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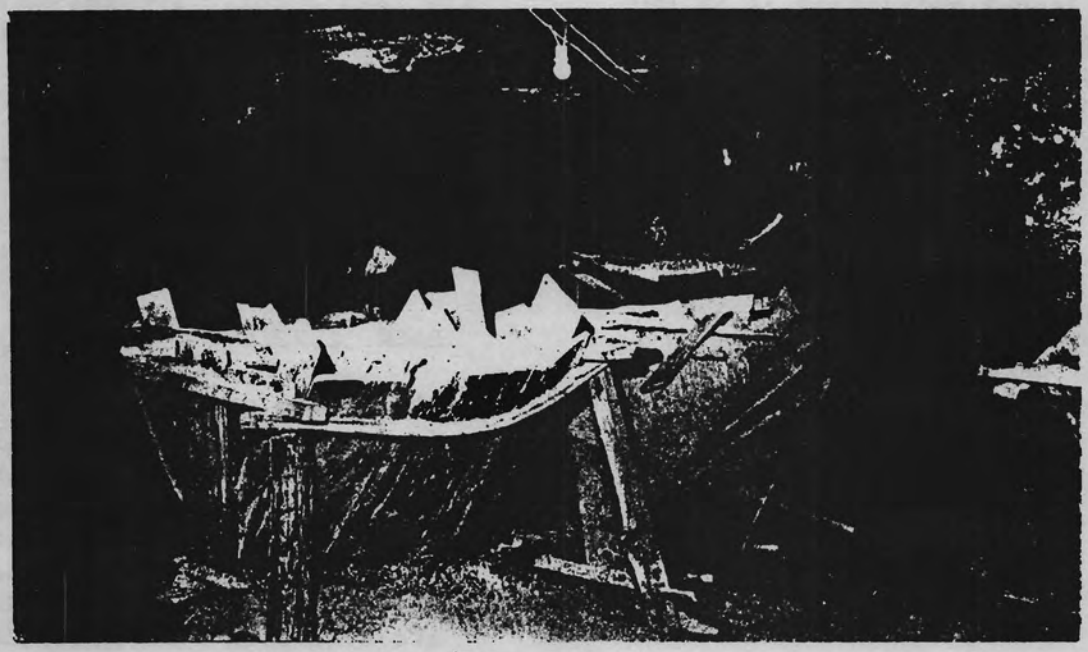
THE JOURNAL OF
Spelean History

OFFICIAL PUBLICATION OF THE AMERICAN SPELEAN HISTORY ASSOCIATION



Volume 20, Number 2 #64 April - June 1986

THE JOURNAL OF SPELEAN HISTORY

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THE ASSOCIATION

The American Spelean History Association is chartered as a non-profit corporation for the study, dissemination and interpretation of spelean history and related purposes. All persons of high ethical and moral character who are interested in those goals are cordially invited to become members. Annual membership is $5.00; family membership is $6.00; and library subscriptions are $4.00. ASHA is the official history section of the National Speleological Society.

COVER

This issue features saltpeter caves. The vats pictured on the cover are from Organ Cave, West Virginia. The photograph is taken from an old postcard estimated to be about 30 to 40 years old.

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THE JOURNAL

The Association publishes the Journal of Spelean History on a quarterly basis. Pertinent articles or reprints are welcomed. Manuscripts should be typed and double spaced. Submission of rough drafts for preliminary editing is encouraged. Illustrations require special handeling and arrangements should be made with the editor in advance. Photos and illustrations will be returned upon request.

BACK ISSUES

All copies of back issues of the Journal are presently available. Early issues are photocopied. Send requests to Jack H. Speece, 711 E. Atlantic Avenue, Altoona, Pennsylvania 16602. Issues from Vol. 1, No. 1 to Vol. 7, No. 2 are available from Kraus Reprint Co., Route 100, Millwood, New York 10546 on microfiche.

1986 NSS Convention

Tularosa, New Mexico
June 22-28, 1986

The Spelean History Session of the National Speleological Society will be held Tuesday morning, June 23, 1986 in Helectite Hall beginning at 9:00 AM. The following papers will be presented.

EDWARD DRINKER COPE'S CONTRIBUTIONS TO SPELEOLOGY

Fred Grady

Edward Drinker Cope (1840-1897) while better known as a vertebrate zoologist and paleontologist, also made considerable contributions to speleology. From 1867 to 1871 Cope explored a number of caves in Eastern United States and described both modern and fossil faunas. After 1871 Cope concentrated on other studies but continued to write occasional papers on cave faunas, especially on fossil bones found in caves.

THE CAVE PAPERS OF EDWARD McCRADY, HENRY T. KIRBY-SMITH, AND HARVEY M. TEMPLETON

Larry E. Matthews

McCrady, Kirby-Smith, and Templeton did extensive cave exploration in the southern half of middle Tennessee during the late 1930's, the 1940's, and the early 1950's. During that time period they published several scientific papers on cave biology and vertebrate paleontology. Supposedly, they had discovered the McCrady Canyon-Waterfall Room area of Cumberland Caverns, Warren Coonty, Tennessee during this time period, but documentation is lacking.

While researching the history of Cumberland Caverns it was discovered that all three men had kept journals of their cave explorations. These journals document many important cave discoveries. Because of their historical and scientific value, these journals are being prepared for publication. The Kirby-Smith papers have already been published in the JOURNAL OF SPELEAN HISTORY.

Plan now to attend the 1977 NSS Convention and Spelean History Session to be held at Sault Sainte Marie, Michigan on August 3 - 7.

CENTRAL KENTUCKY GUNPOWDER FACTORIES

Angelo I. George

The year 1810 was a time when Kentucky reigned supreme with 63 gunpowder mills, annually producing 115,716 pounds (52,488 kg) of gunpowder (Coxe, 1814, p. 126). Economic conditions deteriorated at the end of the War of 1812, as foreign competition, relaxation of trade import tariffs, and a national recession sapped domestic industries in America. By 1820, the number of Kentucky powder mills had declined to 10 (1820 U. S. Federal Census). Only 2 powder factories are known to have been in operation during the Civil War (Fountain Mills, Hart County; and the O'Neil-McCoy Powder Mill, Fayette County). References to these early industries are scant, and efforts have been made to collect and to present their central Kentucky counterparts. Burton Faust (1967, p. 68) is credited with the first contemporary inventory of powder sites in Kentucky. His research showed 4 powder mills, 2 of which, Coon Creek and the Fountain Mills, are found in the central part of the state. Apparently, he knew of others, "but these illustrate the fact that this activity was wide spread even at this early date." Based upon present investigation, 12 sites have been catalogued, of which 8 sites are sufficiently well known to target their locations.

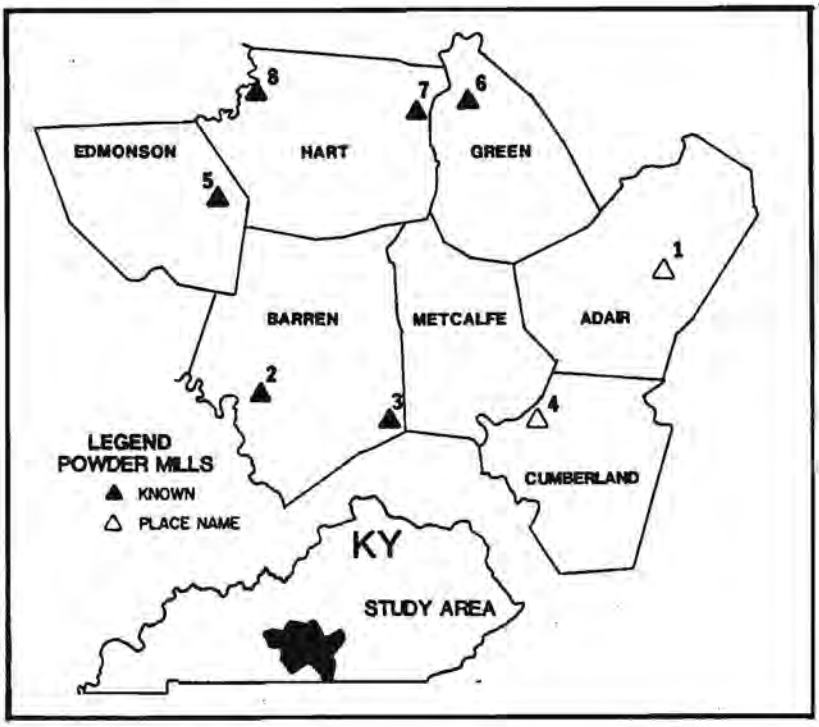

Figure 1. County outline map showing the location of powder mill sites in central Kentucky. The following sites are indicated: (1) Powder Mill Branch, (2) Coon Creek Powder Mill, (3) Nobob Powder Mill, (4) Bombshell Creek, (5) Floating Mill, (6) Fairthorne Powder Mill, (7) Fountain Mills, and (8) Craddock Powder Mill.

The largest gunpowder manufacturing plant was built in 1810 on Lynn Camp Creek in southern Hardin (now Hart) County. And smaller ones were built on: Big Brush Creek (Green County); Green River at Mammoth Cave (Edmonson

County); Nolin River (Hart County); Coon and Nobob Creeks in Barren County. John Courts and Braxton B. Winn became the largest producers of powder in central Kentucky.

Census data collected for 1810 may not represent actual gunpowder production rates from these mills. For example, Warren County had two mills and collectively produced 400 pounds (181 kg) of powder, whereas Adair County, with one mill, produced 12,000 pounds (5443 kg). These data, the best available, do not give a clear picture as to what was actually being produced from these counties. Saltpeter production figures are no better representative of county production levels than the powder mill data. Kentucky had public and private warehouses from 1792 and continued for several decades (Verhoeff, 1917, p. 70-78). All of them were under State supervision, requiring daily inspection and record keeping. The Kentucky warehouse system was set up to regulate and handle foreign export and import commodities, especially: tobacco, flour, hemp, sugar, salt, saltpeter, gunpowder, etc. The warehouse system is still used today to regulate the tobacco industry. I believe the 1810 Census drew heavily from records maintained from these county warehouses.

The 1810 U. S. Federal Census records 3 powder mills in Hardin, now Hart, County, Kentucky. Annual production of these factories produced 1000 pounds (454 kg) of gunpowder, valued at $333.00. By 1820, only one powder mill in the county was in operation. This was the Whitman and Ferris American Powder Mills with an annual production of 2675 pounds (1213 kg) of powder valued at $1250.00.

John Courts lived in one of the first two-story frame buildings in the town of Nobob, Barren County (Simmons, 1940). The house served as stage stop and tavern. In 1810, Courts and his brother-in-law, Braxton B. Winn, operated a general store in Nobob (Goode and Woodford, 1980, p. 358). As their mercantile business prospered, a gunpowder factory was built in 1810, on Lynn Camp Creek. It was constructed on the west side of the creek near two large springs, in the vicinity of an incised meander bend called The Big Hill. The powder mill was strategically located on a wagon road connecting Munfordville with Greensburg at a ford on Lynn Camp Creek. They constructed two pestle buildings, sometimes referred to as separate powder mills (1820 U. S. Federal Census, p. 104/5). The pestle buildings were water powered; one was found at the upper and another one at the lower ford. A saw mill and grist mill was also in operation. Upon John Courts' death, the mill site was reduced to a 500 acre tract of land (Courts, 1817).

John Courts died on February 21, 1817, leaving an exceptionally detailed last will and testament (Peden, 1979, p. 79-81). Provisions were made for the operation of the powder mill and adjacent saw mill throughout the life span of his wife, Fanny Courts. If she or her assignees cannot make a success at operating the establishment, the powder and saw mills would be rented or leased out. Upon the death of Fanny, the estate was divided into equal parts to John's nine children. Other money and property was provided to his deceased daughter's (Polly Moss) two children.

Powder manufactured at the mill was shipped down the Green River on a flat boat and used by Andrew Jackson in the Battle for New Orleans on January 8, 1815 (Collins, 1874, p. 334). It should be noted that most war-related industries, the powder factories, iron foundries and saltpeter caves, claim individual involvement as the sole savior for winning Andrew Jackson's battle against the British in New Orleans.

Sometime between John Courts' death and late 1820, the two powder mills and the saw mill blew up. By late 1820, the Courts Fountain Mills had fallen into an advanced state of disrepair (1820, Federal Census, p. 104/5).

Apparently, the Courts estate was finally divided and sold to Samuel S. Brooking. Research shows this next period of operation starts in 1825 and extends through 1833 (Louisville Public Advertiser, December 30, 1925; Anon. 1980, p. 4; and Rennich, 1984, p. 241).

Brooking promoted his company through many of the western newspapers, especially the Louisville Public Advertiser. The following ad appeared on September 10 and ran through December 30, 1825:

BROOKING & CO'S POWDER WORKS

> This manufactory is under the superintendence of the subscriber, whose attention is almost exclusively confined to the interest of the establishment, which possess a great abundance

of water power; and from the favorable construction of the factory, for the safty of the workmen and facility in manufacturing, will enable the concern to make gunpowder cheaper than any other establishment west of the mountains. The manufactures are disposed to keep the article at a regular and fair price, and will not attempt to undersell, believing the best method to succeed, is to endeavor to excell in quality, and to keep the article at such a price as will afford to them, a profit only. It is kept by most of the wholesale merchants in Louisville, and may be had in all the principal commercial towns in the western country. Letters addressed to the subscriber, should be directed to "Fountain Mills, Hart County, Ky."

SAM'L S. BROOKING

Wholesalers in Louisville advertised his product in the Louisville Public Advertiser, especially John C. Bucklin for September 27, 1826, maintained, "Brooking's Powder -- a constant supply for sale." And Isaac & Willis Stewart promoted the sale of their wares, to include, "Trotter's, Brooking's, Cleaveland's and S. Cooper & Co., warranted gunpowder." Trotter and S. Cooper & Co. were Lexington powder mills and John Cleaveland operated the Phoenix Powder Works in Louisville.

With the fluctuation of powder prices and competition, Brooking used the testimonial and the not to be under sold approach in his advertising campaign. The following Louisville Public Advertiser notice ran on January 2, 1828 (it was originally submitted on February 28, 1827; and Cyrus Edwards, 1940, p. 352, would quote from this advertisement):

BROOKING'S POWDER

FREQUENT fluctuations having occurred in the price of powder, manufactured by me; and, desirous to keep the article at a fair and regular price, persons in Louisville disposing of powder on my account, will hereafter sell at $5.50 per keg of 25 pounds [11 kg] -- $3 per half keg -- for cannon powder $5 per keg. The latter is well calculated for blasting rock, for the use of steam boats, and answers well for musket shooting, the only difference being in the size of the gun.

The powder I am now making is considered by my workmen, better than that heretofore manufactured by me, and great care will be taken to deserve the patronage of dealers in that article, which I have been so liberally favored.

Merchants and agents are requested to notify me of any change that may occur in the market price of powder, which information will be promptly attended to.

SAM'L S. BROOKING

Fountain Mills, Hart Co. Ky.

Saltpeter was being imported from the East Indies to New Orleans. From there, river boats would transport it to the port at Louisville. W. G. Bakewell & Co. (1824), a wholesaler in Louisville, advertised, "to powder makers -- Have on hand for sale, 20,000 pounds 9072 kg crude saltpetre." And Fitzhugh & McDonald (1824) expected a 20,000 pound 9072 kg shipment of crude saltpetre and would take orders, which would be delivered upon arrival. It is assumed that most of saltpeter used in the Brooking operation was purchased in Louisville. Some saltpeter was still locally produced from caves; or at least through 1820 (U. S. Federal Census).

Brooking would diversify his business and acquire a second business partner, a Mr. Sterrett. They formed a new business, called Brooking, Sterrett & Company. They leased the Aetna Furnace, found about 2 miles (1.7 km) north of his powder mill along Lynn Camp Creek. The Courier Journal (January 30, 1928) carried the following article on happenings 100 years ago for the year 1828 (Anon. 1980, p. 4).

Brookings Street [Sterrett] and Company advertised that they had leased Aetna Furnace and New Aetna Forge and would make castings, hollow ware and machinery and bar iron. The Powder Works of S. Brookings, in the same neighborhood, would supply unlimited quantities of powder on order. [I have tried to find the original reference, but have not had any success].

Another Courier Journal article, dated March 26, 1928, taken from a report to the Louisville Public Advertiser in March 1828, contains the following extract (reprinted by Cyrus Edwards, 1940, p. 352):

> Sam'l S. Bookings, Fountain Mills, Hart County, advertised that much pains were taken to maintain his powder at high quality and that agents were required to sell it at uniform prices, $5.50 per keg of 25 pounds [11 kg] for rifle powder, $3.00 a half keg for artillery powder, whole keg $5.00. This powder answers well for musket, cannon or blasting. Mr. Bookings added that the iron works were in full blast conducted under the name of Brooking, Sterrett & Company. These works had always on hand a full supply of castings, for which Gray & Stewart, Louisville, were agents." [I have tried to substantiate this ad in and around the above date, but could not locate the reference.]

Anonymous (1980, p. 4; extract probably from a Cyrus Edwards newspaper article) says:

> Just how long this firm of Brookings, Sterret [t] & Company continued to operate the furnace does not appear. It is not known whether there was any subsequent leases of the property. The writer of this article wishes to answer the above question, as he has an old deed, bearing the date of 5th of June, 1833 between Nancy D. Bookings, Executor and widow of Samuel S. Booking, Decd., and others to Thomas Gibson, transferring the tract of land upon which was located the powder works. This deed was found in the attic of the old log home of Thomas Gibson, the last person to operate the Powder Mills. He died in 1867. Powder was made here for the Civil War. The writer also bought one of the old iron kettles in which powder was made, from the heirs of Thomas Gibson, the kettle at the time it was purchased was under the eave of the old home to catch water. The writer knows of four other of these kettles. They are 42 inches [106.7] cm across the top and about 18 or 19 inches [45.72 or 48.26 cm] deep. In these kettles Sulphur and Saltpeter were dissolved into this liquid charcoal burnt from red wood and leatherwood was added. The charcoal absorbed the liquid, and when dried it was ready for use. The last clause was given the writer by Mr. David Graham, whose father William Shelton was the manager of the upper mill.

Presence of the powder, saw, and grist mills, promoted the growth of a small community. An operation of this size required a large support population to maintain production and provide basic services. An undated letter by Mrs. Charlie Wheeler (circa 1928, in Anon. 1980) describes some of the activity around the community of Powdermills.

> Powdermills is a little village situated in a fertile valley, surrounded by high hills and tall cedar trees, encircled by Lynn Camp Creek, with the most wonderful waterpower in all the country. One hundred years ago this same Powdermills was the most thriving village in the country, consisting of a grist mill, carding machine, where wool was taken and carded into rolls, these spun into thread and woven into cotton cloth by our grandmothers, and an old time saw mill that sawed lumber with a crosscut saw. All these were operated with water power. This same mill sawed the lumber that built the old powdermills at this place. The powder made here was used in the war between the States.... Near this place was the old Furnace, of which my grandfather, John Davis was the foreman of the forge plant moldin; kettles, skillets, oven, lids and all kinds of iron ware, used in those days. ...

In a map drawn for R. C. Ballard Thruston of the Filson Club by Cyrus Edwards in 1932, the location of prominent Hart County geographic features are shown. The old Aetna Furnaces and the powder mills are indicated. Also included is a powder mill date of operation "1810 to 1812".

The Historic Highway Marker found near Linwood on US 31-E says the powder mill was the first in Kentucky to make commercial gunpowder (around 1793, Richard Foley established a powder mill in Lexington, Kentucky; there are gunpowder advertisements by his family in the Kentucky Gazette through 1804). And the Fountain Mills was in operation during the War of 1812 through the Civil War. As outlined, operational periods have been staggered because of death, explosions, decay of the physical plant and change of ownership.

Craddock Powder Mill was owned and operated by John Craddock in northwestern Hart County. By 1820 the powder mill had ceased operation (1820 U. S. Federal Census). The exact location is still under investigation. Probably it is located south of Wheelers Mill on Nolin River in the vicinity of Craddock Cemetery. This is a logical place to have a powder mill, especially since several large saltpeter caves are known in its vicinity, e.g. Granny Puckett, Riders Mill, Lone Star, and Peter Caves.

The 1820 U. S. Federal Census records the following information about the unknown location of the Whitman & Ferris American Powder Mills:

> Whitman & Feris Am powder mills, Raw materials employed Salt Peter Sulpher and Coal. The quantity annually consumned 2000 lbs [907 kg] of saltpetre 325 lbs [147 kg] of sulpher and 350 lbs [159 kg] of coal [.] The cost of annual consumption $500. The number of persons employed 2 man. Machinery one water wheel and 11 pessels [pestles] the whole in operation [.] Expencetives [expenses] amounts of capital invested $150 amounts paid annually for wages $8 [.] Amount of continjent [contingent] expenses $150. productions. The nature and manner of articles manufactured Gun Powder market value of Articles annually manufactured $1250 [.] This establishment is on the decline at this time [.] the demand for and sale of its manufacturers is not good at this place [.] The powder making business has been carried on extensively during the last man [sic.] there are three Powder Mills standing idle and two that has been blown up and saw mill all out of repair and going to Destruction [.] The above named Mills Situcled [situated] on Lynn Camp Creek 2 miles below Aetna furnace and was formaly owned by John Coats [Courts].

This is an early reference of a powder factory using coal as the carbon source rather than charcoal. Coal is locally available from Pennsylvania deposits in the Brush Creek Hills of northern Hart County.

Whitman & Ferris (1820 U. S. Federal Census) identify 5 additional Hart County sites, all of which seem to be on Lynn Camp Creek. Two are obviously identified as part of the Courts establishment; but who owned and where on Lynn Camp Creek were the other three sites? We may never know; the Court House at Munfordville was destroyed by fire on January 3, 1928; and all of the public documents were destroyed (Anon., 1980, p. 5).

In 1810, Barren County hosted two powder mills, annually producing 220 pounds (100 kg) of powder, valued at $73.00.

Gorin (1929, p. 52) says, "in 1813 a powder mill was erected on Coon Creek, south of Skegg's Creek, not far from the State road, where powder was made during the war of 1812-15."

About a mile (1.6 km) west of the town of Nobob, John Courts and Braxton B. Winn built their powder factory in 1812 or 1813 (Gorin, 1929, p. 18; and Simmons, 1940). It was operated for "... two or three years and furnished powder more than sufficient for the consumption of the county" (Gorin, 1929, p. 18). As late as 1940, the old dam and mill race could still be seen in the creek bed (Simmons, 1940). Some of the saltpeter converted at this powder installation came from Payne Saltpeter Cave, Barren County. This cave was owned and operated by General Alexander Elliott Spotswood, a grandson of one of the Colonial Governors of Virginia (Alexander Spotswood).

Another name for Nobob Creek is Flathead Creek. In 1814 or 1815 the powder mill blew up and sent a workman flying out into the air, smashing his head in the creek bed. For a long time thereafter the creek was known as Flathead (Rennick, 1984, p. 214). Gorin (1929, p. 18) says several men were wounded in the explosion and the mill was abandoned. This would place the end of this industry at the start of the national economic recession that followed the War of 1812. It was not cost beneficial to rebuild the powder mill.

Edmonson County was part of Warren County in 1810. There were two powder factories collectively producing 400 pounds (181 kg) of gunpowder valued at $173.00.

T. O. Chisholm (1892, p. 5) says the Wright brothers erected a floating mill up river from Mammoth Cave and made gunpowder in 1812. This is how Floating Mill Island and Floating Mill Hollow received their namesakes. The saltpeter came from Longs (Wrights, Grand Avenue) Cave. Chisholm says,

> ... on Green River near by was a powder mill erected on a flat boat, and to this mill the saltpetre was carried, where it was manufactured into gunpowder. This was in turn sent down Green River into the Ohio, and on down the Mississippi to New Orleans, and largely to the home-made gunpowder of the Wright Brothers at Grand Avenue Cave was due the memorable victory of General Jackson over Sir Edward Packenham and the British.

Fortescue Cuming's (in Thwaites, 1904, p. 135), Sketches of a Tour to the Western Country covering the years 1807 to 1809 describes the operation of a floating grain mill. He says, "these kinds of mills are of a very simple construction--the whole machinery being in a flat [boat], moored to the bank, and the stones being put in motion by the current. They have but little power, not being capable of grinding more than from fifteen to twenty bushels of wheat per day." I would not expect the floating powder mill to be any more efficient than the kind described by Cuming.

The 1810 Federal Census of Green County records one powder mill, producing 120 pounds (54 kg) valued at $40.00.

John Courts had a close competitor about 4.5 miles (7.2 km) east of his Fountain Mills. The Fairthorne Powder factory is found on Big Brush Creek below Brush Creek Baptist Church (Lowe and Scott, n.d., p. 31, 48). This was originally an iron furnace built about 1800. During the War of 1812, it manufactured cannon balls and gunpowder.

Based upon a review of place names found on standard 7.5 minute topographic maps, two additional powder factories are suspected. One is found on Powder Mill Branch, a tributary to Sulphur Creek in Adair County. The Powder Mill Branch site east of Columbia may be the one listed in the 1810 Census. This factory produced 12,000 pounds (5443 kg) valued at $4000.00. The other is Bombshell Creek, a tributary to Marrowbone Creek, Cumberland County. This last site may be named for the geodes or "bombshells" found in the creek bed.

A review of gunpowder factories was made for a 7 county area of central Kentucky. Twelve powder mills are inventoried from published and unpublished references. All of the known sites are positioned along or near major wagon roads or along navigable streams (George 1986, p. 192). Span of operation ranges from 1810 through 1865. Periods of sporadic operation are typical of powder mill activity throughout Kentucky. This is related to explosions, change in ownership, disrepair of installation and economic demand. Criteria for the longevity of powder mills is related to severity of explosions to the installation and the financial willingness of the owner to rebuild. U. S. Federal Census records give a distorted view of the quantity of gunpowder produced in Kentucky. Production figures are believed to represent powder slated for export.

Sincere thanks is extended to Mr. Marion O. Smith for locating the Coxe 1810 Federal Census review. Mr. Gary O'Dell found several early gunpowder advertisements appearing in Lexington newspapers. The staff at The Filson Club, Louisville, Kentucky were instrumental in locating the 1820 Census data as well as other period references to powder mills in Kentucky. The staff in the Kentucky Room, Louisville Free Public Library, were also helpful in finding much needed references used in this research. Mrs. Diana Emerson George proof read the manuscript, and offered helpful suggestions for the improvement of the manuscript.

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NOTE: Angelo I. George has reciently published an article, "Saltpeter and Gunpowder Manufacturing in Kentucky" in The Filson Club History Quarterly, Vol. 60, No. 2, April, 1986, pp. 189-217.

SALTPETER AND THE WAR OF 1812

Stuart S. Sprague
(Met Grotto News, 1066)

Saltpeter is one of the three ingredients without which gunpowder cannot be made. During the War of 1812, the production of saltpeter in western caves made possible the prosecution of the war. Without this source of saltpeter, the United States would have been forced to surrender to England.

One of the three necessary ingredients of gunpowder is saltpeter. During times of peace, foreign sources, especially British India, were used. However, from colonial times it was known that stable sweepings, dirt from old chicken coops and earth from dry caves could produce saltpeter. During the colonial period and more particularly during the Revolutionary War various colonies (by means of bounties) encouraged the domestic production of saltpeter.[1] The Continental Congress was sufficiently concerned about obtaining gunpowder to create a Committee on Saltpeter.[2] With the return of peace, interest in the saltpeter industry flagged. The Tariff of 1789 put saltpeter on the free list.[3] This effectively eliminated saltpeter production in all areas within easy reach of east coast seaports where transportation costs were not sufficiently high to counterbalance higher production costs. The price of labor in the people poor United States was far more costly than that of British India. The obvious result of America's tariff policy was the development of an indigenous industry in the west and the demise of whatever domestic saltpeter manufactures which had existed near the seacoast.

The movement westward accelerated this trend. The rapid development of the backcountry and the expansion of new territories for settlement at the expense of the lower piedmont and tidewater created an ever expanding market for Western saltpeter. The west did not contain <u>old</u> chicken coops or old stables. The sole source of supply was "petre caves."

By 1800 Wyandotte Cave, Indiana; Madison's Cave, Virginia; Organ Cave, West Virginia; Mammoth Cave, Kentucky; and at least twenty-four other caves were known producers of saltpeter.[4] Tennessee, Kentucky and Missouri were among the leading saltpeter producing areas.[5]

The process of manufacturing saltpeter is not complicated. "The earths which yield the lixivia" are put in hoppers and leached with water. The soluble "nitro" dissolves in the water and this mixture, the "liquor", is heated and the saltpeter allowed to crystallize out. Most of the necessary equipment could be made by any clever carpenter so that to become a saltpeter manufacturer required but a small initial outlay. This was particularly true when many cave bearing lands had no settlers. For example, "James McDonald of Bonhomme, and his two sons, went to some caves on the Gasconado River to make salt-petre, and in a few weeks returned with three-thousand weight to Saint Louis."[6] If the saltpeter sold at ten to fifteen cents a pound, this would have been a very profitable venture, considering the value of the dollar in that day. Masses of saltpeter weighing between one hundred and eighteen hundred pounds apiece were not uncommon at this period. Three men often would produce a hundred pounds of saltpeter a day, though half that amount was considered a good day's work. A hundred pounds of "petre-dirt" would produce fifty pounds of saltpeter.[7]

America was fortunate indeed to have such extensive saltpeter works in the West that by 1810 over 400,000 pounds were produced annually.[8] When the War of 1812 broke out and America was cut off from British India and other foreign sources, the West provided the technical know-how and the knowledge of other petre caves which could be tapped. Placing saltpeter on the free list of the 1789 tariff proved a boon; by making the production of saltpeter unprofitable in areas easy of access of the Atlantic seaboard, the Congress had unwittingly kept her saltpeter centers out of easy reach of any invading power.

With the outbreak of the War of 1812, the price of saltpeter at the great seaport cities soon doubled. The profits that could be realized in the West became "so great, as to set half the western world gadding after nitre caves..."[9]

Saltpeter caves became expensive. Mammoth Cave which went for $400 in 1812 was sold within a few months for $10,000.[10] The cave no longer was locally owned. Hyman Gratz, a wealthy Philadelphian who was to ship to Philadelphia by mule back or cart the lion's share of Mammoth Cave's production was the new owner.

Most other owners, it appears, sent their saltpeter production to New Orleans or Saint Louis.[11] Mammoth Cave proved to be the nation's largest producer, a figure of 400,000 pounds commonly given for the total production of this single cave during the war. This figure is roughly equivalent to the total production of the United States for 1810. Cabins to house the "petre monkeys," the miners who dug the "nitre dirt," were built; slaves were purchased; a plank road within the cave that was for nearly a quarter of a century in such good condition as to be compared with a carriage road was constructed; nearly fifteen hundred acres of land to provide wood for the furnace and to guarantee complete ownership of the cave were purchased.[12] Vats twelve to fifteen feet long, eight to ten feet wide and four to five feet deep constructed from "logs, split into halves and from small trees" were made.

"... These vats were ingeniously constructed. The logs were rudely grooved and placed into two layers, one resting on wooden supports with curved surfaces down, the second with convex surfaces fitting into the grooves of those below." In this manner the "liquor" was allowed to drip "into small pits near the corner of the vats, from whence they were constructed to a large reservoir to be pumped to the entrance."[13] The two inch tulip and oak pipes which ran from the vats to the entrance were constructed in sections. One end of each section was tapered like a pencil and was so constructed that it would fit into the next section forming a fairly tight joint. The pipes were augered by hand, extension pieces of drilling equipment permitting the worker to drill the entire length of the log. The pipes were imbedded in cairn-like stone mounds where the length of the pipe line.[14]

Men carried the "petre dirt" from the far recesses of the cave to collecting points where oxen "were kept, day and night, in the cave hauling the nitrous earth," ... to the vats and hoppers.

Today one can see the relics of the miners in situ. The mattock marks, the faggots of a thumb's thickness, the ladders, plank roads, vats, hoppers, water pipes, oxen cart tracks that remain make an indelible impression. To have seen the "petre works" of Mammoth, the even more spectacular remnants at Big Bone, or those of other caverns forces one to realize the size of the operation and the cleverness of the men in creating the necessary wooden structures for the production of saltpeter.

In "Big Cave," Rockcastle County, Kentucky, a cave scarcely mentioned in the literature, sixty to seventy men were employed. This cave runs completely through a mountain spur and oxen were taught to pass through the cave, driverless.[17] Not all saltpeter produced in the West was sent to the East to be manufactured into gunpowder. For example in Kentucky "near Linn Camp was a very extensive powder-mill establishment."[18]

How much gunpowder and how much saltpeter was produced during the war years will never be known.[19] Nevertheless it was sufficient for the needs of the nation. The words written by Horace Carter Hovey, America's first speleo-historian, nearly seventy years ago are as true today as when they were newly minted: "Emphasis should be laid on the fact, not mentioned in any history of the United States, that our War with Great Britain, in 1812, would have ended in failure on our side had it not been for the resources so abundantly furnished by American caverns for the home manufacture of saltpeter at a time when by a general embargo we were wholly cut off from foreign sources of supply."[20]

SALTPETER PRODUCTION (1810)

STATE	COUNTY	COUNTY TOTAL	STATE TOTAL
Virginia	7 Counties		59,175
Kentucky	Barren	18,200	
	Clarke	1,500	
	Christian	250	
	Cumberland	6,223	
	Estill	19,937	
	Fleming	113	
	Floyd	5,515	
	Greenup	7,970	
	Grayson	1,353	
	Henderson	2,260	
	Knox	10,105	
	Montgomery	44,575	
	Ohio	900	
	Pulaski	459	
	Rockcastle	7,390	

SALTPETER PRODUCTION (1810)
(continued)

STATE	COUNTY	COUNTY TOTAL	STATE TOTAL
	Wayne	51,785	
	Washington	40	
	Warren	22,850	201,425
Tennessee	Green & Campbell	2,133	
	Jackson	5,000	
	Smith	10,000	
	White	29,695	
	Warren	100,000	146,828
			407,428 TOTAL

Source: Niles' Weekly Register II, No. 39, p. 213

FOOT NOTES

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2. Douglas, Henry H. Caves of Virginia Falls Church, Virginia: Virginia Cave Survey, 1964

3. Clark, History of Manufactures I, 288

4. Douglas, Caves of Virginia, p. 49; Hovey, Horace C. Celebrated American Caverns, Cincinnati: The Robert Clark Company, 1896, p. 53; Mohr, Charles E. and Sloane, Howard N. Celebrated American Caves: New Brunswick, N.J.: Rutgers University Press 1955, p. 133;
For information regarding the earliest saltpeter caves of Kentucky and their exploitation by farmers on rainy days to supplement their income see Hariette Simpson Arnows' Flowering of the Cumberland, New York: The Macmillan Co., 1963, pp. 288-291 and to a lesser extent her Soodtime on the Cumberland, New York: The Macmillan Co., 1960, p. 39. By 1775 the road to a cave near Mill Springs, Wayne County, Kentucky, was known as the Salt Peter Cave Trace.

5. Bradbury, John Travels in the Interior of America in the Years 1809, 1810 and 1811; ... London: 1819, pp. 253-257; Michaux, F.A. Travels to the Westward of the Allegheny Mountains, in the States of Ohio, Kentucky and Tennessee, London: 1805, pp. 154-155

6. Bradbury, Travels, pp. 256-257

7. Ibid.; Hovey Celebrated American Caverns, p. 53; Hovey, Horace C. and Richard Ellsworth Call, Mammoth Cave of Kentucky, Louisville: John P. Morton & Co., 1897, p. 10; Davidson, Reverend R. An Excursion to the Mammoth Cave, Lexington: 1840, pp. 48-49

8. Niles' Weekly Register II, No. 39, May 30, 1812, p. 213; Douglas Caves of Virginia, p. 36; at the time 114 rounds could be made with one pound of gunpowder. E. I. Dupont DeNemours & Co. Dupont: The Autobiography of an American Enterprise, Wilmington, Delaware, p. 10

9. Bird, R. M. Peter Pilgrim: Or a Rambler's Recollections, 2 Vols. Philadelphia: Lea & Blanchard, 1838, II, pp. 93-94; for saltpeter costs see Dutton, William S. Dupont: 140 Years, New York: Charles Scribner's Sons, 1949, pp. 50-51

10. Jillson, Willard Rouse A Bibliography of Mammoth Cave (1798-1949) Frankfort, Kentucky: Roberts Printing Co., 1953, p. 8

11. Hovey, Celebrated American Caves, p. 56; Clark, History of Manufactures I, p. 345

12. Bird, Peter Pilgrim II, p. 80; Davidson, Excursion to Mammoth, p. 48; Hovey, Celebrated American Caves, p. 67; Hovey, Mammoth Cave, pp. 10-11, 27, 57; Jillson, Mammoth Cave Bibliography, p. 10; Clement Eaton, The Growth of Southern Civilization 1790-1860, New York: Harper & Bros., 1961, p. 64 states that slaves were but infrequently used in dangerous occupations, which would indicate that being a petre monkey was not considered dangerous.

13. Mohr, Celebrated American Caves, p. 133

14. Ibid, p. 122; personal observations at Mammoth Cave, March, 1961

15. Bird, Peter Pilgrim, p. 109

16. Barr, Caves of Tennessee passim; Hovey, Mammoth Cave, pp. 25-27; Martin, Mammoth Cave, p. 25; personal observations in West Virginia, Kentucky, and Tennessee caves.

17. Allen, William B. A History of Kentucky: Embracing Gleanings, Reminiscences, Antiquities, Natural Curiosities, Statistics, etc., Louisville: Bradley & Gilbert, 1872, p. 137; Collins, Lewis, Historical Sketches of Kentucky, Cincinnati, 1850, pp. 500-501

18. Allen, History of Kentucky, p. 125

19. Other Saltpeter producing caves of the period include caves of Wayne and Rockcastle County, Kentucky; Wyandotte Cave, Indiana; Madison's Cave, Clark's Cave, The Lee County Saltpeter Cave, Virginia; the Lost Cave above Franklin and Mill Run Cave, Pendleton County, West Virginia; Cumberland Caverns, Tennessee. Allen, History of Kentucky, p. 137; Collins, Historical Sketches, pp. 500-501; Folsom, Franklin, Exploring American Caves, New York: Crown Publishers, 1956, pp. 51, 142; Davies, William E. West Virginia Geological Survey Volume XIX Caverns of West Virginia, 1949, pp. 38, 219; Hovey, Celebrated American Caves, pp. 126, 156; Martin, Joseph A New and Comprehensive Gazeteer of Virginia, Charlottesville: 1835, pp. 382, 416; Stelle, James Parish, The Wyandotte Cave of Crawford County, Indiana, p. 74. Big Bone Cave produced approximately 20,000 pounds of saltpeter during the war. Morris, Eastin The Tennessee Gazeteer, or Topographical Dictionary, Nashville: W. Hasell Hunt & Co., 1834, p. 2

20. Hovey, Mammoth Cave, p. 11

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Various state cave guides published with the cooperation of the National Speleological Society have proved helpful such as Henry H. Douglas's Caves of Virginia, Falls Church, Virginia: Virginia Cave Survey, 1964; William E. Davies, Caverns of West Virginia, Volume XIX of the West Virginia Geological Survey 1949; Thomas Barr, Caves of Tennessee, 1961.

Important early guides to Mammoth Cave include R. M. Bird's Peter Pilgrim: Or A Rambler's Recollections 2 Vols., Philadelphia: Lea & Blanchard, 1838 and Rev. R. Davidson's An Excursion to Mammoth Cave, Lexington, 1840.

One difficulty in studying War of 1812 saltpeter caves is that since far more caves were used during the civil war for this purpose; unless one has an early written source, it is next to impossible to determine whether the cave was used at the earlier period. In this respect the following proved most useful: Joseph Martin's A New Comprehensive Gazetteer of Virginia, Charlottesville, 1835; Lewis Collins Historical Sketches of Kentucky, Cincinnati 1850; William B. Allen's A History of Kentucky, Embracing Gleanings, Reminiscenses, Antiquities, Natural Curiosities, etc., Louisville: Bradley & Gilbert, 1872; Easin Morris's The Tennessee Gazeteer, or Topographical Dictionary, etc., Nashville: W. Hasell Hunt & Co. 1834.

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Hezekiah Niles' Niles' Weekly Register printed the returns of the third census regarding saltpeter production from caves of the United States which enables one to pinpoint production of this period.

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MAMMOTH CAVE IN THE YEARS 1836-1844

Thomas C. Barr, Jr.
(D. C. Speleograph, 1957)

When Frank Gorin (great-great uncle of Nashville Grotto member Tank Gorin) owned Mammoth Cave in the 1830s, he employed a negro, Stephen Bishop, as guide and explorer. Virtually all the important parts of the "Old Cave" were discovered by Bishop and members of his parties. It was of interest to me to read the account entitled "An Excursion to the Mammoth Cave and the Barrens of Kentucky", by the Rev. R. Davidson (Lexington, Ky., A. T. Skillman and Son, 148 pp., 1840), because Davidson's excursion, made in October of 1836, was during the time of major exploration. Notes from this book are reproduced below.

Traveling down the Green River (named for a man named Green, not because of its color), Davidson landed at Henderson, where he hired a barouche (a four-wheeled carriage with two passenger seats facing each other and the driver's seat in front). He passed through Hopkinsville, Elkton, Russellville, Shakertown, and Bowling Green. At that time a magnificent turnpike was being constructed from Bowling Green to Louisville; some of it was even MacAdamized! Prior to the turnpike, slackwater navigation was of great importance. Approaching the cave, he crossed the Barrens, which now was growing up in thick stands. Davidson attributes the lack of trees on the Barrens, which were an extensive prairie, to burning of the grass by hunters, who sought to drive out the game. When the burnings were stopped, then the trees began to grow. Sir Walter Scott's words--"Kentucky's wood-encumbered brake"--did not apply here. The region which we now call the Mammoth Cave Plateau was in 1836 a sort of park, with stands of blackjack oak interspersed with grassy meadows. Davidson mentions the many sinkholes which dot the landscape, and describes a huge sinkhole just south of Bowling Green where a stream emerges on one side and drives a grist mill, then disappears again on the other side of the sink. This is undoubtedly Lost River.

Entering Mammoth Cave, with Stephen Bishop his guide, Davidson received, as did each member of his party, a candle. The guide carried an oil lamp and a flask of oil, plus a basket full of extra candles. An air current blowing from the cave extinguished the candles. Davidson attributed this to "the uniform temperature of the interior during the year." An interesting comment follows--"Very soon after entering, the cave narrows to a degree that requires even a man to stoop, much more would it effectually exclude a mammoth." Thus it is virtually certain that the Historic Entrance to Mammoth Cave, specifically in the region called "Houchins' Narrows", has been greatly enlarged since 1836. On the walls of this part of the cave I have noticed broken surfaces probably due to blasting, about three or four feet up from the present floor. One must also remember that oxen were used as work animals during the saltpeter mining operations in the War of 1812, and that they had to be gotten through this stoopway, so the approximate dimensions can be guessed at. 400,000 pounds of saltpeter were said to have been mined in Mammoth "during the last war". There was considerable interest in saltpeter mining at that time, and Davidson relates an interesting episode about a man named Wright who was killed in nearby "Saltpetre Cave" (Salt's Cave?) when his light went out and he slipped into a pit. The Giant's Coffin was at that time known as the "Steamboat". Gothic Ave. was the "Haunted Chamber"; the origin of this appellation is related by John Croghan (Rambles in the Mammoth Cave in the year 1844); a new saltpeter miner, confident of his ability to find his way about in the cave alone, was sent to the Salts Room--a side passage off of what is now known as Gratz Avenue, the lower level extension from Gothic Avenue. On the way back he became panic-stricken and ran back and forth until his light fell from his hand and went out. After several hours his absence was noticed, and a half-dozen Negro workers were sent in search of him. They were stripped to the waist--their usual working attire included no shirts--and carried torches. The lost miner was by this time crawling about on hands and knees and was convinced that he was in Hell, only waiting for the commencement of eternal torture. When he saw the rescue party approaching, half naked, and carrying torches he thought they were the very Devils whose arrival he feared, and ran screaming down the passage until he tripped and fell on his face. "By dint of much pulling and shaking he was convinced that he was still in the world and in the Mammoth Cave." Returning to Davidson's excursion--he saw the "Bat Room" (Little Bat Avenue or perhaps Audubon Avenue), where bats "cling to the walls by hundreds like bees". There are now no such large colonies of bats in Mammoth Cave; in Long Cave and Colossal Cave in Mammoth Cave National Park and in nearby James Cave huge bat colonies of *Myotis lucifugus* and *Myotis sodalis* occur, and we may assume that the Mammoth colonies were probably these species. Continuing in the "Main Cave" (now called Broadway), he saw the Cascade, the Church and Pulpit, and the

"Temple", which about 1835 was renamed Chief City by E. F. Lee, an engineer who published a map of the cave. Gorin's Dome, named for "its discoverer and late owner", Frank Gorin, was a major attraction. Davidson took the traditional old tour through the Labyrinth, and looked out the Window, an opening part way down the wall of the Pit (now called Washington's Pit). He even joined the guides in chimneying down near the bottom, and came back covered with mud, to the amusement of his companions. "This was certainly anything but the cave of Trophonius, into which, if anyone ventured, he never laughed again."

They then passed "a frightful chasm called the Bottomless Pit", which they crossed on a "rude ladder", and crawled for a quarter of a mile to the River, discovered "only about a year ago." White fish were reported here, but they found "only a poor miserable mud-fish, caught with the hand by the guide, near the shore, blinded by the light." This was probably a soulpin, a race of Cottus bairdii; one of these I recently saw in Roaring River in Mammoth Cave, and it is common in caves and springs. There had been a canoe on the River, but it was not there at the time of the visit in 1836, having been carried away by a flood. Some of Davidson's companions later took another boat and traveled for "two miles" or more beyond. The trans-fluvial passages of course led to the discovery of Silliman Avenue, Cleveland's Cabinet, and other areas of the cave.

Davidson was appalled at the extensive name-writing on the walls and ceiling of the cave. For him, it was "a practice which may indeed immortalize the visitor, and serve as an agreeable remembrancer to succeeding acquaintances, but which shockingly mars the wild grandeur and magnificence of the scene."

A few additional items of interest are contained in Croghan's book, published in 1844. These are outlined in the following paragraphs:

As one approached the entrance to the cave, he passed the ruins of saltpeter furnaces and large mounds of ashes. Three to five pounds of nitrate are said to have been obtained from a bushel of earth, and if the cave earth were left in the cave for three years, it became reimpregnated with nitrate. The "Rotunda", the "Second Hoppers", and the "Lixiviated Earth" are terms now used by the guides, and originated about this period. $20,000 worth of fixed alkali was used in the year 1814 alone to produce saltpeter. In the Rotunda, the guide, Stephen Bishop, built fires to light the room. Jenny Lind's Armchair was then called the "Devil's Armchair"; one wonders if the Swedish nightingale would have felt honored if she had known what the old name had been.

Wandering Willie's Spring got its name from an itinerant and long-haired violin player, the son of a Cincinnati clergyman, who adopted the name of "Wandering Willie". He spent the night in the cave, sleeping on the bare ground, near the spring. The name, "Giant's Coffin" was now in vogue. The "Sick Room Cave" was the name of a side passage where an explorer became suddenly ill, supposedly because he was smoking a cigar in a crawlway. Epsom salts were abundant and are described as occurring in a part of Broadway near what we now call the Floating Cloud Room. Wright's Rotunda was then called "Cross Rooms". Vandals visited the "Fairy Grotto", a passage off of Broadway beyond Wright's Rotunda, in 1835-36, breaking off many beautiful formations.

As one enters Dante's Gateway and the Wooden Bowl Room, he drops down a place called then "The Steeps of Time"; why this name, nobody knew even then. A description of Pensico Avenue follows in Croghan's account; this passage, leading off just beyond the Bottomless Pit, is a large avenue a half mile in length; it is now usually corrupted into "Pensacola Avenue." According to Croghan, who was an owner of the cave, Echo River was first crossed in 1840. I found Stephen Bishop's name a short distance inside Ganter's Avenue, which leads off to the left a few hundred yards past the boat dock. The "Pass of El Ghor" and "Silliman's Avenue" were names used at that time (1844). Visitors had to climb up a ladder to get into Mary's Vineyard, where botryoidal calcite resembles clusters of grapes. The term "oulophilites", a word applied to gypsum flowers, was coined by Prof. Locke after seeing the flowers in Cleveland's Cabinet--the name, Cleveland's Cabinet, has nothing to do with President Cleveland--the "Cabinet" part is used in the sense of a scientific collection, or "Cabinet".

Emerging from the cave after three days of sight-seeing, Croghan could only exclaim, "It has no brother! It has no brother!" And on this ecstatic note he ends his book. ...But after all--it was his cave.

SALTPETER AND GUNPOWDER SUPPLIES DURING THE CIVIL WAR

Margaret Weesner
(Windy City Speleonews, 1974)

At the outset of the War Between the States, even before the firing at Fort Sumter, officials of the Confederate States of America were aware of the problems they would encounter in fighting a war. At that time the Confederacy had only about five hundred thousand firearms, most of which were old and in a state of disrepair[1], nor did the South have any way of manufacturing more firearms. Another shortage they experienced was of gunpowder. All supplies from Europe and the northern states had been cut off by the blockade, and the Confederacy had only two small powder mills, which were suitable only for local supplies[2]. There were other material shortages at this time also: steel, tin, zinc, leather, tools, hardware, medicines, lead, etc.[3] However, this paper will consider only how the South coped with the shortage of gunpowder, including what methods they used for obtaining and manufacturing it.

On February 10, 1861, the Confederate Provisional Congress passed an act authorizing the President or the Secretary of War to make contracts and employ workers to provide munitions for war.[4] This act included a provision for the establishment of powder mills and for the manufacture of gunpowder. In subsequent acts, the congress provided for Provisional Forces for the Confederate States and later for a regular army. On April 8, 1861, the Confederate Provisional Congress established an Ordnance Bureau, to be headed by Major Josiah Gorgas, a Pennsylvania graduate of West Point Academy. This bureau was in charge of supplying Confederate troops with all munitions, including cannon, hand pistols, shells and gunpowder.

Faced with the task of procuring munitions with limited funds, Gorgas set about obtaining arms from state units and contracting for equipment with private manufacturers in the South and abroad. He realized there were three ways of obtaining munitions: blockade-running, home manufacture, and capture on the battlefield. Of these, only the last was immediately helpful, although the others would be of vast importance later in the war.[5]

At first, supplies of saltpeter or niter, used in making gunpowder, were imported. Governor Brown of Georgia received a shipment of 150 tons of saltpeter with a proportionate amount of sulfur, also used in making powder, just before the Union blockade. Brown turned most of this supply over to the Confederate states, but it could not be expected to last longer than about three months.[6] Throughout the war, large amounts of saltpeter were obtained from blockade runners. In 1863, for example, one million nine hundred and thirty-three thousand pounds of saltpeter were acquired through shipments.[7] However, importation on this scale was expensive. One pound of gunpowder from blockade running cost three dollars, while home-manufactured powder could be purchased for fifty cents per pound.[8] Gorgas felt that home mnaufacture of saltpeter and gunpowder would be more reliable as well as considerably less expensive than blockade running. So on July 10, 1861, he appointed Colonel George W. Rains, an enterprising scientist, to the task of heading powder manufacturing.[9]

Rains knew that the dirt found in caves, which were common in the mountains of Virginia, Tennessee, Kentucky, Georgia, Alabama, and the states west of the Mississippi River, was a source of lime saltpeter. By mixing a solution of lime saltpeter with lye made from wood ashes, potash saltpeter could be made. The potash form was the material used in making gunpowder, along with small quantities of sulfur and charcoal. Not all caves contained saltpeter, and even today scientists are not sure what accounts for the presence of saltpeter in some caves and not in others, but it is thought to be caused in part by the presence of bat droppings.[10] There are several theories about the presence of saltpeter, but for our purposes it is enough that this gunpowder ingredient can be found in many southern caves.

In the fall of 1861, Rains published an article in the Augusta, Georgia, newspaper detailing how Confederate farmers could make saltpeter from caves on their property. In his article "Notes on Making Saltpetre from the Earth of the Caves," Rains described what equipment was needed and outlined in detail the procedures for procuring and refining saltpeter. He even gave suggestions on how many people should be employed at a small operation and what each person's task should be.[11]

Meanwhile, Rains was also starting government-owned saltpeter works. These operations were established in some of the larger limestone caves of

Tennessee, Alabama, Georgia, and states west of the Mississippi River.[12] Many of these cave operations were overrun by Federal troops during the western campaigns of 1861 and 1862.[13] An artificial niter bed was established in Richmond, and later beds were made in Columbia, Charleston, Savannah, Augusta, Mobile and Selma. These beds were large areas of earth set aside, often to be treated with human urine, where niter could be formed and later recovered with the same process used with cave dirt.[14] By late summer of 1862, the numerous Confederate saltpeter works were producing great amounts of saltpeter. In April it was reported that production was less than 500 pounds per day, but from the first of April to the end of May, 24,000 pounds had been recovered. By the end of June an additional 24,000 pounds were available for use in making gunpowder.[15]

Another of Rains's responsibilities was to establish powder mills in the South. His first project in 1861 was to increase the production of a small mill near Nashville so that it could supply A. S. Johnston's troops in Tennessee. The production there increased to 1,500 pounds per day by October and later to 3,000 pounds per day.[16] By February 1862 Rains had established a small powder mill in New Orleans, and by April 10, 1862, a large mill in Augusta, Georgia, worth three hundred eighty-five thousand dollars, had been built and put into operation.[17]

In April of 1862 General Gorgas, head of the Ordnance Bureau, saw a need to establish a separate administration for the mining of saltpeter and other minerals like lead and iron. On April 11, Major Isaac M. St. John was appointed head of the newly-formed Nitre and Mining Bureau. Under his direction, niter and other minerals were mined and refined during the remainder of the war. The niter-bearing area was divided into districts, with an officer in charge of each one. Each district was searched thoroughly for niter-producing caves, and mining proceeded under the direction of the district officers.[18]

After this time in the war, Vandiver, in his book on Confederate war materials, makes no further mention of shortages of saltpeter or problems in obtaining it. It might safely be assumed, therefore, that after 1862 the Confederacy had no trouble supplying its troops with adequate amounts of gunpowder. However, it is difficult to ascertain exactly how many and what sort of people were employed in manufacturing saltpeter or what was the size of the majority of saltpeter operations. In some dry caves, remnants of large and small mining operations still exist. The most common relics are vats and barrels, used for leaching the dirt for saltpeter, ladders and bridges for the miners to walk on, and assorted sizes of wooden shovels and scrapers used to scoop the dirt into bags for transporting.

A collection of papers of a cave superintendent in Alabama has been reviewed recently by Terry Tarkington in the Tennessee Valley Historical Review. According to Tarkington's findings (many of the papers are torn or otherwise made illegible), the life of the cave miner was one of "hardship and want." A superintendent of one works would often write to another begging for loans of "tallow, leather, kettles, wagons, mules, tools and food."[19] The Confederacy operated at least eight saltpeter works in northern Alabama: Sauta Cave (Jackson County), Long Hollow and Big Spring Caves (Marshall County), and Blue Mountain, Cedar Mountain, Nixon's, Culpepper, and Little Warrior Caves (Blount County).[20]

Saltpeter mining in Virginia seems to have been on an equally large scale as in Alabama. Out of two books describing the ruins at sites of saltpeter works in Virginia caves,[21] it appears that most of these operations were fairly large, even though most of the remnants of mining operations have been destroyed or carried out of the caves. For example, Burton Faust tells about widespread mining in Clark's Saltpeter Cave in northwestern Virginia. Here the relics include many wooden tools (metal was needed for making munitions) used to dig and scrape the dirt as well as chip rocks out of the way. Ladders, planks, sieves, and tally marks on the wall are among the other evidence of Civil War mining in this cave.[22] At Fincastle, Virginia, in the southwest section, dirt from the older town buildings was procured for saltpeter production. This town was the headquarters for District No. 3 of the Nitre and Mining Bureau and was considered by them to be very important as a center of mining.[23]

Other caves in Virginia show signs of smaller operations. One is Mebane Saltpeter Cave #1 in Pulaski County. This cave is only 160 feet deep; it contains mattock marks where dirt must have been dug out, but the leaching and processing of the dirt must have taken place outside the cave. Lawson's Saltpeter Cave in Scott County was definitely mined by a small number of people. The miner, John Sallings, left a record of some of his work in this cave, which had deep pits full of saltpeter earth. However, other caves in Virginia have

large V-shaped vats made of wood and elaborate systems of ladders and bridges, both of which are characteristic of large-scale operations.[24]

Some Tennessee caves show evidence of large mining operations also. Big Bone Cave in Van Buren County has several large (8 by 13 by 3 feet) square, wooden vats still standing. Calfkiller Cave in Putnam County has fourteen wooden vats, each about 3.5 feet wide and 10 feet long.[25]

It is hard to know who worked in the caves. Tarkington mentions that in Alabama it was not uncommon for slaves to do much of the labor in the caves, especially digging and hauling the dirt. Other workers were regular soldiers who served their military service in the caves, according to Tarkington.[26] Vandiver indicated that many of the workers were local residents who were eventually granted deferments from the draft because of their work in the caves.[27] In his "Notes on Making Saltpetre," Colonel Rains suggested that at least two or three men work at a small operation. Large operations may have had up to one hundred workers.

From these figures, we can see that saltpeter mining was indeed of great importance to the South during the Civil War. Confederate leaders knew there would be great need for gunpowder and organized the Nitre and Mining Bureau in order to better supply this need. All records seem to indicate that after the first of the war, Confederate forces had no lack of gunpowder. However, Vandiver talks in great length about other shortages which the South did not overcome as well as they did the one of saltpeter. Lead for making bullets was one of the biggest problems.[28] That the Confederacy was so well supplied with saltpeter and thus gunpowder was largely due to the organizational abilities of Gorgas, St. John, and Rains, as well as the abundance of niter-bearing caves in the South. Tarkington indicates that more than half of the South's gunpowder was supplied by internal production, the rest by blockade-running and capture from the North.[29] This would not have been possible had it not been for the abundance of saltpeter in southern caves.

FOOT NOTES

1. J. G. Randall and David Donald, The Civil War and Reconstruction (2nd ed.; Lexington, Mass.: D. C. Heath and Company, 1969), p. 252.
2. Ibid.
3. Frank E. Vandiver (ed.), The Civil War Diary of General Josiah Gorgas (Tuscaloosa, Ala.: University of Alabama Press, 1947), p. 57.
4. Frank E. Vandiver, Ploughshares into Swords: Josiah Gorgas and Confederate Ordnance (Austin, Tex.: University of Texas Press, 1952), p. 57.
5. Ibid., p. 62.
6. Ibid., p. 61.
7. Ibid., p. 104.
8. Ibid., p. 77.
9. Ibid., p. 75.
10. Burton Faust, "Notes on the Subterranean Accumulation of Saltpeter, Journal of Spelean History, 1 (Winter 1968), 3-11.
11. Major Geo. W. Rains, "Notes on Making Saltpetre from the Earth of the Caves," Augusta Steam Power Press Chronicle and Sentinel, reproduced from 1861.
12. Vandiver, Ploughshares, p. 76.
13. Ibid., pp. 122-23.
14. Ibid. p. 107.
15. Ibid., pp. 122-23.
16. Ibid., p. 75.
17. Ibid., pp. 76-77.
18. Ibid., p. 106.
19. Terry W. Tarkington, "Saltpeter Mining in the Tennessee Valley," Tennessee Valley Historical Review (Summer 1973), p. 21.
20. Ibid.

21. These works are: Burton Faust, Saltpetre Caves and Virginia History (Falls Church, Va.: Virginia Cave Survey, 1964), and Peter Hauer, "An Interim Report on Saltpetre Caves in the Virginias," York Grotto Newsletter (1971?).
22. Faust, "Virginia," pp. 42-45.
23. Ibid., p. 46.
24. Hauer, pp. 8, 11-22.
25. Larry E. Matthews, Descriptions of Tennessee Caves (Nashville: Department of Conservation, Division of Geology, 1971), pp. 3-21.
26. Tarkington, p. 21.
27. Vandiver, Ploughshares, p. 143.
28. Ibid., p. 268.
29. Tarkington, p. 18.

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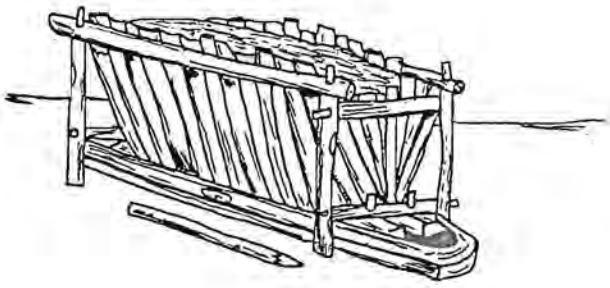

SALTPETER MINING IN THE CIVIL WAR

Richard Peterson
(D. C. Speleograph, 1967)

In order to discuss saltpeter (also spelled **saltpetre**) mining in any detail, it is necessary to give a short account of its use in the United States prior to the Civil War.

The first recorded instance of the manufacture of saltpeter was in 1639 in Massachusetts by Edward Rawson. His actions prompted the Massachusetts legislature to pass an act on June 14, 1642, which urged all families and towns to promote its manufacture.[1]

During the Revolution the value of the saltpeter caves was recognized and saltpeter was mined fairly extensively, but due to the lack of records no real details can be provided.

Records for the War of 1812 are also sketchy, but some statistics can be supplied. When the war broke out and there was a great need for the niter, there was a "niter fever" as Horace Hovey called it, which he likened to the gold fever in California in 1849. Kentucky was one of the main producers with an annual yield of about 400,000 pounds. Gun powder contains 75% niter, 15% charcoal and 10% sulphur.[2] It is doubtful that we would have been successful in the War of 1812 without the gunpowder that was produced from the nitrates of saltpeter caves.

After the outbreak of the Civil War, the Confederates' supply of gunpowder was cut off by the blockade, so the Confederates had to turn to locally produced saltpeter to use in the making of gunpowder.

An act for the organization of a corps of officers to supervise the working of the saltpeter caves was passed on April 11, 1862.[3]

On April 22, 1863, the corps of officers was changed into an independent Bureau of Nitre and Mining in the War Department, Confederate States of America. In addition to securing nitrate the Bureau was charged with mining or procuring iron, copper, lead, and other minerals. Section 3 of this act established that the Bureau should consist of "one Lt. Col. as superintendent, three majors as assistant superintendents, six captains and ten lieutenants . . . who shall have the same pay and allowances as prescribed for officers of cavalry of the same grade."[4] The superintendent of the Bureau was Lt. Col. Isaac St. John.

The government's interest in the small scale home production of nitrates is evidenced by the fact that there exists a form letter and pamphlet that would be sent in answer to queries about the manufacture of saltpeter. The following is one such letter:

To T. N. Cabell
Willow Brance
Nelson City, Va.

C.S.A. War Dept.
Richmond, Va.
Dec. 29, 1862

Sir: Your attention is especially invited to the enclosed printed suggestions for the manufacture of Nitre; and this Dept. would urge on you personally to engage as far as you conveniently can, and encourage others to engage in this work, which is felt to be of grave moment to the Government.

Most respectfully your,
James A. Seddon,
Sec. of War.

The pamphlet which was enclosed with the above letter was a home guide to saltpeter manufacturing. It emphasized techniques for small scale producers. Since caves usually contained large deposits and were worked by contractors, the pamphlet suggests several other places where saltpeter could be found and prepared for use. The places suggested were under old dwellings or Negro quarters, cattle sheds, slaughter houses, old mortar or plaster heaps, markets, tobacco shops, barns and other similar dry old structures.[5]

The suggested process for mining saltpeter according to the Bureau's pamphlet directed one to scrape off the top six to nine inches of cave earth and pack loosely into barrels which have about six inches of loose straw on the bottom. If there is too much clay in the earth, they suggest adding sand. The next step is to saturate with water and let it soak for twelve hours.

Then draw off the water and resaturate the barrel with the same water. Each barrel should be saturated at least twice and the water which is now called liquor can be used on other barrels of earth. The next step is to add ash lye and allow it to curdle and settle from ten to twelve hours. Pour off the clear part and boil off the remainder until it crystallizes. The pamphlet concludes by advising the worker to persevere patiently, disregarding slight discouragements and bearing steadily in mind that any contribution however small is a patriotic contribution.[6]

The greater part of the nitrate produced for the Confederacy was produced either by government works or those worked by private concerns contracted by the government. In Virginia, caves accounted for 156,307 lbs. of the total of 505,584 lbs. of nitrate produced up until September 30, 1864. By that time 1,735,531 lbs. had been produced in the entire country.[7]

The Nitre Bureau was no small operation. This can readily be seen by looking at the budgets for the Bureau which for January to June 30, 1864 was $9,500,000.[8] The next year the budget for the same period, January 1, to June 30, 1865, had risen to $12,500,000. Of this amount $2,500,000 was specifically for niter.[9]

Virginia was by far the leading producer of saltpeter in the Confederacy. Not counting very small operations, there are some thirty-five saltpeter caves in Virginia and another twenty-two in what is now West Virginia. These mining operations, as well as the caves varied greatly in size. They range from the rather large operation in Organ Cave, the world's fifth largest cave, probably requiring several dozen men, to Hanna Cave, a few miles away, where due to the small size of the cave only a few men could have worked at a time.

Since few if any records exist as to the actual method of operation of running these caves when they were being mined, our knowledge of what occurred at the mine itself is based mostly on the relics that remain. In the Virginia-West Virginia area, the best preserved set of relics can be seen in Organ Cave in Greenbriar County where there are remains of thirty-seven hoppers which were often used instead of barrels for leaching the dirt in the caves. In most caves the only evidence, however, are pick marks, heaps of dirt, and a few rotting boards.

Although Virginia was the biggest overall producer of nitrates, the largest single mining operations were further south in Alabama and Big Bone Cave in Tennessee. Big Bone even has a tramway still standing that was used to run carts of dirt back and forth.

These mines were considered strategic targets and were fought over from time to time, in small engagements.

Saltpeter caves and deposits were very important to the South. Without them the South would never have been able to keep its armies supplied with powder. Domestically produced niter amounted to almost one-half of the 3,455,000 pounds that were produced or imported by the Confederacy up to September 30, 1864.[10]

FOOTNOTES

1. Horace Hovey, "Saltpeter Caves", Scientific American, Vol 76, p. 291.
2. Ibid. p. 292.
3. War of the Rebellion: A compilation of Official record of Union and Confederate Armies. Vol. II, p. 594.
4. Ibid. p. 294.
5. Isaac St. John, Pamphlet on Saltpeter Mining published by Nitre and Mining Department, C.S.A. p. 2.
6. Ibid. p. 3.
7. War of the Rebellion, op. cit. Vol. III p. 698.
8. Ibid. p. 627.
9. Ibid. p. 779.
10. Ibid. p. 698.

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