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THE HISTORY OF SALTPETRE MINING IN MAMMOTH CAVE, KENTUCKY

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INTRODUCTION

On my first visit to Mammoth Cave in Kentucky, in August 1922, I observed with particular interest the remains of some wooden crib-like structures and great lengths of wooden pipe, which the guide said were remains of old saltpetre recovery equipment. The implications of these artifacts did not seem especially important until later when I had further opportunity to continue my study of caves and their significant role in the history of our nation.

Saltpetre, early in human history, attained a status of great importance in the technology of the arts and crafts, possibly exceeded only by salt and sodium carbonate. Archeological investigations indicate that as early as 2500 B.C., the time of the Sumerians, saltpetre from Ceylon and India, along with silks from China and spices from the Spice Islands, was an important cargo item for the camel caravans which traveled from the Far East to Egypt. During the time of the Sumerians and the early Egyptians, saltpetre was one of the ingredients of pottery glazes, was used in medicine as a diuretic, a carminative, an antiphlogistic, also as a refrigerant and an embalming material. This last-mentioned use continued for many years, as reported by John Evelyn, one of the Commissioners of His Majesty's Ordnance, who had the responsibility "for regulating the farming and making of saltpetre throughout the

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whole kingdom." Evelyn states in his diary, under date of July 14, 1666, that the Commission met to "sign deputations for undertakers to furnish their proportions of saltpetre." Records and references in the National Library of Medicine of the Surgeon-General's office indicate that as late as the Civil War it was used by the army doctors in the treatment of rheumatism. To the present day it is used in meat-preserving brines and to treat colic in horses.

Although saltpetre had many uses among ancient peoples and was a basic component of many types of incendiaries and pyrotechnic mixtures,¹ careful study of historical records indicates that it was not until Roger Bacon (1214-1294) made his serious study of the explosive properties of the mixture of saltpetre, charcoal, and sulphur (brimstone), and then later Berthold Schwartz's purported invention of bussen (gun), that saltpetre as an essential ingredient of gunpowder "came into its own." There seems to be a great lack of agreement among early writers concerning the first battle in which the "gonne" was used. John Barbour, who wrote circa 1375, in his poem *The Bruce* states that the English used guns at the Battle of Werewater, in 1327. However, more of the early writers appear to favor the Battle of Crecy, which was fought between the French and the English on August 26, 1346.

American historians and even historical novelists have been strangely silent in the presentation of any detailed explanation of how gunpowder, which is a mixture of about 12 to 15 per cent charcoal, 15 to 12 per cent sulphur, and 75 per cent of saltpetre or nitre, was procured. Even Dr. Thomas Walker, in the diary of his travels into Kentucky, offers no information on this point. Apparently gunpowder, one of the most essential aids to survival, was generally taken for granted, and could always be easily purchased when needed. Such an attitude could not be less realistic.

Niccolo Machiavelli (1469-1527) an Italian; in his *The Arte of Warre* presents an excellent summary of the extant general knowledge of the occurrence of saltpetre, ". . . which is a mixture of many substances, gotten out by fire and water of dry and dustie ground, or of the flower that groweth out of new walls in sellers, or of that ground which is found within toombes or desolate caues [caves] where raine can not come in"²

Among the colonists who had migrated to America were craftsmen that brought with them the knowledge of how to make firearms, to collect or produce saltpetre, and to blend gunpowder. One example of the extent of these skills is found in Howard R. Marrore's translation of the *Memoires of the Life and Perigrinations of the Florentine, Phillip Mozzei* (1730-1816). Mozzei, an Italian who resided in the colonies

during the Revolutionary War, stated "When hostilities started there were no guns to be had. We were forced to use old shotguns, each man being obliged to have a mold to make bullets to fit his gun. But in this we really proved that necessity is the mother of invention, for in less than a year all the colonies were making arms and ammunition they needed and as successfully as they could have been made in the Tower of London. It was rare to find a farmer who did not know how to make gunpowder."⁸

That the members of the Continental Congress were aware of the existence of the skills to which Mozzei referred is evidenced by the adoption of a number of Resolutions. The first, adopted on June 10, 1775, suggested that all saltpetre which the colonists had at hand be delivered "with all dispatch" to the closest factory to be processed into gunpowder.⁴ The second resolution, considerable of which came from the pen of Dr. Benjamin Rush, adopted on July 28, 1775, was entitled *Several Methods of Making Saltpetre Recommended to the Inhabitants of the United Colonies by Their Representatives in Congress*. This second resolution as well as others later adopted were designed to promote the production of saltpetre within the colonies.⁵

Most of the separate colonial or provincial governing bodies either adopted the second set of resolutions or others of similar intent and purpose. Some of the Colonies had recognized the necessity of such saltpetre production promotional actions many years earlier. For example, Massachusetts about 1620, Virginia in 1629, and South Carolina in 1707. Thus it is clearly evident that the procurement of saltpetre was recognized to be not only a commercial project for individuals but also a necessity for survival.

The history of the production of saltpetre on the American continent and the processing of this material into gunpowder is an interesting and complex story, replete with many trials and tribulations. A goodly number of the early technical, scientific, political, and professional leaders were involved in some manner. To name only a few will illustrate the importance which was attributed to the material. Benjamin Franklin, Paul Revere, Samuel Adams, Albert Gallatin, Dr. Charles Weisenthall, George Washington, James Madison, Evelyn Eve, Robert Morris, John Hancock, Jonothan Trumbull, Robert Treat Paine, and Charles Lynch are only a few of the leaders who were active in the procurement of saltpetre. This story has yet to be told in all its detail. Since it is too long and too involved even to review at this time the present discussion will be limited to the part that The Mammoth Cave of Kentucky played in the story.

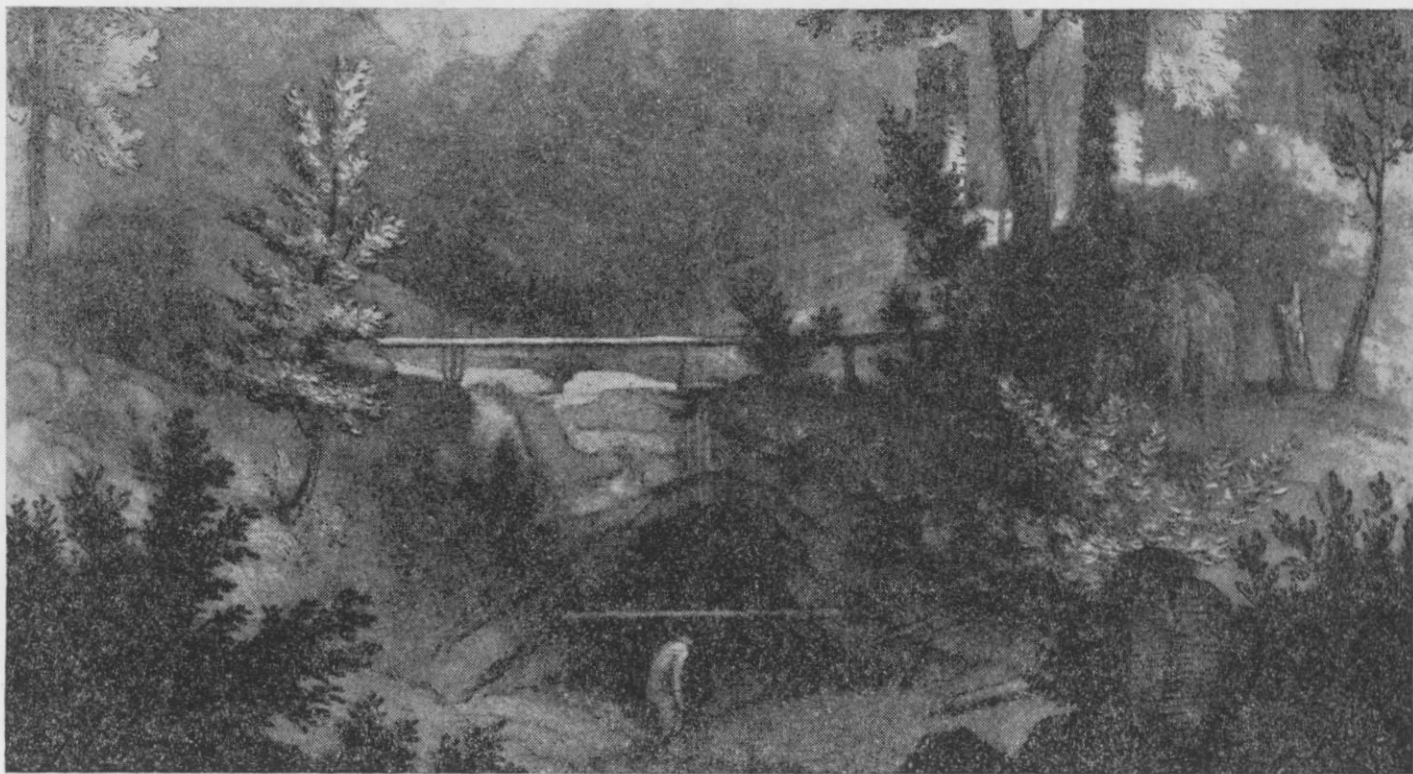
It is the present intent to show by means of a few specific examples of the activities of individuals that the knowledge of the procurement



Engraved by J. Sarrain

ENTRANCE TO MAMMOTH CAVE

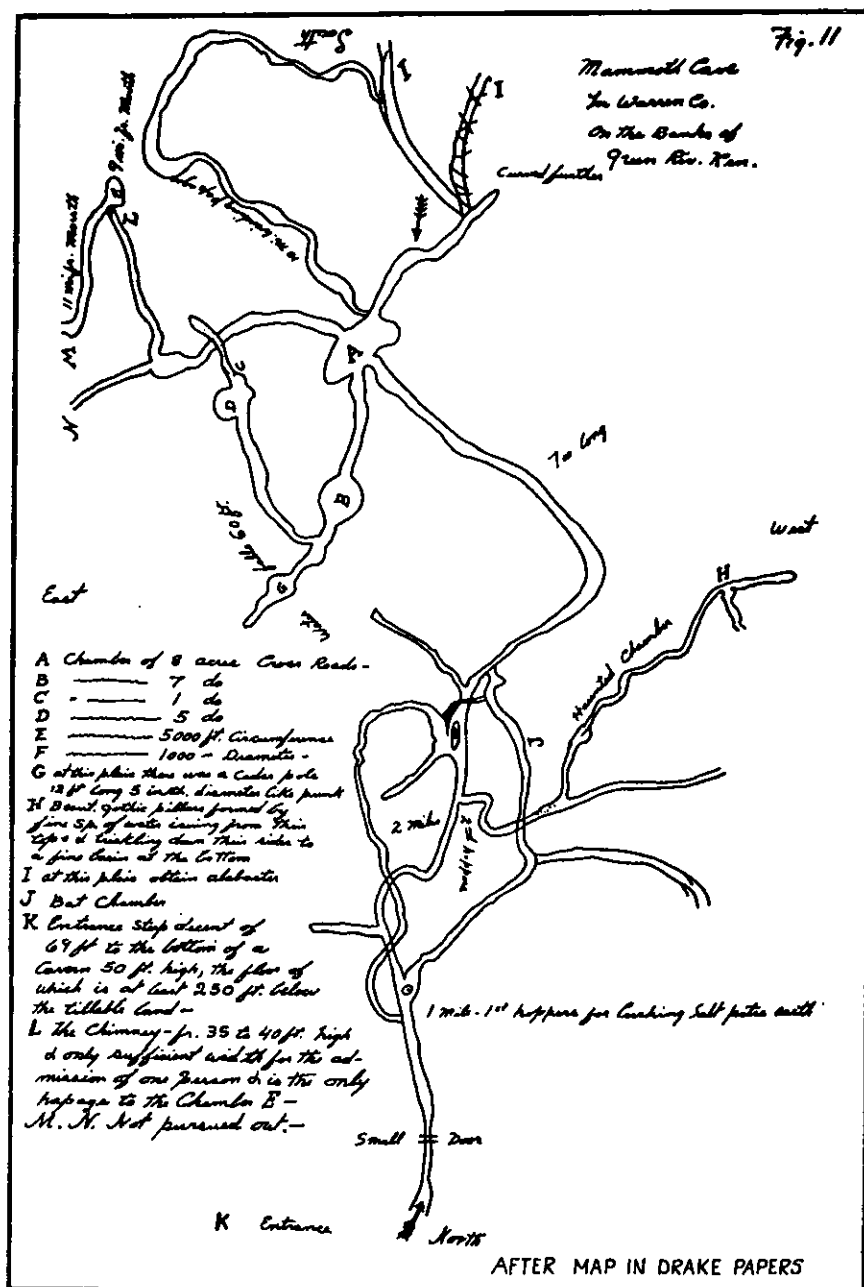
Frontispiece of an article by Robert Montgomery Bird, entitled "The Mammoth Cave of Kentucky," published in *The American Monthly Magazine*, May-June 1837. Negative and prints through the courtesy of the Library of Congress.



Engraved by J. Sartain

ENTRANCE TO MAMMOTH CAVE

Frontispiece of an article by Robert Montgomery Bird, entitled "The Mammoth Cave of Kentucky," published in *The American Monthly Magazine*, May-June 1837. Negative and prints through the courtesy of the Library of Congress.



Artist work by Paul Hohweiler

of saltpetre from caves was known to many who migrated to Kentucky, long before the traditional discovery of The Mammoth Cave, allegedly through the stratagem of a wounded bear. It is not the intent to review the detailed movements of early peoples into the Kentucky region. This phase has been adequately covered elsewhere. It is the intention to discuss certain aspects of the history of The Mammoth Cave. Among these are its location in national territory; its discovery; the individual ownership during the mining operations; the persons who promoted and operated the saltpetre recovery operations; the structure, use, and operation of the equipment used; the description of the processes of mining, recovery, separation, conversion, crystallization, purification, and refinement followed; and some of the business transactions.

Part I

HISTORICAL BACKGROUND

There is a distinct possibility that certain Acts by the British Government which later had the approval of James I may have had some rather unexpected effects on the discovery, exploration, and settlement of Kentucky. So far as the present study is concerned, only two instances are of particular interest.

One: For many years after the first landings on this continent, one of the main objectives of the European rulers was to complete the project which Columbus had in mind when he started his historic voyage, to discover a westward water route to the South Seas and India. Among other instructions the Virginia Company, sometimes called the London Company, which was granted a charter by James I in 1608, sent to Captain John Smith the command that he discover such a passage.¹ This same objective motivated Jacques Cartier when in 1535 he discovered and explored the St. Lawrence, as well as Henry Hudson who, in 1609, tried to follow in a westernly direction the river which was later named for him. Even though no one reached this goal, the idea that such a passage existed would not die and continued to spur westernly directed explorations over both land and sea for many more years.²

Two: James I of England, who followed the example of Elizabeth I, continued to confiscate the lands of those people in Northern Ireland, who provided armed resistance against the Crown. Many people from James' native Scotland were settled on the confiscated property. These actions started about 1609 and continued for many years.³ The confiscation of property; the embargo against the exportation of woolen goods, except to England or Wales; the increase in rental fees; the restriction of civil rights; the curtailment of religious freedom; the infiltration of the Scots; and, the impending threat of famine were some of

the factors which caused a great increase in the migration of these oppressed people to the American continent. This migration reached its peak about 1727 - 1728.⁴

A great number of these people driven from Ireland eventually settled in Pennsylvania, west of the territory held by the Quakers and even beyond that occupied by the Germans, with the hope of being able to avoid many of the restrictions and unpleasantnesses which had caused them to leave their homelands.⁵ In this western location they provided an acceptable buffer and a protective wall for the Eastern Seaboard people against the wandering bands of Indians. It was inevitable that from this stream of emigrants which poured into the western portions of Pennsylvania, during the first half of the 1700's, there were many who pushed generally west and south down the Alleghany and the Ohio rivers. Even though most of them did not know it, they were moving in the general direction of the Kentucky area.

Before the 1700's the lower portions of the Appalachian Mountains sheltered many people who, as Shaler⁶ reports, with the exception of a few slaves, were substantially all those of English extraction who migrated into western Carolina, eastern Tennessee, and southwest Virginia, between the years of 1625 and 1725, having moved into the mountains from the Carolina seacoast. This same writer also reports that these people were much more concerned with the procurement of land, its development, and its products, than were those in New England who were more interested in theological dissertations and religious discussions.

Since they possessed self-sufficient characteristics, these mountain people were able to procure, by their own efforts, substantially all the necessities of life. However, in addition to the food, clothing, and shelter they obtained from the forests, the fields, and the streams, gunpowder was a very essential item not only to provide protection against vandals and marauders but also to shoot game for meat and to provide skins and leather for various purposes. It was common knowledge that caves oftentimes were great storehouses for saltpetre and it was only natural that these frontiersmen, far from the market places where manufactured supplies could be obtained, should seek and utilize such sources wherever available. Thus it was vital that they should "so soon as possible" develop local sources of saltpetre.^a

Almost contemporaneous with the movement of those who migrated down the river valleys in the western section of the Pennsylvania area, other pioneers and settlers traveled up the Potomac^b along its tributary valleys and into the Valley of Virginia. These people appear to have been largely Scotch-Irish, Holland Dutch, German, and English in national origin. A number of families, such as the Hites about whom

more will be told later, moved westward from the Winchester and Shenandoah Valley areas, crossed the mountains and settled along the South Branch River and Patterson Creek valleys. There they met those who had migrated up other tributaries of the Potomac. A number of these people were hog breeders which led Lord Fairfax to name this area Hampshire County.⁷

Many of these settlers such as the Logans, the Buchanans, the Campbells, the Walkers, and the Sallings moved south and west through the valleys between the ranges of the Appalachians along a route which later came to be known as The Wilderness Trail. This migration into the Valley and other sections of Virginia was so great that, as Kercheval states, "by . . . the year 1754, our country increased rapidly in numbers. . ."⁸

About this same time many other people moved westward from the Virginia Tidewater Regions, across the Piedmont, along the James River, and either through or over the Blue Ridge, into The Wilderness Trail area. Along this route they encountered others who had followed this Trail toward the southwestern parts of Virginia. In this way they also met those who had migrated from the Carolinas.

Thus it becomes clear that there were four general streams of migrants toward the Kentucky regions, whose movements were well advanced by 1750. One, the group which had traveled down the Alleghany and Ohio rivers; two, those who had traveled through the Valley of Virginia, then south and west along The Wilderness Trail; three, those who had moved westward from the coastal regions of Virginia and merged with those who had blazed the Trail; and four, the group which had moved north and west from the Carolinas and in the Abingdon, Virginia, region met those who had traveled from the north and east along The Wilderness Trail.^c

Possibly the earliest reports of explorations by white people into the Kentucky area are found in what Shaler⁹ calls Rafinesque's ". . . untrustworthy *Ancient Annals of Kentucky*,"¹⁰ recounting that Hernando de Soto and Louis Moscosco traveled in or near this region during the 1540-1543 period. Collins¹¹ and Durrett¹¹ both repeat this same story. Collins seems to question these reports, since in his *Annals of Kentucky* in a note on page 145 he states, "He [Rafinesque] had access to many French and Spanish works, some very rare." Collins also notes that Rafinesque ". . . does not state his particular authority for *this* statement. . ." Collins also further states in a note, "One other authority [not named] thinks de Soto's successor, Moscosco, was so high up the Mississippi as Kentucky, opposite New Madrid, Missouri." However, the following which must contain a modicum of truth, is paraphrased from these *Ancient Annals* and indicates that travel in the general

Kentucky region must have started very early in the history of our country.

In essence, Rafinesque reports that when de Soto led his expedition from Florida he discovered Tennessee in 1540. The next year he crossed the Chacuga (Mississippi) River and discovered Arkansas. During 1542 while the expedition wandered along the Mississippi Valley de Soto died and was succeeded by Louis de Moscosco. He failed in his attempt to reach Mexico by an overland route. Moscosco and his men returned back across the Missouri River and have been credited with the discovery of Ilicas (Illinois) and Kentucky, while making their escape from the Indians by traveling down the Mississippi.

Apparently very little exploration of consequence was conducted for about the next 100 years. Collins states relative the year 1654 that, "Col. Wood, an Englishman, explored Kentucky as far as the Mischa-cebe (Mississippi) River and discovered several branches of the Ouabousigou (Ohio) River." Collins cites as his authority for this statement Albach, Butler, and Coxe.¹²

One other early exploration of this area should be noted. In 1729, M. Chaussegros de Lory completed and forwarded to the Minister of the Colonies and Marine in Paris, France, notes which he and M. de Longueil made on the first compass survey of the Ohio River. Even though Bellin,¹³ who used these notes in the preparation of his *Carte de La Louisiane, Etc.*, states that they were in existence during the second quarter of the 1700's, their present location is unknown. No doubt this report would constitute the oldest authentic historical evidence about when the first white men visited the Kentucky area.

The average pioneer, who had made his home in the mountain valleys, lived in territory which was productive agriculturally; had vast forests close, as well as great mineral potentialities; but also had demanding problems in self-protection and preservation. One of their many problems, even long before Dr. Walker made his famous journey into eastern Kentucky, was the never-ending search for those greatly needed chemicals—salt and saltpetre.

It was during the first half of the 1700's that the names of frontier families, which were involved in the production of saltpetre in the Appalachian area, began to appear in the literature and reports. McElroy¹⁴ states, "In 1730, however, a certain John (Peter) Salling of Williamsburg, Virginia, was captured near the James River, by a band of Cherokee Indians and carried as far as the Salt Licks of Kentucky (southeast of the Falls of the Ohio). Here he made his escape, but was again captured by a band of Illinois Indians and taken to Kaskaskia, whence, having escaped a second time he returned to Virginia, probably by way of Cumberland Gap." Collins gives a slightly

different twist to the conclusion of the story. He says that Salling was ransomed at Kaskaskia and returned to Virginia by way of Canada. Henderson¹⁵ reports without authentication that "Kentucky was also traversed by John Peter Salling, with his three adventurous [unnamed] companions through the Middle West, in 1742." Butler¹² also reports without any authentication or details that these three men were captured "... while on a hunting trip to the salt licks of Kentucky" and that Salling was taken by the Illinois Indians to Kaskaskia, ransomed, and reached home via Canada, after six years' absence. In spite of the variations in the details of the Salling story it appears that he probably was one of the first white men to reach Kentucky by way of Cumberland Gap. Because he did not voluntarily travel these regions, and since he did not leave any records, reports, or information about the territory, it is questionable whether he should be given credit as an explorer.

The significance of the Salling name in this story becomes evident in events which occurred many years after his death, reported to have been in 1755. In the spring of 1959 the death of John Salling, probably a direct descendant of John Peter Salling, marked the end of an era in the history of our country. This man was *The Last of the Petre-monkeys*,¹⁶ and had lived substantially all of his 113 years on property which his "grandpappy" had settled, near Slant, in the Clinch River Valley, in southwest Virginia. This John Salling told the present writer, several years before his death, that he had worked for the Confederate Nitre and Mining Bureau, as a lad about 13 years of age. He said that he had not worked in the saltpetre caves, but did help collect petre-dirt from under old buildings and hauled it to the salt boiling works at Newman's Ridge, where the dirt was processed for its saltpetre content.

While 1860 is much later than the first reported date on which Mammoth Cave was mined, the fact still remains obvious that the knowledge of how to procure saltpetre was known in southwest Virginia, for many years previous to the middle 1860's. Someone had to teach a 13-year-old boy what to do and how to proceed in the practice of this ancient craft. This assumption finds some support in the existence of a recently reported saltpetre cave in the Cumberland Gap National Historical Park,¹⁷ and the presence of a large saltpetre cave near Ewing, Virginia, only a few miles east of Cumberland Gap, both of which contain evidence of having been known for many years. The dates on which these caves were mined are not presently known.

About 1748, Dr. Thomas Walker, accompanied by John Patton, John Buchanan, a Colonel Wood who was Buchanan's son-in-law, and Charles Campbell who had married Buchanan's sister, went into the

Rich Valley and Buffalo Lick areas along the North Holston River, to survey land for the Loyal Company of Virginia.¹⁸

Evidence indicates that salt springs in some sections of southwest Virginia had been used by the Indians and wild animals as a source of this important dietary supplement. For example, Roanoke was once called Big Lick. However, certain writers, especially Morse,¹⁹ have stated that, "Campbell's or Preston's Salines^d in North Holston, in the state of Tennessee, are the only ones that have been discovered on the upper branches of the Tennessee. Capt. Charles Campbell, one of the first explorers of the western country, made the discovery of this tract in 1745." This property, to which Campbell laid claim, at the time of the original survey was in Tennessee. However, after Dr. Walker and his party surveyed from the previously established boundary between Virginia and North Carolina, in a westward direction toward Cumberland Gap, and located the line which, with some changes, was later adopted as the official boundary between Virginia and Tennessee, the *Salines* were now within Virginia. Campbell was granted his patent by Robert Dinwiddie, Governor of Virginia, on September 23, 1753.²⁰ Morse also states, "The tract (which is part of the present city of Saltville) contains about 300 acres of salt marsh land, as rich a soil as can be imagined. In this flat, pits are sunk, in order to obtain the salt water. The best is found from 30 to 40 feet deep; after passing through the rich soil or mud, from 6 to 10 feet, you come to a very brittle limestone rock, with cracks or chasms, through which the salt water issues into the pits, whence it is drawn by buckets and put into boilers, which are placed in furnaces adjacent the pits."

John Buchanan, apparently more interested in farming than was Campbell, surveyed and claimed vast holdings adjacent the North Holston River, in the Rich Valley area. He settled on this property and established his home. Many of his descendants, some of whom the present writer knows personally, still live in this region. Buchanan, like all other early settlers, needed gunpowder. Since it was general knowledge that many caves were storehouses for saltpetre, it was inevitable that Buchanan should investigate a large cave on his recently-acquired property. This cave was found to contain large quantities of cave earth which was rich in saltpetre.²¹

The same boiling kettle installations which were usable in the production of salt were frequently used to concentrate saltpetre leach water. It was inevitable that Campbell should cooperate with his brother-in-law John Buchanan in the production of saltpetre by making his boiling kettles available. One of the early salt boiling kettles from Saltville may be seen mounted on the Court House lawn in

Marion, Virginia. J. Leander Bishop, in his comments on the production of minerals period of the American Revolution, without giving any authenticating source of information, makes the following statement: "Salt was made by boiling at *Campbell's Salines*, . . . and in 1795, several tons of saltpetre, collected from the nitrous caves in the county (and processed at the salt works) were sent to the Atlantic market."²²

It therefore becomes clearly evident that the practice of the production of saltpetre from the earth of caves was creeping closer and closer to the Kentucky territory. Even Dr. Walker himself was not oblivious to the presence and potential value of caves. In the report on his 1750 trip into the Kentucky territory, he mentions caves at least twice in his *Journal*; once, when he named the pass he traversed through the mountains *Cave Gap*, which is now called Cumberland Gap, and on another occasion, under date of May 12, 1750, that he had ". . . found alum tasting rocks. . .," which could have been saltpetre, near Rock Castle River, along a stream which later came to be known as Crooked Creek.

The Rock Castle River and its tributary Crooked Creek mentioned above are of particular significance. In 1806, Dr. Samuel Brown, who since 1799 had served as professor of chemistry and medical subjects at the Transylvania College Medical School in Lexington, Kentucky, presented a report before the American Philosophical Society, on studies he had made of saltpetre caves in Kentucky. This report is so detailed it does not seem reasonable that he could have spent much less than five years in the collection of information and the preparation of his paper. Brown states that he had not been able to determine ". . . the number of caverns [in Kentucky] which are known to contain it [saltpetre]." However, he does report that in addition to the Great Cave on Crooked Creek (This is on property owned by John Lair of Renfro Valley, and identified on the present day map as the Great Saltpetre Cave, near Mount Vernon) he had visited five other saltpetre caves in the same vicinity, as well as one on Rough Creek, a tributary of Green River.²³ From Dr. Brown's description of the recovery and leaching operations at the Great Cave it is clearly evident that the procedures followed had been sufficiently well established and used for enough years, in this area, that the workmen routinely returned the leached cave-earth back into the cave so it might accumulate additional saltpetre. It had been learned many years earlier that this redistributed earth could be leached again in three to five years and additional amounts of the chemical obtained.

Dr. Charles Weisenthall of Baltimore Towne was one of the doctors for the Continental Army, a member of the Council of Safety of the

Colony of Maryland, and Chairman of the Council Committee on Saltpetre. On October 1, 1776, he sent to Mathew Tilghman, President of the Convention of Maryland, his report on the results of a trip "... to examine the saltpetre earthe on the south bank of the *Potowmack*". He visited one saltpetre producing cave "... on the property of a Col. Hites. . .," who was a farmer and hog breeder in Hampshire County. He reported another about three miles farther up the valley of Patterson Creek, and above Burlington, in the north-central part of what is now West Virginia.

Dr. Weisenthall reported that, in spite of inefficient operations, the natives had procured saltpetre from this cave for a number of years. He also stated, "This saltpetre is exceeding strong and in very large crystals."^e In addition, he stated that he had received "... a sample of saltpetre from the *Ohio*." He does not state from which part of *the Ohio* this sample came. Since this term in general meant any part of the valley of the Ohio River it could well have been from Kentucky.²⁴

Even though considerable gunpowder and lead were imported into the Kentucky area for the use of explorers, settlers, and the fighting forces, before 1800, it does not necessarily mean that there was no saltpetre mined or gunpowder made in the territory. Further in this study it will become evident that well before the War of 1812, the manufacture of gunpowder in Kentucky was an industry of considerable size. It now appears evident, that well before 1800, the knowledge and practice of the procurement of saltpetre from the earth of caves had moved toward and into the Kentucky region from at least two directions, the far northeast and the far southeast.

(To be continued.)

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A copy of this work is in the Rosenwald Collection.

Q155.B32.

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*Note of explanation concerning the numbers which follow certain of the bibliographical references.

(a). The number at the lower left is the Library of Congress or other library book number.

(b). The number at the lower right is the Library of Congress or other library card number.

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PART I. HISTORICAL BACKGROUND

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NOTES

a. A more complete discussion of this topic is found in the present author's *Saltpetre Caves and Virginia History*.

b. The spelling of the name of this river has had many variations among which were *Powtowmack*, *Powtomack*, *Patomak*, *Patowmack*, *Pawtowmack*, *Potamac*, and finally *Potomac*.

c. Abingdon, Virginia, which was very early known as Black's Station, and until after 1777 was called Wolf Hills. This was probably due to the fact that wolves commonly dened in the caves of the area. Probably the best known cave in the area is in the down-town region of the city and extends under and across the main street. The entrance is located on property owned by the Barter Theatre. Abingdon is at the intersection of two early Indian Trails. One of these was between the Carolinas and the Great Lakes. The other was between the eastern Virginia regions, through the Cumberland and Great Stone Gaps of the Cumberland Mountains, and thence across Kentucky toward Lexington and The Falls on the Ohio. This area seems to have been neutral territory in which apparently no fighting took place between the Indian tribes. Almost no Indian weapons have been found here.

d. No mention of Preston or who he might have been has been found in any reference other than that made by Morse. Even the Secretary of the Southwest Virginia Historical Society had no information relative to this man.

e. The present writer has visited this cave on the Col. Hites property and, through the courtesy of Robert Lutz, has a sample of saltpetre which was recovered from this cave. The crystals of this particular sample are the largest the present writer has ever seen. This is considered to be further substantiation of Dr. Weisenthal's description of the cave.