ferry, on a large stream called the Currents. I had camped on the source of this river, in the cliffs of the Ozarks, on my outward trip, and found the region remarkable for its large saltpetre caves. It was here a river of eight feet deep, and three hundred yards wide. At this spot I should have stopped; for, after going beyond it, I found the country was thinly settled, which compelled me to walk some time after nightfall, before I could find a house; and, on presenting myself, the man proved to be surly and gruff, and denied me lodging. It was evident to me, from words that passed, that his wife was expecting to be ill; and, as the house was small, there seemed some reason for his apparent unkindness. I had already come twenty-three miles; the night was dark, and threatened rain; and the next house distant. I should have been happy to exclaim, with the poet,

“Turn, gentle hermit of the dale, and guide my lonely way!”

“but there was no gentle hermit in sight. It was clearly not a question of poetry, but was likely to be one of sober, down-

right prose. I said to him, finally, after a look into the black darkness and desolate woods, that I would only claim my length on the floor, and, to give no uneasiness to his good lady, be off at the slightest intimation. He consented, and I laid down without receiving any notice of the lady's expected illness till morning, when I left my pallet at a very early hour. For three miles beyond, it was a rough region, through which it required daylight to pass, and where I must have lost my way in the dark, had I gone on, the night previously.

I stopped at a cottage for breakfast. It was occupied by a poor woman. Everything bore tokens of this fact. She appeared to have little in the way of eatables herself, but was very willing, in the article of breakfast, to share that little with me. I had passed the night before supperless, after a long day's walk, and the morning's air had further excited my appetite; still, I should have gone on, had another habitation been near at hand; but what the good woman wanted in means, she made up in readiness and hearty good-will; and, if the meal was not sumptuous, I arose as well satisfied as if I had breakfasted with a lord.

Thus refreshed, I went on ten miles, which brought me to the banks of Little Black river. Two miles beyond this stream, I stopped at the house of a Mr. Reeves, at an early hour in the afternoon, my ankle giving indications of returning lameness. Quiet, and a night's repose, had the effect to relieve these symptoms, and I was enabled cautiously to continue my journey the next day. Daylight was ever my signal for rising, and, by easy stages, I made seventeen miles during the day, walking early and late. The first six miles of this distance were made before I stopped for breakfast, and the next ten miles brought me to the ferry over Big Black river — a clear, rapid stream, which, in its progress to the south, is the recipient of all the before-mentioned streams, from the Strawberry river, north; and is itself, finally, a tributary of White river, maintaining through it a free navigation with the Mississippi. After crossing the ferry, I went about half a mile further, and took up my night's lodgings at a Mr. Bollinger's. I felt no further weakness of my foot and ankle, and was happy in the

reflection that my cautious movements had been such as not to overtax the strength of my nerves. Indeed, from this point, (till 1830,) I experienced no further symptoms of lameness.

On the next morning (28th), I walked seven miles, and took breakfast at a Mr. Esty's, where I fell in with the old road, which had originally been laid, when the country came to be settled, on the ancient Indian path. The elevated lands between Black river and the St. Francis, had evidently been the line of march of De Soto, when (in 1541) he set forward from "Quiquate," on the St. Francis, toward the "north-west," in search of Coligoa. Any other course between west and south-west, would have involved his army in the lagoons, and deep and wide channel, of Black river, which forms a barrier for about one hundred and fifty miles toward the south; while this dividing ground, between the Black river and St. Francis, consists chiefly of dry pine lands and open uplands, offering every facility for the movements of his cavalry, which were ever the dread of the Indians.

The first Indian village which De Soto reached, after crossing the Mississippi — probably at the ancient Indian crossing-place at the lower Chickasaw bluffs — and pushing on through the low grounds, was on reaching the elevations of the St. Francis, immediately west of his point of landing. The place was called Casquin, or Casqui; a name which will be recognized as bearing a resemblance to one of the Illinois tribes, who have long been known under the name of Kaskaskias. From this place on the high lands of the St. Francis, he ascended that river, keeping the same side of its current, through a fine country, abounding in the pecan and mulberry, a distance of seven leagues, to the central position of the Casquins. Here it was, and not on the immediate banks of the Mississippi, that he erected a gigantic cross, formed out of a pine tree, which, after it was hewn, a hundred men could not lift.

From this place, after a rest of several days, he was led, by the wily chief, to march against the village and chief of Capaha, who was his hereditary enemy, and who had, in past encounters, proved himself more than his equal in prowess. De Soto

was caught in this trap, which had nearly proved fatal to his gallant army.

Descending the high grounds, evidently, towards the north-east, and crossing alluvial tracts, by a march of about six days he reached the enemy, well posted, strong in numbers, and of great bravery, on the pastoral elevations, which we are disposed to look for at the site of the modern Spanish town of New Madrid. Capaha took shelter on a thickly wooded island in the Mississippi river, where De Soto, assisted by his allies, attacked him in canoes, and from which his allies, and afterwards he himself, were glad to retreat. The chief was a most brave, energetic young man, and fought against his combined enemies with the spirit inspired by long acknowledged success. This place formed the extreme northern limit of De Soto's expedition on the line of the Mississippi, and must have been north of 35° . After this effort, he retraced his steps slowly back to Casqui.

The Kapahas, of whom the Sioux are ethnologically a branch, have occupied the west banks of the Mississippi, extending to the base of the Rocky mountains, as long as we have known that stream. They have been inveterate enemies of the whole Algonquin race, to which the Kaskaskias and Illinois belonged; and it is not improbable that they had, at this early day, not only encountered the Spaniards, but that, after their withdrawal, they fell on the Casquins, and drove them east of the Mississippi, into the country of the Illinois.

While De Soto was in the country of Capaha, he learned that about forty leagues distant, (west, it must needs have been,) there were, in the hill country, quantities of fossil salt, and also a yellowish metal, which he supposed to be gold. He despatched two trusty and intelligent men, with Indian guides and carriers, to procure samples. After an absence of eleven days, they returned, with six of the Indians laden with crystals of salt, and one of them with metallic copper. A hundred and twenty miles west of the supposed point of starting, would carry the messengers across the valley of White river, and far into the Ozark plains and elevations, between the south fork of that stream, and the north banks of the Arkansas—the

same region, in fine, mentioned, in a prior part of these sketches, as yielding those articles, on the authority of the experienced woodsman, Teen Friend. The country through which these messengers passed was sterile and thinly inhabited; but they reported it to be filled with herds of buffalo. These reports led him to march down the banks of the St. Francis, till he reached the village called Quiguate. From thence, having heard of a locality called Coligoa, where he thought there might be gold, he marched again north-west in search of it. This march, in which he followed a single Indian guide, must have led him to the foot of the rough, mountainous, granitic, and mineral region, at the sources of the St. Francis. But this search proved also a disappointment. He was informed that, six leagues north of Coligoa, the buffalo existed in vast herds; but that, if he would reach a rich province, he must march south. It is possible that, in this latitude, he may have, a little, exceeded the utmost point reached by him on the Mississippi; and he hence confined his adventurous marches to Southern Missouri and Arkansas.

Having taken the road again, after my halt at Esty's, I travelled diligently ten miles, at which distance I reached the ferry of Dr. Bettis, at the St. Francis. The scene was rural and picturesque, the river winding along in a deep and rapid bed, between elevated and fertile banks. From appearances, and old fields, it seemed altogether such a spot as might have answered the glowing Spanish descriptions of Casqui. The ferry was managed by a black man; and we cut an American half-dollar on the top of an oak stump, agreeably to the Kentucky mode, to adjust the ferriage. On landing on the north bank, I pursued my journey six miles farther, to one Smith's. It was now the 28th of January, and the weather so mild, that I this day found the witch-hazel in bloom.

CHAPTER XV.

PROCEED NORTH—INCIDENTS OF THE ROUTE—A SEVERE TEMPEST OF RAIN, WHICH SWELLS THE STREAM—CHANGE IN THE GEOLOGY OF THE COUNTRY—THE ANCIENT COLIGOA OF DE SOTO—A PRIMITIVE AND MINERAL REGION—ST. MICHAEL—MINE A LA MOTTE—WADE THROUGH WOLF CREEK—A DESERTED HOUSE—CROSS GRAND RIVER—RETURN TO POTOSI.

I LEFT my night's quarters before daylight was fairly developed. The sky was, indeed, heavily overcast, and it soon commenced raining. Expecting to find a house at no great distance, I kept on, the rain at the same time assuming a more settled form, and falling with steadiness. It was seven miles before I reached shelter (Swaim's). I was thoroughly wetted, and, the storm continuing without abatement, I remained until the next morning. The atmosphere was then clear, and the sun rose pleasantly; but the roads were a perfect quagmire. An immense body of rain had fallen. Every little rivulet roared as if it were a torrent that was out of all patience to deliver its quantum of water to the swollen St. Francis. The ground was perfectly saturated with water; but I picked my way four miles to breakfast. It had been my intention to cross the St. Francis, and take the route through Caledonia to Potosi; but after travelling sixteen miles towards the north-west, and reaching the fords, I found them too much swollen to make the attempt.

After crossing the St. Francis, towards the north, there are strong indications of a change in the geological structure of the country. The horizontal limestone and sandstone series still continue for a distance; but they are covered with large blocks of sienite and granite. What is remarkable in these

blocks, is their angular character, which denotes that they have not been carried far south of their original beds. These blocks increase in frequency and size as we approach the primitive highlands of the St. Francis. And I at length stood, gazing at these rough, red, crystalline peaks, and high orbicular knobs, which reach up from beneath and through the calcareous and sedimentary series, without having lifted up the latter into inclined positions, or in the least disturbing their horizontality—a proof of their priority of position.

I passed the night near the fords, at a farmer's; and finding it impossible, the next morning, to pursue this route, or to get a boat or canoe to cross the river, obtained directions for making my way north-eastwardly, towards St. Michael's. I was now in the probable region of De Soto's Coligoa, the utmost north-westwardly point of his explorations. And it ceased to be a matter of surprise that the Indians had given him such wonderful accounts of the mineral wealth of the sources of the St. Francis. The white inhabitants, at this day, have similar notions. They perceive such an unusual geological display before and around them, that they suppose it indicates mineral treasures. There are stories afloat of all kinds of mineral discoveries—not of gold, indeed, which was De Soto's search, but of tin, lead, copper, iron, cobalt, and antimony. The iron mountains of Bellevieu, so called, are part of this development. At a place called the Narrows, the river rushes between alpine peaks of sienite and black hornblende rock, which lies in huge and confused heaps, plainly indicating ancient volcanic action. I had examined this region, with minuteness, the previous summer, in an excursion through the southern limits of the lead-mines, and now revisited some of the points, respecting which, my curiosity was unsatisfied. I wandered among these attractive peaks about ten miles, and slept at a house (Burdett's), to the occupant of which, I had carried a letter of introduction the year before.

The next day (Feb. 1) proved rainy; but I took advantage of intervals in the weather to advance on my general course about three miles. The sky, the next morning, was still cloudy, dark, and unsettled. When it indicated signs of clear-

ing up, I was advised of another ford of the St. Francis, at a higher point; and I proceeded a part of the way to reach it; but accounts discouraged me, and I bent my steps to the village of St. Michael. Two miles north of this, I came to the noted lead-mine of La Motte, the most southerly in position of the Missouri circle of mines. At this place, they raised large tubular masses of lead-ore, from its position in the red, marly clay. The slags drawn from the ash-furnace denoted, by the intensity of their blue color, its connexion with the oxide of cobalt. Ten miles beyond these mines, after passing an uninhabited tract, I entered Cook's settlement, where I slept.

Next day, I was again in motion at early dawn. The effects of the late copious rains were still an impediment to travelling; but I experienced no further symptoms of lameness, and felt the desire to press on, increasing in proportion as I drew near my starting-point in the prior autumn. I felt that I had succeeded in the accomplishment of a trip of some peril, through a noted mountainous range, into which all but one of my original party had failed to accompany me, and my guides had deserted me at a moment of peculiar peril. It was also true that my only companion had rather abruptly left me, when taken lame on the road. I could not, as I approached the spot of organizing my party for this exploration, help feeling a degree of buoyancy of spirits, while returning to it, in the hope of again meeting familiar acquaintances face to face.

Under this impulse, and with the high health produced by daily exercise, I travelled ten miles on the following day. On reaching Wolf creek, it was found to be filled to overflowing. It was already dark; and a ruinous, tenantless house, with the doors and windows standing open, was the only object that presented itself on the opposite bank. Horse or canoe, there was none; but there could be no hesitation in attempting to cross it. The waters, in the deepest parts of the channel, reached to my breast. I came out, of course, dripping; it was still two miles to the next house, and, casting furtive glances at the masses of darkness in the deserted dwelling, and with a path muddy and indistinct, I hurried on to the point of my destination.

It was the 4th of February when I crossed Big river, the Grande river of the days of Crozat and the financier Law. I was carried across it in the ferry-boat, and took my way over the sylvan, long, sweeping mineral hills, which stretch toward Potosi, entering that busy town at a seasonable hour, having travelled fifteen miles. The first acquaintance I encountered, on reaching within a few miles of it, was a Major Hawkins—a surveyor, an old resident, and a good woodsman, who, cordially extending his hand to welcome my return, exclaimed, “I thought the Indians or the wolves had long ago eaten you up.” This was the first intimation I received that there had been any temerity in the plan for this expedition.

Potosi was now selected as the place for drawing up an account of the mines, and the mineralogical productions and resources, of the country—a memoir on which, was published at New York in the autumn of this year (1819), and which is inserted, in a revised form, in the Appendix to these sketches.

PHYSICAL GEOGRAPHY OF THE WEST.

TWO LETTERS ADDRESSED TO THE HON. J. B. THOMAS, U. S.
SENATE, WASHINGTON.

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## I.

POTOSI, Missouri, Feb. 9th, 1819.

SIR: I beg leave to address you on the subject of my recent expedition into the Ozark region. When I was at your house at Cahokia, I mentioned to you my design of making a tour into the interior of the Territory. I have just returned from the excursion. Two persons were associated with me in the enterprise; but one of them, our mutual friend, Mr. Brigham, was compelled by illness to relinquish the journey, and return, after he had reached Potosi.

We proceeded in a south-west direction, which carried us across the sources of the Maramec and Gasconade. We then entered on the elevated highlands, which alternately pour their waters into the Missouri and Mississippi rivers, reaching, in their development, to the Washita river. Through this rough alpine range, the Arkansas, rising in the Rocky mountains, penetrates, and is the only river that completely separates the chain. Our explorations were confined to the region lying on its northern banks. Winter overtook us on the sources of the White river, giving us a few days of severe weather, but offering, generally, no impediment to travelling. There is much that is most striking and picturesque in the scenery of this region, and not less in its productions and physical character. Nowhere, probably, on the globe, is there such a remarkable succession of limestone caverns, and large, transparent springs. At several places, large brooks flow abruptly out of crevices in the rock; and at one place, a flowing stream, Spring river, thus originates. We found the ores of lead, iron, and manganese, in large bodies. The high uplands are often rent by precipitous valleys and large chasms, caused by the force of these streams. These valleys are well wooded, and contain the richest soil. And this broad region must at no distant day attract

settlement, and will afford facilities for agriculture and mining, while its abundant water-power gives it great advantages for milling and manufactures.

The country is a continuation of the limestone and sandstone formations of the west banks of the Mississippi. The number and extent of the caverns in this formation, is, indeed, remarkable. They yield saltpetre earth, wherever they have been explored. Nitrate of potash has been manufactured in some of these caves, and transported across the wilderness for eighty miles; and a valuable traffic in this article may be established. In the district between the head-waters of White river and the Arkansas, salt is found, in a crystallized state, in the prairies. The region is still occupied by herds of the buffalo, elk, deer, and by the bear, and smaller animals of the latitude, which renders it an attractive country to hunters and trappers.

The Osage Indians, who inhabit it, are the cause of fear and alarm to this class; but it did not appear to us, from the sparse numbers of the Indians, and the periodical flying visits they are in the habit of making the eastern and northern parts of it, that there is ground of permanent apprehension from this source. The policy of locating the Cherokees on the north banks of the Arkansas, may well be questioned; and I have heard this arrangement much spoken against.

Indeed, the agricultural value of the country has been much underrated. Independent of the mineral discoveries mentioned, the arable lands of the Ozark summit-level constitute one of the richest and most beautiful districts in the Territory. The high grass and flowers which cover the prairie-lands, impart the most sylvan aspect to the scene. Springs of the purest water abound, and, by avoiding the chasms, the country is susceptible of being traversed by roads. It only requires to be better known, to attract the notice of emigrants, and will some day bear a great population. I do not doubt that the high road from St. Louis to Fort Smith will probably cross this tract of country. Such a route must greatly shorten the distance.

I cannot refer you to a correct map of the country, and therefore enclose you a sketch, explanatory of my route. From a conversation with Mr. Brigham, I cannot mistake your friendly influence in these explorations. I am desirous to extend them to other parts of the frontiers. I understand that the Secretary of War entertains enlarged and enlightened views on the subject. I should be pleased to be employed in this branch of the public service.

I am, with respect, your ob't serv't,

HENRY R. SCHOOLCRAFT.

## II.

POTOSI, Feb. 15, 1819.

SIR: I had the honor, on the 9th instant, to address you on the subject of my journey into the region of the Ozarks. You will allow me again to trouble you on the subject of explorations.

Government has long been acquainted, by reports, with the existence of native copper on the Upper Mississippi, and the banks of lake Superior. I believe the attempt was made about 1798, to have the localities explored. I know not what success attended that attempt. Probably the remoteness of the country, and the hostility of the Indian tribes, were unfavorable. But I am persuaded that the object is one of importance.

The mineralogy of those regions became the topic of early interest, even in the days of the French supremacy. Copper appears to characterize an extensive area. It is stated to break out in the immediate vicinity of St. Anthony's falls, and to continue through to the southern shores of lake Superior. In its exploration, other traits of the natural history of the country would be developed.

The establishment of a military post at St. Anthony's falls, renders the present a favorable time for exploring the region. Its features and resources are objects of deep interest; and it appears to be the policy of the government, in the disposition of its western and northern posts, to prepare the way for ascertaining these traits at the earliest period. The position of the most advanced posts which are now in the process of location, is such as to afford great facilities for exploration. The hostilities of the Indians are repressed, and a survey of these parts of the public domain could now be effected with comparative safety, and at little expense.

Should you think the appointment of an agent for this purpose, to accompany some of the military movements, would be favorably received by the Secretary of War, may I indulge the hope that, in recommending it, you will remember me in the premises?

I am, with respect, your ob't serv't,

HENRY R. SCHOOLCRAFT.

# APPENDIX.

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## OBSERVATIONS

ON THE

MINERALOGY, GEOLOGY, ANTIQUITIES,

AND

GEOGRAPHY OF THE WESTERN COUNTRY.

## LIST OF PAPERS.

### A. MINERALOGY, GEOLOGY, AND MINES.

1. A VIEW OF THE LEAD-MINES OF MISSOURI.
2. A CATALOGUE OF THE MINERALS OF THE MISSISSIPPI VALLEY.
3. MINERAL RESOURCES OF THE WESTERN COUNTRY. A LETTER TO GEN.  
C. G. HAINES.

### B. GEOGRAPHY.

1. MISSOURI.
2. HOT SPRINGS OF WASHITA.
3. MEMOIR OF WHITE RIVER.
4. LIST OF STEAMBOATS ON THE MISSISSIPPI RIVER IN 1819.

### C. ANTIQUITIES AND INDIAN HISTORY.

1. ARTICLES OF CURIOUS WORKMANSHIP FOUND IN ANCIENT INDIAN GRAVES.
2. ANCIENT INDIAN CEMETERY FOUND IN THE MARAMEC VALLEY.

# I. LEAD-MINES OF MISSOURI.

A MEMOIR ON THE GEOLOGY AND MINERALOGY OF MISSOURI,  
DRAWN UP IN 1819.

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## P R E F A C E.

WHEN we reflect on the history of our own country—its advance in arts, commerce, and agriculture, and the rapidity with which its population has increased, and its resources been developed—the mind is with difficulty brought to believe that all this has taken place within a comparatively short period. These developments are particularly striking in the region west of the Alleghany mountains. A new world has, as it were, been discovered in the Mississippi valley, which, under the strong impulse of emigration, has been transformed, as if by superhuman exertions. No sooner had its great fertility and productiveness become known, than a universal desire for correct information sprang up. Our first travellers in that region did little more, however, than glance at its most obvious and grand features; and with respect to some topics, such as its antiquities and natural history, these notices have had the effect rather to stimulate, than to gratify curiosity.

But, whatever information has been published respecting the country, its mineralogy and geology have remained wholly unnoticed. The mines of Missouri, especially, have failed to attract the consideration which they merit. To supply this deficiency, I have written the following memoir. It is the result of no ordinary degree of opportunity of observation upon the particular mines, and their geological position in the great metalliferous limestone formation west of the Mississippi. Besides visiting the principal mines, and traversing

the country thoroughly, to ascertain the character and value of its mineral resources and geological developments, I made an exploratory tour through the broad and elevated region of the Ozarks, lying west and south of this celebrated tract, extending into the Territory of Arkansas. - If, therefore, I have failed to collect a body of facts sufficient to impress the reader with a sense of the extent, value, and importance of the country, and particularly of its mines and minerals, it can hardly be ascribed to a want of opportunity, or, indeed, of assiduity in the study or arrangement of my facts.

The historical data here recorded, respecting Renault's operations, have never, I believe, appeared in print. They were elicited in the course of a legal investigation, instituted between the heirs-at-law of Renault, the agent of Crozat, in 1723, and sundry individuals, who claimed the same grants on the authority of a date subsequent to the transfer of Louisiana to the United States.

The drawings I give of the lead-furnaces which are peculiar to that section of country, are from actual measurement, done under the eye of an operative smelter of approved skill at Potosi, and are conceived to be minutely correct.

HENRY R. SCHOOLCRAFT.

NEW YORK, Nov. 25, 1819.

In republishing this memoir, advantage has been taken of several judicious suggestions respecting it, made in a critical notice of it, by the able editor of the American Journal of Science, in the volume of that work for 1821.

H. R. S.

WASHINGTON, Jan. 20, 1853.



# A VIEW OF THE LEAD-MINES OF MISSOURI.

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## SECTION I.

### HISTORICAL SKETCH OF THE MINES.

THE rage for adventure, which the brilliant exploits of Cortez, Pizarro, and other Spanish adventurers, had excited throughout Europe, continued for a long time to agitate the public mind, and had not abated at the commencement of the eighteenth century, when an idea of the mineral riches of Louisiana had become prevalent. Gold and silver were then the chief objects which engrossed attention; and in search of them, the earliest discoverers were led to penetrate into the interior. The physical aspect of the country was in general such as to flatter the most sanguine expectations of mineral wealth; and the further the country became known, the more interesting was found its mineralogical character. To men whose preconceived ideas of a country were already high, such appearances must have had the most inspiring effect, and lightened the embarrassments they encountered in exploring a wilderness. Many of the useful metals were thus met with, and gold and silver mines were reported to have been discovered in several places. Red river, the Arkansas, and the river La Platte of the Missouri, were particularly mentioned; and from the evidence which is afforded by the discovery of ancient furnaces, &c., there is reason to conclude that those metals were wrought at a very early period. Judging from appearances, they were ready to conclude the country exhaustless in mines; and the most exaggerated accounts of them appear to have been transmitted to Europe, particularly to France, where a lively interest was felt in the prosperity of the infant colonies in Louisiana and Illinois; and in the descriptions published at that day, the lands are reputed to equal in fertility the banks of the Nile, and the mountains to vie with the wealth of Peru.

It was in this supposition of the immense wealth of Louisiana, both in the vegetable and mineral kingdoms, that the renowned Mississippi scheme originated, which, from the imposing character it was made to assume under the guidance and direction of M. Law, drew upon it the

eyes, not only of France, but of all Europe, and produced one of the most memorable disappointments recorded in the annals of commercial speculation.

Louis XIV., by letters patent, bearing date September 14th, A. D. 1712, granted to Anthony Crozat, Counsellor of State, Secretary of the Household, &c., the exclusive privilege of commerce of that district of country, now known as the States of Louisiana, Mississippi, Tennessee, and Illinois, and the Territories of Missouri and Arkansas, with the proprietary right of the mines and minerals he should discover in the country, reserving the fifth part of all bullion of gold and silver, and the one-tenth of the produce of all other mines. The exclusive privilege of commerce was granted for a term of fifteen years; but the right of the mines was conveyed in perpetuity to him and his heirs, on the condition that such mines and minerals should revert back to the crown of France, whenever the working of them was discontinued for three years together. The bounds of Louisiana, as granted to Crozat, are described in these words: "Bounded by New Mexico, (on the west,) and by the lands of the English of Carolina, (on the east,) including all the establishments, ports, havens, rivers, and principally the port and haven of the Isle of Dauphine, heretofore called Massarè; the river of St. Louis, heretofore called Mississippi, from the edge of the sea as far as the Illinois; together with the river of St. Philip, heretofore called Ouabache (Wabash); with all the countries, territories, lakes within land, and the rivers which fall directly or indirectly into that part of the river of St. Louis."

In the month of August, A. D. 1717, M. Crozat solicited permission to retrocede to the crown his privilege of the exclusive commerce and the mines of Louisiana, which was granted by an arret of the Council of State, during the minority of Louis XV. In the same month, letters patent were granted by the Council of the Regency to an association of individuals at Paris, under the name of "The Company of the West," by which they were invested with the exclusive privilege of the commerce of Louisiana, and the working of the mines, to the same extent as it was enjoyed under the grant of Crozat. These letters patent were dated on the 23d of August, A. D. 1717, registered 6th September of the same year, and were to be in force on the 1st of January, 1718, and to continue for a period of twenty-five years. By them, not only such grants and privileges were conveyed as had previously been enjoyed by Crozat; but they were invested with additional powers, rights, and privileges. The territory was granted in free allodium, (*en franc allieu*,) in lordship and in justice, the crown reserving to itself no other rights or duties but those of fealty and liege homage, which the company was required to pay to the king, and to his successors at each mutation of kings, with a crown of gold of the weight of thirty marks. The boundaries were the same as described in the grant to Crozat; and the mines and mining grounds, opened or discovered during the term of its privilege, were declared to belong to the

company incommutably, without being holden to pay any rents or proceeds whatever. The company was also invested with the right to sell and alienate the lands of its concession, at whatever price or rents they might fix, and even to grant them *en franc allieu*, without reserving the rights of justice or lordship. It was also provided, that if, after the expiration of the twenty-five years for which the exclusive privilege of commerce was granted, the king should not see proper to continue the privilege by a new grant, all the lands and islands, mines, and mining grounds, which the Company of the West should have inhabited, worked, improved, or disposed of on rent, or any valuable consideration whatever, should remain to it for ever in fee simple, to use and dispose of as a proper inheritance, on the simple condition that the company should never sell such lands to any other than the subjects of France.

A company incorporated with such ample rights and privileges, did not fail to draw upon it the attention of the speculative, or to enlist the aid of the enterprising capitalists of the French metropolis. The country of the Illinois was reputed rich beyond comparison: the financial estimates submitted to the view of the public, offered prospects of unusual gain, and capitalists flocked with avidity from all quarters to enrol themselves as members of the company, and partake of the promised wealth. If anything had been wanting to accelerate the pace of adventurers, or to fan the ardor of hope, it was the genius, the financial abilities, and the commanding influence of M. Law, who was placed at the head of the company, and was the moving power in every transaction. Hence, it is no subject for surprise that the most extravagant anticipations were entertained by the members of the Company of the West, or that the unusual splendor of the Mississippi scheme was only equalled by the signal disappointment in which it eventuated.

In the year after the Company of the West had been instituted by the royal patent of the king, they formed an establishment in the country of the Illinois, at fort Chartres; and in order to promote the objects of their institution, and to encourage the settlement of the country, held out the most liberal inducements to French emigrants, and made them donations of all lands which they should cultivate or improve. Miners and mechanics were also encouraged to emigrate; and the city of New Orleans, which had been founded during the last year of the authority of Crozat (1717), received a considerable accession to its population in the fall of the same year, and settlements began to extend along the banks of the Mississippi, and in the country of the Illinois.

Among the number of adventurers to Illinois, was Philip Francis Renault, (the son of Philip Renault, a noted iron-founder at Consobre, near to Mauberge, in France,) who came over as the agent of the Company of St. Philips, an association of individuals which had been formed under the patronage of the western company, for prosecuting the mining business in the upper country of Louisiana and Illinois. It appears also

that he was a member of the Company of the West, and he is spoken of as "Director-General of the mines of the Royal Company in Illinois;" a name by which not only the present State of Illinois, but a vast district of the adjoining country, appears then to have been known.

Renault left France in the year 1719, with two hundred artificers and miners, provided with tools, and whatever else was necessary for carrying the objects of the company into effect. In his passage he touched at the island of St. Domingo, and purchased five hundred slaves for working the mines; and, entering the Mississippi, pursued his voyage up that river to New Orleans, which he reached some time in the year 1720, and soon afterwards proceeded on his way to Kaskaskia, in Illinois. Kaskaskia was then inhabited solely by the French, and was one of the earliest posts occupied by them when they began to extend themselves from Canada, along the great western lakes, and down the Ohio and Mississippi. Renault established himself in the vicinity of this town, near fort Chartres, at a spot which he named St. Phillips, (now called the Little Village,) and from this sent out his mining and exploring parties into various sections of Illinois and Louisiana. These parties were either headed by himself, or by M. La Motte; an agent versed in the knowledge of minerals, whom he had brought over with him. In one of the earliest of these excursions La Motte discovered the lead-mines on the St. Francis, which bear his name; and, at a subsequent period, Renault made the discovery of those extensive mines north of Potosi, which continue to be called after him. Other mines of lead were also found, but their distinctive appellations have not survived; and a proof of the diligence with which Renault prosecuted the object, is furnished by the number and extent of the old diggings which are yet found in various parts of the country. These diggings are scattered over the whole mine country; and hardly a season passes, in which some antique works, overgrown with brush and trees, are not found.

Renault, being probably disappointed in the high expectations he had formed of finding gold and silver, turned his whole force towards the smelting of lead; and there is reason to conclude that very great quantities were made. It was conveyed from the interior on pack-horses (the only mode of transportation which was practicable at that early period). The lead made by Renault was sent to New Orleans, and thence chiefly shipped for France. That he also discovered copper, is probable, as a grant of land made to him at Old Peora, on the Illinois river, embraces a copper-mine.

Renault's operations were, however, retarded and checked, from a quarter where it was least expected. By an edict of the king, made at Paris, in May, 1719, the Company of the West was united to the East India and Chinese Company, under the title of the Company Royal of the Indies (*La Compagnie Royale des Indes*). And in 1731, the whole territory was retroceded to the crown of France, the objects of the company

having totally failed; and Renault was left in America, without the means of prosecuting the shining business. His exertions in behalf of the company were not, however, overlooked by the government, and four several grants of land were made to him in consideration of his services. These grants bear date June 14th, A. D. 1723, and cover the Mine La Motte, and some other very valuable tracts, which, after having laid dormant for a period of about sixty years, have recently been claimed by the representatives of his heirs-at-law.

Renault, however, remained in Illinois several years after the explosion of the Mississippi scheme, and did not return to his native country until 1742. With him the greater part of his workmen returned; the slaves were sold, and the mining business fell into neglect. Here is a period to the first attempt at mining in Louisiana. The country was ceded to Spain in 1762, and taken possession of in 1769.

After Renault's departure, little or nothing appears to have been done in the way of mining; and, even after the Spanish had taken possession of the country, the lead-mines were but little attended to. The force which Renault had with him was sufficient to protect him from the attacks of the savages; but, after his departure, the settlements on the Mississippi, feeble in themselves, could not furnish protection to such as might be disposed to work at the mines. The Spanish, however, in a few years after taking possession of the country, did something; and in process of time new discoveries were made, and the mining business began to assume a more respectable character. The principal discovery made under the Spanish authority was that of Mine à Burton, which takes its name from a person of the name of Burton, or Le Breton,\* who, being out on a hunt

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\* The following sketch of the life of Burton is given by Colonel Thomas H. Benton, of St. Louis, in the *Enquirer* of that city, October 16, 1818:—"He is a Frenchman, from the north of France. In the fore-part of the last century, he served in the Low Countries, under the orders of Marshal Saxe. He was at Fontenoy when the Duke of Cumberland was beat there by that Marshal. He was at the siege of Bergen-op-Zoom, and assisted in the assault of that place when it was assailed by a division of Marshal Saxe's army, under the command of Count Lowendahl. He has also seen service upon this continent. He was at the building of fort Chartres, on the American bottom; afterwards went to fort Du Quesne (now Pittsburgh), and was present at Braddock's defeat. From the life of a soldier, Burton passed to that of a hunter; and in this character, about half a century ago, while pursuing a bear to the west of the Mississippi, he discovered the rich lead-mines which have borne his name ever since. His present age cannot be ascertained. He was certainly an *old soldier* at fort Chartres, when some of the people of the present day were little children at that place. The most moderate computation will make him a hundred and six. He now lives in the family of Mr. Micheaux, at the little rock ferry, three miles above St. Genevieve, and walks to that village almost every Sunday to attend mass. He is what we call a square-built man, of five feet eight inches high, full chest and forehead; his sense of seeing and hearing somewhat impaired, but free from disease, and apparently able to hold out against time for many years to come."

in that quarter, found the ore lying on the surface of the ground. This man, who is still living in the vicinity of St. Genevieve, at the advanced age of one hundred and nine years, had been employed while a youth under Renault. The period of this discovery it would be very difficult now to ascertain, Burton himself being unable to fix it. It has probably been known about forty years.

The processes of mining pursued under the Spanish government appear to have been very rude and imperfect, not more than fifty per cent. of lead being got from the ore. The common open log furnace was the only one employed, and the lead-ashes were thrown by as useless.

In 1797, Moses Austin, Esq., performed a journey from the lead-mines in Wythe county, Virginia, to the Mine à Burton, in Louisiana, and obtained a grant of land one league square, from the Spanish authorities, in consideration of erecting a reverberatory furnace, and other works, for prosecuting the mining business at those mines. This he commenced in 1798, previous to which time no furnace for smelting the ashes of lead had been erected. Mr. Austin sunk the first regular shaft for raising the ore, and introduced some other improvements which were found beneficial. He also, in 1799, erected a shot-tower, in which patent shot of an approved quality were made. A manufactory of sheet-lead was completed during the same year, and the Spanish arsenals at New Orleans and Havana drew a considerable part of the supplies for their navy from this source.

About this time, a few other American families crossed over into Louisiana Territory, and settled in the neighborhood of the mines. These, from their more enlightened and enterprising spirit, were an acquisition to the mining interest; and as their earliest attention was directed to it, the lead business began to revive; and at the time the Territory was taken possession of by the United States, the mines were extensively and advantageously worked.\* The Mine à Robino, Mine à Martin, and many others, were shortly afterwards discovered. Since the year 1804, the number of mines has been astonishingly multiplied; Shibboleth, New Diggings, Lebaum's, and Bryan's mines, are among the latest discoveries of consequence.

The lead-mines did not fail to attract the earliest attention of the American government; and, immediately after the occupation of the Territory, measures were taken to ascertain their situation, the method

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\* The following is a list of the principal mines worked under the Spanish government, with their situation :

|                       |                                   |
|-----------------------|-----------------------------------|
| Mine La Motte.....    | Head of St. Francis river.        |
| Mine à Joe .....      | On Flat river.                    |
| Mine à Burton .....   | On a branch of Mineral Fork.      |
| Old Mines.....        | do. do.                           |
| Renault's Mines ..... | On Mineral Fork, or Fourche Arno. |

of working them, &c. Several laws have since been enacted on the subject, and a reservation made of all discoveries upon public lands.

The emigration to Louisiana, which had partially commenced under the Spanish government, took a more decided character after the cession of the country to the United States, but has been particularly great within the last few years.

In 1812, that part of Louisiana bordering on the gulf of Mexico, including New Orleans, and extending up the Mississippi to 33° north latitude, was erected into a State under the name of Louisiana, and the remainder formed into a territorial government by the name of Missouri. There is a petition now before Congress (Feb. 1819) for the admission of Missouri into the Union on a footing with the original States. By this petition it is contemplated that White river will form the southern boundary; and the country between that and the northern line of Louisiana, including our claims on the Spanish, will be erected into a territorial government, under the name of Arkansas.\*

Respecting the present state of the lead-mines, it is only necessary here to add, that they are worked in a more improved manner than at any former period; that they are more extensive than when the country came into the hands of the United States, and of course give employment to a greater number of miners, while every season is adding to the number of mines; and that the ores may be considered of the richest kind. Every day is developing to us the resources of this country in minerals, and particularly in lead; and we cannot resist the belief that, in riches and extent, the mines of Missouri are paralleled by no other mineral district. In working the mines, in raising and smelting the ore, and in the establishment of the different manufactures dependent upon it, there is much to be done. Though the processes now pursued are greatly superior to those in use under the French and Spanish governments, there is still ample room for improvement. The earth has not yet been penetrated over eighty feet! We know not what may be found in the lower strata of the soil. There is reason to believe that the main bodies of ore have not yet been hit upon; that they lie *deeper*, and that we have thus far only been engaged upon the spurs and detached masses. There is also reason to believe that bodies of the ores of zinc exist in the district of the mines, and that copper will be afforded by the lower strata of earth. It is found overlaid by lead-ores in many of the European mines; and the geognostic character of the country leads us to conclude that it may also be found here.

The want of capitalists in the mine country, and of practical skill in the boring, blasting, sinking shafts and galleries, oppose obstacles to the

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\* A law erecting the Territory of Arkansas from the southern part of Missouri, has since passed; but its northern boundary is extended so as to include all White river above the latitude of 36° 30'.

successful progress of mining. There is but one regular hearth-furnace for smelting in the whole district; and that is on the modern plan of English furnaces. There are not over four or five regular shafts in about forty mines; there is not an engine, either by horse, steam, or water power, for removing water from the mines, several of which have been abandoned on this account, with rich prospects of ore in view. In fine, there is little of that system which characterizes the best-conducted European mines, and which, by an application of the most recent discoveries in mechanics, chemistry, and philosophy, render them the admiration of every intelligent visiter. Should the subject attract the attention of mining capitalists, the circumstance would form a new era in the history of the mining operations of this country. Something also remains to be done by the government; the existing laws are inadequate to the purposes for which they were enacted. That feature restricting leases to three years, is injudicious; the period is so short, that it deters those who are most able from engaging in it at all. It is desirable that such a system should be established as would indicate the annual produce of the mines, number of hands employed, and such other facts as are necessary in forming a series of statistical tables on the subject. The want of such data has hitherto prevented us from properly estimating the importance of the mines in a national point of view. The acquisition of a scientific knowledge of minerals should also be facilitated in this quarter. There should be a mineralogical school located in the country, where students might be instructed in that useful science. In a country so rich in minerals, and whose wealth will always so much depend upon a proper development of these resources, the knowledge of mineralogy should be laid open to every one, and should be within the reach of such as do not wish, or cannot get, the other branches of a liberal education. To obtain this knowledge now, a person would be compelled to travel to remote parts of the Union, and to incur an unreasonable expense. No one who is conversant with the advantages which Germany has derived from such a seminary, will deny the utility of a similar one in the United States.

Yet, with all the disadvantages under which the lead-mines have been viewed, there are many who may be surprised to find their annual products, from the best information, stated at three millions of pounds; and from this some idea may be formed of their riches and extent, and, when they come to be properly and regularly worked, how greatly they will contribute to the national wealth.\*

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\* The following are the principal historical epochs of Louisiana, chronologically arranged :

|                                                          | A. D. |
|----------------------------------------------------------|-------|
| Discovered by Ferdinand de Soto, and named Florida ..... | 1539  |
| Visited by the French from Canada .....                  | 1674  |
| Settlement made by La Salle .....                        | 1683  |
| A settlement made at Beloxi.....                         | 1699  |



## SECTION II.

### TOPOGRAPHICAL AND GEOLOGICAL OUTLINE OF THE MINE COUNTRY.

THE district of country formerly known as the lead-mines of Louisiana, extends from the head-waters of the St. Francis, in a north-west direction, to the Maramec, a distance of seventy miles, by about forty-five in width, having the Mississippi on its eastern borders. It is included, very nearly, between 37° and 38° north latitude, and comprises an area of about three thousand square miles. Most of the mines are situated within a circle of this general area, of which Potosi and Mine à Burton constitute a centre.

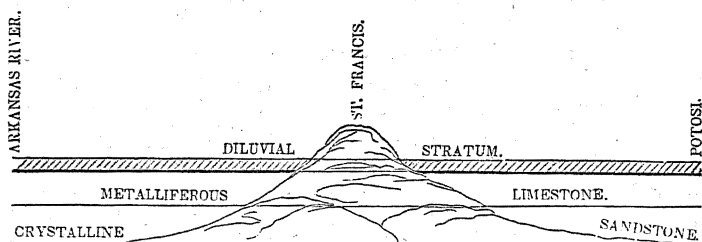
The rock formation of the country appears to be simple and uniform. At the lowest depths observed in valleys, there is a crystalline sandstone, which often consists of transparent quartzose grains, adhering by the force of aggregation. The lead-bearing limestone reposes upon this. Both formations are deposited in perfectly horizontal strata. Valleys which carry streams have been worn down into this formation, presenting this order of arrangement very satisfactorily. A stratum of red, marly clay, spreads over the limestone. Above this, constituting the top layer, or surface soil, rests a bed of diluvial materials, filled with broken-down fragments of rock, masses of radiated quartz, and chips of hornstone. Vegetable matter and black sand form a covering over such parts of this diluvial deposit as constitute valleys and agricultural plains. The Mississippi river lays open this formation along its western banks, from the influx of the Missouri to Cape Girardeau.

Beneath this metalliferous column lie the primitive rocks. The most striking feature of this kind is found in the occurrence of a primitive formation at the sources of the river St. Francis. My attention was arrested by this fact, soon after I began to examine the mine country. This formation consists of sienite, rather than granite; the mica being

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|                                                               |      |
|---------------------------------------------------------------|------|
| Granted to Crozat by Louis XIV., 14th September .....         | 1712 |
| New Orleans founded by the French .....                       | 1717 |
| Retroceded to the crown by Crozat.....                        | "    |
| Granted to the Company of the West.....                       | "    |
| Retroceded by the Company of the West.....                    | 1731 |
| Ceded by France to Spain .....                                | 1762 |
| First occupied by the Spanish.....                            | 1769 |
| Ceded to the United States.....                               | 1803 |
| Taken possession of by the United States, 20th December ..... | "    |
| Louisiana became a State, August.....                         | 1812 |
| Missouri Territory erected, 4th June .....                    | "    |

generally replaced or represented by hornblende. The feldspar, which constitutes three-fourths of the mass, is of a dull red hue. The rock in connection is greenstone trap, which is sometimes porphyritic. I observed small masses of sulphuret of iron in some parts of this rock. The upheaval of this formation appears to have been of the most ancient era of geological action; for the stratified limestones and sandstones, which lie upon or in juxtaposition to these elevations, have not been disturbed in their horizontality. The altitude of this primitive tract does not probably exceed one thousand feet above the waters of the St. Francis river. Vast blocks of the red sienite have been detached, and scattered southwardly over the secondary rocks, apparently by the force of some antique deluge, setting from the north. The whole series of formations may be judged of by the following diagram:



The general aspect of the country is sterile, though not mountainous. The lands lie rolling, like a body of water in gentle agitation. In some places they rise into abrupt cliffs, where the rock formations appear. Generally, they present the form of diluvial ridges, sparingly covered with forest, and bearing a growth of prairie-grass and herbage. The western banks of the Mississippi, between St. Genevieve and Herculaneum, present a mural front to this district, in a series of elevated perpendicular cliffs of compact limestone. The whole coast extending to St. Louis, appears to be sufficiently elevated to have served as a former barrier to waters covering the low grounds of Illinois. The strata exhibit ancient water-marks of a diluvial character. They are broken through, from the west, by small streams draining the mine country.

No indications of lead-ore have been found in these cliffs. The mines are situated at considerable distances west of them; and when the observer has arrived at their localities, he finds the ore often lying in the unconsolidated soil. This soil is a stiff, reddish-colored clay, filled with fragments of cherty stones, quartz, and small gravel, clearly attesting its diluvial character. This soil extends to the depth of from ten to twenty feet, or more, and is based on limestone rock. It is so firm, in some places, as almost to resist the pickaxe; in others, it partakes more fully of marl, and is readily penetrated. The ore lies in this marly clay, and

is often accompanied by sulphate of barytes and calcareous spar. The country is particularly characterized by radiated quartz, which is strewn in detached pieces over the ground, and is also found imbedded in the soil at all depths. This substance is here called *blossom of lead*, or *mineral blossom*. Pyrites, and some other ores of iron, are also found in detached masses upon the surface, and, very rarely, lead-ore.

Such is the general character of the mineral lands, which are covered with a stunted growth of oaks, denominated post-oaks. Walnut is found in some instances out of the valleys. A ridge of yellow pine extends west of the mines, between the St. Francis and Maramec, and is more decidedly barren than the grounds covered with oak. All the open, elevated tracts, are clothed with herbage, which hides their flinty aspect, and gives the country a picturesque appearance. The minor slopes and ravines are often rendered almost impassable by hazel, vines, and other bramble, which appear to be indicative of a better, or rather a deeper soil. The whole area of upland soil, which rests as a mantle over the rocks, is a diluvium, which must, we think, be referred to an early period of diluvial action.

The only true alluvium of the mines appears to be confined to the valleys or plains, which are, consequently, the principal seats of cultivation, and thus derive an additional value from their contiguity to the barren tracts. This alluvium rests on the red marl-clay, or mineral diluvium; the latter of which is uniformly found on penetrating it. Some of the mines exist in, and have been pursued beneath, this top alluvion, across the valleys. Others are seated beneath an arable soil, bearing a forest. Many of the most barren and stony parts of the elevated lands are, on the contrary, destitute of mines. The depth of the mineral soil varies exceedingly. It barely conceals the rock formations in many of the more elevated positions, and frequently does not conceal them. It is deepest in the plains and depressed grounds, being accumulated much in the manner we should expect, on the supposition of a general diluvial submersion.

The principal objection to a general diluvial action, involving the whole Mississippi valley, appears to arise from the admission of the limestone rock's being the true locality of the ore. But we think there are too many facts in support of this opinion, to leave any reasonable grounds for questioning it. Several of the mines in the mineral soil have been traced down into the rock, and have been pursued through apertures, closing and expanding in the manner of true veins. In the numerous cases where the rock has put a stop to further mining, and it has exhibited no signs of ore, it may be supposed that the ore has been moved, by diluvial force, from the original position of the mine, and been finally deposited, with the soil, upon unmetalliferous portions of the rock. And could we with certainty determine the course of diluvial action, the principles of mining might be, in some respects, employed in searching for

the original vein. It is evident, from the unscratched and unbroken surface of much of the ore and its spars, that it could not have been transported far; while the portions of it called gravel ore, which evince its diluvial character, are manifest proofs of a change, more or less extensive, in the general position of the ore.

With respect to the character of the limestone, we have been perplexed with its protean character, and, to avoid apparent contradictions, were led, at first, to adopt distinctions of strata, which we very soon saw were untenable. It is evidently the American equivalent for the metalliferous limestone of England, and, as a formation, is of the transition era. In a specimen of this rock, now before us, taken from a fresh excavation at Potosi, forty feet below the surface of the soil, and thirty-one feet below the original surface of the rock, the structure is in part compact, and in part granular; the compact portions having minute shining crystalline points, and the granular being without any appearance of crystallization, but changing, in the width of about forty lines, from compact granular to a dull arenaceous structure, quite friable between the fingers. Part of the mass is vesicular, and the vesicles are studded over with minute crystals of white opaque quartz. The two extremes of this specimen have the appearance of totally different formations, yet are both calcareous. By experiment, I found a portion of the lower arenaceous part almost completely soluble, in the cold, in nitro-sulphuric acid; and the actual residuum was, in part, owing to a defect in trituration.

Most of the limestone rock disclosed by excavation in the mines, is of the granulated kind; while the structure of the rock above the surface, where the strata are exposed to the weather, as in cliffs and hill-sides, is of the solid, glistening, pseudo-compact variety. Both these varieties, as shown in the specimen, are geologically identical, notwithstanding their striking differences in hardness, structure, colour, and particularly in crystalline lustre. This lustre is, however, as shown by examination with the magnet, owing almost exclusively to minute facets of calcareous crystals, which render it rather sparry than crystalline.

We have examined large portions of this rock, in all its varieties, for organic remains; but have not succeeded in finding any well-characterized species, although a further and fuller search might, and probably would, disclose some species. We observed a single mass of the rock, an imperfectly columniform structure, apparently organic. The rock is rather vesicular than cavernous in its structure. The heavy deposit of diluvium conceals the surface. But if the appearances in the mine-diggings are to be received as general indicia, the surface of the concealed rock is extremely rough and irregular, standing up, in the mineral soil, in huge lumps, which renders the general depth at which it may be reached, a question of great uncertainty.

It has been intimated that the sparry-compact, and the dull granulated varieties of the limestone, are often contiguous; and we have seen, by

the examination of a hard specimen, that they are geologically identical as a formation. If this compact variety from the mines be compared with the principal formation in the precipitous cliffs forming the western banks of the Mississippi, in front of the mine tract, they will be found to coincide in so many points, that these two localities may be deemed parts of the same formation, and as being identical in age. The principal differences consist in the occurrence of organic remains in the strata along the banks of the Mississippi; a discovery attributable to the more full exposure of these cliffs to observation. There is also an apparent absence of the granulated, or sand-lime variety. These two calcareous tracts are not, however, continuous, being separated by a formation of granular quartz, or white crystalline sandstone, which runs nearly parallel with the Mississippi for a distance, a few miles west of it. This stratum of rock, which appears to be rather a quartzose sandstone than a granular quartz, reappears west of Potosi, in the barren area called the Pinery, and is also apparent at several localities between the waters of the Maramec and the St. Francis.

At a point thirty miles west of the Mississippi, in about the latitude of St. Genevieve, the primitive formation reveals itself in a series of mountain masses of granite, which cover a comparatively extensive area. This tract appears to be the nucleus of the country, rising through the great secondary formations which intervene between the Alleghany and the Rocky mountains. Its western limits have not yet been explored; but it probably covers an area of not less than a hundred square miles. The mines lie north of it. This granite is composed almost exclusively of reddish feldspar and quartz. The proportion of mica is small, and this mineral is often absent. It has been employed as a material for mill-stones. It is connected with greenstone, which is sometimes porphyritic.

We have now three formations of rock, as constituting the mine series; and it only remains to point out their relative position and extent, with the best means at our command. This might seem to be a very simple process, and would indeed be so, were it not that the area over which the formations extend is extensive, and is covered with deep formations of the diluvial and alluvial character, bearing a forest. The primitive is immediately succeeded by the two latter. Mine à La Motte is situated in the mineral diluvium, and is distant about two miles from the granite on Blackford's fork. The first appearance of rock, in situ, north of this point, is at Rock creek, a few miles distant, where the granular quartzose sandstone appears. There is no further appearance of rock in this direction for many miles. The white crystalline sand-caves of St. Genevieve are seated in this formation. It is again disclosed on the Platten creek, and in the elevations west of the Joachim creek, called Fort Rock, and in the white sand-caves near Herculanum. Whether it is continued farther in the approach to the Maramec, cannot be stated; but the line of country which is thus traversed by it, is probably sixty miles. The

only point where this rock appears on the banks of the Mississippi, is in the range of the Cornice Rocks.

Proceeding west across this formation, the mineral diluvium succeeds, and conceals the rock formations; but, wherever they are disclosed by the action of the streams, and by excavations, the metalliferous limestone appears, which constitutes the lowest stratum yet found in the mine region proper. But it is to be observed, that no excavations of any considerable depth have been made; the rock has not been penetrated to any great depth. The principal seat of the mines consists of the area included within the circuits of the Grand river and Mineral Fork, constituting the main tributaries of the Maramec. These streams extend something in the shape of a horse-shoe around the mines. Immediately west and south-west of this area, the white sandstone reappears, extending south towards the granite. The position of the two formations may be represented by a pair of expanded dividers, opening northward; the two shanks of which denote the sandstone ridges, and the head, or rivet, the primitive.

The most valuable mineral products of the mines, in addition to lead, are iron and salt; the latter of which is made, in limited quantities, at a saline spring at Madansburgh, in the county of St. Genevieve. Other indications of it exist at one or two localities in the township of Bellevieu, and on the Maramec river, where efforts were formerly made to manufacture salt.

Iron-ores are found at numerous points; but no body of the ores of this metal is known, comparable, in extent or value, to the locality of Bellevieu, called the Iron Mountain. The ore exists, at this place, in a very massive form. It is in the state of a micaceous oxide. It has been tried in a slag furnace, and smelted easily, without a flux. The iron obtained was of a very malleable quality, and spread freely under the hammer. This locality is embraced by the waters of Cedar creek, which, at the distance of seven miles, are stated to afford a water-power adequate for the reduction and working of the ore. About five miles distant, at Stout's settlement, occurs another body of this ore.

Zinc is found, in the form of a sulphuret, in small quantities, at several of the lead-mines in Washington county. A single mass of the sulphuret of antimony has been discovered in the granitical district, which affords also a locality of coarse graphite, and some other minerals, which will be noticed in the sequel.

A sulphur spring exists a few miles west of the Mississippi, in Jefferson county. The water issues, in a copious stream, from an aperture, situated near a cliff of the compact limestone. It is of a bright, transparent quality, but indicates, by its taste, its sulphureous impregnation, and deposits sulphur, in a whitish pulpy form, on the pebblestones and fallen vegetation of the brook which issues from the spring.

Topographically considered, the mine country is a hilly and uneven tract, having a considerable elevation above the waters of the Mississippi. It is well watered, with numerous springs, brooks, and streams, and, from the prevalence of a firm diluvial soil, affords facilities for roads. The climate is favorable to health. The manner in which the smelting of the ores is performed, being in the open air, is probably less injurious to those engaged in it, than if the furnaces were enclosed with buildings.

Some losses are sustained in the death of cattle, which die with a disease called the mine sickness. Cows and horses, which are frequently seen licking around old furnaces, often die without any apparent cause. Cats and dogs are taken with violent fits, which never fail, in a short time, to terminate their lives. This is usually attributed, by the inhabitants, to the effects of sulphur, driven off from the ores in smelting. It is more probable that it arises from the sulphurous acid in its combination with barytes, which may operate as a poison to animals. The sickness is wholly confined to quadrupeds.\*

The soil thrown out of the pits, at the abandoned mines, is found to produce some plants, and even trees, which are not peculiar to the surface. Such are the cottonwood and the beech-grape, species which are usually confined to the arenaceous alluvions of valleys. And we think their growth here is not promoted by the mineral clay, which is manifestly of a fertilizing property, when cast on the surface; but to the disintegration of the sand-lime, producing a soil favorable to such productions. The sensitive brier, observed in the mine district, is evidently not of this class, as it is found remote from any mine excavations.

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\* On this passage, Mr. Silliman remarks, "that sulphur is not poisonous to men or animals. . . . The *carbonate* of barytes is eminently poisonous; but we have never heard that the *sulphate* is so. May not the licking around the furnaces expose the cattle to receive lead, in some of its forms, minutely divided? or, if it be not active in the metallic state, both the oxide and the carbonate, which must of course exist around the furnaces, would be highly active and poisonous. Is it not possible, also, that *some* of the natural waters of the country may, in consequence of saline or acid impregnations, dissolve some of the lead, and thus obtain saturnine qualities? We must allow, however, that we are not acquainted with the existence of any natural water thus impregnated."—JOUR. SCI., Vol. III.

### SECTION III.

#### LOCAL POSITION OF THE SEVERAL MINES.

SINCE the first discovery of lead in this Territory, the number of mines has been much increased, and hardly a season passes without some new discovery. Every discovery of importance soon becomes the centre of mining attraction. As the ore is found in the diluvial soil, it is generally exhausted on reaching the solid rock; and after penetrating a considerable area of the surface with any, or but partial success, the locality is abandoned, and a new one sought. As the mines are worked without capital, and the ore is dispersed over a wide area, the number of localities is almost indefinite. Upwards of forty principal sub-districts are known, most of which are appropriately denominated *diggings*. The earliest discovery, at Mine à Burton, has been one of the most valuable, and still continues to afford the ore. Mine à La Motte has also proved an extensive deposit, and is still unexhausted. New Diggings, Shibboleth, and Richwoods, are among the discoveries of later date, which have yielded very large quantities of ore. But the mode of mining in the diluvial soil must exhaust it of its mineral contents, and direct miners, in after years, to the true position of the ore, in the calcareous rock. So long as the search continues in the soil, the business will partake of the uncertainty which now attends it, and which renders it rather an object of temporary enterprise, than a fixed employment.

In the search for ore in the soil, scarcely any uniform principles can be certainly relied on. Generally, rocky and barren localities are avoided, and large and deep beds of the red metalliferous clay sought for. The occurrence of crystallized quartz, or spars, on the surface, is regarded only as a general indication, but cannot be depended on to ensure local success. These masses are found to be distributed on and through the top soil, as other debris, being sometimes contiguous to, and sometimes remote from, ore. But they are never, so far as I have observed, found with the ore.

The method of searching for and raising the ore, is simple. Having fixed on a spot for digging, the operator measures off about eight feet square. A pickaxe and shovel are used for removing the earth. A practised hand will pitch the earth from a depth of eight or ten feet. A windlass and bucket are then placed over the pit, and the excavation thus continued. Small detached masses of ore, or spars, are often found in the soil, in approaching a larger body. The ore is the sulphuret, or galena. It has a broad, glittering grain, and is readily divisible into cubical fragments. It occurs in beds, or detached masses, which are deposited horizontally in the soil. They are often accompanied by the sulphate of barytes, or by calcareous spar; sometimes by blende, or iron



pyrites. The ore is often connected with the barytic spar, indicating the latter to be a true matrix. The direction of these beds of ore appears to be irregular. Veins of ore are confined to the rock.

The variety of ore called *gravel ore*, differs from the preceding chiefly by its marks of attrition, and connection with diluvial pebble-stones. No spars have been noticed in these gravel-beds, although it is probable that a careful search might detect them.

The calcareous spar is most abundant in connection with rock diggings. It is translucent, or transparent, and often exhibits the property of double refraction. The miners, who employ their own conventional terms, call this substance *glass tiff*, to distinguish it from the sulphate of barytes, which is denominated *tiff*. Much of the radiated quartz of this district bears the marks of diluvial action. It is not uncommon to find masses of it, in which the angles of the crystals are quite defaced. Veins of ore in the rock correspond generally, in their course, I think, with the cardinal points, in the instances of their being pursued horizontally. But they dip at various angles with the plain, or sink perpendicularly into the rock.

The horizontal position of the ore-beds in the red clay soil, may be regarded as an evidence of its being a diluvial deposit.

The metalliferous, red, marly clay, is, in fine, the most interesting geological problem connected with the mines, and is calculated to show us how little we know of the true eras of the diluvial deposits. After every examination which we have been able to make, we are decidedly of the opinion that this formation belongs to the diluvial, and not to the alluvial era. It seems, indeed, to assert a claim to be considered, among the western strata, as immediately succeeding the secondary. It lies directly next to, and upon, the limestone rock. We have witnessed the progress of an excavation on the public square of Potosi, in which the soil was removed down to the rock, and a clean area of its surface was exposed. There was no other stratum below it, and between the clay and rock. And such we believe to be its general position. The radiated quartz and pebble drift is above it, and, consequently, constitutes a subsequent deposit. And hence it is that the numerous fragmentary masses of the former, called *mineral blossom*, are no sure indications of the subterraneous presence of ore. The gravel-ore and mixed diluvial gravel is likewise a newer deposit, coinciding with the era of the primitive and secondary boulders. No large primitive boulders, however, exist in the mine district, if we except the angular fragments of granite, south of St. Michael, which are, indeed, just without the lead-yielding area. Pebbles of common quartz, granite, and greenstone, are found in the surface soil, and are also to be observed, in accumulated masses, in the beds of brooks. Occasionally an orbicular mass of these rocks, of the size of a melon, is observed. It is evident, from these appearances, that no formations of the primitive exist, towards the sources of the Mississippi, for a great

distance, as it is from this direction that diluvial action appears to have been propagated. This clay soil is free from boulders, and is of a homogeneous texture. It partakes, in its qualities, so largely of marl, as to operate as a manure, on being thrown out of the pits, and, after a few years, is covered with a very rank growth of trees, vines, &c. This is a characteristic trait of the locality of abandoned diggings.

The following is a catalogue of the mines. It comprises those of most note, which are now worked, or have been at some former period.

- |                                         |                                 |
|-----------------------------------------|---------------------------------|
| 1. Mine à Burton.                       | 23. Moreau's Diggings.          |
| 2. Mine à Robino.                       | 24. Tapley's Diggings.          |
| 3. Mine à Martin.                       | 25. Lambert's Diggings.         |
| 4. New Diggings.                        | 26. Old Mines.                  |
| 5. Citadel Diggings.                    | 27. Mine Shibboleth.            |
| 6. Perry's Diggings.                    | 28. Elliot's Mines.             |
| Hawkins's Mine.                         | 29. Belle Fontaine.             |
| 8. Rosebury's Mine.                     | 30. Cannon's Mines.             |
| 9. Austin's Shaft.                      | 31. Little Diggings.            |
| 10. Jones's Shaft.                      | 32. Becquet's Diggings.         |
| 11. Rocky Diggings, (Prairie de Roche). | 33. Mine Liberty.               |
| 12. Gravelly Diggings.                  | 34. Renault's Mines.            |
| 13. Brushy-run Diggings.                | 35. Miller's Mine.              |
| 14. Stricklin's Diggings.               | 36. Mine Silvers.               |
| 15. Bibb's Diggings.                    | 37. Fourche à Courtois.         |
| 16. Tebault's Diggings, (Pinery).       | 38. Pratt's Mine, Big river.    |
| 17. Mine Astraddle.                     | 39. Lebaum's Mine, Richwoods.   |
| 18. Masson's Diggings, or Partney's.    | 40. Mine à Joe, Flat river.     |
| 19. J. Scott's Diggings.                | 41. Bryan's Mines, Hazel run.   |
| 20. T. Scott's Diggings.                | 42. Dogget's Mine, do.          |
| 21. Micheaux's Diggings.                | 43. Mine La Motte, St. Michael. |
| 22. Henry's Diggings.                   | 44. Gray's Mine, Big river.     |
|                                         | 45. M'Kane's Mine, Dry creek.   |

The most noted mines are Mine à Burton, New Diggings, Shibboleth, Richwoods, Old Mines, and the numerous mines on the waters of the Mineral Fork of Grand river. Mine à La Motte, Mine à Joe, and Bryan's Mines, are east and south of the principal group of mines in Washington county, and at a considerable distance from them. A few general remarks may be applied to all these mines.

The mines possess one general character, although there are some peculiarities which I shall hereafter mention. The ore is found in detached pieces and solid masses, in beds, in red clay, accompanied by sulphate of barytes, calcareous spar, blende, iron pyrites, and quartz. The ore is of that kind called, by mineralogists, lead-glance, or galena, and is the sulphuret of lead, of chemistry. As it is dug up or quarried from the adhering spar, it presents a very rich appearance. It has a

broad, glittering grain, of a lead-gray colour, which passes into a bluish shade. The ore is easily broken by the blow of a hammer, and may be pounded to a fine powder, still preserving its glittering appearance. In breaking it, it always separates in cubes. Sometimes detached lumps of four or five pounds weight, of a cubical form, are found imbedded in the clay. Its primitive figure of crystallization is particularly observable after the ore has been desulphurated by heat, which, at the same time, increases its splendor, and renders the lines of intersection between the facets more plainly discoverable.

The clay, or red earth, in which the ore is found, appears to partake largely of marl; and a difference of quality is to be observed at the different mines. It all, however, operates more or less as a stimulant to vegetation, on being thrown out of the pits. Mixed with the clay are innumerable pieces of radiated quartz, very beautiful in appearance. This forms the first stratum, and is about fourteen inches in depth; then succeeds a stratum of red clay, four or five feet thick, and sparingly mixed with substances of the same kind; after this, a layer of gravel and rounded pebbles, of a silicious character, ensues; these are about a foot in depth, and lead-ore, in small detached lumps, is then found. This is of the description called gravel-ore, and no spars are found accompanying it. The greatest proportion of lead-ore is, however, found imbedded in marly clay, accompanied by the sulphate of barytes, and resting on limestone rock. The rock is struck at a depth of from fifteen to twenty feet, and is a metalliferous limestone, of a semi-crystalline structure, lying in horizontal beds. It is traversed by veins of lead-ore. Sometimes these expand in the shape of caves, where masses of galena occur.

The most valuable substance accompanying the lead-ore, is an ore of zinc, which is found at several of the mines. Another substance, found with the ore in considerable quantities, is the sulphate of barytes. This is sometimes in immediate connection with the ore, but more frequently in contiguous masses, in the clay.

The sulphate of barytes, called *tiff* by the lead-diggers here, is the same substance called *cawk* by English miners. It is very white, opaque, and very heavy, and may be considered as the proper matrix of the lead-ore.

There are also found considerable quantities of calcareous spar, particularly in the caves and veins in rock. This substance is often observed in large orbicular or irregular masses, which have the appearance of external attrition. On breaking them, they fall into rhombs, which are very transparent and glittering; in color, they are either white, or honey-yellow.

Pyrites are common at the mines, sometimes crystallized in regular cubes of a beautiful brass-yellow color, and, at others, found in tabular masses, or mixed with blende, sulphate of barytes, or calcareous spar. Quartz is found throughout the whole mine district, both on the surface

of the ground, and at all depths below. It is generally in the form of tabular pieces, whose surfaces are thickly studded over with small pyramids of transparent rock-crystal, and present an appearance of the utmost beauty and splendor, looking like so many diamonds set over the surface of white stone. These crystals are frequently grouped in the form of a hemisphere, circular, or oriform, solitary or in clusters, forming the different varieties of mamillary and radiated quartz; and, when met with in their pristine beauty, present a very rich and brilliant appearance. It has acquired the popular name of *blossom of lead*, or mineral blossom, a term perfectly significant of its supposed affinity.

The exterior stratum of red clay, with its ores and minerals, will be best understood by comparing it to a garment thrown over the rock-formations of the country. The search for ore has been generally confined to these clay diggings, which are pursued, very much, with the apparatus of common well-digging. If, on reaching the rock, no vein of ore is discovered, the work is generally dropped.

On viewing the district on a large scale, this external clay stratum appears to have originally derived its mineral contents from veins in the calcareous, lead-yielding rock. This metalliferous rock has evidently, in former ages, been scooped out by rivers and streams, forming valleys and vast diluvial plateaux, where the abraded materials were deposited. The original subterranean veins were concealed by these geological changes.

Some of the mines exhibit traits that may be mentioned. Mine La Motte is one of the oldest mines in the Territory, having been discovered in 1720, by the person whose name it bears. The mines are very extensive, and a large quantity of ore is annually raised. They are situated within two miles of St. Michael, Madison county, and on the head-waters of the river St. François. No spars are found accompanying the ore; iron pyrites is occasionally met with, and plumbago is found in the vicinity. The ore, which is less brilliant, and differs in other characters from any other in the mine tract, is at the same time more refractory; in some instances, the greatest difficulties have been experienced in the smelting. Hence, an idea has originated that it is combined with other metals; but no experiments, I believe, have been made to ascertain this point.

On a visit to these mines, I observed the inside of the ash-furnace beautifully tinged with a blue color of considerable intensity. This furnace is built of a white sandstone, which becomes vitrified on the surface, forming glass. We are acquainted with no substance which will communicate a blue color to glass in fusion but cobalt; hence, it is not unreasonable to infer that this metal is volatilized during the smelting, and is thus brought into contact with the liquefied surface of the stone, imparting to it the color noticed. That the ores of La Motte contain an unusual portion of sulphur, is very probable. I draw this inference both from its refractory nature and dull appearance. Sulphur always renders an ore

refractory; for, when it is expelled by torrefaction, the ore melts easily. Its dull aspect is not less conclusive; for, the more an ore is roasted, and the more sulphur there is driven off, the brighter it grows. This is evident to every smelter, who cannot fail to observe the surprising brilliancy the ore assumes after it has gone through the first operation in the log furnace. That the difficulties daily experienced in smelting the La Motte ores are, therefore, attributable to the extraordinary quantity of sulphur they contain, is extremely probable; for, even if they were united with other metals, with silver or with cobalt, these would not increase their infusibility, except by the extra quantum of sulphur they brought with them. At least, we have no facts to prove that a simple alloy does not melt as easily as a pure metal, while there are many to show that alloys are of the most easy fusibility.

The quantity of ore raised at New Diggings has been very great, a regular vein having been found; but they were abandoned several years ago on account of the water, which rushed in with such rapidity, that to remove it every morning with a common windlass and bucket was found a work of such labor as to render the business unprofitable. The mines were left with the most flattering veins of ore in view. The general character of these mines is such as to justify the erection of a steam-engine, and other works for prosecuting the business on an extensive scale; and their revival at some future period may be confidently looked for.

Mine Renault is situated about six miles north-north-west of Mine à Burton, in a very rocky part of the country, which affords some of the most picturesque views of mountain scenery. The region is strongly marked by mineral appearances, rendering it probable that other substances of value, besides lead, may exist in that vicinity. Ores of zinc are abundant at this mine, and a body of micaceous oxide of iron is found in the neighborhood.

Bryan's Mines are seated on Hazel run, and are among the most recent discoveries of consequence. Near a million pounds of lead were made here during the first year of the discovery. The mine is characterized by yielding no heavy spar; sometimes a little calcareous spar is found, and then adhering to the ores; a circumstance which I have nowhere else observed. Much of the ore of these mines is found in tabular pieces, which are sonorous in a considerable degree; the ore is brilliant, and smelts readily, yielding the same as at Mine à Burton.

Gray's Mine, situated on Big river, in the northern extremity of the mine tract, is remarkable for a body of white clay, which was discovered in searching for ore. In sinking several pits at this mine, a stratum of clay of an unusual appearance was struck at the depth of from eight to ten feet, and no ore was procured at those places; the diggings were abandoned in consequence of the clay, which covers a considerable area of ground on the banks of Big river. This mineral substance bears a striking resemblance to specimens of a pyrous crucible clay.

Elliott's Mines lie upon the Mineral Fork, and are characterized by the abundance of pyrites, and the beauty of the calcareous spar found there. Considerable quantities of blende were also met with, and strong indications of the existence of copper are furnished. During the remarkable earthquakes of 1812, a fine spring of water at the mouth of the mines suddenly became warm and foul, and in a few days dried up entirely, and no water has run there since. Illuminations in the atmosphere (arising doubtless from phosphorus) are frequently observed in this vicinity on the approach of night.

At Mine à Burton, there is found adhering to the sides of the log-hearth furnace, a grayish-white sublimated matter, of great weight, which I take to be a sublimate of lead. It is considered as chiefly sulphur or arsenic by the lead-smelters, and is thrown by as useless. It is found at every furnace, and a very large quantity could be annually collected. This induced me to undertake some experiments on the subject. I was convinced, on reflection, that there could be no sulphur, at least no considerable quantity of sulphur, in it, from the fact that all sulphur, or other inflammable matter, expelled from the ore in the furnace, would undergo immediate combustion. This is also observable in the color of the flame while the ore is torrifed. Indeed, every person conversant with the nature of this substance must know that it cannot be otherwise. The furnace is entirely open, and does not rise over seven or eight feet in height; consequently, there is no opportunity for it to condense. That the sulphuric acid is driven off, is undoubted; for, whenever sulphur is burned, this acid is set at liberty; but it has no opportunity for entering into a new combination within the body of a log furnace.

The idea of arsenic in the substance alluded to, is perfectly erroneous, and has originated in an ignorance of the nature of the ores of these mines. It is the *sulphuret of lead*, and not the *arseniate*. That there is a small portion of silver and antimony in combination with the ore, is probable; but they too are mineralized by sulphur. Reflecting on this, I became convinced of the popular error, and, to ascertain the point, made the following experiments:

A. I took a lump of the sublimated matter, freed from adhering impurities, and reduced it to the state of a fine powder by pulverizing in an agate mortar, and trituration. Of this I mixed six parts with four of pulverized borax, and a little charcoal, and submitted it to the intense heat of a small chemical furnace. On removing the crucible, I found a button of metallic lead in the bottom, weighing nearly four.

B. Dissolved a quantity of the powdered sublimate in nitric acid; it effected a ready solution, with violent effervescence. Poured on liquid carbonate of potash until no more precipitate fell. I then collected the precipitate, and washed away the superfluous alkali by clear water, and dried it in the shade. The result was a very fine, and a very white powder, of considerable weight. This was a carbonate of lead (white lead).

With a quantity of the white lead thus made, I mixed linseed oil, and painted a board. The color was of the most delicate white, and it gave a good body. On inspecting this board several months afterwards, I found the color inclining a little to yellowish. But perhaps it stands as well as any white lead would, prepared from litharge, by solution in nitric or acetic acids, and precipitation by carbonated alkali.

C. Mixed eight parts of sublimate with twelve of muriate of soda, and fused in a crucible, with a tight cover, in a high heat. Result, a yellow, hard, heavy, vitrified mass, resembling muriate of soda and lead.

M'Kain's Mine is situated on a small stream called Dry creek, running into Big river not far from its junction with the Maramec. The mine is worthy of remark only on account of a body of steel-grained lead-ore found there. This ore is found to yield less lead in smelting than the common broad-grained ore, and, as may be inferred from its texture, contains silver.

So little has been done, of late years, in mining in the rock, that the character of the veins must be judged of from limited facts. But there can be no question, from what is known, that the true scene of mining operations is the rock.

Along the west banks of the Mississippi, and also in some of the interior valleys, we observe that the metal-bearing limestone rests on crystalline sandstone. Both preserve a horizontal position, and both are deposited, at the distance of about seventy miles south of Potosi, upon pre-existing formations of sienitic granite, embracing hornblende rock; some of the latter of which is porphyritic.

These primitive formations mark the geography of the country at the sources of the St. Francis. They form alpine peaks, through which the river forces its way. Mine à La Motte is within two miles east of this tract. These peaks have been raised to their present position without disturbing the horizontality of the limestones and sandstones. Hence the conclusion of their prior elevation.

At a still further southern point, and before reaching the banks of the St. Francis at Bettis's ferry, the horizontal rocks again appear. But, in this instance, sienitic and granitic boulders are scattered over the southern series of the calcareous strata, showing, with equal clearness, that the geological era of the boulder stratum was posterior to the deposition of the horizontal strata, and that the force which scattered the boulder stratum was from the north.

## SECTION IV.

### METHOD OF WORKING THE MINES.

THE method of raising the ores, and the processes pursued in separating the metal, are, upon the whole, extremely simple. A pickaxe and shovel are the only tools in use for removing the earth; and the drill, rammer, and priming-rod, are added when it is necessary to blast. Having determined on the spot for digging, the process commences by measuring off a square of about eight feet, and throwing out the earth, spar, and gravel, until the miner sinks beneath the depth he can throw the earth. An expert hand will pitch his earth clear out of the pit from a depth of ten, twelve, and even fifteen feet. At this depth a common windlass and bucket are placed over the centre of the pit, and the digging continued by drawing up the earth, spar, and ores, if any are found, in the manner pursued in sinking a well. During his progress, the miner is notified of his approach to a body of ore, by small detached lumps occasionally found imbedded in the soil, within a few feet of the surface. Sometimes lumps on the top of the ground determine on the place for digging. The spar is also a sign by which he judges, as there is seldom a body of spar found without lead-ore. There are also other signs by which an experienced digger is advertised of his prospects, and encouraged to proceed with cheerfulness in his work. These are, peculiar appearances in the texture of the spar, and sometimes minute specks of ore scattered through it, the changes in the color, and other qualities of the earth, gravel, &c. If these appearances are promising, and bits of ore are occasionally met with, he is encouraged to sink down a great depth; but if they should fail, he is generally induced to abandon the pit, and commence at another place.

In searching for ore, the soil, the slope of the hills, spar, blossom, trees, &c., are taken as guides, and some are obstinately attached to these signs. Others, who have been fortunate in finding ore where these appearances were least promising, wholly disregard them, and pay no attention to rules. In general, there is a greater disposition to trust to luck and chance, and stumble upon ore, than by attending to mineral character, to be sure of success. As those who search by rules are generally incapable of those minute remarks on the distinguishing character and geological situation of minerals, which are necessary in order to ensure success, it frequently happens that they meet with disappointments. An incident of this kind is enough to perplex a man who has not habituated himself to reasoning on the subject, and to weaken his belief in the affinity of ores and stones. Such a man will not stop to compare and reconcile facts, which are seemingly opposite, or to investigate the nature of general principles.



Hence miners exclaim on the uncertainty of finding ores by rules drawn from the observations of science; that the strata of the earth are irregular, and not to be depended upon like the rock formations in Europe; and that, in fine, we have no guides by which its mineral treasures are to be sought, and that, in so confused a soil, chance is the best guide. Such a man is more ready to follow the mysterious guidance of the divining-rod than the light of reason, and would be easily persuaded that fortune is more surely the result of blind chance, than of feasible schemes, well planned and well executed.

There would be, nevertheless, some truth in the uncertainties and the confusion complained of, were those circumstances among the observations of scientific men. But it will be hazarding little to say, that when such observations are made, there will be found as much regularity, harmony, and order, in the superposition of the strata, as generally exist. The few facts I have noticed, lead to this conclusion.

Having raised a sufficient quantity of ore for smelting, the next process consists in separating the spar, and cleaning the ore from all extraneous matter. This is done by small picks, tapered down to such a point that a careful hand may detach the smallest particle of adhering spar. It is necessary that the ore should be well cleaned, as it would otherwise prove refractory in smelting. If there be any lumps of uncommon size, they are beaten smaller. The object is to bring the lumps as near as may be to an uniform size, so that the heat may operate equally in desulphurating the ore. It is desirable that the lumps should be about the size of a man's two fists, or perhaps fifteen pounds' weight; if too small, a difficulty and a waste is experienced in smelting. In this state, the ore is conveyed to the primary furnace, (see Plate I.) and piled on the logs prepared for its reception. When the charge is put in, which may in a common way be about five thousand pounds, it is surrounded by logs of wood, and covered over at the top, the fire being lit up at the mouth below. A gentle warmth is created at first, which is raised very gradually, and kept at this point for about twelve hours, to allow the sulphur to dissipate; the heat is then increased for the purpose of smelting the ore, and, in twelve hours more, the operation is completed, and the lead obtained. Wood is occasionally added as the process goes on, and there is a practical nicety required in keeping the furnace in proper order, regulating the draught of air, &c., so that some smelters are much more expert, and thereby extract a greater quantity of lead from a like body of ore, than others. This furnace is called the log furnace, and, so far as I know, is peculiar to this country. It is of a very simple construction, consisting of an inclined hearth, surrounded by walls on three sides, open at top, and with an arch for the admission of air below. Upon the whole, it appears well adapted to the present situation and circumstances of the people. It is cheap, simple, may be built at almost any place, and answers the purpose very well. A good furnace of this kind may be

built at a cost of from fifty to sixty dollars, every expense considered; and one of the most considerable items in the sum total is the bill of the mason, who cannot be hired, in this region, to work for less than two dollars per day.

PLATE I., Figure 1. *A Perspective View of the Log Furnace.*

- a, the front wall, 8 feet long, 7 feet in height, and 2 feet in thickness.
- b b, the side walls, 8 feet long, and 2 feet thick.
- c, the hearth, 2 feet wide, and 8 feet in length.
- d d, the ledges on each side of the hearth, 10 inches in height, and 1 foot wide. These serve to elevate the logs above the hearth, at the same time creating a draught for the air, and passage for the lead.
- e, the eye of the furnace, or arch, 2 feet across at bottom, with an arch thrown in a half circle, or a flat stone laid across at the height of the ledges.
- f, the iron ladle for dipping out the melted lead.
- g, the iron mould. Every bar of lead cast in this, is called a *pig*.
- h, the hole in the ground, for the reception of the lead as it runs from the furnace.

Figure 2, is a perspective view of the furnace from the back or open part. The same letters used in Figure 1 apply to the same parts of the furnace in this figure.

Figure 3. *Ground Plan.*

- a, the eye or arch in front.
- b b, the side walls.
- c, the hearth.
- d d, the ledges.

The process of charging the furnace may be mentioned. Three large oak logs, rolled in from the back side, and resting at each end on these ledges, fill up the width of the furnace; small split logs are then set up all around on the two sides and front; the ore is then piled on until the furnace is full, and logs are then piled over it, beginning at the back, and continuing over to the front, so that the ore is completely surrounded by wood. This furnace is always built on the slope of a hill, as represented in Plate I., Fig. 1; and the hearth is laid on an angle of 45°, so that it falls four feet in a distance of eight. Two furnaces of the size here described are generally built together, by which there is a saving of the expense of one wall, and the work is rendered stronger, one serving as a support to the other. Not only so, but the same number of hands will keep a double-eyed furnace in blast, which are required at a single one. It takes three hands, one to cart wood during the day-time, and the other two to relieve each other alternately, every twelve hours, at the furnace. When a charge is melted off, the furnace is cooled, new

Fig. I.

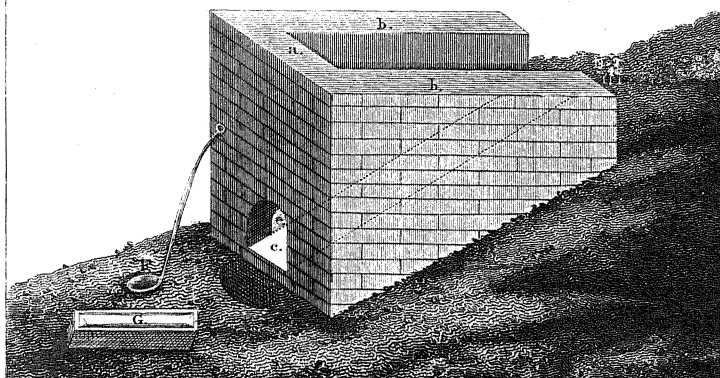


Fig. II.

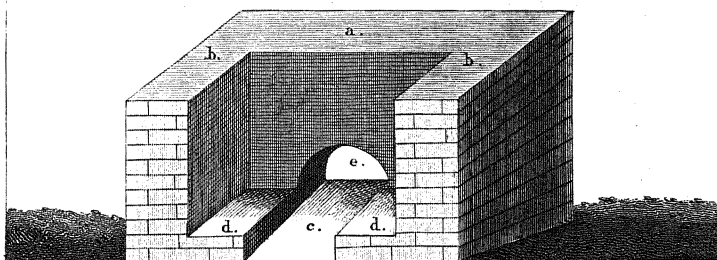
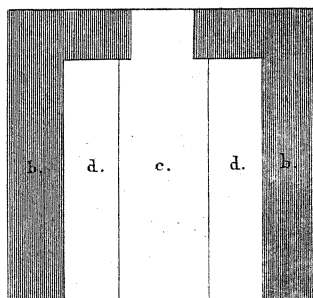


Fig. III.



*J. C. Schuchert, Del.*

*Engraved by J. C. Schuchert*

*For Smelting Lead Ore*



logs and upright pieces put in, and the whole operation begun anew. Twenty-four hours is the time generally allotted for each smelting, but it often takes thirty-six; and when there is bad wood and want of attention, it requires still longer, and indeed the result is never so good.

The ore is estimated to yield, in the large way, fifty per cent. the first smelting. A considerable portion of what is put in, however, does not become completely desulphurated, and is found in the bottom of the furnace after cooling. This is chiefly the smallest lumps, which have fallen through the apertures that burn between the logs, before they were thoroughly roasted, and thus, getting out of the way of the heat, lie entangled with the ashes. Some lumps, which are too large, also escape complete desulphuration, and either remain unmelted, or else, when the fire is raised, melt altogether into a kind of slag, and produce little or no metallic lead. This constitutes what are called the lead-ashes. The larger pieces, consisting of ore but partially desulphurated, are carefully picked out from among the ashes, and added at the next smelting in the log furnace; while the remainder is thrown by in heaps for further examination.

The lead-ashes are still rich in lead, and, when a sufficient quantity has accumulated from repeated smeltings, it is taken off to a proper place contrived for the purpose, and separated from the cinders, wood-ashes, and other adhering impurities. This is done by washing the whole in *buddles*, one set below another, in the manner of the potter, when it is necessary to *search* his clays. The ashes, which consist of clotted lumps of a moderate hardness, are first pounded to a gross powder, and then introduced into the water through a sieve. The wood-ashes and other impurities, being lighter, swim on the top, and, by letting off the water, are thus carried away. Fresh water is added, the ashes briskly stirred with a hoe, and the water again let off, carrying a further portion of impurity with it. By repeating this operation several times, the lead-ashes are brought to the required degree of purity. Thus washed, they are carried to a furnace of a different construction, called the ash furnace (see Plate II.), and undergo a second smelting.

PLATE II., Figure 1. *A Perspective View of the Ash Furnace.*

- a, the ash-pit, 2 feet wide, 6 feet long, and 20 inches in height.
- b, the mouth of the fire-arch, a foot square.
- c, the mouth of the flue, where the charge is put in.
- d, the iron pot for the lead to flow in, when the furnace is tapped.

Figure 2, is a longitudinal section through the furnace, at right angles with the front, showing the curve of the arch, flue, &c.

- a, the ash-pit.
- b, the grates, 10 inches square, and 3 feet long; these are pieces of hewn stone.
- c, the mouth of the fire-arch.

- d*, the *santee*, consisting of two stones, 3 feet long, and 3 feet 6 inches wide, with a thickness of 6 or 7 inches. They reach from the bottom of the ash-pit to a foot above the basin-stone, the interstice between them being rammed full of clay, and the whole measuring 18 inches across. (This keeps the lead, slag, &c., from running into the fire-arch, and is an important part of the furnace, requiring considerable skill and accuracy in the construction.)
- e*, the basin-stone, 4 feet square, and 1 foot thick.
- f*, the flue, or throat, 10 feet long, 22 inches wide, and 11 inches in height. This must be continued a foot and a half over the mouth of the flue, or apron, making the whole length eleven and a half feet; some prefer the flue twelve and a half feet.
- g*, the mouth of the flue or apron, where the furnace is charged; this flares from 22 inches to 3 feet, in a distance of 3 feet, (as shown in Fig. 3.)
- h*, the fire-arch, 3 feet high in the centre, 18 inches high where the arch begins to spring, and the same over the centre of the basin-stone.

Figure 3. *Ground Plan.*

From *a* to *b*, 8 feet; from *b* to *c*, 8 feet 6 inches; from *a* to *d*, 8 feet 6 inches; from *e* to *f*, 6 feet; from *e* to *g*, 13 feet.

- h*, the basin, 4 feet long, and 22 inches wide, except in the centre, where it is 24 inches wide.
- i*, the flue.
- k*, the mouth of the flue, or apron, 3 feet at the front, and 22 inches in the rear.
- l*, the *santee*.
- m*, the fire-arch, with grates at bottom. (This is 22 inches wide at each end, 24 inches in the centre, and 5 feet long from the inside of its mouth to the *santee*.)
- n*, the mouth of the fire-arch.
- o*, the iron pot for the lead to flow into, set in the curve made in the wall for convenience of tapping.
- p*, the curve in the wall for drawing off the slag.

Figure 4, is a perspective view of the mouth of the flue where the furnace is charged.

From *a* to *b*, 6 feet; from *a* to *c*, 5 feet; from *a* to *d*, 1 foot.

*c*, the mouth of the flue, 22 inches wide, and 11 high. (This flares out to 3 feet in the distance of 3 feet, the flue covering half of it, so that the heat may be thrown down on the ashes.

One of the principal points to be attended to in building an ash-furnace is the elevation of the flue. It should rise  $5\frac{1}{2}$  feet in 10; some prefer  $5\frac{1}{2}$  in 11. If the ascent be too steep, the ore will run down into the basin

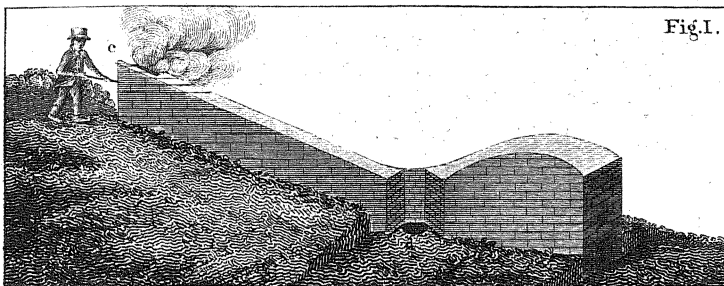


Fig. I.

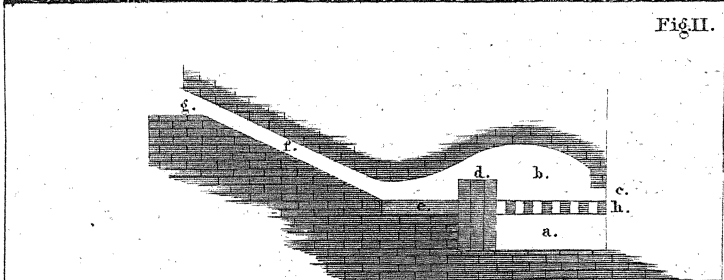


Fig. II.

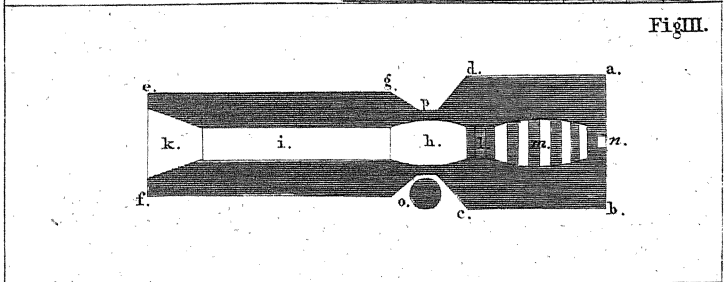


Fig. III.

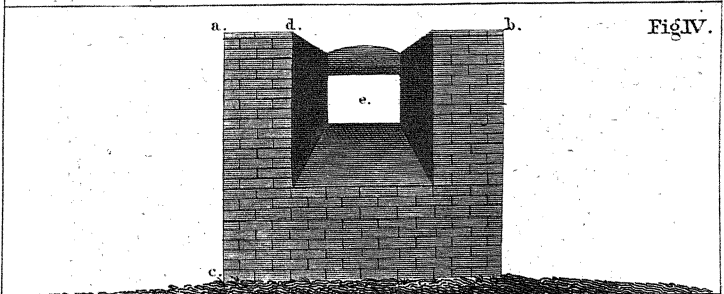


Fig. IV.

before it gets hot, which is detrimental. If the ascent be too low, the bottom of the flue next to the basin will soon be eaten away by the heat, and thus in a short time undermine and destroy the furnace.

The flux employed is also a matter of moment. Sand, and pulverized flinty gravel, are mixed with the lead-ashes before smelting. The object of this is to promote the vitrification of the slag, which would otherwise remain stiff; the particles of revived lead would not sink through to the bottom, but remain entangled with it, and thus be lost. Lime is also sometimes employed for the same purpose; and indeed any earth would operate as a flux to the scoriaceous part of the lead-ashes, if added in a due proportion, particularly the alkaline earths. Lime and barytes, both of which are afforded in plenty at the mines, might therefore be advantageously employed, when no sand or easy-melting silicious gravel could be obtained. Good fusible sands are readily attacked and liquefied by submitting to heat with oxides of lead, alkaline salts, or any other alkaline or metallic flux; hence their extreme utility in glass, enamels, and all other vitrescent mixtures. When, therefore, silicious sand can be obtained, it will be found a more powerful flux to lead-ashes than either gravel, lime, spars, or any other substance, if we except the fluor spar. This is probably better adapted as a flux than even silicious sands; but it has not yet been brought to light at the lead-mines. Perhaps the lower strata of the earth may afford it. It is found at a lead-mine near Cave-in-Rock, on the right bank of the Ohio river, in the State of Illinois, and, with the exception of a little found at Northampton, Massachusetts, is the only place where this rare, useful, and beautiful mineral, occurs in the United States.\*

The situation for an ash-furnace is always chosen on the declivity of a hill, as represented in the plate. The inside work, or lining, consists of slabs of hewn limestone, laid in clay-mortar, and backed by solid masonry. Although a stone less adapted for furnaces could hardly be found, yet it is made here to answer the purpose, and is an evidence of the ingenuity of men in making a bad material answer when a good one cannot

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\* I was mistaken in supposing this the only locality of the fluete of lime in the United States. It has also been found "in Virginia, near Woodstock or Miller's town, Shenandoah county, in small loose masses, in the fissures of a limestone containing shells. (Barton.)—In Maryland, on the west side of the Blue Ridge, with sulphate of barytes. (Hayden.)—In New Jersey, near Franklin Furnace, in Sussex county, disseminated in lamellar carbonate of lime, and accompanied with mica and carburet of iron; also near Hamburg, in the same county, on the turnpike to Pompton, in a vein of quartz and feldspar. (Bruce.)—In New York, near Saratoga Springs, in limestone; it is nearly colorless, and penetrated by pyrites.—In Vermont, at Thetford.—In Connecticut, at Middletown, in a vein, and is accompanied by sulphurets of lead, zinc, and iron. (Bruce.)—In Massachusetts, at the lead-mine in Southampton, where it is imbedded in sulphate of barytes, or granite; its colors are green, purple, &c.—In New Hampshire, at Rosebrook's Gap, in the White Mountains, in small detached pieces. (Gibbs.)"—CLEVELAND'S MINERALOGY.



be found. No sandstone or freestone, of that refractory kind used in glass and iron furnaces, is afforded in this vicinity; and the smelters seem to prefer rebuilding their furnaces often, to incurring the expense of transporting good infusible sandstones from a distance. It is not perhaps duly considered, that a furnace built of refractory materials, although expensive in the erection, would be sufficiently durable to warrant that expense, and outlast several built of limestone, which burn out every blast, and have to be rebuilt from the foundation.

Limestone is a combination of the pure earth *lime* with *carbonic acid* and *water*; it is a carbonate of lime. When subjected to a red heat, it parts with its carbonic acid and water, and, if the operation be continued long enough, is converted into quicklime. This effect, therefore, takes place as well in the lead-furnace as in the limekiln, and with this difference only—that in the former it is laid in a wall, protected in some degree from the heat, and will not part with its carbonic acid readily; while in the latter it is broken into comparatively small lumps, exposed to the heat on all sides, and is easily and readily converted into quicklime.

Nevertheless, although this calcination is constantly progressing, an ash-furnace will last from fifteen to twenty days, according to the skill which has been displayed in its construction, and the particular quality of the stone employed. When the stone partakes of clay (alumina), it runs into a variety of argillaceous limestone, and is manifestly better adapted to resist the effects of fire. Whenever the furnace is cooled, so that the stone can attract moisture from the atmosphere, it falls into quicklime. This change does not, however, take place rapidly; for the burning has seldom been uniform, and the stones have either been overburned, or not burned enough; so that it requires several days, and even weeks, to assume the powdery state.

An ash-furnace, built of limestone, is estimated to cost a hundred dollars. This includes every expense, and such a furnace lasts during one blast, say fifteen or twenty days; perhaps, with great care, it will run a month. During this time, from sixty to ninety thousand pounds of lead ought to be made.

When a furnace is completed, it requires several days to dry it, and bring it to the proper state for smelting. About ten days are usually spent in this. The fire is begun very moderately at first, being only the warmth of a hot smoke, and is kept so for the first five days, by which means the moisture of the mortar and stone is gradually expelled, and without any danger of cracking the stone, or otherwise injuring the furnace. It is then raised a little every day until the furnace is brought up to a full red heat, when it is ready for the first charge of ashes.

The operation begins by shovelling a layer of ashes on the mouth of the flue, then adding a thin layer of sand or flinty gravel as a flux, and then more ashes; and so adding gravel and ashes alternately, until the required quantity is shovelled up. This is suffered to lie here and grow

thoroughly hot before it is shoved down the flue into the basin; for, if introduced cold, it would check the heat too suddenly, and prove injurious in the result. When hot, the charge is shoved down the flue with a long-handled iron hoe, and another portion of ashes and gravel immediately shovelled on the mouth, suffered to heat, and then pushed down as before. This operation of heating and charging is continued until the furnace has a full charge, which may require about six hours, and in two hours more the furnace is ready for tapping. The slag, which is in a very fluid state on the top of the lead, is first drawn off, and the aperture closed up with stone and mortar. The smelter then goes to the opposite side of the furnace, and prepares for drawing off the lead by driving a stout sharp pointed iron bar through the side of the furnace, at a particular place contrived for this purpose. On removing the bar, the metallic lead flows out into a large iron pot set in the ground, and accompanied by a considerable quantity of a semi-metallic substance, called *zane*. This is lead not perfectly revived, being combined with some earthy particles, and oxide of lead. The *zane* occupies the top of the pot, and is first ladled out into hemispherical holes dug in the clay near by. This substance is of the consistence of the prepared sand used by brass-founders when hot, but acquires considerable solidity when cold. The metallic lead is then ladled into iron moulds of about eighteen inches in length, and yielding a pig of lead of about fifty pounds each. The quantity of *zane* made at each tapping is about equal to that of metallic lead. This is afterwards taken to the log furnace, and readily converted into lead. The lead made at the ash-furnace is not thought to be of so pure a quality as that of the first smelting made at the log furnace. It undoubtedly contains any other metals that may be combined with the ore, and is therefore more refractory. Such lead is thought to be a little harder, and some pretend to discover a lighter color.

The lead-ashes are reckoned to yield fifteen per cent. of lead (*zane* and all), which, added to the first smelting, makes an average product of sixty-five per cent. This estimate will hold good uniformly, when the ores have been properly dressed, and the smelting well performed. Any spar adhering to the ore, renders it refractory; blende and pyrites have the same effect. The latter is particularly injurious, as it consists chiefly of sulphur; a substance known to render all ores refractory.

The slag created by the ash-furnace is a heavy, black, glassy substance, well melted, and still containing a portion of lead. Some attempts have been made to obtain a further portion of lead from it, by smelting with charcoal in a blast-furnace; but the undertaking has not been attended with complete success, and is not generally thought to warrant the expense. The per centage of lead recovered from the slag is not estimated at over ten, and, with the utmost success, cannot be reckoned to exceed twelve.

Some practical and miscellaneous observations may here be added.

Metallic lead in the pig is now (Feb. 1819) worth \$4 per cwt. at the mines. It sells for \$4 50 on the banks of the Mississippi, at St. Genevieve and Herculaneum; for \$5 50 in New Orleans; and is quoted at \$6 in Philadelphia. This is lower than has ever been known before, (except at one period,) and a consequent depression in the mining business is felt. There is a governmental duty of one cent per pound on all bar and pig lead imported into the United States; but it does not amount to a prohibition of foreign lead from our markets. Perhaps such a prohibition might be deemed expedient. It is what the lead-smelters here call for; and certainly the resources of this country are very ample, not only for supplying the domestic consumption, but for exportation.

Those who dig the ore do not always smelt it. The merchants are generally the smelters, and either employ their own slaves in raising the ore, or pay a stipulated price per cwt. to those who choose to dig. For every hundred pounds of ore, properly cleaned, the digger receives two dollars. He works on his own account, and runs the risk of finding ore. It is estimated that an ordinary hand will raise a hundredweight per day, on an average of a year together. This, however, depends much upon luck; sometimes a vast body is fallen upon, with a few hours' labor; at others, many weeks are spent without finding any. He who perseveres will, however, generally succeed; and the labor bestowed upon the most unpromising mine, is never wholly lost. The above average has been made by those long conversant with the business, and upon a full consideration of all risks.

Custom has established a number of laws among the miners, with regard to digging, which have a tendency to prevent disputes. Whenever a discovery is made, the person making it is entitled to claim the ground for twenty-five feet in every direction from his pit, giving him fifty feet square. Other diggers are each entitled to twelve feet square, which is just enough to sink a pit, and afford room for throwing out the earth. Each one measures and stakes off his ground, and, though he should not begin to work for several days afterwards, no person will intrude upon it. On this spot he digs down, but is not allowed to run drifts horizontally, so as to break into or undermine the pits of others. If appearances are unpromising, or he strikes the rock, and chooses to abandon his pit, he can go on any unoccupied ground, and, observing the same precautions, begin anew. In such a case, the abandoned pit may be occupied by any other person; and sometimes large bodies of ore are found by the second occupant, by a little work, which would have richly rewarded the labors of the first, had he persevered.

In digging down from fifteen to twenty feet, the rock is generally struck; and as the signs of ore frequently give out on coming to the rock, many of the pits are carried no further. This rock is invariably limestone, though there are many varieties of it, the texture varying from very hard and compact, to soft and friable. The former is considered by

the diggers as a flinty stone; the latter is called rotten limestone; and, from its crumbling between the fingers, and falling into grains, there is a variety of it called sandstone. It is all, however, a calcareous carbonate, will burn into quicklime, and, as I find on experiment, is completely soluble in nitric acid. As no remains or impressions of shells, animalculæ, or other traces of animal life, are to be found in it, I conclude it to be what geologists term metalliferous limestone; a conclusion which is strengthened by its semi-crystalline fracture. It exhibits regular stratification, being always found in horizontal masses. How far this formation extends, it would be difficult to determine; but, so far as my observation goes, it is invariably the basis on which the mineral soil at Mine à Burton, and the numerous mines in its vicinity, reposes. It is overlaid by secondary limestone in various places on the banks of the Mississippi, between Cape Girardeau and St. Louis. It is also seen passing into a variety of secondary marble, in several localities. I have seen no specimens of this mineral, however, which can be considered as a valuable material in sculpture.

I have already mentioned the per centage of lead obtained by smelting in the large way. I shall here add the result of an assay made on the ore. One hundred parts of ore yielded as follows:

|                                                                                                              |                  |
|--------------------------------------------------------------------------------------------------------------|------------------|
| Metallic lead .....                                                                                          | 82               |
| Sulphur driven off by torrefaction .....                                                                     | 11               |
| Earthy matter, and further portion of sulphur, either<br>combined with the scoria, or driven off by heat.... | 7 by estimation. |
|                                                                                                              | <hr/> 100        |

The ore experimented upon was the common ore of Mine à Burton, (galena.) I took a lump of the purest ore, completely freed from all sparry and other extraneous matter, beat it into a very gross powder, and roasted for an hour and a half in a moderate heat, with frequent stirring. On weighing the mass, it had lost 11 of sulphur. I now beat this to a very fine powder, and treated it with a strong flux of nitre and dry carbonate of soda, adding some iron filings to absorb the last portions of sulphur. The whole was enclosed in a good Hessian crucible, previously smeared with charcoal, with a luted cover, and exposed for twenty minutes to the high heat of a small chemical blast-furnace.

The richest species of galena, of which we have any account, is that of Durham, England. An analysis of a specimen of this ore by Dr. Thompson, gave the following result:

|                     |             |
|---------------------|-------------|
| Lead .....          | 85 13       |
| Sulphur .....       | 13 02       |
| Oxide of iron ..... | 0 5         |
|                     | <hr/> 98 65 |

Many of the English, and nearly all the German ores, are, however, much poorer. Of five several experiments made by Vauquelin on ores from different mines in Germany, sixty-five per cent. of lead was the richest, and all were united with uncommon portions of carbonated lime and siliceous matter.

The button of metallic lead found at the bottom of the crucible in chemical assays, contains also the silver, and other metals, if any should be present in the ore. So also, in smelting in the large way, the metallic lead is always united with the other metals. When ores of lead contain any considerable portion of silver, they assume a fine steel grain; and the crystals, which are smaller than in common galena, oftener affect the octohedral, than the cubical figure. They are also harder to melt; and the lead obtained is not of so soft and malleable a nature as that procured from the broad-grained, easy-melting ore.

The proportion of silver in lead varies greatly. It is sometimes found to yield as high as twelve per cent., and is then called argentiferous lead-glance; but, in the poorest ores, it does not yield more than one ounce out of three hundred. To separate the silver from the lead, a process is pursued called the refining of lead, or cupellation. This is effected by exposing the lead to a moderate heat in a cupel, and removing the oxide as soon as it forms on the surface, until the whole is calcined, leaving the silver in the bottom of the cupel. The lead in this process is converted into litharge, the well-known substance of commerce; and the silver is afterwards refined by a second process, in which the last portions of lead are entirely got rid of. This process is known at the German refineries under the name of *silber brennen*, burning silver.

The rationale of cupellation is simply this. Lead on exposure to heat, with access of air, is covered by a thin pellicle or scum, called an oxide; and by removing this, another is formed; and so, by continuing to take off the oxide, the whole quantity of lead is converted into an oxide. It is called an oxide, because it is a combination of lead with oxygen (one of the principles of air and of water.) By this combination, an increase of weight takes place, so that a hundred pounds of bar-lead, converted into the state of an oxide, will weigh as much over a hundred, as the weight of the oxygen which it has attracted from the atmosphere. Silver, however, on being exposed to heat in the same situation, cannot be converted into an oxide; it has no attractive power for oxygen. Hence, when this metal is contained in a bar of lead, the lead only is oxygenated on exposure in a cupel; whilst the silver remains unaltered, but constantly concentrating and sinking, till the lead is all calcined. This is known, to a practised eye, by the increased splendor assumed by the metal.

I do not think the ore of Mine à Burton contains a sufficient quantity of silver to render the separation an object. This is to be inferred from its mineralogical character, from the mathematical figure and size of the

crystal, its color, splendor, &c. The territory is not, however, it is believed, deficient in ores which are valuable for the silver they contain. The head of White river, the Arkansas, the Maramec, and Strawberry rivers, all afford ores of lead, the appearance of which leads us to conclude they may yield silver in considerable quantity.

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## SECTION V.

### ANNUAL PRODUCT, AND NUMBER OF HANDS EMPLOYED.

ON this head, it is very difficult to procure proper information. The desultory manner in which the mines have been wrought, and the imperfect method in which accounts have been kept, when kept at all, with other circumstances, which are in some measure incidental to the operations of mining in a new country, oppose so many obstacles in the way of obtaining the desired information, that I find it impossible to present a correct statement, from authentic sources, of the annual product of the mines for any series of years. When Louisiana was first occupied by the United States, Mine à Burton and Mine La Motte were the principal mines wrought; but the few Americans who had emigrated into the territory, under the Spanish government, were fully aware of the advantages to be derived from the smelting of lead, and, united to the emigrant population which shortly succeeded, made many new discoveries, and the business was prosecuted with increased vigor, and to a much greater extent. The interior parts of the country, and such as had before been deemed dangerous on account of the Indians, were now eagerly explored; and the fortunate discovery of several immense bodies of ore near the surface of the ground, whereby the discoverers enriched themselves by a few days' labor, had a tendency greatly to increase the fame of the mines, and the number of miners. But, as generally happens in new countries, among the number of emigrants were several desperate adventurers, and men of the most abandoned character. Hence, the mines soon became the scene of every disorder, depravity, and crime, and a common rendezvous for renegadoes of all parts. It is by such persons that many of the mines were discovered, and several of them wrought; and it is, therefore, no subject of surprise, that, on inquiry, no accounts of the quantity of lead made, and the number of hands employed, are to be found.

To secure the public interest, and remedy, in some degree, the irregularities practised at the mines, a law was passed in Congress, a few years after the cession of Louisiana, reserving all lead-mines, salt-springs, &c., which should be discovered on the public lands, subsequent to that period; and the Governor of the Territory was, at the same time, author-

ized to grant leases to discoverers for three years. The great defect of that law appears always to have been, that a specific agent was not at the same time authorized to be appointed for the general superintendence, inspection, and management of mines — an office which, from its nature, can never be properly incorporated with that of the territorial executive, and which, with every inclination, it is presumed his other avocations would prevent him from discharging either with usefulness to the public, or satisfaction to himself. But, whatever be the defect of the law, certainly the advantages which the government proposed to derive from it have not accrued. No revenue, it is understood, has yet been realized under it, and we are now as much at a loss how to arrive at a true statement of the mineral product of Missouri, as if the mines had never been a subject of governmental legislation.

When a discovery of lead has been made, the miners from the neighboring country have flocked to it, and commenced digging as usual, no one troubling himself about a lease; and thus the provisions of the act have been in a great measure disregarded. Men of respectability, and of sufficient capital to carry on mining in a systematic manner, have, it is believed, been frequently deterred from making applications for leases, from the short period for which only they can be granted. It would warrant the expense of sinking shafts, erecting permanent furnaces, galleries, and other works necessary for prosecuting the business to advantage; for, no sooner would such works be erected, and the mines begin to be effectually wrought, than the expiration of the lease would throw them into the hands of some more successful applicant.

But, although we have no data to form an authenticated schedule of the annual product of the mines for any required number of years, there is something to be obtained by collecting and comparing facts, detached and scanty as they are. Something also is to be acquired by consulting the books which have been kept of late years in the warehouses on the Mississippi, where the lead is sent for exportation, and some information is also to be gleaned from various other sources. It is from information thus obtained that I proceed to an enumeration of the products of the different mines, and the number of persons to whom they furnish employment and support, satisfied, at the same time, that although the information may not be all that could be desired, yet it is all which, without the most extraordinary exertions, could be obtained.

The amount of crude ore delivered at the furnaces of Mine Shibboleth, during one of its most productive years (1811), was something rising of 5,000,000 of pounds. The ore of this mine is estimated to yield, in the large way, from 60 to 70 per cent., reckoned at  $62\frac{1}{2}$ , which is probably a fair average. The product of the mine in 1811 was 3,125,000 pounds. Shibboleth is, however, one of the richest mines in the Territory, and this is the product of one of those years in which it was most profitably worked. It was then a new discovery, vast bodies of ore were found near

the surface, and the number of miners drawn together by the fame of its riches was uncommonly great. It has since declined, although the ore is still constantly found; and I am informed by Colonel Smith, the present proprietor, that the product this year (1819) will be about one million of pounds.

The number of persons employed in digging lead at Mine à Burton has been constantly lessening for the last four or five years; and this celebrated mine, which has been worked without interruption for more than forty years, and is stated to have yielded as high as three millions per annum, is manifestly in a state of decline. During the last summer (1818), the greater part of which I resided at that place, there were not more than thirty miners employed; and the total product of the different pits, shafts, and diggings, composing this mine, did not exceed half a million of pounds. Of this quantity, Messrs. Samuel Perry & Co. were the manufacturers of about 300,000 lbs. They contemplate realizing an increased quantity during the present year. John Rice Jones, Esq., is also engaged in penetrating the rock in search of ore, with the most flattering prospects, and is determined, as he informs me, to sink through the upper stratum of limestone, and ascertain the character of the succeeding formations. It is highly probable, reasoning from geognostic relations, that the lower formations will prove metalliferous, yielding both lead and copper; a discovery which would form a new era in the history of those mines. The present mode of promiscuous digging on the surface would then be abandoned, and people made to see and to realize the advantages of the only system of mining which can be permanently, uniformly, and successfully pursued, viz., by penetrating into the bowels of the earth.

Several other persons of intelligence and capital are also engaged in mining at this place, and it is probable that the total amount of lead manufactured at this mine during the year 1819 will fall little short of one million of pounds.

It is not to be inferred, however, that because the number of miners at Potosi has decreased, the mines are exhausted. On the contrary, there is reason to conclude, as already mentioned, that the principal bodies of ore have not yet been discovered, and that it is destined to become the seat of the most extensive and important mining operations. The ore heretofore raised at these mines has been chiefly found in the stratum of earth which forms the surface of that country, and is bottomed on the limestone. This stratum consists of a stiff red clay, passing in some places into marl, and in others partaking more of the silicious character forming a loam, and imbedding the ores of lead, accompanied by the various mineralogical species before mentioned. These minerals are often of a very attractive character for cabinets.

The depth of this soil is sometimes thirty feet; and in this the diggings have been chiefly done, requiring no other machinery than is



used in well-digging; and the stratum of rock has generally put a stop to the progress of the miner, although veins of ore penetrating it have often invited him in the pursuit. But it requires different tools, machinery, and works, for mining in rock; the process is also more tedious and expensive, and is considered especially so by those who have been accustomed from their youth to find bodies of ore by a few days' digging in the earth, and who, if they should work a fortnight at one place, and not fall upon a bed of ore, would go away quite disheartened. The principal search has therefore been made in the sub-stratum of clay, where large bodies of ore are sometimes found by a day's, and sometimes by an hour's work. Hence, in the neighborhood of Potosi, the ground has been pretty well explored, and more search and labor is required to find it than in other and more distant places, where new mines continue annually to be discovered. But, with the exception of Austin's shaft, who sunk eighty feet, and the mines opened by Jones, the rock at this mine remains unpenetrated. Austin found large quantities of ore filling crevices in the rock, and the appearances were flattering when the last work was done. In sinking down, a change in the rock was experienced, passing from compact solid gray limestone, by several gradations, into a loose granulated limestone, very friable, and easily reduced to grains. This stone was in some instances completely disintegrated, forming a calcareous sand; and the most compact bodies of it, on a few weeks' exposure at the mouth of the shaft, fall into grains. These grains are, however, wholly calcareous, and readily soluble in nitric and muriatic acids. The portion which I submitted to experiment was taken up completely, nor was any sediment deposited by many months' standing. On going deeper, the rock again graduated into a compact limestone, very hard, and of a bluish-gray color, in which were frequently found small cavities studded over with minute pyramids of limpid quartz. These variations in the structure of the earth and rock in that place, are still observable by the stones, spars, and other minerals, lying around the mouths of the mines; and, upon the whole, the appearances are such as to justify a conclusion that the lower strata of rocks at Potosi, and the numerous mines in its vicinity, are of a highly metalliferous character, and such as to warrant the expenditures incident to a search.

From a statement lately drawn up, and certified by the proprietors of warehouses at Herculaneum, it appears that the total quantity of pig and bar lead, and shot, exported from that place, from January 1, 1817, to June 1, 1818, a period of eighteen months, was 3,194,249 pounds. Herculaneum may be considered the depôt for the lead of Mine Shibboleth, Richwoods, Bellefontaine, a portion of the lead of Mine à Burton and Potosi, and a few other mines in that neighborhood. Perhaps nearly or quite half of the whole quantity of lead yearly smelted at the Missouri mines, is shipped from this place. Here then is an average product of

2,395,667 pounds per annum, for the years 1817 and 1818, from those mines which send their lead to Herculanum.

Assuming the ground that these mines produce only half of what is annually made at the whole number of mines, which I conclude may be a true estimate, we shall arrive at the conclusion, that the annual product of the Missouri mines for those years was four millions, seven hundred and ninety-one thousand, three hundred and thirty-four pounds. This, estimated at the present price of four cents per pound, gives us a sum of one hundred and ninety-one thousand, six hundred and fifty-three dollars. This is the produce of one year; and supposing the mines to have produced the same average quantity during every year since they have been in possession of the United States, we have a sum of three millions, sixty-six thousand, four hundred and forty-eight dollars; which is more than the original cost of Louisiana, as purchased from France during the administration of President Jefferson. Let those who have any doubts of the value of our mines, reflect upon this, and consider that it was the product of a year when the mines were in a manifest state of decline, and wrought wholly by individuals, with a foreign competition to oppose, and without the benefits resulting from a systematic organization of the mining interest.

Nearly all the lead smelted at the Missouri mines is transported in carts and wagons from the interior to St. Genevieve and Herculanum. As it must necessarily be deposited for storage at those places, it was naturally expected that authentic accounts of the lead manufactured in the Territory for many years, might be obtained on application. But in this, I experienced some degree of disappointment. At St. Genevieve, although a warehouse has been kept at the landing for many years, the lead sent to town has not all been stored. From the earliest time, and before the establishment of a warehouse by Mr. Janies, the French inhabitants of St. Genevieve had all been more or less engaged in the storage, purchase, and traffic of lead. Every dwelling-house thus became a storehouse for lead, and, in these cases, no regular accounts were kept of the quantities received or delivered. The same practice has, in some measure, continued since, so that it is impossible to obtain, with any precision, the amount shipped from this place. At Herculanum, a warehouse has been kept since the year 1816; and on application to Mr. Elias Bates, the proprietor, he was so obliging as to allow me permission to peruse his book of receipts, for the purpose of making extracts. The following details embrace the receipts of lead at that place for a period of two years and eleven months, ending May 18, 1819.

I. *A Series of Receipts, from June 16, 1816, to December 31 of the same year, being a period of six months and fourteen days.*

|                                    |             |
|------------------------------------|-------------|
| Fol. 1. Aggregate of receipts..... | 52,781 lbs. |
| 2.....                             | 57,097      |
| 3.....                             | 55,039      |
| 4.....                             | 58,892      |
| 5.....                             | 50,639      |
| 6.....                             | 63,787      |
| 7.....                             | 55,663      |
| 8.....                             | 47,287      |

Aggregate of separate individual acc'ts during same period. 322,134

Total ..... 763,319

II. *A Series of Receipts from 31st Dec. 1816, to 31st Dec. 1817.*

|                                    |             |
|------------------------------------|-------------|
| Fol. 1. Aggregate of receipts..... | 12,375 lbs. |
| 2.....                             | 51,521      |
| 3.....                             | 49,023      |
| 4.....                             | 60,576      |
| 5.....                             | 54,242      |
| 6.....                             | 47,321      |
| 7.....                             | 60,956      |
| 8.....                             | 51,420      |
| 9.....                             | 43,774      |
| 10.....                            | 42,694      |
| 11.....                            | 47,958      |
| 12.....                            | 15,482      |

537,343

Aggregate of separate individual acc'ts during same period. 501,903

Total ..... 1,039,246

III. *A Series of Receipts from 31st Dec. 1817, to 31st Dec. 1818.*

|                                    |             |
|------------------------------------|-------------|
| Fol. 1. Aggregate of receipts..... | 24,261 lbs. |
| 2.....                             | 45,981      |
| 3.....                             | 31,041      |
| 4.....                             | 39,424      |
| 5.....                             | 34,711      |
| 6.....                             | 44,266      |
| 7.....                             | 31,315      |
| 8.....                             | 56,442      |
| 9.....                             | 33,932      |

341,372

Aggregate of separate individual acc'ts during same period. 112,203

Total ..... 453,575

IV. *A Series of Receipts from 31st Dec. 1818, to 18th May 1819.*

|                                                             |               |
|-------------------------------------------------------------|---------------|
| Fol. 1. Aggregate of receipts.....                          | 14,764 lbs.   |
| 2.....                                                      | 44,323        |
| 3.....                                                      | 44,628        |
|                                                             | <hr/> 103,715 |
| Aggregate of separate individual acc'ts during same period. | 26,211        |
|                                                             | <hr/>         |
| Total .....                                                 | 129,926       |

## RECAPITULATION.

|             |              |
|-------------|--------------|
| 1816 .....  | 763,319 lbs. |
| 1817 .....  | 1,039,246    |
| 1818 .....  | 453,575      |
| 1819 .....  | 129,926      |
|             | <hr/>        |
| Total ..... | 2 386,066    |

During eighteen months of the same period, from Dec. 31st, 1816, to June 1st, 1818, there was deposited with, and shipped by, sundry other persons in Herculanum, as ascertained by Colonel S. Hammond and M. Austin, Esq., 517,495 pounds of lead, together with patent shot, manufactured by Elias Bates and Christian Wilt, to the amount of 668,350 pounds. For the remaining part of the estimated term, (two years and eleven months,) it is reasonable to presume that a like quantity of lead was exported through private channels at Herculanum, and a like quantity of shot manufactured by Messrs. Bates and Wilt. This will make the quantity of pig and bar lead shipped by individuals, 1,034,990 pounds, and the quantity of patent shot manufactured, 1,356,700 pounds; which two sums, added to the receipts of Mr. Bates's warehouse, as detailed above, gives us an aggregate amount of 4,757,990 pounds, for the period of two years and eleven months. St. Genevieve, as has already been mentioned, is probably the storehouse for one-half of the mines, and may therefore be estimated to have received and exported the same quantity of pig and bar lead during the same period, making a total of 9,515,512 pounds, which gives an average product of more than three million of pounds of lead per annum.

It would be interesting to know in what proportion the different mines have contributed to this amount. The above details show us their collective importance; but we should then be enabled to estimate their individual and comparative value. With this view, I have compiled, from the best information, the following

## ESTIMATE.

| Mines.                   | Pounds of lead. | No. of hands. |
|--------------------------|-----------------|---------------|
| Mine à Burton .....      | 1,500,000.....  | 160           |
| Mine Shibboleth .....    | 2,700,000.....  | 240           |
| Mine La Motte .....      | 2,400,000.....  | 210           |
| Richwoods .....          | 1,300,000.....  | 140           |
| Bryan's Mines .....      | 910,100.....    | 80            |
| Dogget's Mines .....     |                 |               |
| Perry's Diggings.....    | 600,000.....    | 60            |
| Elliot's Mines .....     | 45,000.....     | 20            |
| Old Mines .....          |                 |               |
| Bellefontaine .....      |                 |               |
| Mine Astraddle .....     | 450,000.....    | 40            |
| Mine Liberty .....       |                 |               |
| Renault's Mines.....     |                 |               |
| Mine Silvers.....        |                 |               |
| Miller's Mines .....     |                 |               |
| Cannon's Diggings .....  | 75,000.....     | 30            |
| Becquet's Diggings ..... |                 |               |
| Little Mines .....       |                 |               |
| Rocky Diggings.....      | 1,160,000.....  | 130           |
| Citadel Diggings .....   |                 |               |
| Lambert's Mine.....      |                 |               |
| Austin's Mines .....     |                 |               |
| Jones's Mines .....      |                 |               |
| Gravelly Diggings.....   | 50,000.....     | 20            |
| Scott's Mine .....       |                 |               |
| Mine à Martin.....       |                 |               |
| Mine à Robino .....      |                 |               |
|                          | 11,180,000      | 1130          |

In this estimate are included all persons concerned in the operations of mining, and who draw their support from it; wood-cutters, teamsters, and blacksmiths, as well as those engaged in digging and smelting lead-ore, &c. The estimate is supposed to embrace a period of three years, ending 1st June, 1819, and making an average product of 3,726,666 lbs. per annum, which is so near the result arrived at in the preceding details, as to induce a conclusion that it is essentially correct, and that the mines of Missouri, taken collectively, yield this amount of pig-lead annually.

The United States acquired possession of the mines in the year 1803,

fifteen years ago last December; and, assuming the fact that they have annually produced this quantity, there has been smelted, under the American government, fifty-five million pounds of lead.

On the view which has now been taken of the Missouri mines, it may be proper here to remark —

1. That the ores of these mines are of the richest and purest kind, and that they exist in such bodies as not only to supply all lead for domestic consumption, but also, if the purposes of trade require it, are capable of supplying large quantities for exportation.

2. That although at different periods the amount of lead manufactured has been considerable, yet this produce has been subject to perpetual variation, and, upon the whole, has fallen, in the aggregate, far short of the amount the mines are capable of producing. To make these mines produce the greatest possible quantity of lead of which they are capable, with the least possible expense, is a consideration of the first political consequence, to which end it is desirable that the reserved mines be disposed of, to individuals, or that the term for which leases are granted be extended from three to fifteen years, which will induce capitalists, who are now deterred by the illiberality of governmental terms, to embark in mining. That there be laid a governmental duty of two and a half cents per pound on all imported pig and bar lead, which will exclude foreign lead from our markets, and afford a desired relief to the domestic manufacturer. The present duty is one cent per pound. But this does not prevent a foreign competition; and the smelters call for, and appear to be entitled to, further protection.

3. That although the processes of mining now pursued are superior to what they were under the Spanish government, yet there is a very manifest want of skill, system, and economy, in the raising of ores, and the smelting of lead. The furnaces in use are liable to several objections. They are defective in the plan, they are constructed of improper materials, and the workmanship is of the rudest kind. Hence, not near the quantity of metallic lead is extracted from the ore which it is capable, without an increase of expense, of yielding. There is a great waste created by smelting ore in the common log furnace, in which a considerable part of the lead is volatilized, forming the sublimated matter which adheres in such bodies to the sides of the log furnaces, and is thrown by as useless. This can be prevented by an improvement in its construction. To pursue mining with profit, it is necessary to pursue it with economy; and true economy is, to build the best of furnaces, with the best of materials. At present the furnaces are constructed of common limestone, which soon burns into quicklime, and the work requires rebuilding from the foundation. Not only so, but the frequency with which they require

to be renewed, begets a carelessness in those who build them, and the work is accordingly put up in the most ordinary and unworkmanlike manner. Instead of limestone, the furnaces ought to be constructed of good refractory sandstone, or apyrous clay, in the form of bricks, which will resist the action of heat for a great length of time. Both these substances are the production of that country, and specimens of them are now in my possession.

4. From the information afforded, it has been seen that the mines are situated in a country which affords a considerable proportion of the richest farming-lands, producing corn, rye, wheat, tobacco, hemp, flax, oats, &c., in the greatest abundance, and that no country is better adapted for raising cattle, horses, hogs, and sheep. The country is well watered, and with the purest of water; the climate is mild and pleasant, the air dry and serene, and the region is healthy in an unusual degree. Every facility is also afforded by its streams for erecting works for the manufacture of white and red lead, massicot, litharge, shot, sheet-lead, mineral yellow, and the other manufactures dependent upon lead. The country also abounds with various useful minerals besides lead, which are calculated to increase its wealth and importance. It is particularly abundant in iron, zinc, manganese, sulphur, salt, coal, chalk, and ochre.

5. That a systematic organization of the mining interest would have a tendency to promote the public welfare. To this end, there should be appointed an officer for the inspection and superintendence of mines. He should reside in the mine country, and report annually to the proper governmental department on the state of the mines, improvements, &c. His duty should consist in part of the following items, viz.:

- a. To lease out public mines, and receive and account for rents.
- b. To prevent the waste and destruction of wood on the public lands.
- c. To see that no mines were wrought without authority.
- d. To keep the government informed, periodically, of the quantity of lead made at the different mines, and of new discoveries of lead, or any other useful minerals; and,
- e. To explore, practically, the mineralogy of the country, in order fully to develop its mineral character and importance. Connected with these duties, should be the collection of mineralogical specimens for a national cabinet of natural history at Washington.

The superintendent of mines should be a practical mineralogist, and such a salary attached to the office as to induce a man of respectable talents and scientific acquirements to accept the appointment. To allow the manufacturers of lead every advantage consistent with the public interest, the rent charged on mines should not exceed two and a half per cent. on the quantity manufactured, which is equivalent to the proposed governmental duty on imported lead, whereby the revenue would

not only be kept up, but might be considerably enhanced. The foregoing details exhibit an annual produce of 3,726,666 pounds of lead, which, it is presumable, may be half the quantity the mines are capable of producing, with proper management. But, estimating the lead at four cents per pound, and taking that as the average quantity, the annual rents, at two and a half per cent., will create a revenue of thirty-two thousand four hundred and ninety dollars.

This subject is believed to be one that commends itself to the attention of the government, which has, from a policy early introduced, reserved the mineral lands on the public domain. No one can view it in the light of these facts, without perceiving the propriety and necessity of an efficient organization of this branch of the public interest.



# MINERALOGY.

## A CATALOGUE OF THE MINERALS OF THE MISSISSIPPI VALLEY.

IN the arrangement of this catalogue, the order introduced in Professor Cleveland's mineralogical tables, has been chiefly observed. It is the commencement of an investigation into the physical history, character, and mineral resources of the West, which it will become the duty of future observers to continue and perfect. The field is an extensive one, and invites attention. The order and beauty that are observed in this branch of natural history, afford as striking proofs as any of the other departments of it, of that design which, in so remarkable a manner, pervades the organization of the various classes of bodies, animate and inanimate, on the surface of the globe. So far as respects mineralogy, its species and varieties have not all been seen, in crystallized forms, agreeably to our imperfect state of microscopical knowledge; but as far as the species have been brought within observation, in the classes of crystals and crystallized ores, they rival, in their colors and exact geometrical forms, other systems of bodies.

In revising the list, those specimens are dropped, respecting which further reflection or examination has shown, either that the early descriptions were imperfect, or that the quantity of the mineral was deficient.

### I. ALKALINE AND EARTHY SALTS.

1. Nitrate of potash..... Nitre.
2. Muriate of soda..... Salt.
3. Sulphate of barytes ..... Heavy spar.
4. Carbonate of lime ..... Calc. spar.
  - a. Rhombic crystals.
  - b. Concrete forms.
5. Fluuate of lime ..... Fluor spar.
6. Sulphate of lime ..... Gypsum.
7. Sulphate of magnesia..... Magnesia.
8. Sulphate of alumine and potash. Alum.

## II. EARTHY COMPOUNDS AND STONES.

## 9. Quartz.

- |                               |                                       |
|-------------------------------|---------------------------------------|
| <i>a.</i> Hexagonal crystals. | <i>h.</i> Red ferruginous quartz.     |
| <i>b.</i> Radiated.           | <i>i.</i> Tabular                   “ |
| <i>c.</i> Chalcedony.         | <i>j.</i> Granular               “    |
| <i>d.</i> Agatized wood.      | <i>k.</i> Hoary                   “   |
| <i>e.</i> Agate.              | <i>l.</i> Carnelian.                  |
| <i>f.</i> Jasper.             | <i>m.</i> Buhrstone.                  |
| <i>g.</i> Hornstone.          | <i>n.</i> Opalized wood.              |

## 10. Pumice.

## 11. Mica.

## 12. Feldspar.

## 13. Hornblende.

## 14. Greenstone porphyry.

## 15. Clay.

- |                           |                   |                           |
|---------------------------|-------------------|---------------------------|
| <i>a.</i> Native alumine. | <i>c.</i> Reddle. | <i>b.</i> Indurated clay. |
|---------------------------|-------------------|---------------------------|

## 16. Basanite.

## 17. Indian pipestone.

Opwagonite.

## 18. Schoerl.

## 19. Novaculite.

## III. COMBUSTIBLES.

## 20. Sulphur.

- |                         |
|-------------------------|
| <i>a.</i> Crystallized. |
| <i>b.</i> Concrete.     |

## 21. Graphite.

## 22. Coal.

- |                             |
|-----------------------------|
| <i>a.</i> Slaty-bituminous. |
| <i>b.</i> Wood-coal.        |
| Bituminous shale.           |

## IV. METALS.

## 23. Native copper.

## 24. Iron.

## 25. Sulphuret of iron.

## 26. Iron glance.

## 27. Micaceous oxide of iron.

## 28. Brown oxide of iron.

## 29. Ironstone.

## 30. Argillaceous oxide of iron.

## 31. Ochrey oxide of iron.

## 32. Sulphuret of lead.

- |                          |
|--------------------------|
| <i>a.</i> Common galena. |
| <i>b.</i> Specular.      |
| <i>c.</i> Granular.      |
| <i>d.</i> Cobaltic.      |

33. Carbonate of lead.
34. Earthy oxide of lead.
35. Sulphuret of zinc.
36. Sulphuret of manganese.

#### FIRST CLASS.

1. NITRE—SALTPETRE. This salt, in its efflorescent state, exists extensively in the limestone caves of Missouri and Arkansas. It also impregnates the masses of earth found in these recesses. This earth is lixiviated with wood-ashes, which allows the nitre to take a crystalline form. I visited a large cavern, about eighty miles south-west of Potosi, where this salt was manufactured, and observed its efflorescences in other caves in the Ozark range.

2. MURIATE OF SODA. About one hundred and fifty thousand bushels of common salt are annually made from the United States' saline on Salt river, in Illinois. It appears, from the remains of antique broken vessels found in that locality, to have been manufactured there by the ancient inhabitants. There is a saline, which has been profitably worked, on Saline creek, in St. Genevieve county. Two salt springs are worked, in a small way, in Jefferson county, Mo. The springs in Arkansas are reported to be extensive, and rumors of rock-salt on its plains have been rife, since the purchase of Louisiana. The hunters whom I met in the Ozark range, invariably affirmed its existence, in crystalline solid masses, in that quarter; from which also, it is to be recollected, De Soto's scouts brought it, in 1542.

3. SULPHATE OF BARYTES—HEAVY SPAR. This mineral is found, in considerable quantities, at the principal lead-mines of Missouri, west of the Mississippi. It presents its usual characters—it is heavy, white, shining, opaque, and easily fractured. It is sometimes found crested, columnar, prismatic, or in tabular crystallizations. Its surface is frequently covered by a yellowish, ochrey earth, or ferruginous oxide. It sometimes exists as the matrix of the sulphuret of lead—more frequently, as one of its accompanying minerals.

#### 4. CARBONATE OF LIME.

a. *Calc. Spar.* This form of the carbonate of lime is common in the lead-mine regions of Missouri. At Hazel run, it constitutes, to some extent, the gangue of the lead-ores. It is generally imbedded in lumps in the red clay mineral soil. These lumps are round, externally; but, on being broken, reveal a rhomboidal structure, and are beautifully transparent.

b. *Stalactites.* This form of the carbonate of lime is found in a cave on the head-waters of Currents river, in Missouri. The stalactites are found in concretions resembling icicles hanging from the roof, or in

columns reaching to the floor. The specimens are translucent. Stalactites are also found in a very large cave (Winoca) on Findley's fork, one of the tributaries of White river, Arkansas. They form two large vases in this cave, which are filled with the most crystalline water.

c. *Stalagmite* (Calcareous Alabaster). The cave which has just been mentioned on Findley's fork, affords this mineral in small, solid globules, which strew the floor of the cave.

5. FLUOR SPAR. The elevated lands on the west banks of the Ohio, near the picturesque shores of Cave-in-Rock, in Illinois, disclose this mineral. It exhibits its well-known character. It is generally of a purple, or amethystine hue, and crystallized, as its primary form, in cubes. Externally, these crystals are dull. Its association here is with the ores of lead, which have been extensively searched for in former times. It is plentifully found, sometimes in large crystals, which have an external appearance as if they had been subjected to the influence of turbid water. It has been thus far, chiefly, explored in the diluvial stratum.

6. GYPSUM. Foliated masses of this mineral occur in the river cliffs in St. Clair county, Illinois. It is found in large quantities near the salines in Upper Arkansas. Dr. Sibley, speaking of the formation in that vicinity, says: "It is a tract of about seventy-five miles square, in which nature has arranged a variety of the most strange and whimsical vagaries. It is an assemblage of beautiful meadows, verdant ridges, and rude misshapen piles of red clay, thrown together in the utmost apparent confusion, yet affording the most pleasing harmonies, and presenting in every direction an endless variety of curious and interesting objects. After winding along for a few miles on the high ridges, you suddenly descend an almost perpendicular declivity of rocks and clay, into a series of level and fertile meadows, watered by some beautiful rivulets, and adorned here and there with shrubby cotton trees, elms, and cedars. These meadows are divided by chains formed of red clay, and huge masses of gypsum, with here and there a pyramid of gravel. One might imagine himself surrounded by the ruins of some ancient city, and that the plain had sunk by some convulsion of nature more than one hundred feet below its former level; for some of the huge columns of red clay rise to the height of two hundred feet perpendicular, capped with rocks of gypsum, which the hand of time is ever crumbling off, and strewing in beautiful transparent flakes, along the declivities of the hill, glittering like so many mirrors in the sun."

7. SULPHATE OF MAGNESIA. A large and curious cavern has been discovered in the calcareous rocks at Corydon, near the seat of government of Indiana, which is found to yield very beautiful white crystals of this mineral. To what extent these appearances exist, is unknown; but the cavern invites exploration.

8. ALUM. Efflorescences of the sulphate of alumina exist in a calcareous cavern in the elevated ranges of Bellevue, in the county of Washington, Mo. No practical use is made of it.

9. QUARTZ. This important family of mineral bodies exists, in many of its forms, on the west banks of the Mississippi. They will be noticed under their appropriate names.

a. *Granular Quartz*. There is a very large body of this mineral about eight miles west of St. Genevieve, near the Potosi road. It is known as the site of a remarkable cave. The sides, roof, and floor of the cave, consist of the most pure and white granular quartz. It is quite friable between the fingers, and falls into a singularly transparent and beautiful sand. Each of these grains, when examined by the microscope, is found to be a transparent molecule of pure quartz. It possesses no definable tint of color, is not acted upon by either nitric or muriatic acids, and appears to be an aggregation of minute crystals of quartz. It occurs in several caves near the road, whose sides are entirely composed of it; and its snowy hue, and granular structure, give it the appearance of refined sugar. It appears to me to be composed of siliceous matter nearly or quite pure, and possesses, as I find on treatment with potash, the property of easy fusibility. Could the necessary alkali and apyrous clays be conveniently had at this spot, I cannot conceive a more advantageous place for a manufactory of crystal glass.

b. *Radiated Quartz*. This mineral is found in great abundance at the Missouri lead-mines, where it bears the striking name of mineral blossom, or blossom of lead—an opinion being entertained that it indicates the presence or contiguity of lead-ore. Examined with care, it is found to consist of small crystals of quartz, disposed in radii, which resemble the petals of a flower. These crystals are superimposed on a basis consisting of thin lines, or tabular layers, of agate. It is found either strewn on the surface of the soil, imbedded in it, or existing in cavities in the limestone rock.

c. *Chalcedony*. This species is brought down the Mississippi or Missouri, and deposited in small fragments along the Missouri shore. It also constitutes the principal layers in the thin tabular, or mamillary masses, which constitute the basis of the radiated quartz. Most commonly, it is bluish-white, or milk-white.

d. *Agatized Wood*. Fragments of this mineral are brought down the Missouri, and deposited, in occasional pieces, along the banks of the Mississippi.

e. *Hornstone—Chert*. This substance appears to have been imbedded extensively in the calcareous strata of the Mississippi valley; for it is scattered, as an ingredient, in its diluvions. Frequently it is in chips, or fragments, all of which indicate a smooth conchoidal fracture. Sometimes it consists of parts of nodules. Sometimes it is still solidly imbedded in

the rock, or consolidated strata, as on the coast below Cape Girardeau, Mo. Indeed, so far as observation goes, it characterizes all the district of country between the western banks of the Mississippi river, and the great prairies and sand deserts at the foot of the Rocky mountains. Its color is generally brown, with different shades of yellow, black, blue, or red. It appears nearly allied to flint, into which it is sometimes seen passing. It runs also into varieties of jasper, chalcedony, and common quartz; and the different gradations from well-characterized hornstone, until its distinctive characters are lost in other sub-species of quartz, may be distinctly marked. The barbs for Indian arrows, frequently found in this region, appear to have been chiefly made of hornstone.

f. *Jasper*. This mineral also appears to have been imbedded in the silico-calcareous rocks of the western valley; and it is found, in the fragmentary form, on the banks of the Mississippi, and also on its plains below the Rocky mountains. The fine yellow egg-shaped pebbles of White river, are common jasper. Several specimens, picked up in a desultory journey, possess striking beauty. The first is a uniform bottle-green, very hard, and susceptible of a high polish. The second is the fragment of a nodular mass, consisting of alternate concentric stripes of green, brown, and yellow; the colors passing by imperceptible shades into each other. A specimen found in Potosi consists of alternate stripes of rose and flesh red.

g. *Agate*. This mineral is picked up, in a fragmentary form, along the banks of the Mississippi. Its original repository appears to have been the volcanic and amygdaloidal rocks about its sources, which have been extensively broken down by geological mutations, during ante-historical periods. The fragments are often beautifully transparent, sometimes zoned or striped. Sometimes they are arranged in angles, presenting the fortification-agate. The colors are various shades of white and red, the latter being layers of carnelian. All the pieces found in this dispersed state are harder than the imbedded species, and are with difficulty cut by the lapidary.

h. *Opal*. A single specimen of this mineral, from the right banks of the Ohio, near Cave-in-Rock, Illinois, is of a delicate bluish-white, and opalesces on being held to the light. It is not acted on by acids. This locality is remarkable as yielding galena, heavy spar, blende, calcareous spar, fluor spar, pyrites, coal, and salt. It belongs to the great secondary limestone formation of the Ohio valley. It is cavernous, and yields some fossil impressions.

i. *Red Ferruginous Quartz*. This occurs as one of the imbedded materials of the diluvion of the Mississippi valley.

k. *Rock Crystal*. Very perfect and beautiful crystals of this mineral are procured near the Hot Springs of Arkansas. They consist, generally, of six-sided prisms, terminated by six-sided pyramids. Some of these

are so perfectly limpid, that writing can be read, without the slightest obscurity, through the parallel faces of the crystals.

l. *Pseudomorphous Chalcedony*. Lake Pepin, Upper Mississippi. This appears to have been formed by deposition on cubical crystals, which have disappeared.

m. *Tabular Quartz*. West bank of the Mississippi, Missouri. Of a white color, semi-transparent. The plates are single, and the lines perfectly parallel.

n. *Hoary Quartz*. West banks of the Mississippi, Mo. The character of hoariness appears to be imparted by very minute crystals, or concretions of quartz, on the surface of radiated quartz.

o. *Common Quartz*. This mineral is found in veins of from one to eight or ten feet wide, in the argillaceous rock formation in the vicinity of the Hot Springs of Washita. It is also seen, in very large detached masses, on the south bank of White river. The character of these rocks will not be recognized on a superficial view; for they have a gray, time-worn appearance, and are so much covered by moss, that it was not until I had broken off a fragment with a hammer, that I discovered them to be white quartz. Pebbles of quartz, either white or variously colored by iron, are common on the shores of White river, and, joined to the purity and transparency of the waters, add greatly to the pleasure of a voyage on that beautiful stream.

p. *Buhrstone*. Raccoon creek, Indiana. This bed is noted throughout the western country, and affords a profitable branch of manufacture. It covers an area of from ten to fifteen acres square. Its texture is vesicular, yet it is sufficiently compact to admit of being quarried with advantage, and the stones are applied to the purposes of milling with the best success.

q. *Sedimentary Quartz—Schoolcraftite*. This mineral occurs three miles from the Hot Springs of Washita. It is of a grayish-white color, partaking a little of green, yellow, or red; translucent in an uncommon degree, with an uneven and moderately glimmering fracture, and susceptible of being scratched with a knife. Oil stones for the purpose of honing knives, razors, or tools, are occasionally procured from this place, and considerable quantities have been lately taken to New Orleans. It gives a fine edge, and is considered equal to the Turkish oil-stone. It appears to me, from external character and preliminary tests, to consist almost entirely of siliceous matter, with a little oxide of iron. Its compactness, superior softness, specific gravity, and coloring matter, distinguish it from siliceous sinter. It has been improperly termed, heretofore, "novaculite." It contains no alumine. It sometimes reveals partial conditions, or spots, of a degree of hardness nearly equal to common quartz.

r. *Carnelian*. Banks of the Mississippi, above the junction of the Ohio. Traces of this mineral begin to be found, as soon as the heavy alluvial lands are passed. It is among the finest detritus of the minerals

of the quartz family, brought down from upper plains. The fragments, in these lower positions, are small, transparent, and hard, colored red or yellowish.

s. *Basanite* — *Touchstone*. This mineral is found in the Mississippi detritus; but no fixed locality has been ascertained.

10. *PUMICE*. The light, vesicular substance, found floating down the Missouri and Mississippi, is not, properly speaking, a true pumice, capable of the applications of that article in the arts; but it cannot be classified with any other species. It is more properly a pseudo-pumice, arising from partial volcanic action on the formations of some of the tributaries of the Missouri, which originate in the Rocky mountains. It is brought down by the June flood, sometimes in large masses, which, as the waters abate, are left on the islands or shores. It is incompletely vitrified, consisting of spongy globules. The masses are irregularly colored, agreeably to the vitrified materials, red, black or brown. Its tenacity is very great.

30. *MICA*. In the granitical, or primitive district, at the sources of the St. Francis. The great body of these rocks is a sienite, or sienitic granite, or greenstone. Like the northern granitical tracts, the mica is generally replaced by hornblende. The folia, usually, are small.

31. *FELDSPAR*. With the preceding. The great bulk of these granitical formations consists of red feldspar. Where the greenstone becomes porphyritic, the feldspar is a light green.

32. *HORNBLENDE*. With the preceding. This mineral assumes its crystalline form, in large areas of the sienite rock. With the two preceding minerals, mica and feldspar, and common quartz, it constitutes the mountain peaks of that remarkable district. It is the only locality, except the Washita hills, where these formations rise to an elevation above the great metalliferous, sandstone, and carbonaceous deposits of the central area of the Mississippi valley, south of the Sauk rapids, above St. Anthony's falls, and the head-waters of the St. Peter's, or Minnesota river. The latter constitute the northern limits of the great horizontal, sedimentary, semi-crystallized rocks west of the Alleghanies.

33. *GREENSTONE PORPHYRY*. With the preceding.

34. *PUDDINGSTONE*. In the tongue of land formed by the junction of the Ohio with the Mississippi, directly beneath the alluvial lands at the old site of fort Massac, and at the village called "America." Also, in large, broken blocks, along the west shores of the Mississippi, near the "chalk banks," so called, in Cape Girardeau county, and at Cape Garlic, on the west banks of the Mississippi.



33. **NATIVE ALUMINE — WHITE, FRIABLE, PURE CLAY.** At the head of Tiawapeta bottom, Little Chain of Rocks, west banks of the Mississippi, Cape Girardeau county, Missouri. This remarkable body of white earth is locally denominated chalk, and was thus called in the first edition of this catalogue. It is employed as a substitute for chalk, but is found to contain no carbonic acid, and is destitute of a particle of calcia. It appears, from Mr. Jessup,\* to be nearly pure alumine. The traveller, on ascending the Mississippi from the mouth of the Ohio, passes through a country of alluvial formation, a distance of thirty-five miles. Here the first high land presents itself on the west bank of the river, in a moderately elevated ridge, running from south-east to north-west, and terminating abruptly in the bank of the river, which here runs nearly at right angles with the ridge, and has been worn away by the action of the water. This ridge consists of secondary limestone, overlying a coarse reddish sandstone, which, at the lowest stage of the water in summer, is seen in huge misshapen fragments, at the immediate edge of the water, and at intervals nearly half way across the river, as well as on the Illinois shore. The mineral occurs in mass, abundantly. It is nearly dry, of a perfectly white color, and chalky friability. It embraces masses of hornstone, resembling flint. It also occurs at a higher point on the same shore, two miles below the Grand Tower.

34. **PLASTIC WHITE CLAY.** Gray's mine, Jefferson county, Mo.

35. **OPWAGUNITE† — GEOGNOSTIC RED CLAY.** Prairie des Couteau, between the sources of the St. Peter's river and the Missouri. It exists in lamellar masses, beneath secondary masses. It is of a dull red color, is soft, compact, easily cut, and is a material much employed and valued by the Indians for carving pipes, and sometimes neck ornaments. Occasionally it has brighter spots of pale red. It is also found on the Red Cedar, or Folle Avoine branch of Chippewa river, Wisconsin, of a darker color, approaching to that of chocolate. It is polished by the Indians with rushes.

### III. COMBUSTIBLES.

36. **SULPHUR.** In flocculent white deposits, in a spring, Jefferson county, Missouri.

37. **MINERAL COAL.** Bituminous, slaty coal, constitutes a very large geological basin in the Ohio and Mississippi valleys, where it appears to have resulted from the burial of ancient forests. At Pittsburgh, I found it composing thick strata in elevated grounds, on the south banks of the

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\* Long's Expedition.

† From "opwagun," (Algonquin) a pipe; and "lithos," (Gr.) a stone.

Monongahela river. In an excursion up that stream, it characterizes its banks at intervals for forty miles. It inflames easily, burns with a pitchy smoke and bituminous smell, and throws out a great heat. It occurs in veins in limestone, along with argillaceous slate, indurated clay, red sandstone, and bituminous shale, which are arranged in alternate strata, one above the other, preserving an exact parallelism with the waters of the Alleghany, Monongahela, and Ohio rivers. The coal always constitutes a vein between the shale and clay which are found immediately above and below it. The clay appears to have originated from the decomposition of shale; for it may be observed in all stages of the decomposition, from a well-characterized argillaceous slate, to plastic clay.

The veins of coal are from a foot to nine feet in thickness, and the strata of coal, shale, limestone, &c., are repeated; so that the sides of the hills which afford coal, exhibit several strata, with the rock intervening, one above another. The greatest distance, in a perpendicular direction, from one stratum to another, is perhaps one hundred feet; and such is the regularity of the coal formation in this region, that the description of one pit, or bed, will apply almost equally to any other within a circuit of two hundred miles, every section of which is characterized by coal. Sometimes pyrites of a tin-white color are found mixed among the coal. In Missouri, it occurs at Florissant.

38. GRAPHITE—PLUMBAGO. Twelve miles south of Potosi, Washington county, Mo., in a large body.

### 39. SULPHURET OF LEAD.

a. *Galena*. One of the most remarkable formations of this ore in America, if not in the world, is furnished by the metalliferous limestones of the Mississippi. Of these, Missouri furnishes one of the most celebrated localities. These mines were first explored by the renowned Mississippi Company, in 1719, and have continued to be worked during the successive changes which it has experienced under the French, Spanish, and Americans, to the present period. The number of mines now wrought is about fifty, and the quantity of lead annually smelted is estimated at three millions of pounds. The ore is the common galena, with a broad glittering grain, and bluish-gray color, and is found accompanied by sulphate of barytes, blende, pyrites, quartz, and calcareous spar. It yields, on assay, eighty-two per cent. of metallic lead, the remainder being chiefly sulphur. (Vide "View of the Lead-Mines.")

b. *Granular Sulphuret of Lead*. Mine La Motte, Madison county, Missouri.

c. *Cobaltic Sulphuret of Lead*. With the preceding.

40. OXIDE OF LEAD. Earthy, yellow. Wythe county, Virginia.

41. CARBONATE OF LEAD. Lead-mines of Missouri. It occurs in some of the mines as a crust, or thin layer, on ores of galena.

42. SULPHURET OF ZINC. In the form of black blende. Lead-mines of Missouri.

43. OXIDE OF ZINC. Earthy, grayish-white. In the mineral called "dry-bone." Missouri lead-mines.

#### 44. IRON.

a. *Iron Glance*. In the Iron Mountain and Pilot Knob, on the sources of the river St. Francis, Missouri. It occurs in vast masses, granular, and sometimes specular, without iridescence. Also, on White river, Arkansas.

b. *Micaceous Oxide of Iron*. Sources of the St. Francis river, Missouri. A vein of this ore, several feet wide, is found in red sienite, on the banks of the river St. Francis, at the Narrows, Madison county, Missouri Territory. Its unusual appearance has for several years attracted the attention of the inhabitants. It is situated four miles south of the extensive lead-mines of La Motte, and in the centre of a highly interesting geological and mineralogical section of country. The rocks at that place are the old red granite and sienite, in mountain masses, with veins of greenstone, greenstone porphyry, and gneiss.

c. *Red Oxide of Iron*. Flint river, Tennessee.

d. *Brown Hematite*. On the dividing ridge between Strawberry and Spring rivers, Arkansas.

e. *Argillaceous Oxide of Iron—Ironstone*. Banks of the Monongahela, Pennsylvania.

f. *Sulphuret of Iron*. Accompanying the ores and vein-stones of the Missouri lead-mines.

g. *Magnetic Oxide of Iron*. Fifteen miles below the Hot Springs, on the Washita river, Arkansas. In quantity.

45. BLACK OXIDE OF MANGANESE. On Big Sandy river, Kentucky. Also, on the sources of the Maramec and Spring rivers, Missouri, accompanied by the brown oxide of iron.

46. NATIVE COPPER. Scattered masses of this metal have been found on Big river, and also in a shaft sunk near Harrisonville, Illinois. Nothing, however, is known in America, to equal the vast quantities of this metal found in the trap veins on the banks of lake Superior.

47. SULPHATE OF COPPER. On the Washita river, fifteen miles below the Hot Springs, Arkansas.

# CATALOGUE OF MINERALS AND GEOLOGICAL SPECIMENS, (CONTINUED.)

OCTOBER, 1819.

1. Sulphate of lime. Arkansas.
2. Sulphuret of lead, in quartz. Washington county, Mo.
3. Agate, from Persia. Brought by Captain Austin.
4. Serpentine. Derby, Conn.
5. Galena upon crystallized quartz. Missouri.
6. Limpid quartz. Hot Springs, Arkansas.
7. Striped agate. St. Genevieve county, Mo.
8. Sienite. Persia.
9. Silicious breccia. Illinois.
10. Sulphuret of lead. Shangum Mountain, Ulster county, N. Y.
11. Garnet, in micaceous schistus. Watertown, Litchfield county, Conn.
12. Galena, iron pyrites, &c., in quartz. Northampton, Mass.
13. Serpentine. Derby, Conn.
14. Red granite. River St. Francis, Madison county, Missouri Territory.
15. Red oxide of zinc. Sussex county, N. J.
16. Metalliferous limestone. Missouri.
17. Agate. Strawberry river, Arkansas Territory.
18. Dolomite. Stockbridge, Mass.
19. Lamellar galena. Bryan's mines, St. Genevieve county, Mo.
20. Shell-limestone. Bermuda.
21. Arseniate of cobalt, with nickel, in actynolite. Chatham, Conn.
22. Galena in quartz. Shangum Mountain, N. Y.
23. Regulus of antimony.
24. Granular argillaceous oxide of iron (pea ore). Staten Island, N. Y.
25. Olivine. Europe.
26. Indicolite in lamellar feldspar. Chesterfield, Mass.
27. Brucite, (Gibbs,) silicious fluat of magnesia, in transition carbonate of lime, with graphite. Sussex county, N. J.
28. Sulphate of lime. Nova Scotia.
29. Serpentine. Hoboken, N. J.
30. Sulphuret of antimony, with crystals of carbonate of lime. Cornwall, England.
31. Chalcedony. Easthaven, Conn.

32. Arseniate of iron, in quartz. Connecticut.
33. Arseniate of cobalt, with iron pyrites and copper. Ireland.
34. Indurated talc. Hoboken, N. J.
35. Primitive granular limestone. Kingsbridge, N. Y.
36. Galena in quartz. Wales.
37. Carbonate and sulphuret of copper, with calcareous spar, in sandstone. Schuyler's mines, Bergen county, N. J.
38. Iron pyrites (cubical). Haddam, Conn.
39. Ferruginous oxide of manganese. Greenwich street, New York city.
40. Green feldspar. Hoboken, N. J.
41. Chert. Wales.
42. Brown hæmatite. Salisbury, Conn.
43. Indicolite, in lamellar feldspar. Chesterfield, Mass.
44. Tremolite. Litchfield county, Conn.
45. Sappare (Cyanite of Cleveland). Litchfield county, Conn.
46. Chabasie. Deerfield, Mass.
47. Anthracite, with quartz. Rhode Island.
48. Fluuate of lime. Derbyshire, Eng.
49. Asbestos. Milford, Conn.
50. Zeolite. Giants' Causeway, county of Antrim, Ireland.
51. Hydrate of magnesia. Hoboken, N. J.
52. Serpentine (verte antique). Milford, Conn.
53. do. (pure). Milford, Conn.
54. Primitive granular limestone, equalling Carrara marble. Stockbridge, Mass.
55. Precious serpentine. Hoboken, N. J.
56. Beryl, in granitic rock. Haddam, Conn.
57. Sediment in the Hot Springs of Washita, Arkansas Territory.
58. Asbestos. Milford, Conn.
59. Talc. Staten Island, Richmond county, N. Y.
60. Graphic granite. " " "
61. Amethystine quartz. Easthaven, Conn.
62. Prehnite. Hartford, Conn.
63. Jasper. Egypt.
64. Granite. Greenfield Hill, Conn.
65. Fibrous carbonate of lime, resembling zeolite. Hoboken, N. J.
66. Chalcedony. Easthaven, Conn.
67. Tremolite. Litchfield, Conn.
68. Sulphuret of antimony. Cornwall, Eng.
69. " " " "
70. Agate. Corlaer's Hook, Island of New York.
71. Sulphuret of molybdena, in granite. Bergen, N. J.
72. Cellular mass of sandstone and quartz, with crystals of quartz. Schuyler's mines, N. J.
73. Crystallized carbonate of lime, with carb'te of copper. Same mines.

74. Micaceous oxide of iron. River St. Francis, Madison county, Mo.
75. Petrified wood. Locality unknown.
76. Sulphate of copper (blue vitriol), with carbonate of copper, in a ferruginous sandstone. Schuyler's mines, N. J.
77. Carbonate of copper. " " "
78. Agate. South bank of White river, Arkansas Territory.
79. Sulphuret of lead, carbonate of copper, and yellow oxide of iron. Schuyler's mines, N. J.
- 80, 81, 82, and 83. Calcareous spar. Lead-mines, Missouri.
- 84 and 85. Sulphuret of lead, in sulphate of barytes. "
86. Argentiferous lead-glance. Mine La Motte, Missouri.
87. Specular oxide of iron, with quartz. Bellevieu, Washington county, Missouri.
88. Sulphuret of zinc. Lead-mines, Missouri.
89. Yellow mamillary quartz, incrusting with sulphate of barytes and hæmatitic iron. Old Mines, Missouri.
90. Lamellar sulphate of barytes. Lead-mines of Missouri.
91. Brown hæmatite. Staten Island, N. Y.
92. Greenstone porphyry. River St. Francis, Madison county, Mo.
93. Cubical lead-glance, with calcareous spar. Bryan's mines, Mo.
94. Crested sulphate of barytes. Lead-mines, Missouri.
95. Pyramidal sulphate of barytes (prism spar). "
96. Lamellar sulphate of barytes, with galena. "
97. " with crystals of calcareous spar. "
98. Blende, with iron pyrites. Elliott's mines, "
99. Flint. Locality unknown.
100. Granular sulphuret of lead. Mine La Motte, Missouri.
101. Pumice of the Missouri river.
102. Pseudo-volcanic product of same.
103. Ferruginous sulphate of barytes, on radiated quartz. Lead-mines of Missouri.
104. Crested brown oxide of iron. Jefferson county, Mo.
105. Radiated quartz, incrusting with sulphate of barytes and iron. Potosi, Mo.
106. Granular lead-ore (a sulphuret). Mine La Motte, Mo.
107. Brown oxide of iron, crystallized in octohedrons. Washington county, Mo.
108. Mamillary quartz, on a basis of agate. River St. Francis, Mo.
109. Radiated quartz. Lead-mines of Missouri.
110. " " " "
- 111, 112, 113, 114, and 115. Mamillary quartz. Lead-mines of Missouri.
116. Chalky clay. Cape Girardeau, Mo.
117. Cubical pyrites, with calcareous spar. Mineral Fork, Mo.
118. Radiated quartz, incrusting with crystallized oxide of iron. Jefferson county, Mo.

119. Tabular galena. Bryan's mines, Mo.
120. Radiated quartz. Jefferson county, Mo.
121. " " Potosi.
122. Hoary quartz (a variety unnoticed in the books). Potosi.
123. Galena, in heavy spar. Potosi.
124. " on radiated quartz. "
125. Carbonate of lime, covered by crystals of quartz. Potosi.
126. Metalliferous limestone. Potosi.
127. " " "
128. Granite. Missouri.
129. Radiated limpid quartz. Lead-mines of Missouri.
- 130 and 131. Sulphuret of lead. Potosi.
132. Galena, with calcareous spar. Bryan's mines, Mo.
- 133 and 134. Galena, partially desulphurated by heat. Potosi.
135. Chalcedony. St. Genevieve county, Mo.
136. Madreporite. Gallatin county, Illinois.
137. Primitive granular limestone. Carrara, Italy.
138. Egyptian marble.
139. Argillaceous porphyry. France.
- 140 and 141. Milford marble.
- 142 and 143. Philadelphia marble.
144. Egyptian marble.
145. Bituminous shale.
146. Cubical iron-ore. Jefferson county, Mo.
147. Regulus of nickel and cobalt.
148. Tourmaline. Greensburgh, Westchester county, N. Y.
149. Graphic granite. Corlaer's Hook, N. Y.
150. Fibrous gypsum. Nova Scotia.
151. Trap. Corlaer's Hook, N. Y.
152. Tremolite, in carbonate of lime. Somerstown, Westchester county, New York.
153. Asbestos in steatite, on carbonate of lime. New York.
154. " " " " "
155. Lamellar pyrites. Sussex county, N. J.
156. Graphite " " "
157. Pyrites, in hornblende. " "
158. Brass yellow pyrites. " "
159. Jaspery agate. Corlaer's Hook, N. Y.
160. Pyrites, with specular oxide of iron. Sussex county, N. J.
161. Sulphate of barytes. Schooley's Mountain, N. J.
162. " " Washington county, Mo.
163. Bitter spar. Hoboken, N. J.
164. Arseniate of cobalt. Chatham, Conn.
165. Sulphate of lime. Nova Scotia.
166. Granular quartz. St. Genevieve county, Mo.

167. Sulphate of lime. Nova Scotia.
168. Common striped jasper. Corlaer's Hook, N. Y.
169. Sulphate of lime. Nova Scotia.
170. Compact limestone. Herculaneum, Mo.
171. Limestone. St. Louis, Mo.
172. Fibrous quartz. Schuyler's mines, N. J.
173. Quartz. Dutchess county, &c., N. Y.
174. Sulphuret of zinc, in crystallized quartz. Ulster county, N. Y.
175. Brown hæmatite. Salisbury, Conn.
176. Greenstone porphyry. Madison county, Mo.
177. Galena. Missouri.

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SHELLS.

1. *Murex** *canaliculatus*, with *Voluta mercatoria** included.
2. " " with *Voluta oliva** included.
3. " " with *serpulæ* attached and included.
4. *Murex** *carica*, with two pairs *Mya** *arenaria*.
5. *Helix** *ampullacea*, with two small madrepores.*
6. " " with seven *Cypræa** *monita*—African money.
7. *Venus** *mercenaria*, with four small ones; a variety of species included.
8. " " two valves, intermediate between the last named.
9. *Cardium** *leucostomum*.
10. *Cardium** *edule*.
11. *Buccinum** *perdix*, three shells.
12. *Murex** *neritoideus*, two shells.
13. *Venus** *maculata*.
14. *Patella** *fornicata*, six shells.
15. *Buccinum** *testiculus*, two shells.
16. *Venus** *Paphia*, two valves.
17. Larva* of *strombus gigas*, six shells.
18. *Buccinum*† *glabratum* (Ebura of Lamarck).
- 19 and 20. *Cypræa*† *lirabica*.
21. *C. sordida*,* Linn. *C. carneola*, Lam.
22. *C. caput*† *serpentis*. Viper's head; cowry.
23. *C. exanthema*.* (False argus.)
24. *Buccinum** *patulum*.
25. *Voluta* *prunum*.*
26. *Cypræa** *lota*, two shells.

* Occidental shells.

† Oriental shells.

27. *Voluta guttrata*.†
28. *Bulla** *gibbosa*, seven shells.
29. *Ostrea** *edulis*.
30. *Peetsen*.*
31. *Venus** *tigerina*.
32. *Tellina** *radiata*.
33. *Dentalium*.*
34. *Nerita** *mammilla*.
35. *Bulla** *ampulla*.
36. *Voluta oryzy** (Rice shells.)
37. *Voluta** *nivea*.
38. *Arca** *glycymeris*.
39. *Cerea** *noe*.
40. *Mytilus** *modiolus*.

* Occidental shells.

† Oriental shells.

MINERAL RESOURCES OF THE WEST.

A LETTER TO CHARLES G. HAINES, ESQ., SECRETARY OF THE ASSOCIATION FOR
THE PROMOTION OF INTERNAL IMPROVEMENTS AT NEW YORK.

NEW YORK, October 5th, 1819.

SIR: In reply to your communication of the 4th inst., I submit the subjoined remarks on the following questions:—

I. “To what extent are the lead, and other mines, worked in our western country, either by the United States’ government, or by individuals?”

In the extensive region to which this inquiry has allusion, are found numerous ores, salts, ochres, and other minerals; and the catalogue is daily increasing, by the discovery of new substances, which promise to become important to the commerce of the western country; but the only mines worked are those of lead, iron, and coal.

The lead-mines are situated in Missouri Territory, (formerly Upper Louisiana,) and extend on the western bank of the Mississippi for a distance of about one hundred miles, by forty in width, comprising the present counties of Washington, St. Genevieve, Jefferson, and Madison. The first lead-ore was discovered by De Lochon, La Motte, and others, acting under the authority of the Company of the West, as early as 1720. Since which period, the number of mines has been annually increasing by new discoveries, under the jurisdiction which has been successively exercised over that country by France, Spain, and the United States. The number of mines now worked is forty-five; thirty-nine of which are in Washington county, three in St. Genevieve, one in Madison, and two in Jefferson. The quantity of lead annually smelted from the crude ore, I have estimated at three million pounds; and the number of hands to whom it furnishes employment, at eleven hundred. A considerable proportion of these are, however, farmers, who only turn their attention to mining a part of the year, when their farms do not require their labor;

the residue are professed smelters and miners, including blacksmiths and others, whose services are constantly required. The price of lead at the mines is now four dollars per cwt. It is worth four dollars and fifty cents on the banks of the Mississippi, at St. Genevieve and Herculeaneum, and is quoted at seven dollars in Philadelphia. The ore exclusively worked is the common galena, or sulphuret of lead, with a broad glittering grain. It is found in detached pieces and beds in red clay, and in veins in limestone rock, accompanied by sulphate of barytes, calcareous spar, blende, quartz, and pyrites. It melts easily, yielding, in the large way, from sixty to seventy-five per cent. of pure metal. By chemical analysis I procured eighty-two per cent. of metallic lead from a specimen of common ore at Mine à Burton. The residue is chiefly sulphur, with a little carbonate of lime and silix. It contains no silver, or at least none which can be detected by the usual tests.

All the lead smelted at these mines is transported in carts and wagons to the banks of the Mississippi, and deposited for shipment at Herculeaneum or St. Genevieve. The different mines are situated at various distances, from thirty to forty-five miles in the interior, and the cost of transportation may be averaged at seventy-five cents per cwt. In summer, when the roads are in good order, it may be procured at fifty cents; but in the spring and fall, when the roads are cut up, it will cost one dollar. The transportation from Herculeaneum and St. Genevieve to New Orleans, may now be procured at seventy cents per cwt. This is less than the sum paid, previous to the introduction of steamboats on the Mississippi and its tributary streams. Hence, it costs more to convey a hundred-weight of lead forty miles by land, in wagons and carts, than to transport the same one thousand miles (the distance from Herculeaneum to New Orleans) by steamboats. An improvement of the streams of the mine country, so as to render them navigable at all seasons for keel-boats and barges, is therefore a subject of the first moment. The Maramec river, a stream of one hundred and eighty miles in length, and a hundred yards wide at its mouth, which enters the Mississippi eighteen miles below St. Louis, draws its waters from the mining counties of Washington, Jefferson, St. Genevieve, and the unincorporated wilderness on the south-east, and the fertile counties of Franklin and St. Louis on the north-west; and its south-eastern tributaries meander throughout the mine tract. The principal of these are Grand river and Mineral Fork, which are navigable in spring and fall for keel-boats of a small size, and might, I believe, be rendered so throughout the year, at an inconsiderable expense.

The lead-mines are exclusively worked by individuals, either under the authority of leases obtained from the United States for a limited time; on lands which were granted by the French or Spanish, and the titles to which have been subsequently confirmed by the United States; on unconfirmed lands; or in violation of existing laws.

There are few sections of the valley of the Mississippi which are not characterized by iron and coal. Iron-ore is abundant on the Ohio and its tributaries, particularly on the Alleghany, Monongahela, and Muskingum. It is worked at several foundries in the counties of Fayette, Armstrong, and Alleghany, in Pennsylvania. The most noted furnaces are at Brownsville, from which the extensive foundries at Pittsburgh are chiefly supplied with pig-iron. It is also worked at Zanesville, on the Muskingum, and on Brush creek, in Ohio; and a foundry at Cincinnati, and another at Louisville, in Kentucky, are supplied with pig-iron from the latter place. The ore is chiefly of that kind called the argillaceous oxide, and produces iron which is well adapted for steam-engine machinery, and for hollow-ware.

Stone-coal, of an excellent quality, is abundant at Pittsburgh, where it is largely consumed in iron-foundries, glass-furnaces, and other manufactories, and also in private dwellings. The most extensive pits or galleries are situated immediately opposite the city, on Coal Hill, where it has been pursued into the hill eight or nine hundred yards. It is found breaking out on the banks of the Alleghany at several places, at and near Kittaning, where beds of it have been opened; and I have even observed traces of it in the vicinity of Olean, near the head of Genesee river, in the State of New York. On the Monongahela it extends by Williamsport, Brownsville, and Greensburgh, to the vicinity of Morgantown, in Virginia; and such is the abundance of this mineral, and the uniformity and regularity which the geological structure of this part of the country presents, that there is no considerable section of it, within a circle of two hundred miles in diameter around Pittsburgh, which does not afford beds of good inflammable coal. Pursuing the Ohio down from Pittsburgh, it is successively worked at Wellsburg, Wheeling, Gallipolis, and Maysville. In Illinois, on Great Muddy river, and at Alton; in Missouri, at Florissant, and on Osage river; and in Arkansas, on the Washita river; this valuable mineral has also been found.

II. "What mines have been discovered?"

V. "Where are the most valuable mines to be found in the western country?"

The reply to these inquiries has been, in part, anticipated by the preceding details. Lead and other mines are, however, found in several other sections of the western country. An extensive body of lead-ore is found near Prairie du Chien, on the west bank of the Mississippi, about five hundred miles above St. Louis. The ore is in the state of a sulphuret, is easily reduced, and yields about sixty-two and a half per cent. of metal. These mines are worked in an imperfect manner by the savages, the Sacs and Foxes, the original owners of the soil; and considerable quantities are annually brought down to St. Louis by the north-west

traders. Lead-ore is also found on the river Desmoines of the Mississippi, where it was formerly worked by the French—on the Osage, Gasconade, and Mine river of the Missouri; on the White river and its tributaries; on the St. Francis; and on the Arkansas, where it is combined with a small proportion of silver. It is also found at Cave-in-Rock, Gallatin county, Illinois, accompanied by fluor spar; at Drennon's Lick and Millersburgh, in Kentucky; and on New river, at Austinville, in Wythe county, Virginia. At the latter place, it has been worked without interruption for nearly fifty years; and the mines still continue to be wrought. The ore is galena, accompanied by the carbonate of lead, and the earthy oxide of lead; the latter of which is worked in the large way, as is said, to a profit.

Zinc is found in Washington county, Missouri, in considerable quantities; but only in the state of a sulphuret.

Copper has been found in small masses, in a metallic state, on Great Muddy river, and at Harrisonville, Monroe county, Illinois. A grant of land made to P. F. Renault, in 1723, at Old Peoria, on the Illinois river, specifies the existence of a copper-mine upon it; but the most remarkable bodies of copper which the globe affords, are stated to exist on the western shores of Lake Superior, and on the Upper Mississippi. It is found in the metallic state, but accompanied also, as is said, by the sulphuret and carbonate of copper. The ores stretch over a very extensive region, and have been traced as low as the falls of St. Anthony. There is, indeed, reason to believe that copper is disseminated from the west bank of Great Muddy river, in Illinois, in a north-west direction, to the western shore of Lake Superior, as all the streams, so far as observed, which flow either north or south at right angles with such a line, afford traces of copper. Thus, the Kaskaskia, the Illinois and its tributaries, the St. Peter, Wisconsin, and the southern forks of the Wabash and Miami, all furnish specimens of copper, as well as lead, zinc, and iron. An attempt was made by President Adams to explore the copper-mines of the north-west; but I know not what success attended the undertaking. Considering the certainty with which all travellers, since the days of Carver, have spoken of the existence of these mines, with the daily concurrent testimony of traders from that quarter, and their great importance in a national point of view, it is matter of surprise that they have been so long neglected. Is not the present an auspicious time for authorizing a mission into that quarter, for the purpose of exploring its physical geography?

Iron is a mineral common to all parts of the western country. One of its most remarkable localities is the head of the river St. Francis, in Missouri Territory, where it extends through a considerable part of Madison and Washington counties. The most noted body is called the Iron Mountain, and is situated about forty miles west of the Mississippi, in Bellevue, Washington county. The ore is here found in immense masses,

and forms the southern extremity of a lofty ridge of hills, which consists chiefly of red granite, but terminates, in a rich alluvial plain, in a mass of solid ore. It is chiefly the micaceous oxide, accompanied by the red oxide, and by iron-glance. It melts very easily, producing a soft, malleable iron.

Coal is not less common, and may be considered among those extensive mineral formations which stretch, in so remarkable a manner, throughout the vast basin included between the Alleghany and Rocky mountains. Salt and gypsum may also be referred to the same great geological formations, as they are to be traced, accompanying each other, from the western section of New York, to the southern banks of the Arkansas, where immense quantities of salt and gypsum exist. Clay, flint, ochre of various kinds, saltpetre, alum, reddle, soapstone, plumbago, oil-stone, marble, serpentine, &c., may be enumerated among the useful minerals of less importance, which characterize that region.

III. "To what extent and advantage do you think the mines might be worked, under proper management and superintendence?"

IV. "Are the laws of Congress, which have been passed in relation to our lead-mines, salutary in their operation?"

I have stated the amount of lead annually produced by the Missouri mines at three millions of pounds, which, on reflection, I think is sufficiently high. But there are numerous difficulties opposed to the successful progress of mining in that country, by the removal of which, the amount would be greatly augmented. Some of these difficulties arise from the peculiar nature of the business, from a want of skill, or of mining capital in those by whom mining operations are conducted; but by far the greatest obstacle results from the want of a systematic organization of the mining interest by the United States, or from defects in existing laws on the subject.

Immediately after the occupation of Louisiana by the United States, inquiry was made into the situation and extent of the mines; and a law was passed, reserving all mines discovered on the public lands, and authorizing the territorial executive for the time being to lease out such mines for a period of three years. A radical defect in this law appears always to have been, that there was not, at the same time, authorized the appointment of a specific agent for the general management and superintendence of mines. Such an officer has long been called for, not less by the public interest, than by the intelligent inhabitants of the western country, who feel how nearly a proper development of its mineral wealth is connected with their individual prosperity and national independence. The superintendent should reside in the mine country, and such a salary should be attached to the office as to induce a man of science to accept it. His duty should be to report annually to Congress the state of the mines,

their produce, new discoveries, and proposed alterations in existing laws. He should lease out and receive rents for the public mines—prevent the destruction of timber on mineral lands, and the working of mines without authority, and should be charged with the investigation of the physical and geographical mineralogy of the country. At present, the most flagrant violations of the laws are practised—mines are worked without leases—wood is destroyed on lands which are only valuable for the wood and the lead-ore they contain; and the government derives but a small revenue from those celebrated mines, which, whether we consider their vast extent, the richness of the ore, or the quantity of metal they are capable of annually producing, are unparalleled by any other mineral district in the world.

There is another feature in the existing law, which is not beneficial in its operation. It is that clause restricting the terms of leases to three years. To embark in mining operations with profit, it is necessary to sink shafts and galleries, build engines, and erect other necessary works, which are, in some degree, permanent in their nature, and require much time and expense in their completion. A considerable part of the period must, therefore, elapse before the mine can be put in a state for working; and no sooner is that done, and it begins to afford a profit, and promises a reward for the expense incurred, than the expiration of the lease throws all these works into the hands of some new adventurer, or more successful applicant. This prevents many from engaging in mining on the public lands, and especially those who would be best able to prosecute the business; and of the number who take leases, a great proportion continue to pursue the desultory method of mining in alluvial* ground, introduced at an early period by the French, but which is attended with very great uncertainty.

Improvements remain also to be introduced in regard to the processes of mining, the furnaces employed, and the method of raising the ore. Inseparable from this subject is the distribution of more enlarged practical and scientific views of mining and minerals generally, which might, in a great degree, be effected by the dissemination of practical treatises on the subject, or by the employment of experienced and skilful miners from Europe.

When such improvements shall be effected, with others to which it is not necessary here to advert—when miners are properly secured in the object of their pursuit, either by permanent purchases from government, or by leases for a long period of years—and when the facilities for transportation which that country is destined to afford, by the improved navigation of its streams, and by the introduction of turnpikes, roads, and

* This word is used in its common acceptation in 1819.

bridges, are introduced, there is reason to conclude that the annual amount of lead produced will far surpass the proceeds of those mines under the present arrangement, and, indeed, it is impossible to calculate the extent to which it may be carried. It is, perhaps, a moderate estimate to say, that they are capable of being made to yield, by judicious management, six millions of pounds of lead per annum, and that they will furnish employment to three thousand hands.

During my late tour throughout the western country, including nearly a year's residence in the interior of Missouri, I devoted much time to this interesting subject, and have been enabled to collect a body of facts on the physical resources and character of that country, and particularly of its mines and minerals, which it is my design to lay before the public. I must, therefore, refer you to this work, which is now in press, for further details on this subject, and, in the mean time, I beg your indulgent perusal of this hasty outline.

With respect, Sir,

Your obedient servant,

HENRY R. SCHOOLCRAFT.

GEOGRAPHY.

MISSOURI.

WHEN Louisiana was admitted into the Union as an independent State, all that part of the territory situated north of 33° north latitude, and formerly known as Upper Louisiana, was erected into a separate territorial government, under the name of Missouri. This term is the name of a tribe of Indians who formerly dwelt near the Missouri river. The Territory also included those boundless plains and unexplored countries stretching from north to south, at the foot of the Rocky mountains, and which pass into the province of Texas on the south, and are bounded by the western line of Louisiana on the east. In the month of March of the present year, the southern part of Missouri Territory, including the unincorporated regions on the west and south-west, was erected into a separate Territory, under the name of Arkansas. The regions to the north-west may be considered as an unincorporated wilderness, where the authority of the United States, so far as the Indian title has been extinguished, is maintained in detached posts and garrisons, under the immediate government of military commandants. The bounds of Missouri, as designated in the late law respecting that country, are as follows: beginning on the Mississippi river, in latitude 36° north, and running due west on the latitude line to the river St. Francis, thence up that river to $36^{\circ} 30'$ north latitude, thence west to a point due south of the mouth of the river Kansas, thence north to a point opposite the mouth of the river Desmoines, thence east to the Mississippi river, and down the middle of that river to the place of beginning.

It embraces some of the most prominent geographical features of the western country, and, from the meeting of such mighty streams on its confines, and its relation to all the country situated north and west of it, must become the key to all the commerce of those regions, and is destined to have a commanding influence on the surrounding States, and on the political character and mutations of that country. It is bounded by the

States of Illinois and Kentucky, from which it is separated by the Mississippi river on the east and north-east, and by the Territory of Arkansas on the south.

The country west of the Mississippi differs, in some respects, from any other section of the western country, and affords a variety in its physical aspect which is nowhere else to be met with. A great proportion of the lands in this Territory are of the richest kind, producing corn, wheat, rye, oats, flax, hemp, and tobacco, in great abundance, and in great perfection. The lands bordering on the Missouri river, as far as the Territory extends, are rich beyond comparison. They consist of black alluvial soil, of unknown depth, and partaking largely of the properties of marl; and the heavy growth of forest trees by which it is covered, indicates the strength of the soil. As you recede from the banks of the rivers, the land rises, passing, sometimes by almost imperceptible gradations, and sometimes very abruptly, into elevated barrens, flinty ridges, and rocky cliffs. A portion of the Territory is, therefore, unfit for cultivation, but still serves as the matrix of numerous ores, which are distributed abundantly in the hills and mountains of the interior. There is very little land of an intermediate quality. It is either very rich or very poor; it is either bottom-land or cliff, prairie or barren; it is a deep black marl, or a high bluff rock; and the transition is often so sudden, as to produce scenes of the most picturesque beauty. Hence, the traveller in the interior is often surprised to behold, at one view, cliffs and prairies, bottoms and barrens, naked hills, heavy forests, rocks, streams, and plains, all succeeding each other with rapidity, and mingled with the most pleasing harmony. I have contemplated such scenes, while standing on some lofty bluff in the wilderness of Missouri, with unmixed delight; while the deer, the elk, and the buffalo, were grazing quietly on the plains below.

Situated between the 36th and 40th degrees of north latitude, the Territory enjoys a climate of remarkable serenity, and temperate warmth. That clear blue sky, so much admired by the aborigines, is characteristic of the country; and an atmosphere of unusual dryness, exempts the inhabitants from those pulmonary complaints which are more or less the consequence of a humid atmosphere. A country so situated cannot fail to prove genial to the vegetable kingdom. It would be difficult to point out a section of country which affords a more interesting field for the botanist. Its prairies and barrens are covered with a profusion of wild flowers, shrubs, and plants; and its cultivated fields yield to the hands of the planter, a great proportion of the useful vegetables of the earth. Corn succeeds remarkably; no country surpasses the banks of the Missouri for the vigor of its crops. Wheat, rye, oats, flax, and hemp, are also raised with advantage. Tobacco is an article recently introduced, but is found to succeed well, and the lands are said to be well adapted to its growth. Cotton is raised in the southern part of the Territory for

family use, but is not an advantageous crop for market. The climate and soil are also adapted to the growth of the sweet or Carolina potato, and to fruit-trees of various kinds. The peach and the apple are most generally cultivated. Of wild fruits, the woods afford abundance; among which, the grape, persimmon, papaw, pecan, and filbert, are conspicuous. Some varieties of the grape are delicious, and they are very common at the mines, where the inhabitants prepare a wine from them, which has a pleasant flavor.

The population of the Territory, exclusive of the aborigines, has been stated at 46,000, the greatest proportion of whom have emigrated into it within the last five years. They consist of people from various parts of the United States and Europe. A large number are from Tennessee, Kentucky, New York, and New England. The original inhabitants were French and Spanish. There are few of the latter remaining; but the former constitute a respectable proportion of the population.

The principal towns of Missouri are St. Louis, St. Genevieve, St. Charles, and Franklin. Of a lesser size, are Herculaneum, Potosi, New Madrid, Cape Girardeau, Jackson, Chariton, Florissant, and Carondelet. St. Louis is the capital of the Territory, and by far the largest town west of Cincinnati, Ohio. It consists of about 550 houses and 5000 inhabitants, and has two banks, three houses for public worship, a post-office, theatre, land-office, and museum, including forty stores, with several mills, manufactories, &c. It is eligibly situated on the western bank of the Mississippi river, eighteen miles below the junction of the Missouri, and, from its commanding situation, is destined to become the emporium of the western country.

Franklin, at Boon's Lick, on the Missouri, has 150 houses, is the thoroughfare for emigrants to that quarter, and is surrounded by one of the richest bodies of land west of the Alleghany mountains, to which emigration is flowing with unexampled rapidity.

St. Charles, situated twenty-one miles above St. Louis, on the Missouri, is also a handsome and flourishing town. The same may be said of Chariton, one hundred and eighty miles above, at the mouth of Chariton river.

No country in the world affords such an extent of inland navigation by its streams, as the basin lying between the Alleghany and Rocky mountains, whose congregated waters are carried to the ocean by those stupendous natural canals, the Mississippi, Missouri, Ohio, and Illinois. The Mississippi river itself, in whose current all these majestic streams unite, and are discharged into the Mexican gulf, washes the eastern boundaries of the Territory, from the mouth of the river Desmoines to that of the St. Francis, a distance of more than five hundred miles. The Missouri, swelled by its great tributaries, the Yellowstone, Little Missouri, Whitestone, La Platte, Kansas, and Osage, passes diagonally

nearly through its centre, affording on both sides a widely-extended tract of soil transcendently rich, and bearing a luxuriant growth of forest trees and plants, interspersed with prairie. It is navigable, without interruption, from its junction with the Mississippi to its falls, a distance of two thousand miles.

The Ohio is a thousand miles in length from its head, at Pittsburgh, to its junction with the Mississippi, and, in its passage, successively washes the shores of Pennsylvania, Virginia, Ohio, Kentucky, Indiana, and Illinois—shores which are covered with villages, towns, and settlements, and lined with an industrious and hardy population.

The Illinois is also a stream affording a great length of navigation, and lands of superior quality, and has a natural connection with the great north-western lakes, into which boats may, at certain seasons, uninterruptedly pass.

These rivers, communicating with all parts of the country by their tributaries, afford the advantages of commercial exchange, trade, and manufactures, to a greater extent, and a richer description of country, than is anywhere to be found in Europe, Asia, or Africa.

Of these advantages, the Territory of Missouri, occupying so commanding a position in the geography of the country, must always partake largely, and may, from the wealth already concentrated in its capital, St. Louis, enjoy almost exclusively the trade of the Missouri and upper Mississippi.

The streams which originate within the lines described by the political boundaries of the Territory, and which, either during their whole course, or for a considerable distance, meander through it, are the Osage, the Gasconade, Maramec, Salt river, St. Francis, and Black river. Of a lesser magnitude are Mine river, Chariton, Currents, Fourche à Thomas, Eleven-points, and Spring rivers; the four latter running southerly into the Arkansas Territory, and discharging their waters into Black river, which is itself a tributary of White river.

The Osage originates in a prairie country, near the ninety-sixth degree of west longitude, about one hundred miles north of the Arkansas, and, after meandering in an east and north-east direction for a distance of five hundred miles, unites with the Missouri one hundred and thirty miles above St. Louis. In its course it is swelled by several tributaries, the principal of which is the Little Osage, its great south-eastern fork. This river affords, in its whole length, large bodies of the choicest prairie-land, interspersed with woodland, and occasionally with hills, and is navigable for moderate sized boats. Its banks afford exhaustless beds of stone-coal, and some iron and lead is found, while its upper forks reach into the country of the Pawnees—a country rich in salt. The Osage Indians inhabit its banks; but a part of their lands have been purchased by the United States. It is a very beautiful stream, and

situated in a delightful climate; and when its borders are opened for emigration, and its resources properly drawn forth, will support a large population, and a profitable trade. Its fertile soil and genial climate entitle it to the rank of one of the first tributaries of the Missouri.

In estimating the length of western rivers, there is one circumstance which is not properly estimated by an eastern reader. It is their serpentine course, which is so remarkable, that, in running one hundred miles on a geographical line, they will, by their great windings, measure at least double that distance; so that a river stated to be one thousand miles in length by its banks, cannot be calculated to traverse a country of more than five hundred miles in extent; indeed, I believe that a fair average of distances would show the geographical distance to be less.

The Gasconade enters the Missouri one hundred miles above St. Louis. Its length is about two hundred miles, and it is navigable for half that distance. It is made up of several streams running from a ridge of high lands, separating the waters which fall on the north into the Missouri, from those which flow on the south into the Mississippi. Its banks afford but a small proportion of tillable lands, being bordered with rocks and sterile hills. The rocks are, however, cavernous, and afford saltpetre; and the hills are covered by pine timber, which is sawed into boards and plank. In these two articles, the commerce of this river will always principally consist. The current is rapid, and affords by its fall many mill-seats, so that boats and rafts may descend with ease; but its ascent is attended with great labor. On this stream are already situated several saw-mills.

The Maramec also originates in high lands, two hundred and fifty miles south-west of its mouth, and is separated from the waters of the Gasconade only by a dividing ridge of land. It is swelled in its course by a great number of streams, the most noted of which are the Little Maramec, Bourbuse, Fourche à Courtois, Big river, and Mineral Fork. It forms a junction with the Mississippi eighteen miles below St. Louis, where it is two hundred yards wide. It is only navigable about fifty miles, except in high floods in the spring and fall, when most of its tributaries may be ascended with boats. This stream waters the country of the mines, and interlocks, by its affluents, with the Gasconade on the west, and the St. Francis on the south. The mines of Missouri are situated on its southern shores.

Salt river enters the Mississippi one hundred and three miles above St. Louis, and seventy-three miles above the mouth of the Illinois. The settlements on its banks are rapidly progressing, and the lands are noted for their fertility.

The St. Francis originates, with Big river, in broken lands in the southern part of Washington and St. Genevieve counties, and joins the Mississippi five hundred miles below. The most noted bodies of iron-ore

in the western country lie on its head, at Bellevieu. The La Motte lead-mines also lie along the banks of one of its tributaries. It affords, in its course, a proportion of excellent land, mixed with some that is rocky, and bordered near its mouth with much that is swampy, low, and overflown. A raft of trees, about two hundred and fifty miles above its month, obstructs the navigation, which would otherwise be good to within fourteen miles of St. Michael, the seat of justice for Madison county.

Black river has its origin near the heads of the Gasconade and the Maramec, and is swelled in its course by the river Currents, Fourche à Thomas, Eleven-points, Spring and Strawberry rivers, and forms a junction with White river about forty miles below Poke Bayou, where the road to Arkansas and Red river crosses it. The banks of Black river, and of all its tributaries, afford rich alluvial land of more or less extent; but the intervening ridges are rocky and sterile.

Although there is much high land in this Territory, there is perhaps none which, strictly speaking, is entitled to the appellation of a *mountain*. A ridge of high land, called the Ozark chain, commencing on the banks of the Maramec, near the Fourche à Courtois, extends in a south-west direction to the banks of White river, in Arkansas Territory, a distance of about four hundred miles, and occasionally rises into peaks of mountain height. This ridge serves to divide the waters of the Missouri from those of the Mississippi; the streams on one side running south into the latter, and those on the other running north into the former. The body of red granite found on the head of the St. Francis, lies in mountain masses, and forms, in connection with the accompanying rocks, some of the most rude and terrific scenery, full of interest in a mineralogical, as well as a geological point of view.

In the preceding view of the lead-mines of Missouri, and in the catalogue of minerals subsequently introduced, I have already anticipated much that might with propriety be given here; it may therefore be sufficient to give a brief synopsis of both.

The lead-mines in this Territory are situated about forty miles west of the Mississippi, and sixty miles south-west of St. Louis. They occupy a district of country between the waters of the St. Francis and the Maramec, one hundred miles in length, by about forty in breadth. The first lead-ore was discovered by Philip Francis Renault and M. La Motte, acting under the authority of the Company of the West, about the year 1720; since which period, the number of mines has been greatly augmented by new discoveries. The quantity of lead annually smelted from the crude ore, I have estimated at three millions of pounds; and the number of hands to whom it furnishes employment, at eleven hundred.

Iron-ore is found in very large bodies in Bellevieu, Washington county—on Fourche à Courtois, where it is accompanied by manganese—on Big river—on Platten and Joachim creeks—and on the waters of the St.

Francis and Black rivers. Stone-coal exists in large bodies at Florissant, and in various places on the Osage river.

On the banks of the Maramec and the Gasconade are found numerous caves, which yield an earth impregnated largely with nitre, procured from it by lixiviation. On the head of Currents river are also found several caves, from which nitre is procured; the principal of which is Ashley's cave, on Cave creek, about eighty miles south-west of Potosi. This is one of those stupendous and extensive caverns which cannot be viewed without exciting our wonder and astonishment, which is increased by beholding the entire works for the manufacture of nitre, situated in its interior. The native nitrate of potash is found in beautiful white crystals, investing the fissures of the limestone rock, which forms the walls of this cave; and several others in its vicinity exhibit the same phenomenon.

Of the number of inhabitants now resident in the Territory, I have estimated eleven hundred to be engaged in mining; but the number was much greater at a former period, one thousand men having been employed at Mine à Burton alone. The residue of the population are farmers, mechanics, and manufacturers, including professional men. There is also another class of society, which I shall notice under the name of hunters. The farming class is by far the largest, as the fertility of the soil, and the advantage of procuring lands on easy terms, and in a mild climate, afford the strongest and surest prospects of gain to the emigrant. There are probably fewer mechanics than are required by the existing population. The wages of mechanics of all kinds are very high. A carpenter or bricklayer cannot be hired for less than two dollars per day, and often receives more. Other mechanics are also in demand, particularly in the new settlements; and these are increasing with such rapidity, as to invite the emigration of skilful and industrious artisans from all parts, with the sure prospect of success.

The manufactures of the Territory, in addition to its grand staple, lead, consist in the distillation of whiskey from rye and corn, in the flouring of wheat, the fabrication of coarse cotton goods, and tow cloth in private families, and of patent shot. Some white lead has been made at St. Louis. A clothier's and fuller's works have been recently established on Big river; and a number of tan-yards, where raw hides are manufactured into leather, are in successful operation in various sections of the country.

Made up of emigrants from all other parts of the United States, and from Europe, the inhabitants can hardly be said to have acquired an uniform character. Hospitality to strangers, enterprise in business, ardor in the pursuit of wealth, an elevated pride of country, and perseverance under the pressure of many difficulties growing out of the infancy of the settlements, are the most conspicuous traits in the character of the inhabitants west of the Mississippi. They are robust, frank, and daring.

Taught, by the hardships and dangers incident to a frontier settlement, to depend for security and success upon their own individual exertions, they rely little upon extraneous help, and feel that true independence, flowing from a conviction that their own physical exertions are equal to every call, necessity, and emergency of life. Observations drawn from habitual intercourse, and from witnessing their public debates, would also lead us to conclude, that their enjoyments arise more from those active scenes attendant upon adventures which require corporeal exertion, than from the arts of peace, refinement, and intellectual research.

Duelling is unfortunately prevalent in Missouri; and the practice, while it continues to receive the sanction of men occupying the first rank in society, cannot be expected to fall into disrepute, but must, on the contrary, continue to exert its influence over other classes of the community, and to involve, in some measure, in its consequences, those who from principle are opposed to it.

Those scenes of riot and atrocity, however, which have been imputed to the inhabitants of the mines by former travellers, do not now exist; the most beneficial changes having been effected in the state of society in that country. Emigration has added to the former population an accession of talents and intelligence, which has served to mark the society at the mines with much of the hospitality, decorum, and refinements of older settlements.

The first inhabitants of this part of ancient Louisiana were French and Spanish; the former of whom still constitute a considerable proportion of the population, but of the latter there are very few remaining. The French language is therefore spoken, in many settlements, almost exclusively; and many of the Americans have found it advantageous to acquire a knowledge of that tongue.

The hunter class of the population is composed of persons from various sections of the Union, who have either embraced hunting from the love of ease or singularity, or have fled from society to escape the severity of the laws, and to indulge in unrestrained passion. Learning and religion are alike disregarded, and in the existing state of society among the Missouri hunters, we are presented with a contradiction of the theories of philosophers of all ages; for we here behold the descendants of enlightened Europeans in a savage state, or at least in a rapid state of advance towards it. These hunters are chiefly located on the White, Arkansas, and Red rivers. Their numbers may be computed at a thousand or fifteen hundred. The late division of the Territory will throw nearly all of them into Arkansas.

The principal tribe of Indians in this Territory are the Osages, a powerful nation residing on the Osage river. They are remarkable for their tall stature, and their fine proportions. It is very rare to see any of them under six feet. They inhabit a delightful country, and are in amity with the United States. Their chiefs are hereditary, and in war they fight on

horseback. Their warriors are called *braves*, to which honor no one can arrive without having previously plundered or stolen from the enemy. Hence, plundering and stealing are acts of the greatest merit, and demand rewards proportionate to the adroitness or extent of the act. They are also in the habit of plundering white hunters and travellers, but are never known to commit murders on such occasions.

A part of the ancient and once powerful tribes of Shawnees and Delawares, also inhabit this Territory. They are located on the banks of Apple creek and Fourche à Courtois.

Many of the plantations and mines are worked by slaves, and among them are to be found blacksmiths and carpenters, whose services are extremely valuable to their masters. The introduction of slavery into this section of the western country, appears to have taken place at an early day, and it has led to a state of society which is calculated to require their continued assistance.

HOT SPRINGS OF WASHITA.

THE attention of the traveller in the interior of Missouri and Arkansas, is frequently arrested by the novelty of the scenery, and the wild and singularly fanciful aspect of the country; he is often induced to stop, to survey some cavern, water-fall, high, loose-hanging cliff, or other natural phenomenon. It is in this light that those natural curiosities, the Hot Springs of Washita, will be found to reward attention.

These springs, which have been known for many years, are situated on a stream called Hot Spring creek, which falls into the Washita river eight miles below. They lie fifty miles south of the Arkansas river, and six miles west of the road from Cadron to Mount Prairie, on Red river.

The approach to the Springs lies up the valley of the creek, which is partly made up of its waters. On leaving the banks of the Washita, the face of the country almost imperceptibly changes from a rich soil, covered with a luxuriant growth of trees, to a sterile mineral tract. On the right hand rises the Hot Mountain, with the springs issuing at its foot; on the left, the Cold Mountain, which is little more than a confused and mighty pile of stones; and the view in front is terminated by a high point of land, which makes down gradually into the valley, and separates the creek into two forks, of nearly equal size.

The Hot Mountain is about three hundred feet high, rising quite steep, presenting occasionally ledges of rocks, and terminating at top in a confused mass of broken rocks, with here and there a pine or oak tree. Its sides, notwithstanding their sterility and the steepness of the ascent, are covered by a most luxuriant growth of vines, particularly muscadine, the fruit of which is delicious.

The Cold Mountain is separated from the Hot by a valley of about fifty yards wide, through which the creek flows; it is nearly as steep as the other, about of an equal height, and terminates in the same confused manner. Some pine trees are found on it, but its sides are destitute of vegetation.

The springs issue near the foot of the Hot Mountain, at an elevation of about ten feet above the level of the creek. They are very numerous all along the hill-side, and the water, which runs in copious streams, is quite hot. It will scald the hand, and boil an egg hard in ten minutes. Its temperature is considered that of boiling water; but Dr. Andrews, of Red river, tells me that it cannot be reckoned over 200° of Fahrenheit.

There is a solitary spring, situated seventy feet higher than the others, on the side of the mountain; but it is also of an equal temperature, and differs in no respect from those below. Evaporation produces a dense fog, which hangs over the springs, and upon the side of the hill, looking at a distance like a number of furnaces in blast. It is probably the condensation of this fog by the cold air at night, which produces such a rank growth of vines on the side of the mountain, where, otherwise, there would hardly exist a sign of vegetable life.

An idea of the beneficial effects of this water is generally prevalent throughout the Territory, and numbers annually resort to the springs. They are found serviceable in rheumatisms, paralysis, pains in the breast, and all chronic and nervous complaints. The method of using the water is various. Bathing and sweating are generally resorted to. It is also drunk as hot as can be borne, and is not, like ordinary warm water, productive of nausea in the stomach. Of the chemical or medicinal properties of the water, little is known, as no accurate analysis has been made. The water appears clear, pure, and beautiful; it deposits a sediment, which is sometimes red, and in other places green or yellow. Some of the springs have a petrifying quality. The warmth of the water, acting along the courses of the streams, has a stimulating effect on the vegetation.

There is abundance of a beautiful green moss growing in the springs, near their edges; and their devious courses to the creek below are only indicated by a more vigorous growth of grass and moss all along the borders, and a brighter green.

The mineralogical character of the country around the springs is highly interesting. Three miles above is a quarry of oil-stone, of a peculiar and valuable kind. It has a very compact texture, is heavy, translucent, and gives a fine edge to a razor. The rock formations here are limestone, slate, and quartz. Veins of white quartz, four or five feet in width, are found running through the slate rock. Fine crystals of limpid quartz are also abundant in the neighborhood. At the cove on Washita river, fifteen miles below the springs, there is a body of magnetic iron-ore; sulphates of copper and zinc, and sulphuret of iron, in cubical crystals, occur in the same locality.

These springs, geologically, exist in a primitive formation, which may be considered the southern termination of the Ozark chain. Ancient volcanic forces have raised the beds of slate, sienite, and greenstone, of the chain, to their present elevations. The waters owe their heat to these long-extinguished, but deep-slumbering fires, which may hereafter break out into new activity.

UNICA, OR WHITE RIVER.

IN order duly to estimate the magnitude, position, character, and importance of any of our great western rivers, it is necessary to consider the relation they bear to each other, and to the surrounding country. A mere topographical description of an isolated section of country—a mountain, a stream, or a mine—may possess its value; but without a survey, however cursory, of the contiguous regions, it must lose much of its interest to the general reader, and much of its utility to the geographical student. It will be necessary, therefore, to cast a glance at the extensive country in which this river lies, before its individual consideration can be profitably commenced.

In looking on the map of ancient Louisiana, the most striking physical trait presented is the Rocky mountains, extending from Mexico into the unexplored regions north and west of lake Superior, with the del Norte, Red river, Arkansas, Kansas, La Platte, and Yellowstone, all issuing from its sides near the same point, and uniting (with the exception of the former) at different points in the vast basin below, with the Missouri, the Ohio, and the Mississippi, in whose congregated floods they roll on to the Mexican gulf. Other streams traverse the country; but these are the principal rivers of Louisiana, whose heads rest on the Rocky mountains. Immediately at the foot of these mountains commence the almost interminable plains of sand, or Kanbian desert, stretching from north to south for more than a thousand miles, and with an average breadth of six hundred. To this succeed the highlands and mountains of the present Territories of Missouri and Arkansas, which preserve a pretty exact parallelism, from north to south, with the Rocky mountain chain, and give rise to several rivers of secondary magnitude. This again is bounded by the alluvial tract of the Mississippi, being the third grand parallel division presented by the surface of the soil. Through these, the Red river and the Arkansas hold their unaltered course, and reach the Mississippi without a fall; while the Kansas, the La Platte, and the Yellowstone, bending northward, reach the Missouri, without meeting any mountains to oppose their progress. The rivers of secondary magnitude, whose origin is east of the highlands bordering the western desert, are the Teche, Vermillion, Tensaw, Washita, Little Missouri, Courtableau, Boeuf, Little Red, Grand, White, Black, Osage, Maramec, Gasconade, and St. Francis rivers. Of these, White river, a stream hitherto almost wholly unknown, or only

known to hunters, and which has not received its deserved rank on any existing map, is one of the most considerable. It was therefore with surprise that I found, on travelling into those remote regions, so considerable a stream unnoticed by geographers, or only noticed to attest their want of information respecting its size, length, tributaries, character, productions, and importance. I therefore concluded that a summary of these particulars, as observed by myself during a tour into that quarter, would be an acceptable piece of service, and, with this view, began these observations.

White river originates near the ninety-seventh degree of west longitude, and about the thirty-sixth of north latitude, and, after running in a very serpentine course for thirteen hundred miles, enters the Mississippi fifty miles above the mouth of the Arkansas, and seven hundred above New Orleans. Its waters, unlike most of the western rivers, are beautifully clear and transparent, being wholly made up of springs that gush from the diluvial hills which are found, for more than half its length, within a few miles of, and often immediately upon, its banks. So much of the country through which it runs, is, therefore, sterile and rough; but the immediate margin of the river uniformly presents a strip of the richest alluvial bottom-land, from a quarter of a mile to a mile and a half in width. On this, corn, wheat, rye, oats, flax, hemp, and potatoes, have a vigorous growth; the mildness of the climate, and the fertility of the soil, combining to render it one of the most favorable of all countries for the pursuits of agriculture. Cotton also succeeds on the banks of this river as high up as settlements have extended, and will hereafter be an important item among its agricultural productions. The district of tillable land on this river, like many others west of the Mississippi, is chiefly confined to its banks. Bordering this, is found a chain of hills on either side, which sometimes close in upon the river's banks in perpendicular cliffs; and the adjacent country may in general be considered as sterile. To this remark, all its tributaries are exceptions; for they invariably afford, however small, tracts of the most fertile land, covered with a heavy growth of forest trees and underbrush. The cane is also common to this stream in its whole course, and affords a nutritious food for cows, horses, and hogs, who are fond of it, and fatten upon it. This plant being an evergreen, cattle and horses may feed upon it all winter; and it is accordingly given to them, as a substitute for hay, by the Indians and hunters.

The only inhabitants on the upper part of White river, so far as inhabitants have penetrated, are hunters, who live in camps and log cabins, and support themselves by hunting the bear, deer, buffalo, elk, beaver, raccoon, and other animals, which are found in great plenty in that region. They also raise corn for bread, and for feeding their horses. They seldom, however, cultivate more than an acre or two, subsisting chiefly on animal food and wild honey, and pay no attention to the cultivation of garden vegetables, if I except some cabbages, noticed at a few

habitations. When the season of hunting arrives, the ordinary labors of a man about the house and cornfield devolve upon the women, whose condition in such a state of society may readily be imagined. The inhabitants, in fact, pursue a similar course of life with the savages, having embraced their love of ease, and their contempt for agricultural pursuits, with their sagacity in the chase, their mode of dressing in skins, their manners, and their hospitality to strangers.

The furs and peltries which are collected during repeated excursions in the woods, are taken down the river at certain seasons in canoes, and disposed of to traders, who visit the lower parts of this river for that purpose. Here they receive, in exchange for their furs, woollen cloths, rifles, knives, hatchets, salt, powder, lead, iron for horse-shoes, blankets, iron pots, shoes, and other articles of primary importance in their way of life. Those living near the cultivated parts of Lawrence county, in Arkansas Territory, also bring down, in exchange for such articles, buffalo beef, pork, bears' meat, beeswax, and honey, which are again sold by the traders along the banks of the Mississippi, or at New Orleans. Very little money is paid, and that in hard cash only; no bank-bills of any kind being taken in that quarter. I happened to be present, on my return from the head-waters of White river, at one of these exchanges, where a further opportunity was offered of observing the manners and character of these people. Bears' meat was sold at \$10 per cwt.; buffalo beef at \$4; cows' beef at \$3; pork, in the hog, at \$3 50; venison hams at 25 cents each; wild turkeys, the same; wild honey at \$1 per gallon; beaver fur, \$2 per lb.; bearskins, \$1 50 each; otter skins, \$2; raccoon skins, 25 cents; deerskins, 25 cents per lb. These prices were considered high by the purchaser; but they were only nominally so, as he paid them off in articles at the most exorbitant rates. Common three-point or Mackinaw blankets were sold at \$8 each; butcher-knives at \$2; rifle-locks at \$8; common coarse blue cloth at \$6 per yard; coffee at 75 cents per lb.; salt at \$5 per bushel; lead at 25 cents per lb.; gunpowder at \$2 per lb.; axes at \$6 each; horseshoe-nails at \$3 per set, &c. The trade of this river is consequently attended with profits which amply repay the risks and fatigues incident to a voyage in that quarter. Vast quantities of furs and skins are annually brought down this river, with some beeswax, honey, beef, bacon, &c.; and whenever the hunter population yields to the farming and mechanical class, the list of its productions will be swelled by corn, rye, wheat, oats, flax, hemp, and cotton; a sufficiency of each of which has already been raised, to show that the climate and soil are well adapted to their culture. Its mineral products are also worthy of attention. Iron-ore, lead, zinc, and manganese, have already been discovered; and among its earthy minerals may be enumerated marble, agate, jasper, hornstone, and rock crystal; specimens of which, with some others, I picked up during my journey there. Caves with nitre are also common; and large forests of pine timber, which will be

wanted in the progressing settlements on the Mississippi, are situated on its northern tributaries, and may be floated down at an inconsiderable expense.

White river runs through a section of country which, according to a recent political division, belongs chiefly to the Territory of Arkansas; but several of its tributaries originate in Missouri, the chief of which are James river, Great North Fork, or Pine river, and Black river, with its auxiliaries — Currents, Fourche à Thomas, Spring, Eleven-points, and Strawberry rivers.

About a hundred and fifty miles below the Pawnee mountains, the main south fork of White river is joined by the War Eagle and Osage forks; a region remarkable for the abundance of beaver found in its streams. In the course of the succeeding two hundred miles, it is joined by King's river and Tower creek on the south, and by Roaring fork and James river on the north; the latter being by far the largest stream it has thus far received, and contributing nearly as much water as all the others put together. From the mouth of James river to its junction with the Mississippi, it is successively joined by Long, Bull, Swan, Beaver, and Big creeks, by the Little and Great North Forks, Black and Cash rivers, on the north; and on the south by Bear and Crooked creeks, Buffalo Fork, and Little Red river; and it is finally connected with the Arkansas river by a natural canal called the *cut-off*, about thirty miles above its junction with the Mississippi, which affords a navigable water communication at all seasons. Many of the above tributaries are streams of no ordinary magnitude, and afford boat navigation for many hundred miles; they are all characterized by tracts of rich alluvial lands on their banks. James river, Buffalo Fork, Great North Fork, Black river, and Little Red river, merit individual attention.

James river originates in the Ozarks, a few miles south of the Gasconade, in Missouri Territory, and, after running in a south-west direction for two hundred miles, in the course of which it is swelled by Findley's river, and by other streams, forms a junction with White river a thousand miles above the mouth of the latter. Its waters are as pure as crystal; it lies under a climate the most mild, salubrious, and delightful; and on its banks are situated a body of the most fertile and beautiful lands which the whole valley of the Mississippi affords. The timber on its banks is abundant; a remark which cannot with justice be made of many parts of the adjacent country, and nothing can exceed the vigor and the verdure of vegetable nature on the borders of this beautiful stream. Prairies are also found within a mile of its western banks, and extend towards the Grand Osage, as far as the eye can reach, level as a graduated plain, and waving with tall grass, on which the elk, the buffalo, and the deer, feed in countless numbers.

Findley river forms a junction with this stream, near the centre of this choice body of land, and about one hundred miles above its mouth.

Twenty miles above the junction of these streams, on the immediate banks of James river, are situated some valuable lead-mines, which have been known to the Osage Indians, and to a few White river hunters, for many years. The Indians have been in the habit of procuring lead for bullets at that place, by smelting the ore in a kind of furnace, made by digging a pit in the ground, and casing it with some flat stones, placed so as to resemble the roof of a house inverted; such is the richness of the ore, and the ease with which it smelts. The ore has not, however, been properly explored, and it is impossible to say how extensive the beds or veins may prove. Some zinc, in the state of a sulphuret, is found accompanying it. There is not one inhabitant on all this stream; my own cabin, erected for a temporary purpose at the mines in January last, being the only human habitation within two hundred miles of that place.

Buffalo Fork originates near the north banks of the Arkansas, and, after traversing a rocky country for about one hundred and eighty miles in a north-east course, joins White river at the Buffalo Shoals, about seven hundred miles above the Mississippi. It is a fine region for game, and affords some good lands.

The Great North Fork, or Pine river, is a stream of two hundred miles in length, and a hundred yards wide at its mouth. Its waters are clear, being entirely made up of springs, which are numerous all along its banks; but the navigation is interrupted by rapids. It originates with James river and the Gasconade, in a ridge of high land, which throws a part of its waters into the Missouri, and a part into the Mississippi, the streams running in opposite directions. In travelling into that country, I accidentally arrived at the extreme head of this river, where it consists only of some drizzling springs, and pursued it down, in all its windings, to its junction with White river, about twelve miles below the mouth of Buffalo Fork. It is bordered on both sides by limestone bluffs, covered generally with tall pines, and affording some detached strips of valuable land. On the whole, however, it must be considered a sterile region, which will never admit of a dense population. The bottoms are overrun by cane and brier, which render travelling extremely fatiguing.

This stream appears generally to have been considered by geographers as the head of White river, which is accordingly, on most maps, made to originate at this place. The error has been, in some degree, corrected in Robinson's new map of Louisiana, lately published at Natchez, which may be esteemed the best map extant respecting that section of country. He calls it Pine river.

Black river is a large, deep, and gentle stream, composed of numerous auxiliaries, which draw their waters from the counties of Wayne, New Madrid, and Lawrence; the two former lying in Missouri Territory, and the latter in Arkansas. It is navigable with boats of the largest burden, at all seasons of the year, for more than one hundred miles. Little Black, Currents, Fourche à Thomas, Eleven-points, Spring, and Straw-

berry rivers, are all streams of considerable size, coming in on the west, and deserve particular notice on the future maps of that country. Their banks afford choice bodies of fertile lands, which are already the seat of many plantations and farms, where corn, rye, wheat, oats, flax, hemp, and cotton, are raised in the greatest perfection, and the settlements are rapidly increasing. Considerable quantities of beef and pork are also put up for the New Orleans market, every facility being afforded by the luxuriance of grass in the woods, and the abundance of acorns in the fall, for raising and fattening hogs and cattle. Lawrence county is generally considered among the first farming districts west of the Mississippi. Davidsonville, the seat of justice for this county, is situated on the west bank of Black river, at the junction of Spring river. The settlements on Strawberry river, on the Currents, Fourche à Thomas, Poke Bayou, and other places, are in a flourishing condition.

Little Red river issues near the sources of Buffalo Fork, and runs parallel with the Arkansas for a great distance, but inclines gradually to the north-east, and joins White river about two hundred miles above its mouth. It affords a considerable body of choice land, but is subject to very sudden rises, which overflow its banks, and have retarded, to some extent, the further settlement of its valley.

Such are the principal tributaries of White river; a stream which is navigable, with keel-boats of thirty tons burden, to the foot of Buffalo Shoals, a distance of seven hundred miles from its mouth, and may be ascended with light vessels five hundred miles higher. It draws its waters from a district of country about three hundred miles in width, by seven or eight hundred in length, having on its borders and tributaries large bodies of very rich lands, mixed with much that is poor and unfit for cultivation; but, taking into view its advantageous situation for commerce, its political relation to the two Territories, in a part of each of which it lies, and the extensive bodies of farming-lands on James river, Buffalo Fork, and Black river, we may anticipate the period when a large population shall find their support on its banks — when numerous villages and towns shall decorate its shores, and the productive labor of its inhabitants swell greatly the commerce of the western country, while they themselves command an important influence in its political transactions.

One of the most interesting events connected with the history of this river, is the visit paid to it by De Soto in 1542. The place of his crossing it is not certainly known.

STEAM NAVIGATION ON THE MISSISSIPPI.

STEAMBOATS were first introduced on the Mississippi about 1812; and, within seven years of that time, not less than fifty boats, of all classes, had been built. The following list, which I made in 1819, embraces all the steam-vessels which are known to have been put upon that stream and its tributaries, prior to that era, and is believed to give with accuracy their names and tonnage.

Fulton's first successful experiment in the application of Savary's steam-engine, as improved by Watt and Bolton, to the propulsion of vessels, dates in 1807; so that but five years elapsed before the invention was introduced, and twelve years before it was spread, on the western waters. The impracticability of navigating those waters by the force of sails, caused the invention to be hailed there with acclamation; and this explains the cause of its rapid multiplication.

No.	Names.	Tons.	No.	Names.	Tons.
1.	Etna	200	27.	St. Louis Packet	150
2.	Vesuvius	280	28.	Ramapo	100
3.	Orleans	200	29.	Rising States	150
4.	Alabama	300	30.	Maid of Orleans	100
5.	Columbus	400	31.	Hamlet	100
6.	Tamerlane	200	32.	Perseverance	50
7.	James Ross	250	33.	Johnson	75
8.	United States	500	34.	Eagle	100
9.	Paragon	250	35.	Vesta	110
10.	Thomas Jefferson	200	36.	Harriet	40
11.	Ohio	300	37.	Constitution	45
12.	General Jackson	100	38.	Louisiana	60
13.	Maysville	152	39.	Governor Shelby	60
14.	Exchange	154	40.	Franklin	80
15.	Volcano	140	41.	Rifleman	60
16.	Madison	100	42.	Newport	45
17.	Kentucky	60	43.	Expedition	150
18.	Hecla	100	44.	General Clark	150
19.	Napoleon	200	45.	Henderson	150
20.	Washington	150	46.	Tornado	250
21.	Buffalo	100	47.	Elizabeth	175
22.	James Monroe	70	48.	Missouri Packet	100
23.	Cincinnati	85	49.	Post-Boy (for pas'gers only) ...	
24.	St. Louis	200	50.	Western Engineer	40
25.	General Pike	75			
26.	Independence	100			
				Total	7306

In addition to these, there are two new boats building at Pittsburgh, one at Wheeling, one at Steubenville, one at Marietta, two at Cincinnati, one at Frankfort, two at Shippingport, one at Madison, and two at New Albany, making a total number of sixty-three. There are also several more in contemplation, so that it is probable another year will considerably augment the number. The first steamboat on the western waters was built at Pittsburgh in 1811, eight years ago. Hence it appears there has been an average increase of eight boats per annum; but by far the greatest proportion have been built within the last three years.

7306 tons, at 4 cents per lb. freight up from New Orleans,	
amounts to	\$584,480 00
7306 tons, at 1 cent per lb. freight down to New Orleans ...	146,120 00
10 passengers down in each boat, at \$60.....	39,800 00
5 “ up in each boat, at \$100	31,500 00
	<hr/>
	\$801,900 00

It is presumable that each boat will perform three trips to and from New Orleans per annum, which will make an aggregate amount of freight and passage money of \$2,405,700 per annum. From this, some idea of the trade, population, and business of the vast valley of the Mississippi, may be formed. And let it be remembered, at the same time, that the transportation of merchandise is not wholly done by steamboats. The Ohio and Mississippi are still lined with keel-boats and barges; and much of the produce is still carried to market in flat-bottomed boats, of a temporary construction, which are not calculated to ascend the stream, and are therefore generally sold for a trifle, or abandoned.

The following is extracted from a comparative statement of the increase of the principal articles of produce which arrived at the New Orleans market during a period of three years.

Productions.	1815.	1816.	1817.
Bacon and hams, cwt.	7,000	13,000	18,000
Butter, lbs.	<hr/>	500	1,800
Cotton, bales	60,000	65,000	65,000
Corn, bushels	120,000	130,000	140,000
Flour, barrels	75,000	98,000	190,000
Molasses, gallons	500,000	800,000	1,000,000
Pork, barrels.....	8,000	9,700	22,000
Sugar, hhds.	5,000	7,300	28,000
Taffia, gallons	150,000	300,000	400,000
Tobacco, hhds.	5,000	7,300	28,000
Wheat, bushels.....	<hr/>	<hr/>	95,000
Whiskey, gallons.....	150,000	230,000	250,000

ANTIQUITIES AND INDIAN HISTORY.

SOME ARTICLES OF CURIOUS WORKMANSHIP FOUND IN AN ANCIENT BARROW.

AN opinion is entertained by many well-informed persons in the United States, that the country has, at some remote period, been inhabited by a civilized people, prior to its settlement or subjugation by the savages. To the many evidences furnished to strengthen this opinion, by the remnants of fortifications, tumuli, &c., may be added the discovery of several articles of antiquarian value, and of singular workmanship, of glass, or antique enamel, lately made on the eastern shores of lake Erie.

I have had an opportunity of examining a specimen of these antique glasses, and, on the authority of my informant, am enabled to remark that they were taken up about two months ago, from an ancient barrow in the town of Hamburg, where they were found deposited in an earthen pot. Contiguous to this pot were also found a skull, and some other human remains, thought to be of an unusual size. This mound, or supposed repository of the dead, is situated in an uncultivated part of the town, and several trees were growing upon it at the time the excavation was made; some of which were judged to be upwards of two feet in diameter.

The glass relic which I had an opportunity to examine, (and I am told they are all alike,) is in the form of a large barrel-shaped bead, consisting of a tube of transparent green glass, covered with an opaque coarse red enamel. Its length is nine-tenths of an inch, its greatest width six and a half tenths of an inch, and the bore of the tube two-tenths of an inch. Near the circle of the bore of this tube, is an aperture of the size of a large needle, perforating the tube from one end to the other. The enamel which covers the tube of transparent glass appears to have been ornamented with painting, in figures resembling a spindle, or two inverted sections of a circle; but they are now hardly perceptible, as the bead appears to have been considerably worn.

But the circumstance most indicative of art in the making of this bead, is a species of enamelling which has been performed both on the external and internal surfaces of the tube, previous to its being covered by the coarse red enamel. This second enamel is white, and, as the external surface of the tube was not smooth, but in parallel *strie* or veins, exhibits the appearance of a white vine between the green tube and the red enamel. This enamelling appears to have been done, not by melting on any vitreous composition, as is practised at the present day, but by the effect of calcination for some time in a low red heat. This, it is known, will deprive glass, especially green glass, of its transparency, and render the surface white to a certain depth.

The composition of the tube of glass, I have judged to be simply a silicious sand and an alkali, probably with a small addition of lime or vegetable ashes. It is hard, and will not receive scratches like the lead glasses; and I conclude from this circumstance that there is no lead in the composition. Its color seems also owing to the impurity of the materials employed, like the common window and bottle glass, and is probably caused by a minute portion of iron, in the state of an oxide, combined with the sand and alkali.

The red enamel covering the tube, and the pot in which these glasses were found, seem to have been constructed of similar materials, as they differ very little in color, texture, or other external character. Probably a very fusible brick-clay, highly impregnated with the oxide of iron, and pulverized fragments of green glass, are the principal ingredients of both. The earthen pot is manifestly constructed of different materials from those employed for brown pottery at the present period. It is a more imperishable substance, of a close texture, and vitreous appearance.

I shall not presume to speculate in opinions which discoveries of this interesting nature are calculated to create; it may, however, here be added, that the fabrication of these glasses would suppose a perfection in the arts, which none of the Indian tribes inhabiting this country at the period of its discovery, had arrived at. That if introduced by the French from Canada, in their earliest communications with the Indians inhabiting the western parts of the State of New York, a sufficient time would hardly have elapsed for the growth of trees of such size as were found upon the mound from which these relics were taken. And that, if not introduced by the French at the period alluded to, we must refer their manufacture back to a very remote date, and one on which Indian tradition is wholly silent.

Since visiting the western country, I have had occasion to notice a similar discovery on Big river, in the Territory of Missouri. On opening an Indian grave (or what was considered such) on the bank of this river, several beads of glass, of a similar character, were found. They were accompanied by many bones of the human frame, of extraordinary size, and which indicated, to common observation, a stature of seven or eight

feet in height. The person appeared to have been deformed, either by birth or accident, as the right jaw-bone ran in a straight line from the mouth back, while the left preserved the usual curve. The excavation was made near the edge of the stream, where the soil is a rich alluvion, and covered by a heavy growth of forest trees, such as are peculiar to the richest Ohio and Mississippi bottom-lands. We may add, that it corresponds best with history and probability to attribute these relics to the early period of the fur-trade.

ANCIENT INDIAN CEMETERY IN THE VALLEY OF THE MARAMEC RIVER.

IN the autumn of 1818, the existence of a number of small tumuli, or antique Indian graves, was made known in the valley of the Maramec. This discovery was made about fifteen miles south of St. Louis. Curiosity led several persons to visit the spot and examine them, and my attention was thus called to the subject. It was conjectured that the bones found in these graves were the remains of a race of beings much smaller than those of the present day.

The essential facts connected with these discoveries, are these:—The tumuli, which are small, occupy a wood near the dwelling of a Mr. Long. The attention of this gentleman was arrested by this smallness of cemeterial dimensions, or place of burial. Drs. Walker and Grayson, of St. Louis, proceeded to the spot, opened several of the graves, and examined their contents. The length of the stature of the interred persons, measured by their stony casings, varied from twenty-three inches, to four feet two or three inches. But the skeletons, with the exception of the teeth, were reduced to a complete limy substance, and their forms destroyed. The graves had originally been cased with rude flat stones at the sides, and also at the head and feet. A flat stone had also, in some instances, been laid over the top, and earth piled on the grave, above the surface of the ground, to the general height of three feet. This was a characteristic feature, and seemed designed to mark the locality. In this stony coffin, all the softer and destructible parts of the body had submitted to decay, with the exception before mentioned—the teeth. The examination of these became, therefore, the principal source of interest. They found the enamel perfect, and were surprised to discover that they were the teeth of rather young persons, who had, however, passed the age of puberty. The molars and incisors were of the ordinary dimensions and character of second teeth. The jaw-bone of the first specimen examined, appeared to have its full complement, except the *dentis sapientia*, which

physiologists do not generally recognize until after the ages of eighteen to twenty-three.

Many graves were examined, which differed more or less in length, between the extremes stated, but agreed in their general conformity of parts; from all which, these gentlemen came to the conclusion that the remains denoted a stature of inferior size, while appearances indicated a remote antiquity as the epoch of burial, which might as well be supposed to be five centuries as one. This antiquity was inferred, as well from the reduction of the bones to their elements, as from the growth of large trees upon the graves, the roots of which penetrated into their recesses.

Upon this exhibition of facts, a legal gentleman* of intelligence calls attention, with great pertinency, to the ancient manners and customs of the Indians, in the burial of their dead.

"As yet, I have seen no attempt to account for the size and appearance of these skeletons, upon any other supposition than that they are the remains of a people far less in size than any known at the present day. Unwilling to adopt a belief so contrary to the general order of nature, and to the history of the human species, so far as it has been transmitted to us, I shall hazard some conjectures upon the subject, which I think will, in some measure, tend to dissolve the mystery that hovers over these bones, and to reconcile their appearance with the general history of our race. To be sure, Nature, in her sport, has now and then produced monsters. A taste for the marvellous among travellers and historians, has occasionally conjured up a race of giants, or a nation of pigmies; but when the light of truth has reached us from the distant corners of the earth, where they were said to dwell, we have found them to assume the size, shape, and attitude of men, and nothing more. So far as observation or history extends, we find the species nearly the same in all ages and in all countries. Climate has had some effect upon the size, and upon the complexion. The excessive cold of the north has shortened an inch or two the necks of the Esquimaux, and the heat of the south has colored the African. But what, in this genial climate, should make dwarfs? It is here, if anywhere, that we should naturally expect to find giants! All the other productions of nature are here brought forth in the highest perfection. And shall *man* here grow a pigmy? Unless we are ready to adopt the opinion of certain naturalists, that the human species are the legitimate descendants of the apes, and that they once wore tails, and were of their diminutive size—unless we are ready to believe the history of the Lilliputians, and of Tom Thumb—I think we shall discard the idea of a nation of dwarfs, as wholly preposterous. But how, on any other supposition, shall we account for the appearances upon the farm of Mr. Long?

"None of the graves found there exceed four feet in length, many of

* Rufus Pettibone, Esq., of St. Louis.

them fall short of three, and the teeth found in all of them show that they contain the remains of human beings who had arrived at years of maturity. The manners and customs of the Indians with respect to the treatment of their dead, will, I think, solve all difficulties, and satisfactorily account for these appearances, without doing violence to nature. According to the testimony of travellers and historians, it has been the custom among many tribes of Indians to hang their dead in baskets upon trees and scaffolds, until their flesh was consumed, and then to take them down, clean their bones, and bury them. There existed an order of men among them called *bone-pickers*, with long nails like claws, whose business and profession it was to clean the unconsumed flesh from the bones, previous to burial. This custom still exists among the Indians on the waters of the Missouri, and rationally accounts for the appearances upon the farm of Mr. Long. The bones of a skeleton of the ordinary size, when separated, would naturally occupy a grave of three or four feet in length. It appears that in all the graves which were opened, the bones, except the teeth, were reduced to a chalky substance, so that it would be impossible to know, with any certainty, in what state, condition, or form, they were deposited there. These skeletons are said to rest on their sides. Taking this fact to be true, it goes to strengthen my ideas on this subject. In burying a corpse, it is natural, and, so far as we are acquainted, universally the custom, to bury them with the face upwards. We can look upon our dead friends with a melancholy complacency—we cast a long and lingering look after them until they are completely shut from our view in the grave; and nothing is more hard and heart-rending than to tear our last looks from them. It is natural, then, that the body should be placed in such a position as most to favor this almost universal desire of the human heart. But, in burying a skeleton, it would be as natural to avert the horrid grin of a death's-head from us. To face the grinning skeleton of a friend, must fill us with horror and disgust. 'Turn away the horrid sight,' would be the language of nature. If we adopt my supposition as correct in this case, all the facts correspond with nature. But if we adopt the opinion of a recent writer, our conclusions will be at war with nature, reason, and universal observation."

The following observations by the Rev. J. M. Peck, of St. Louis, may also here be added:

"One grave was opened which measured four feet in length; this was formed by laying a flat stone at the bottom, placing one on each side, one at each end, and covering the mouth with another. In the last circumstance, this grave differed from the others that were opened; the contents were a full-grown skeleton, with the head and teeth, part of the spine, the thigh and leg bones, in a tolerable state of preservation. The leg-bones were found parallel with the bones of the thighs, and every appearance indicated, either that the corpse had been entombed with the legs and thighs placed so as to meet, or that a skeleton had been depo-

sited in this order. The first opinion seems the most probable, from the fact that a large stone pipe was found in the tomb, which I understand is now in the possession of Mr. Long."

Both implements of war, and of domestic use, are buried with the dead bodies of the Indians; but it admits of a query if they are ever deposited with the mere skeleton.

"It is a well-known fact," says Bishop Madison, while writing on the supposed fortifications of the western country,* "that, among many of the Indian tribes, the bones of the deceased are annually collected and deposited in one place, that the funeral rites are then solemnized with the warmest expressions of love and friendship, and that this untutored race, urged by the feelings of nature, consign to the bosom of the earth, along with the remains of their deceased relatives, food, weapons of war, and often those articles they possessed, and most highly valued, when alive."

This fact is substantiated from various respectable sources. The pious custom of collecting the relics of the dead, which accident, or the events of a battle, might have dispersed through the wilderness, easily accounts for the graves on the Maramec, as well as explains the origin of the artificial mounds in the vicinity. If these were opened, there would be found promiscuously deposited the bones of the aborigines, which pious veneration, from year to year and from century to century, industriously collected. The cemetery alluded to, on the plantation of Mr. Long, may be viewed as the public burial-place of some powerful nation of the same size, and similar customs, with other Indians.



OSAGES.

THIS tribe claims, as original possessors, the territories of the Ozarks, over which my journeys have chiefly laid. They claim all the country north of the Arkansas, to the Maramec. The term Ozark appears to me to be compounded from Osage and Arkansas.

They are manly, good-looking, stout-limbed men, erratic in their mode of life, living a part of the year in fixed villages, and roving with their families through the forests, in search of game, the remainder. Their territories are immense.

The Osages, if we may judge from popular opinion, are very much in the condition of the sons of Ishmael—"Their hand is against every man,

* See American Philosophical Transactions, Vol. VI.

and every man's hand against them." It is remarkable that they possess so much skill as they do in public negotiations, which they manage with address, with a bold, direct air, employing enlarged thoughts and phrases, which are calculated to impress the hearer favorably as to their mental abilities.

But little opportunity has been had of personal observation on their manners and customs. Their mode of encampment has been seen, and is so arranged as to place the chiefs of the village, or camp, in the position of honor. It is stated that, at daybreak, a public crier makes proclamation of the expected events and duties of the day, which, to ears uninitiated, sounds like a call to prayer. I fancy the prayer of Indians, if they pray at all, is for deer and buffalo.

It appears from the manuscript records of General William Clark, at St. Louis, which I have been permitted to see, that they have a tale, or fiction, of their origin from a snail and beaver. If this is an allegory, we are to suppose that persons bearing these names were their progenitors. I avail myself of the public interpreter of the language to submit the following vocabulary of it.*

* Omitted.

EXTRACTS FROM THE AMERICAN JOURNAL OF SCIENCE.

NOTICE of "A View of the Lead-Mines of Missouri, including some Observations on the Mineralogy, Geology, Geography, Antiquities, Soil, Climate, Population, and Productions, of Missouri and Arkansas, and other sections of the Western Country; accompanied by three Engravings. By HENRY R. SCHOOLCRAFT, Corresponding Member of the Lyceum of Natural History of New York." 1821.

As this work has been more than a year before the American public, and is already well known, it may seem superfluous to make any remarks upon it at so late a period. It was our purpose to have given it an early notice, but circumstances which could not be controlled, prevented. Still, as it is devoted to subjects which form a prominent object in this Journal, and is, as far as we are informed, the only elaborate and detailed account of a mining district in the United States, we are not disposed to remain silent, especially as the discharge of the duty is not likely to be painful, either to ourselves or to the author. Reviews in form, although within the plan of this Journal, do not constitute one of its most leading objects, and we do not hold ourselves responsible for analyses or even for notices of new American books, unless they appear particularly interesting or important, or hold a very intimate connexion with the great design of our work.

We have already intimated that we regard Mr. Schoolcraft's work in this light. We take it for granted that the statements of facts made by this author, are both faithful and accurate; the information which we have incidentally derived from other sources, certainly countenances this impression, but the whole amount of it is small, compared with the details contained in the present volume.

Mr. Schoolcraft's opportunities for observation were extensive, particularly in relation to the mines of lead in the Missouri region. Among those mines he spent a year. "I have made (says he) a personal examination of every mine of consequence, with a view to ascertain its general character and value and its peculiarities. I have travelled on foot over the whole mine country, exploring its minerals, its geological structure, its geographical position, soil, climate, productions, towns, streams, set-

lements, and whatever else appeared to me to be necessary to describe, explain and illustrate the subject before me."

Mr. Schoolcraft appears to have made good use of the advantages which he enjoyed, and his countrymen are indebted to him for a great amount of valuable information. He appears also to have studied the observations of preceding writers, and, with their works before him, it was in his power to correct errors and to supply deficiencies.

He has prefixed an historical sketch which we presume will be acceptable to every reader. The French, as is well known, were the original discoverers and settlers of the Missouri, and Illinois regions, which were embraced in their vast scheme of forming a chain of posts and settlements from the mouth of the St. Lawrence, to that of the Mississippi. They did not occupy the country of the Missouri and Illinois till more than a century after the settlement of Quebec, and about a century before the present period. At that time, (1720,) the lead mines were discovered by Philip Francis Renault, and M. La Motte, and by them they were wrought, although they and the adventurers under them were disappointed in their expectations of finding gold and silver.

At the end of about half a century, the country passed into the hands of the Spaniards, and under their dominion, probably about forty years since, the principal mine was discovered by a man of the name of Burton, and from him it has derived the name of Mine à Burton.

It appears that the processes of mining under the Spaniards were very imperfect, as they obtained only fifty per cent. of lead from the ore, threw away the lead ashes, and did not attempt any manufactures of shot or any other articles. They employed only the open log furnace.

In 1797, Moses Austin, Esq., a native of Connecticut, who had been occupied with lead mines in Wythe county, in Virginia, obtained from the Spanish government, a grant of a league square in the mining district in consideration of his introducing a reverberatory furnace. He sunk the first regular shaft—the mining having, till that time, been prosecuted solely by open digging, in the manner of quarries. Mr. Austin also introduced the manufacture of shot, and that of sheet lead soon followed. About the same time several other American families collected at the mines, and infused new spirit and enterprise into the mining operations, so that they were carried on with considerable vigour at the time when (in 1803) the country was transferred to the United States. Mr. Schoolcraft, from whom these facts are taken, remarks, that since 1804, the number of mines has been astonishingly multiplied—population has flowed rapidly in—the processes on the ore have been much improved—better furnaces have been constructed, and "every season is adding to the number of the mines." "Every day is developing to us the vast resources of this country, particularly in lead," and the author expresses his opinion that "the mines of Missouri are paralleled by no other mineral district in the world."

From the specimens which we possess of this ore, and from the documents produced by the author respecting the produce of the mines, we believe his opinion is correct, especially if we consider the fact that "the earth has not yet been penetrated over eighty feet;" "we know not what may be found in the lower strata." "There is reason to believe that the main bodies of ore have not been hit upon, that they lie deeper, and that we have thus far been only engaged upon the spurs and detached masses."

Mr. Schoolcraft informs us that although the mining business is much improved, there is still a great deficiency both of capital and of skill—there is in the whole district but one regular hearth furnace for smelting, and that not the best;—among forty mines, there are only four or five regular shafts—there is among all the mines, no engine of any description for raising water, and some of the richest mines with the best prospects in view, have been in consequence abandoned. Yet, under all these disadvantages, the annual produce of the mines is estimated at three millions of pounds of lead.

The author suggests the expediency of establishing a school of mines and minerals in the midst of the mines themselves; this would, without doubt, be a very proper measure, but in the meantime, skilful practical miners, and captains of mines, such as are found in every mining district in Europe, would supply the immediate demands of the country.

The mining district, formerly called the lead mines of Louisiana, is situate between the 37th and the 38th degree of north latitude, and between the 89th and 92d degree of west longitude, covers three thousand one hundred and fifty square miles—it is from seventy to one hundred miles long by forty or forty-five, extending in width from the Mississippi southwest to the Fourche à Courtois, and in length from the head waters of St. Francis northerly to the Maramec.

Lead ore is found in almost every part of this district. Mr. Schoolcraft says, "the general aspect of the country is sterile, though not mountainous: the lands lie rolling, like a body of water in gentle agitation. In some places the hills rise into abrupt cliffs, where the great rock formations of the country may be seen; in others, they run into level plains—a kind of highland prairie."

"The soil is a reddish colored clay, stiff and hard, and full of fragments of flinty stones, quartz and gravel; this extends to the depth of from ten to twenty feet, and is bottomed on limestone rock. It is so compact in some places, as almost to resist the pick-axe; in others it seems to partake of marl, is less gravelly, and readily penetrated. The country is particularly characterized by quartz, which is strewed in detached pieces over the surface of the ground, and is also found imbedded in the soil at all depths. This is here called blossom of lead. Iron ores and pyrites are also scattered over the surface of the ground, and occasionally lead ore. Such is the general character of the mineral hills, which are invariably covered by a stunted growth of oaks."

Walnut is also found on the hills, and there is a ridge of yellow pine, not more than six or eight miles wide, running nearly southeast and northwest, but it is nearly or quite destitute of lead—the mines lie generally east of it. In summer the flinty aspect of the country is veiled by a luxuriant growth of grass, which gives it a very pleasing and picturesque appearance.”

The valleys have a rich alluvial soil, well fitted for cultivation; but our limits will not allow us to mention the vegetable productions of the country. This region is well irrigated, and very healthy, being possessed of a fine climate. Mr. Schoolcraft remarks, that during a residence of ten months he never heard of a death; the country is free from the fevers which infest some of the neighboring regions. It seems, however, that the animals are visited by what is called the mine sickness. “Cows and horses are frequently seen to die without any apparent cause. Cats and dogs are taken with violent fits, which never fail, in a short time, to kill them.” It is said that the inhabitants impute these affections to the sulphur exhaled in smelting the lead, as the cattle are often seen licking about the old furnaces. But sulphur is not poisonous either to men or animals. The author imputes it to the sulphate of barytes, with which the district abounds, which he states is a “poison to animals.”

The carbonate of barytes is eminently poisonous; but we have never heard that the sulphate is so. May not the licking around the furnaces expose the cattle to receive lead in some of its forms, minutely divided? or, if it be not active in the metallic state, both the oxides and the carbonate, which must of course exist around the furnaces, would be highly active and poisonous. Is it not possible, also, that some of the natural waters of the country may, in consequence of saline or acid impregnations, dissolve some of the lead, and thus obtain saturnine qualities? We must allow, however, that we are not acquainted with the existence of any natural water thus impregnated.

Among the mineral productions of this region, certainly not the least remarkable mentioned by Mr. Schoolcraft, is the Iron Mountain, where the ore is piled in such enormous masses as to constitute the entire southern extremity of a lofty ridge, which is elevated five or six hundred feet above the plain: the ore is the micaceous oxide, and is said to yield good malleable iron.

There is another body of iron ore five miles west of the iron mountain, scarcely inferior to that mentioned above, and it appears that several other beds exist in the same vicinity.

Zinc is abundant, but as the ore is the sulphuret, it is not very valuable. It is not mentioned that calamine, which is the useful ore of zinc, has been found.

As to the geological nature of the country, in which the lead mines are situate, he informs us that “Bellevue abounds in granite;” that the only vein of granite rock in the mine country (as far as he had opportunity to

observe) passes across the southwestern end of Madison county—runs into Bellevue—is four or five miles wide, and twenty or thirty miles in a direction from southeast to northwest.

The granite is spoken of in another place, (p. 170,) as being a geological phenomenon, as containing imbedded in it or lying upon its surface, gneiss, green stone, porphyry, iron ores, &c.; it is spoken of as a red granite, containing very little mica, and as being used for mill-stones. It is mentioned as the “only mass of granite known to exist between the primitive ranges of the Alleghany and Rocky mountains,” and as being surrounded on all sides, and to an almost immeasurable extent, with secondary limestone.

Again, (p. 193,) the granite is cited as the “old red granite in mountain masses, with some veins of green stone, green stone porphyry, and gneiss;” it is said to terminate in very rough and broken high lands. At page 213, it is mentioned, still again, as giving origin to the river St. Francis, whose “springs gush out among these stupendous piles of red granite.” Besides the ores of iron, lead and zinc, “quartz, feldspar, shorl, mica, and graphite are among the minerals furnished by that region, and “green stone, gneiss, and green stone porphyry, are among the larger masses of rock.” The green stone, it seems, “is found in large isolated fragments, lying promiscuously among the fragments of granite which have tumbled down from the lofty cliffs above, and is rendered porphyritic by crystals of green and flesh-colored feldspar.”

We have no right to doubt that the rock described is granite, as the principal features delineated, correspond with that supposition. As it is described as being solitary, the only granite between the Alleghanies and the Rocky mountains, we are led to ask, is it a portion of the nucleus of our globe, covered on every side, for many hundred miles, with secondary rocks, and here heaving its head through the superincumbent strata, and standing alone? But what are we to conclude of the limestone? We should have liked especially to have had the relations of this limestone with that remarkable granite region pointed out. Does this latter repose on the granite, where it dips obliquely under, as it probably does, in order to find its way beneath the other rocks, and to vindicate its claim to a fundamental position? But, perhaps we are asking more than is reasonable, for, it may be that there are no such sections in the strata as would expose all these facts to view, and enable the observer to decide.

These hints we have dropped, not, we trust, from a captious disposition, but because we have found a real difficulty in conceiving clearly of the geological nature of this limestone, which, it seems, is the basis of the lead-mine country, and therefore it is very important that its characters should be indubitably fixed. We have not been so fortunate as to see Mr. Schoolcraft's specimens; possibly a view of them would have rendered the preceding remarks, in part at least, unnecessary.

Leaving the geological features of the lead-mine district, we proceed to

cite some interesting and important facts from Mr. Schoolcraft's work:—"The soil," he remarks, "is a reddish colored clay, stiff and hard, and full of fragments of flinty stone, quartz and gravel; this extends to the depth of from ten to twenty feet, and is bottomed on limestone rock. It is so compact in some places as almost to resist the pick-axe; in others it seems to partake of marl, is less gravelly, and readily penetrated. The country is particularly characterized by quartz, which is strewed in detached pieces over the surface of the ground, and is also found imbedded in the soil at all depths. This is here called blossom of lead. Iron ores and pyrites are also scattered over the surface of the ground, and occasionally lead ore. The mineral productions of the country, in addition to lead, are zinc, iron, ochre, red chalk, saltpetre, sulphur, alum and salt."

The ore (the author remarks) is the lead glance, galena, or sulphuret of lead. It is very rich and beautiful, and specimens in our possession fully confirm Mr. Schoolcraft's account; they have a very broad and perfectly foliated fracture, and a high degree of metallic lustre; they break in cubical fragments, and the minutest portions still retain this form.

We have already observed that large fragments are found loose in the earth: they sometimes weigh four or five pounds; we have such specimens from these mines; they are of a cubical form, and are surrounded, except where they have been broken, by an earthy incrustation.

It is observed that the marly earth thrown out from the pits, enriches the ground, so that in a few years it is covered with a very rank growth of trees, vines, &c., and this is a regular characteristic of old diggings. Innumerable portions of radiated quartz, and sharp fragments of flinty stones are mixed with the clay, and form the first stratum of about fourteen inches. The next is of a red clay, and is four or five feet thick, and less mixed with similar siliceous substances. Then comes a layer of gravel and rounded siliceous pebbles, about one foot thick, containing small portions of lead ore. The thickness of the bed of ore is generally a foot; and the lumps of ore appear to have been rounded by attrition, like common gravel. "This is the character of what is called the gravel ore, and no spars are found accompanying it. The greatest proportion of lead ore is, however, found imbedded in, and accompanied by, the sulphate of barytes, resting in a thick stratum of marly clay, bottomed on limestone rock." They invariably arrive at the rock at the depth of from fifteen to twenty, or sometimes thirty feet; a new process by boring and blasting is now necessary, and most diggers abandon their pits rather than prosecute them at this expense. If, however, as there can be little doubt, the limestone is the real matrix of the lead ore, the time will come when the present diggings will be considered as merely superficial beginnings, and the work will be resumed where hitherto it has been abandoned. It seems that the almost invariable practice of the miners is, to persevere till they strike the rock, and then to go and dig elsewhere; they cannot, if disposed, prosecute the business by levels or

galleries, for they are not permitted to carry on their mining except immediately under the surface that is covered by their respective leases, or by twelve feet square, which, if unoccupied, an adventurer may cover by occupancy. Among the substances accompanying the lead, blende and the sulphate of barytes are said to be very abundant; the latter in specimens which we have, is particularly brilliant and white;* the quartz is often prettily crystallized, and is so invariable a concomitant of the ore, that the miners, as we have before remarked, give it the meaning appellation of mineral blossom.

A curious fact is mentioned by Mr. Schoolcraft, respecting the Elliott's mines. "During the remarkable earthquakes of 1812, a fine spring of water at the mouth of the mines suddenly became warm and foul, and in a few days dried up entirely, and no water has run there since." "Illuminations in the atmosphere are frequently observed in this vicinity on the approach of night."†

It seems there is a considerable quantity of a greyish white sublimate collected at the log hearth furnaces, and rejected by the workmen upon the supposition that it is sulphur and arsenic; but Mr. Schoolcraft, by unquestionable experiments, ascertained that it was lead, as would appear, in the form of a carbonated oxide. A considerable loss is in this manner sustained, and in a more advanced state of the metallurgic operations of these mines, the author's valuable suggestions will not be neglected. There is one mine (M'Kain's) where the ore is of the steel-grained variety—it is said to yield less lead, and is inferred to contain more silver than the common ores; we are aware that this is the common impression, but our own experiments on different varieties of lead ore would induce us to think that it cannot be relied upon. We have examined fine steel-grained ore which contained very little silver; in one specimen only one five-thousandth part, and in another, and that a foliated specimen, we found three and a half per cent. of silver.

The methods of digging for the ore are sufficiently simple. "A pick-axe and shovel are the only tools used for removing the earth, and the drill, hammer and priming rod are added when it is necessary to blast." The process is carried on as in digging a common well.

We must refer our readers to the book itself for a clear account of the furnaces and furnace operations, employed for smelting the lead; it will be the more intelligible, as it is accompanied by two good plates containing views and sections of the furnaces. A circumstance which appears very extraordinary is, that the furnaces are most commonly built of lime-

* It is mentioned by the author, as a chemical test or reagent: it may, by decomposing it by ignition with charcoal, or with an alkaline carbonate, be made to afford its earth for the preparation of barytic tests, but we are not aware that it is itself ever used as a test.

† They are attributed by the author to phosphorus. Is it supposed to be in the form of phosphuretted hydrogen? May not these be electrical phenomena?

stone, which is of course calcined, and brought to the condition of quicklime by a few blasts, and then it crumbles and the furnaces must be rebuilt.

The ore yields at first fifty per cent., and then the ashes give fifteen per cent. more—sixty-five* in the whole.†

Custom, says the author, has established a number of laws among the miners, with regard to digging, which have a tendency to prevent disputes. Whenever a discovery is made, the person claiming it is entitled to claim the ground for twenty-five feet, in every direction from his pit, giving him fifty feet square. Other diggers are each entitled to twelve feet square, which is just enough to sink a pit, and afford room for throwing out the earth. Each one measures and stakes off his ground; and though he should not begin his work for several days afterwards, no person will intrude upon it. On this spot he digs down, but is not allowed to run drifts horizontally, so as to break into or undermine the pits of others. If appearances are unpromising, or he strikes the rock, and chooses to abandon his pit, he can go on any unoccupied ground, and, observing the same precautions, begin anew. In such a case, the abandoned pit may be occupied by any other person; and sometimes large bodies of ore are found by the second occupant, by a little work, which would have richly rewarded the labors of the first had he persevered.

Mr. Schoolcraft, from various particulars, infers that the average annual produce of the Missouri lead mines, as mentioned before, is three million pounds per annum, and the lead was worth in 1819, at the mines, four cents per pound.‡ For the last three years, up to 1819 inclusive, the produce of the mines was estimated at three million seven hundred twenty-six thousand six hundred and sixty-six pounds per annum of pig lead, which the author supposes to be not more than one half what the mines are capable of yielding.

The number of miners is between eleven and twelve hundred, and the number of hands employed in labor at different mines is from twenty to two hundred and forty, including in both cases persons of all descriptions.

Many miscellaneous topics connected with the general subject of his work, are introduced by Mr. Schoolcraft, such as the sections relating to the manufactures, and uses of lead, &c., but it is not our object to advert to these topics.

Among the miscellaneous mineral productions of the western regions, there are some that are interesting; and it will be seen from the author's table of minerals, that the list is various. There are several caverns which produce nitrate of potash by the usual treatment; and Ashley's

* According to Dr. Meade, the Missouri ore affords only a trace of silver. (See Bruce's Minl. Journal, vol. 1, p. 10.)

† Mr. Schoolcraft thinks it may yield seventy per cent.—it gave him by analysis eighty-two per cent.

Cave, about eighty miles from Potosi, is said to be one of stupendous size, and to "afford native nitrate of potash in beautiful white crystals."

The novaculite is mentioned as occurring on Washita, as described by Mr. Bringer in the present number.

Steatite exists in abundance at the falls of St. Anthony, on the Mississippi, and is used by the Indians for pipes.

The fluete of lime, near Shawneetown, was described in the first volume of this journal.

Among other minerals, Mr. Schoolcraft mentions chalcedony in several varieties, earthy oxide of lead, native copper, alum, manganese, opalized and agatized wood, opal, jasper, coal, gypsum, native epsom salts, pumice stone, agate, onyx, burr millstone, native iron, &c.; for the localities and descriptions of which, we must refer to the book itself.

Those facts of Mr. Schoolcraft's volume which relate to statistical and political topics, do not come within the plan of these remarks.

During our cursory notice of this work, we have cited a number of the most prominent facts which it contains, both because they are in themselves important, and because we were willing to call the attention of our readers both to them, and to the volume in which they are contained. Both are, in our view, entitled to great respect; and we confess ourselves very much indebted to Mr. Schoolcraft for a great mass of valuable information, which, in a connected form, is, we believe, nowhere else to be found. His statements (as regards the most valuable part) are drawn from his own research and observations, and have evidently been the result of much effort, and of no small share of fatigue and personal privation. We trust that so valuable a work will not stop with a single edition, and perhaps we might venture to suggest to the author, that in a second, he might advantageously condense into one view some facts which are several times repeated in different parts of the volume—such as those respecting the granite and its connected rocks, the lead ore and its associated minerals, &c.

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