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AN EXAMINATION OF THE LEMP BREWERY CAVE

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The Lemp Brewery Cave has been the subject of fascination for spectators since the 1840s, when German brewer Adam Lemp began modifications to a natural cave for lagering beer in St. Louis, Missouri. Lemp's success kept the brewery in operation until 1920 when the Lemp family sold the rights to the family property. During Lemp ownership, the lagering cave went through a number of modifications including the addition of a swimming pool and theater to suit family needs. The cave was abandoned until 1946, when a pharmaceuticals manufacturer, Lee Hess, purchased it and surrounding properties for use as a tourist attraction. The tourist cave was in operation until 1961, when the property was purchased by the Missouri Department of Transportation because it was going to be impacted by the construction of Interstate 55.[1] In March 2011, Cave Archaeology Investigation and Research Network (C.A.I.R.N.) researchers examined the remnants of the historic Lemp Cave, conducting an archaeological reconnaissance for the current property owner and for cavers. Accounts regarding cave use and chronologies were reviewed during pre-field investigations. C.A.I.R.N. documented and examined artifacts and architectural features in the Lemp Cave for comparison to the historic written accounts and oral histories. The following paper recounts the findings and conclusions from field investigations in regards to the extent of Lemp Cave use over time.

Background

In 1822, Gottfried Duden reported to brewers in his German homeland that the limestone caves in St. Louis were perfect for storing and aging beer. During the early 19th Century, a wave of German immigrants entered America due to political and religious unrest in Germany, and this saw an influx of German brewers into St. Louis.[2] According to a local reporter in 1857, until 1840 St. Louis had no particularly strong German character, but shortly after there was a sudden immigration explosion, and the town became 'inundated with breweries, beer-houses, sausage-shops, Apollo gardens, Sunday concerts, Swiss cheese, and Holland herrings'.[3]

Established in 1840, Johann Adam Lemp's Western Brewery was located at 37 South Second Street, between Walnut and Elm Streets, near the present site of The Gateway Arch. With business sales rising, a larger storehouse became necessary. Increasing demand for his beer led Lemp in 1845 to begin modifications on a natural cave in South St. Louis to age beer delivered by wagons from his Second Street brewery.[4]

Lemp's successful enterprise led him to become one of St. Louis's most prominent millionaires and by 1850, Lemp constructed a brewery building directly above the cave. Lemp's lagering cave consisted initially of three compartments for barrel storage, but further success required expansion.[5] A number of additional underground cellars were dug here, but eventually the introduction of mechanical refrigeration caves remedied the need for lagering caves. No longer needed for lagering, Lemp's brewery cave underwent whimsical modifications by other family members, such as the construction of the aforementioned swimming pool and theater.

Family problems and prohibition eventually caused the Lemps to sell the brewery and family grounds to the

International Shoe Company in 1922.[6] The cave served as a dump until 1946 when Lee Hess purchased it and adjacent properties, transforming it into a tourist attraction known as Cherokee Cave. Cherokee Cave ran from 1950 to 1961 when it and some surrounding buildings were purchased and partially destroyed by the Missouri Department of Transportation for the construction of I-55.[7] The remaining portion of the cave is currently under private ownership and is officially closed to the public.

Cave use for beer storage

Readily available underground storage in St. Louis afforded natural insulation where brewers would place ten- to fifteen-barrel casks on skids in caves. Caves were carved with arched ceilings and divided into sections so the whole space would not get warm while one section was being emptied. Ice chambers were sometimes added above the caves when these proved inadequately cool for lager beer. The use of caves became an important technique for lagering beer in the mid-19th century.

Early 19th-century American brewhouses were typically no more than two stories in height, often with ventilation such as a louvered cupola above. Traditional techniques and hand-operated equipment with limited height of buildings encouraged the process to spread out more horizontally until later in the 19th century. The process began with water which would be pumped to a reservoir found at the highest level of the brewhouse. It then ran downward into a copper kettle for boiling and down again into a mash tun, where it would then be mixed with malt to become mash. The grains were strained from the mash while it drained into the underback, then pumps would lift the mash back into the brew kettle for boiling into wort. Once the wort cooled enough not to kill the yeast, it flowed into large vats below, where the yeast would be added. The beer was then stored in cool underground caverns.[8]

One of the first caves documented in St. Louis for cold beer storage was known as the 'English Cave', owned by the McHose & English. In 1842 the business partners began developing a natural cave in the southern part of the city near the present day Benton Park. The cave measured 255 feet long, 40 feet wide, and, on average, 30 feet high. The cave was described in early reports as 'one room reached by a flight of fifty steps, and a second room ten feet below ... with a small spring falling from the ceiling ...' The English Cave was used for both storing 3,500 barrels of beer and as a subterranean drinking and entertainment establishment, which also served as an important retail outlet for the brewery.[9]

Lemp's cave was featured by a local newspaper in spring of 1845; it was about 100 yards long, divided (horizontally) into three compartments with an average width of 20 feet, storing 3,000 barrels.[10] By 1850, Lemp had become one of the larger brewers in St. Louis with production of 4,000 to 5,000 barrels per year, which called for expanded facilities.[11]

An early competitor of Lemp was the partnership of Julius Winkelmeyer and Frederick Stifel who, by 1847, four years after being established, needed a larger brewery due to their success. Their new Union Brewery produced between 3,000 and 4,000 barrels of beer in its first year of operation, and by 1850 was the largest beer producer in the city with 7,500 barrels of beer.[12] Much like Lemp's success, Winkelmeyer's rapid growth would need structural expansion, which required two underground cellars directly below the Union Brewery's Market Street site.[13] Winkelmeyer utilized a natural cave for preparing a two-level underground space which involved more complicated alterations than Lemp. Later reports noted the cellars had

> four-foot-thick masonry walls and stone and brick columns ... . the upper level functioned as the fermenting cellar, while the lower level was for the actual lagering of the beer.

The lower level cellar, about

> 40 to 50 feet below the street level, was divided into a main and two side galleries, [with] a bedrock foundation and graceful brick and masonry vaulted arches. Great wooden hogsheads, eight feet in diameter, lined the walls, resting on brick and oak rails.[14]

By the 1850s, further demand for Winkelmeyer's beer necessitated further expansion, and more extensive subterranean storage spaces were developed. This arrangement took advantage of the cooler temperatures deep underground to attend to lager's special needs.

Another brewer, Joseph Uhrig, also needed the proper facilities to produce lager beer. He

> purchased a large lot containing a natural cave perhaps ten blocks ... from his brewery site, [where he] excavated large lager cellars to store beer produced back at [his] Eighteenth and Market [Street brewery].

What had begun as a 40 foot long cave 42 feet underground had turned into tunnels that extended to a length of 210 feet and eventually enlarged.

> There were three main passages running east and west, with 15-foot ceilings of arched brickwork and floors 20 feet wide with shallow drainage trenches down their centers.

Thus, 'Uhrig's Cave' was set up much like the Lemp Cave with large lager cellars at some distance from the brewery, here acquiring a malt house and ice house above, along with a large beer saloon and dance hall.[15] Tables were eventually placed in a lager cellar for people to enjoy a nice cold beer, and the cave became a popular destination.[16]

After the Civil War the attitude toward brewing gradually became more scientific, concerned with precision engineering of the product and equipment. A significant advancement was the development of artificial refrigeration.[17]

In the span of 1845 to 1920, Lemp Cave went through many modifications to fulfill the owners' varying needs, so it was difficult to determine when exactly rooms were upgraded or altered for their purposes. According to architectural historian Susan Appel, during the period of 1810 to 1860, evolution of Midwestern breweries from primitive to more sophisticated was poorly recorded, and the chronology of this change is difficult to pin down. Historical archaeologist Herman Ronnenberg believes archaeology could assist the study of chronology of brewery architecture.[18]

> With the advent of lager breweries in America, architecture had to accommodate different needs. The longer, colder storage phase made the development of cold storage necessary. At first, brewers brewed in cold weather and used naturally cold areas such as caves or underground cellars to lager (age) the beer.[19]

Artifacts and architectural features within Lemp Cave

In 2011, C.A.I.R.N. conducted an archaeological and architectural assessment of cave features and noted artifacts in what was known as the 'Lemp Cave' portion of the larger Cherokee Cave system. The assessment did not include the manmade/non-cave brewery cellars beneath the Lemp brewery. The brewery cellars or lowest level of vaults feature limestone barrel-vaulted ceilings that rise fairly continuously from lower walls of the same material. The cave passage continues beyond the brewery cellars through an iron door. The assessment was to examine architectural features in the cave outside the cellars, which is considered Lemp's lagering extension into the cave due to business demand. A major contributor to this assessment was examination of all written material regarding the Lemp cave, interviews with historians and caving members of the local Meramec Valley Grotto, and examination of photographs. The historical artifacts documented in the cave were considered, but were regarded 'loosely' as time stamps for the actual cave use, due to changes in ownership and reports of numerous visitors over the past 50 years. Historic architecture documented in the cave consisted primarily of doorways, modified cave walls, and associated historic architectural features such as drains, possible ice holes in the ceiling, and a spiral staircase. Documentation also included archaeological/architectural features such as brick-lined drains, light fixtures, and vertical shafts. Artifacts, architecture, and features were photographed with scales and measured. For the reconnaissance purposes, rooms were identified, numbered, and separated by arched doorways or masonry walls. The following is a summary of each room and findings beginning from the western end of the cave at the spiral staircase shaft and moving eastward (see map, Fig. 1).

Spiral staircase

At the western end of the cave passage is a vertical circular brick chamber approximately 2½ meters in diameter, which housed a historic spiral staircase (Fig. 2). In 1946, geologist and paleontologist George Gaylord Simpson took a tour of the Lemp Brewery Cave to examine peccary bones recovered from an excavated passage in the cave. Simpson describes in some detail the remnants of the cave he saw while venturing

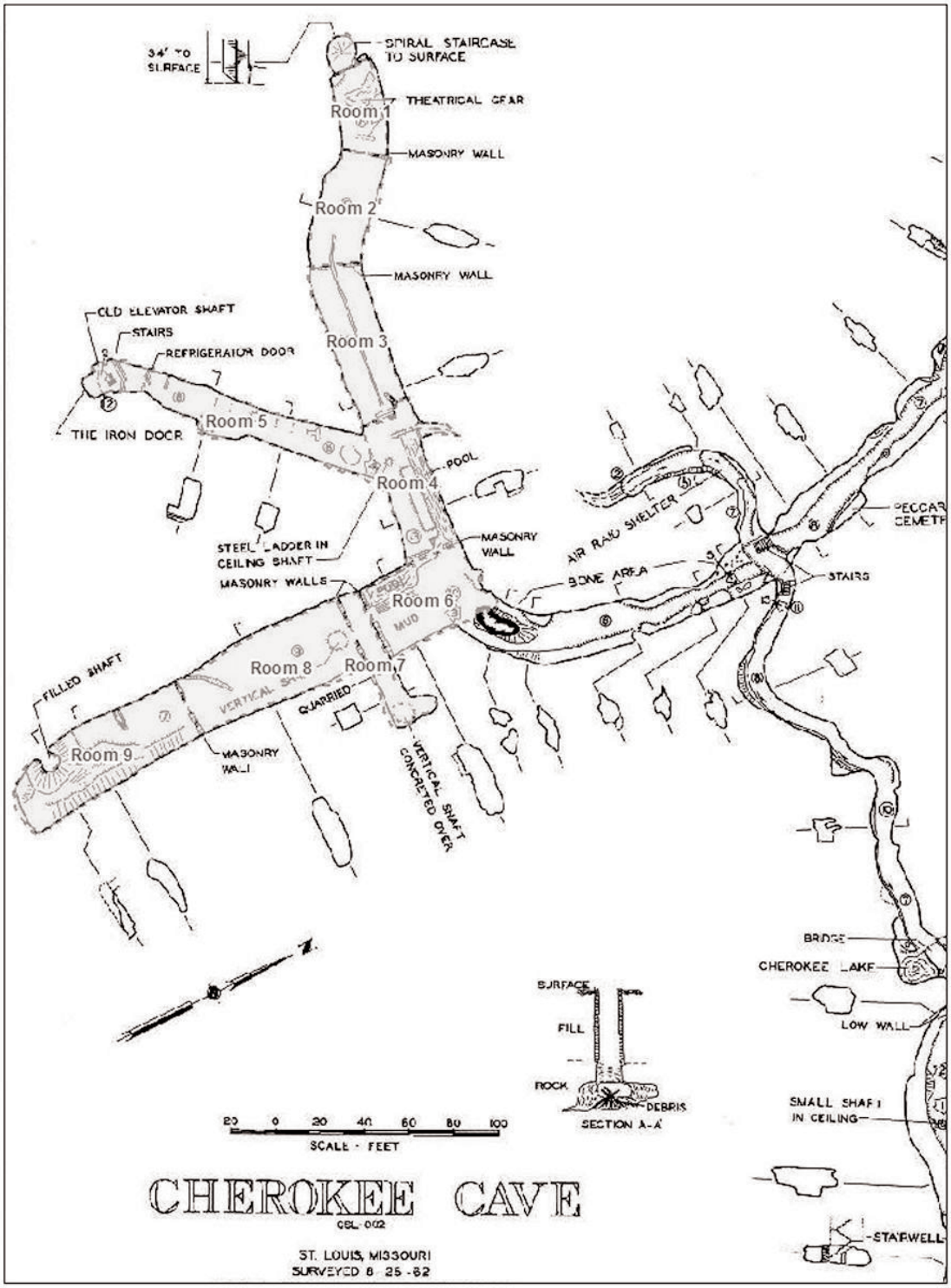

Figure 1. Map of Lemp/Cherokee Cave. (Modified version of 25 August 1962 map by Paul Johnson and Cooperators of the Missouri Speleological Survey.)

Figure 2. Remaining spiral staircase in vertical entrance shaft.

from the now historic spiral staircase into the 'vaulted' passage beyond. According to Simpson, 'a circular, brick-lined shaft about 85 feet deep had been reopened and a spiral iron staircase installed' by Lee Hess for cave access.[20] The opening to the spiral metal staircase was in a parking lot of a candy company at the northwest corner of Thirteenth and Cherokee Streets.[21] The staircase frame still resides in the brick chamber but in ruin. The entrance into the cave from the spiral staircase leads into the theater room via a segmental arch of red brick laid in rowlock courses (Fig. 3), below which is a squared-off pass-through.[22] The bottom of the stairway shaft is full of brick and metal debris. The staircase is nonfunctioning since six or so meters of the staircase has been intentionally broken in the middle, halting access (Fig. 2). The broken stair steps were noted in the debris pile and in the theater room. Simpson's account mirrors the sequence of spaces and some details encountered during our 2011 reconnaissance.

A historic 'service entrance', also called a fuse block, was documented as an archaeological feature alongside the wall beneath the arch between the spiral staircase shaft and Room 1 (Fig. 4). A service entrance consisted of a porcelain switch knife with two screw-type fuses, and was typically mounted on a household porch, in an entry hall, or in a basement.[23] After a disconnect switch of some type, the main wires would pass through the grooves on the right of the device, feeding the fuse sockets on the left. Several of these would be strung together until a sufficient number of fused circuits were created. In some cases they were enclosed in a box - a home-made version of a fuse box. Sometimes they were mounted exposed, as on the entrance wall. The service entrance was commonly used between 1910 and the 1920s.[24]

According to Susan Appel, an undated document (perhaps of c.1900) containing specifications (but no

Figure 3. Brick segmental arch in spiral staircase shaft, facing east towards Room 1.

Figure 4. Service entrance fragment along cave wall in spiral staircase shaft.

drawings) for a proposed new entrance to the cave (when in use by the Lemp family) for the area of the spiral staircase near the theater. The document was from the office of Widmann, Walsh & Boisselier, the famed brewery architects responsible for much of Anheuser-Busch's architecture in the later 19th century, among many other Midwestern breweries.[25]

Room 1 (The Lemp Theater)

The first room east of the spiral staircase shaft has a roughly barrel-vaulted ceiling, manmade but shaped from the natural cave. The room measures 11.96 meters in length. According to Scott Intagliata,[26] one of Adam Lemp's nine grandchildren fancied himself an actor, so in the late 19th century a theater was constructed in the cave and adorned with floodlights and wire-and-plaster scenery. Rother and Rother detailed the history:

> during the construction of this room, Lemp destroyed the cave's original shape and replaced it with large plaster-of-Paris formations. These formations, tinted in outlandish colors, served as the stage's backdrop.[27]

Simpson states that the Lemp actor utilized the room when the beer was moved out, presumably in the late

Figure 5. Iron Gate fragments possibly used as part of scenery in Lemp theater (Room 1).

19th century.[28] According to the local Meramec Valley Grotto cavers in St. Louis, the theater was to resemble a Bavarian Forest. Traces of blue, red, and yellow paint can still be seen on parts of the cave ceiling and nearby walls. Approximately 5.42 meters from the west wall is a pile of debris consisting of gate fence frames mixed with large shaped portions of plaster over chicken wire (Fig. 5). This debris was no doubt part of the theater scenery and backdrop.

An older metal light is anchored to the ceiling nearby and appears to have been utilized for the theater (Fig. 6). Simpson describes the lighting as 'remains of the crude but serviceable floodlights used to illumine this scene'.[29] The theater is entered through two passages, one on the west wall (from the spiral staircase shaft) and one on the east wall (to Room 2). The west wall is

Figure 6. Metal floodlight anchored to the ceiling in Room 1, possibly utilized for the theater lighting.

Figure 7. A flat arch vertical joint doorway, with a lintel of metal below red blocks of either clay or stone, leading into the Spiral Staircase shaft on the western wall of Room 1.

Figure 8. Load-bearing lintel of solid granite above the doorway on the eastern wall of Room 1.

red brick laid in regular courses of common bond.[30] The doorway on the west wall leading into the spiral staircase shaft has a flat arched, vertical joint doorway with a lintel of metal below red blocks of either clay or stone (Fig. 7). The opposite doorway on the eastern theater wall is rectangular with a load-bearing lintel, which appears to be a solid granite stone over the doorway (Fig. 8). The wall between the theater (Room 1) and Room 2 is constructed of large uneven blocks coursed roughly in a common rubble technique.

Room 2

Like Room 1, Room 2 has a roughly barrel-vaulted (half-round) ceiling and measures about 15.36 meters in length and 6.66 meters in width. The large cave room extends to the east between masonry walls with framed doorways. The western wall features the rectangular opening spanned by a stone lintel mentioned previously, and it leads into Room 2 from the theater (Fig. 8). Rusty metal hinges were noted on both sides of the doorways (three hinges in all), whose use is still undetermined, as they do not appear to have supported doors. The masonry wall separating Room 2 and Room 3 features large uneven stones laid in a roughly coursed or common rubble technique. Metal supports hang suspended from the ceiling in Room 2, which might have been a functional part of beer lagering, or lighting, or might have held piping for circulating brine (Fig. 9). When mechanical refrigeration began to be developed in a reliable way (1870s & 80s), breweries with extensive underground facilities often enhanced their ability to control temperatures by installing piping alongside walls and ceilings, which generally circulated refrigerated brine through the

Figure 9. Metal hooks suspended from the cave ceiling in Room 2.

cellars, the brine cooled by often massive refrigeration machines.[31]

The eastern doorway of Room 2 has the same load-bearing lintel as the western door. The purpose for this room is undetermined at this time, but, in the author's opinion, it was most likely a lagering room prior to mechanical refrigeration. According to Walker,[32] the advent of mechanical refrigeration allowed parts of the cave to be put to uses other than aging beer.

Room 3

Room 3 measures 18.64 meters in length and 8.10 in width, roughly barrel-vaulted on the north side of the cave wall. Artifact concentrations in Room 3 were primarily electrical debris, a wire insulator, iron grate fragments, an Edison Mazda lamp/light bulb fragment, wooden planks, crockery, and earthenware.

Figure 10. Grate fragment on cave floor below small hole in ceiling in Room 3.

The iron grate (Fig. 10) was located directly beneath a vertical shaft or narrow hole, and possibly served as a cover on the surface or for water drainage into the cave. The vertical shaft was possibly used for dropping ice down into the cave during the lagering period, thus, may be evidence of the use of ice in the Lemp cave. An early American tradition dating as far back as Jamestown in the 1600s was the use of ice storage wells used to preserve ice during the hot summer months.[33] The ice business was a substantial one in the 19th century. In 1805, for example, Boston merchant Frederick Tudor shipped ice from a pond in Lynn, Massachusetts, to Boston, the southern United States, South America, and the West Indies as business demands mushroomed. Later in the century, brewers developed above-ground icehouses plus systems that added salt to the ice to lower its temperature. Ice was also piled in underground cellars where casks were stored to keep temperatures cold. By the mid-19th century, brewers were the largest users of ice in America, spurring the revolution of mechanical refrigeration technology.[34] The proximity of the Mississippi River was likely beneficial in the retrieval of quantities of ice for St. Louis beer makers prior to the advent of mechanical refrigeration.

Room 4

The function of Room 4 is undetermined, but it too could have been a lagering/storage room during brewery operation. Room 4 sits lower than the previous rooms, and a concrete staircase of four steps leads down from Room 3 into Room 4. Just inside the wall between Rooms 3 and 4 is the opening to Room 5, which extends to the southwest of Room 4. Near that entrance to Room 5 is a mound of debris directly below a narrow vertical shaft, possibly another ice drop hole or another entrance into the cave. The vertical shaft is approximately 4 meters from the top of the mound debris formation, and it houses a steel ladder within it; the ladder stops within the shaft with no extension to the floor (Fig. 11).

On the north side of the Room 4 is a narrow sluiceway filled with water. According to the cave map included in

Figure 11. Narrow shaft in cave ceiling with ladder in Room 4.

the Walker book,[35] this is labeled 'pool'. The sluiceway is 2.3 meters wide and 4.54 meters long, filled with muddy water and debris and ending in a large mud-filled manmade pool with a concrete base following along the north perimeter of the room. Whether this pool was functional as a swimming pool or used for lagering is undetermined (Fig. 12). Large pipes and pipe fragments are visible along the muddy floor of Room 4 at the mouth of the manmade pool or sluiceway. St. Louis beer historian Donald Roussin[36] believes that some of the pipes in the cave are old water and/or sewage pipes used either by the historic brewery or the city. Further research could establish when water/sewage pipes were installed.

The eastern end of the sluiceway is separated from Room 6 by a masonry wall built along the cave floor. Traces along the ceiling indicate an upper masonry wall that has been removed, but that would match up with the lower wall. The lower masonry slopes downward into an arch in the center at 4.4 meters wide and 3.0 in high (Fig. 13). The purpose or intention of the wall is still unclear.

Two wire insulators with framing were documented in Room 4 (Fig. 14). The insulators and framing were the style typically used outside of a house for overhead service from an electrical pole during the early 20th cen-

Figure 12. Sluiceway or 'pool' in Room 4 with large pipes (bottom of photo) running along the cave floor at the western edge of pool.

Figure 13. Lower masonry wall that may have been used as a doorway during Lemp's ownership.

tury, which would have carried service deeper into the cave, beyond Room 6, possibly into the old Minnehaha cave, later called the Cherokee tour cave.[37]

Room 5

Room 5 opens from the southwest corner of Room 4 and runs in a southwestern direction from Room 4 to an old iron door. According to Rother and Rother (1964), the iron door was installed in 1944 to protect the International Shoe Company's property, when it was rumored that a night club might be established in the cave.[38]

Along the upper cave wall of Room 5 near the iron door are two small mounted insulators (Fig. 15). These were part of an electrical system known as knob-and-tube wiring, which was in use from 1880 to the 1930s.[39] The earliest wiring methods in homes and commercial establishments used cleat, or exposed wiring. Cleats, about 3" long, had nail holes at each end and two recesses for wire; each was nailed together with another cleat to the ceiling, pinching the two wires between them. Eventually, exposed wiring moved to concealed wiring with cleats, and porcelain knobs to tie off the wiring. The porcelain knobs were fastened to the framing with a nail that went through their middle.[40] This feature shows that the electrical features throughout the cave were installed over a range of time, as would be true of any commercial building that saw use over many decades.[41]

When electricity was first introduced to the cave is unknown. However, according to brewery historian Don Roussin,[42] in 1878 the Lemp boiler house had an electrical alarm gauge to register high and low electricity, making explosions, etc., almost impossible. In the 1893 Cox publication, Lemp was credited with having a new building with five of the most modern refrigerating machines and an electric light plant.

Room 5 is a narrow corridor-like passage with rusted metal bars and hooks suspended from the ceiling between Room 4 and the iron door. Beyond the iron door are the Lemp cellars which are described in *St. Louis, Future Great City of the World*, published in 1875:

> the cellars, three in depth, extend fifty feet below the curbstone, and are supplemented by a vast natural cave ...

Figure 14. Wire insulators with framing found on cave floor of Room 4.

Figure 15. Two mounted insulators on upper cave wall in Room 5.

Figure 16. An elliptical arch on the south end of Room 6, which is rumored to be the swimming pool room. Note the small window in the upper left hand corner of the photo with metal bars possibly used for ventilation.

with the foreman, who evidently knows each foot of that changing labyrinth we traverse passage after passage with casks on each side and flagging under foot again and again.[44]

Room 6 (Swimming Pool)

The cave passage beginning in Room 6 changes direction, turning at a right angle to the south from the previous rooms. This room's longer dimension runs north to south at 16.1 meters long and is 8.5 meters wide. Simpson states that the Lemps added another creative element to the cave at about 200 feet east of the theater, where he found

a concrete-lined pool, presumably used as a reservoir in the old brewing days, and reputedly used as a swimming pool in the later (but now also old) days of theatricals and parties.[45]

The swimming pool is along the west wall of Room 6, its dimensions 14.3 meters long and 9.0 meters wide. Two-thirds of the pool is filled with mud and debris.

The passage in the south wall of this room is through an elliptical stone arch measuring 2.37 meters in length and 0.6 meters thick (Fig. 16), its shape nicely crafted with nearly regular voussoirs (the stones that edge the arched opening).[46] The southern wall here is built of the same large uneven stones laid in a roughly coursed or common rubble technique seen in the theater and elsewhere in the cave. Near the cave ceiling next to the archway is a 'window' 0.8 meters wide and 0.6 meters high (Figures 16 and 17). The window-like form in the photo has vertical reinforcing bars of iron. The feature may have served as a form of ventilation device between rooms.[47] The window is now bricked behind the bars, a change probably made after the lagering portion was no longer in use.

Figure 17. Possible ventilation window lined with bricks and bars in Room 6.

A separate passage along the northeast wall of Room 6 leads into the natural Minnehaha/Cherokee Cave portion. Mr. Hess had the cave wall removed with a hydraulic jack, thus connecting two cave spaces that did not connect when the Lemps owned the Lemp Cave.[48]

Room 7

Room 7 is a narrow quarried passage to the south of Room 6, but extending farther east and to a large vertical shaft boarded up at the top. Room 7 is about 26.09 meters in length and 8.68 meters wide and clearly mined out. The purpose of the room is unknown, but the large vertical shaft could have possibly been a location for an elevator for removal of beer barrels or casks (Fig. 18). Historical documentation indicates an elevator was used in the Lemp Brewery.[49] Scammel and Coyler (1880) highlighted the 'endless chain lift' as one of the simplest devices for raising brewery vessels from cellars.[50] An elevator shaft seems likely, but no artifacts or architectural features were found to support this claim.

The east end of Room 7 turns north into a small alcove, where stained traces of wood along the floor indicate a possible division of a separate room. Small holes drilled out in the cave wall within the small alcove could be remnants of dynamite holes for expanding the cave passage.

Figure 18. View upward into circular shaft mined out with wooden ceiling in Room 7, possibly an elevator shaft.

Room 8

From the west end of Room 7 the cave continues south through a manmade wall and doorway into Room 8. The doorway facing north has an elliptical rowlock arch of well-laid red brick. The room is about 7.93 meters wide. The purpose of the room is unknown, but archaeological and architectural features suggest lagering. A rusted metal plaque with an inscribed number 9 was documented at the base of the archway facing north (Fig. 19). According to St. Louis beer historians Kevin Kious and Donald Roussin, the plaque and number over the doorway could have been intended to identify one of the lagering rooms.[51]

A second rusted plaque more rectangular in shape was documented on the opposite side of the same brick archway facing south (Fig. 20). The inscription on the plaque was illegible due to corrosion. At the eastern corner of the north wall near the archway entry is a small bricked-up niche. The small niche was probably part of a ventilation system for the lager room and, like that in Room 6, was bricked up at a later date as well. A historic bottle with a handmade base was placed within the niche in the wall near the entrance. This particular bottle type could be an export lager bottle common in the 1870s and still used today.

Figure 19. A rusted metal plaque within an elliptical brick rowlock arch doorway into Room 8.

Figure 20. Rusted plaque over opposite side of doorway in Room 9.

The 'export' style of beer bottle was a general type of beer bottle used even today for lager beers (Fig. 21), though they are also used by modern 'microbreweries' for almost any style of beer, e.g., porter, ales, stout, weiss (wheat beer). The name 'export' apparently is derived from the major exporting business conducted by the St. Louis breweries after the pasteurization process was applied to beer bottling in the early 1870s. Much of this production was shipped - i.e., 'exported' - to the Western states and Territories. Of interest, export beer bottles were often used (or more likely re-used) for soda, cider and sarsaparilla, at least in the frontier West, where bottles of any type were likely in short supply during much of the 19th century.[52] During the 1870s, bottles were filled manually before being packaged and shipped. If shipped great distances, bottles were put into barrels padded with sawdust, which later transitioned to wooden boxes which held more bottles. Orders for barrels of bottled beer are often seen in old brewery records.[53]

Other artifacts located in Room 8 consist of a clear glass 32-ounce bottle base, with a machine-made seam, a clear broken bottle base, and two buckets. One of the bottle bases located in a debris pile was labeled with the

Figure 21. Possible export type Lager bottle manufactured in the 1870s in Room 8.

maker's mark 'C 14' (Fig. 22). According to Lockhart et al., several recorded historic bottles have marks with letter/number combinations ranging from A2 to Y6.[54]

Room 9

Room 9, probably a lagering room, was the final room in the archaeological and architectural assessment of the cave. The entrance way into the room was identical to that between Rooms 7 and 8 (Figs. 19 and 23). It is likely that Rooms 7 to 9 were used for the storage of casks, since, as Intagliata noted, the cave had been lengthened to meet Lemp's lagering needs.[55] Where the south end of this lagering room terminates, it is filled with brick rubble, possibly from later modifications by Hess for tour purposes.

Figure 22. Historic bottle base with C 14 maker's mark in Room 8.

The room is 28.1 meters in length, 7.5 meters wide and 2.9 meters in height. Debris consisting of bottles, bricks, and stone reside along the east side of the room. Along the floor on the west side of the room is a bottle-shaped depression with a brick inset (Fig. 24). A pipe was noted running along the floor through the doorways from Rooms 7 and 8 to the floor depression in Room 9. The bottle-shaped depression in the floor is believed to be a drain for melted ice for lagering, according to Roussin, who has documented this same type of drain in other St. Louis brewery caves.[56]

Artifacts in Room 9 consisted of bottle and bottle base clusters, including a pint liquor bottle and two marked bottle bases ('WF & S MIL' and 'C14'). The mark WF & S MIL indicates the bottle was made by William Franzen & Son, Milwaukee, WI (c. 1900-1929). This mark is commonly seen on many beer bottles from the Midwest, and may have been introduced on ware as

Figure 23. Elliptical brick archway design in Room 9 similar to Room 7.

Figure 24. Bottle-shaped floor drain into the western cave wall with brick inset in Room 9.

early as 1896. The C14 mark is sometimes a mold letter, but may stand for a glass company. The bottles of the handblown variety with a capital 'C' on the base, found in the general vicinity of the St. Louis, Missouri metro area might be products of the St. Louis Glass Works, first formed in the 1840s.[57]

The pint liquor bottle found here is believed to be an example of the Baltimore Oval flask. This particular flask style was most popular during the late 1890s and first two decades of the 20th century, then largely disappeared during National Prohibition. The Baltimore Oval is actually rectangular in cross-section, but with rounded edges. The wide front and back panels are flat as are the sides, which are sometimes banded on these flasks. The Baltimore Oval is similar to the covered flask (Dandy) except more rectangular in cross-section with distinctly flattened sides. Different variations of this style also existed; some of these went by names like 'The Chicago' (shorter neck and more flattened), 'St. Louis Oval' (less distinctly flattened on the two large sides), 'Philadelphia Oval' (rounded on the narrow sides instead of flattened), 'The Wheeling Oval' (front and back rounded slightly outwards), 'Pittsburg' (sic) (very similar), and likely many others from different glass-making companies.[58]

Four bottle necks were identified in the debris pile (Fig. 25). The first bottle neck and shoulder was identified as the export style beer bottle. According to historian Bill Lindsey,[59] the export style of beer bottle has a body length that is usually equal to or a bit taller than the height of the shoulder, neck, and finish combined. They usually also have a somewhat distinct though variable bulge to the neck and a relatively slim to moderate diameter body. The bulging neck is thought by some to be a way to deal with the foam when bottling. Lindsey, however, suggests the bulging neck is simply a stylistic feature that was aesthetic, popular, and traditional, as shown by the noted precursor bottles.[60] The shoulder of the export style is distinct but short and fairly sharply angled in from the shoulder to where the neck begins.

Figure 25. Historic bottle necks from Room 9 (Left to Right: export lager, eagle flask, liquor flask, and milk bottle.

The export shape is strongly linked to lager beers which were first bottled around 1872-73.[61]

The second bottle neck resembles the 'Eagle' flask bottle, which was primarily produced and popular during the first decades of the 20th century. The bead ring on the neck right above the junction of the neck and shoulder is a typical distinguishing feature of the Eagle flask. Possibly used as early as the late 1890s, or more likely, the very early 1900s, the Eagle style of flask quickly became quite popular; at the Illinois Glass Company the Eagle first appeared in the 1906 catalog. The origin of the name Eagle is unknown, although it likely originated as some glassworks' proprietary name for the shape, which eventually became generic for the style, as they are listed by that name in various bottle makers' catalogs.[62]

The third bottle neck resembles the Kentucky flask, as documented in the 1906 Illinois Glass Company catalog.[63] The fourth bottle neck is a machine-made historic milk bottle. The sides of the neck have short vertical lines, which is the most common neck embossing. The necks of milk bottles were embossed to make it easier to grasp the bottle and to aid creameries in identifying their bottles.[64] Two mid-20th-century bottle necks and an embossed 1925-1935 milk bottle fragment were also documented.

Conclusion

In Spring 2011, C.A.I.R.N. conducted an archaeological/architectural assessment of the Lemp Cave portion of Cherokee Cave in St. Louis, Missouri. The intent was to document historic architecture and archaeological/architectural features related to the original cave, which had been modified and utilized by the Lemp family for lagering and other purposes between the 1840s and 1920. The lagering cave was a natural cave transformed by the Lemp family by building masonry walls with arched openings to create a series of distinct rooms for both business and (later) pleasurable purposes. The difficulty in dating these rooms lies in determining the time frame for the extent of beer lagering in the cave. Our principal question centered on whether the entire Lemp Cave was used for lagering purposes, or whether more rooms were quarried later by family members for recreational purposes. For the assessment, C.A.I.R.N. relied specifically on artifacts, archaeological and architectural features, consultation with historians, and oral and written histories. The artifacts, such as the export bottle and Baltimore oval and eagle flasks found in Rooms 8 and 9, allude to activities as early as 1870 to 1900. However, the bottle fragments may have been placed in the room at a later date by someone other than the Lemps. Certain historical archaeological/architectural features, such as electric lighting, can provide a timeframe of cave use. The brickwork doorways in the cave do not represent a specific timeframe; however, the examination of the brickwork within doorways may help determine when the brick was manufactured compared to other brick archway doors in Lemp Cave or other known brewery caves in the city. Archaeological excavation, if available, may also shed light on room use in the cave. The gathered information, any additional information that may surface, and photographs of this particular cave will allow comparison studies for other accessible brewery caves.

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