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# Michigan's Upper Peninsula Is the Cradle of Paul Bunyan's Beehives

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The common sobriquet for the many charcoal kilns still scattered across Michigan's Upper Peninsula is "beehive kiln." The term is so familiar that beehive is often considered an adjective that describes any charcoal kiln. However, "beehive" is in fact a type or design of a charcoal kiln, closely resembling a traditional beehive shape (Figure 1). James "J. C." Cameron, Jr. has been credited with the development and introduction of the beehive charcoal kiln to Michigan's Upper Peninsula, Northeastern Wisconsin, Northern New York, and the Far West. Interestingly, the beehive charcoal kiln has at least part of its origin story set in the Upper Peninsula.

**Figure 1**. An 1878 advertisement from *The Mining Journal* illustrates the traditional beehive shape, which is a focus of this article.[1]

The beehive shape of many of the Upper Peninsula's charcoal kilns has led to the moniker "Paul Bunyan's beehives" to describe the crumbling charcoal kilns that used to sit along the Upper Peninsula's roads and railroad tracks.[2] At least, that was a common reply to inquiring tourists who queried Yoopers on the purpose of the large stone or brick structures on the side of road. One newspaper article wanted to set the record straight: "THEY'RE NOT BEEHIVES OR IGLOOS,"[3] and another explained that they were: "Tumble-down limestone kilns, which tourists mistake sometimes for Paul Bunyan's beehives, [that] stand along railroad tracks in various parts of the upper peninsula as silent reminders of a once flourishing charcoal industry."[4]

Even by the late 1950s, another newspaper article lamented: "Today many visitors pass batteries of beehive shaped charcoal kilns in the Upper Peninsula without even knowing what they are."[5] They extended beyond the Upper Peninsula's iron region, with one newspaper photograph showing "a row of old charcoal kilns, which have been standing for many years along the canal near Houghton," along with the title: "Some of Paul Bunyan's Beehives in U. P."[6]

In the mid-1930s, when U.S. Highway 41 South into Marquette was being rerouted, a battery of charcoal kilns adjoining the road had to be destroyed to make way for the new route. A few kilns survived, touted as a prime tourist attraction, until 2016 when the last surviving kiln of the battery collapsed.[7] The loss struck a nerve in Marquette and pleas went out to "resurrect our beloved, historic and now collapsed beehive kiln that stood in Marquette for over 130 years."[8] A beehive charcoal kiln was reconstructed as part of the Iron Ore Heritage Trail and now welcomes visitors to Marquette.[9] At the time of the rerouting the story was told of the beehive charcoal kilns near the Carp River:

> The kilns were erected there and at many other Upper Peninsula places when charcoal iron was a leading product of the district. Lumberjacks were plentiful, and their fertile imaginations endowed the kilns with the title of 'Paul Bunyan's bee-hives'. The kilns have the conical shape of a hive, but are immensely larger, and many an inquisitive tourist has been intrigued by some resident's statement that Paul Bunyan utilized them in the palmy days of lumbering to develop a strain of honey-bees which weighed from two to four pounds apiece.
>
> The original bees are supposed to have been imported by Paul from Madagascar, in order to wipe the mosquito menace in the spring of the year. However, the story goes that the imported stock made friends with the mosquitoes, and intermarried with them. The dire result was a new kind of mosquito with one stinger in front and another behind, a combination that gave the lumberjacks a world of trouble and left them worse off than before. The average summer visitor takes this statement with a grain of salt, but some have been known to swallow it whole.
>
> Several other rows of charcoal kilns still stand in the Upper Peninsula of Michigan, where they have been landmarks for decades.[10]

Notice that the story of these kilns described them as having “the conical shape of a hive.” That is interesting, as two of the common designs or styles of a charcoal kiln are conical and beehive. That can be confusing, as the beehive kiln is a specific design. Discussion follows of the various charcoal kiln designs and types.

**What Exactly Is a Beehive Charcoal Kiln?**

James C. Cameron, Jr. described his new design as a “Bee-hive Charcoal Kiln,” which was “in the form of a parabolic dome.”[11] While charcoal kilns were constructed using simple and well-known shapes, an exact visualization of the forms would be a valuable review. The basic shapes of charcoal kilns are rectangular, round, conical, and beehive. A rectangular kiln is usually built of brick, with vertical walls, and an arched roof. Length varies from 40 to 50 feet; width varies from12 to 17 feet; height varies from 12 to 18 feet; and capacity varies from 55 to 90 cords (Figure 2). Rectangular charcoal kilns were one of the earliest kiln designs and existed in the Upper Peninsula (Figure 3). Round kilns differ from rectangular kilns only in shape. They also have vertical walls and an arched top, with a diameter at the base of 28 to 30 feet (Figure 4).[12] There is a discussion of these kiln shapes and their use in the Upper Peninsula in an earlier volume of this journal.[13]

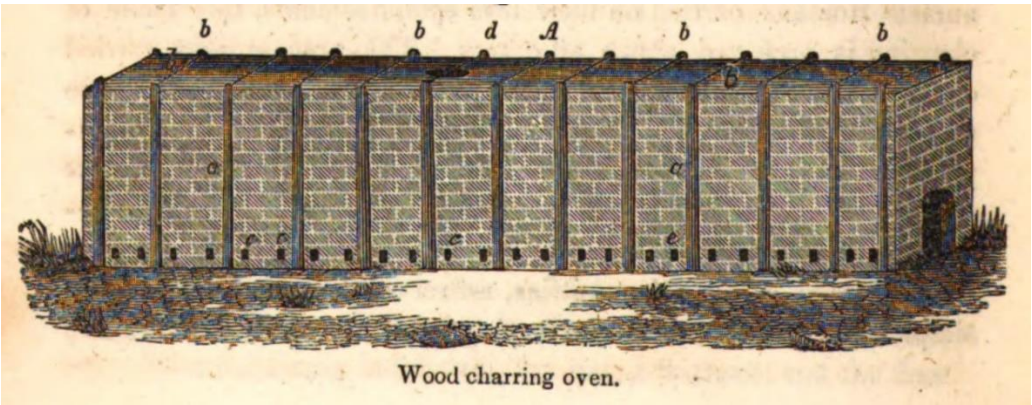



**Figure 2.** Rectangular charcoal kilns, with vertical sides, vent holes at the bottom, and a door at the front .[14]

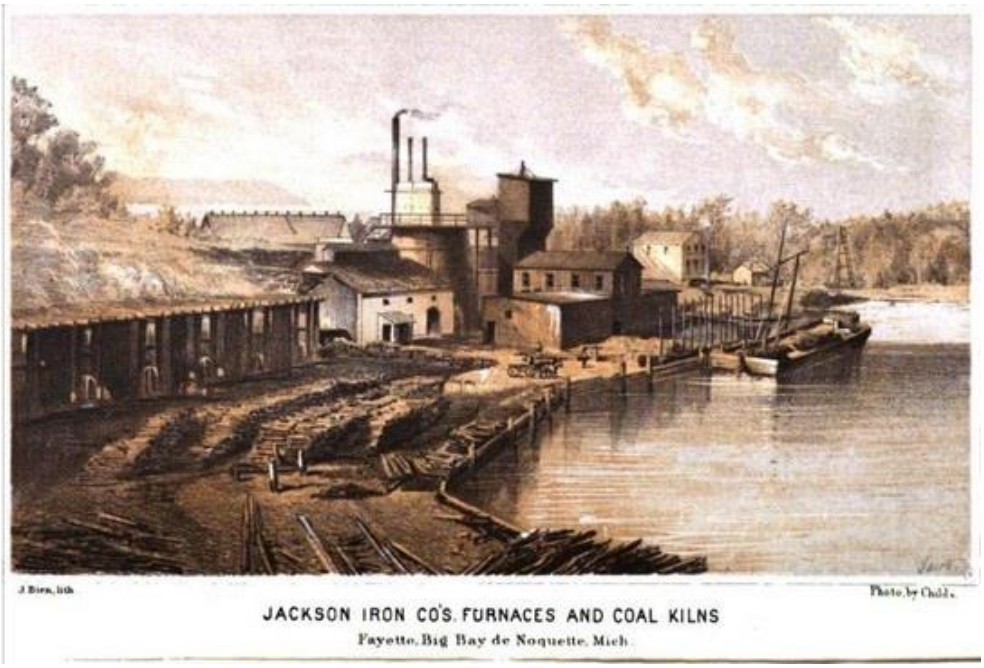



**Figure 3.** Rectangular charcoal kilns at Fayette Furnace, to the left near the wood piles, before being replaced with conical charcoal kilns.[15]


**Figure 4.** Round charcoal kilns at the Ashland Iron and Steel Company, Ashland, Wisconsin. Note the vertical sides and arched tops. Round kilns tended to be in batteries near the furnaces or at railroad locations. (Image courtesy of Ashland Historical Society Museum.)

The kilns were usually constructed of brick, stone, or stone and brick, with stone foundations. Kiln doors were made of cast iron. Both types of kilns had rows of vents holes along the bottom.[16] The round kiln had a cast iron ring opening on the top. The bottom door was used for loading wood and unloading charcoal, while the upper or top door was used for loading wood. By 1880 both the rectangular and round kiln designs were disappearing, as other designs were more economically built and efficiently managed.[17]

The other two charcoal kiln designs were conical and beehive. The two designs were often confused as the beehive form closely resembles the conical form. There are two reconstructed charcoal kilns on Michigan's Upper Peninsula, located at Marquette and the Fayette Historic Townsite. Those kilns provide an excellent example of the two kiln designs: the Marquette charcoal kiln is of the beehive design (Figure 5) and the Fayette charcoal kiln is of the conical design (Figure 6).[18]

**Figure 5.** BEEHIVE CHARCOAL KILN. The reconstructed Marquette kiln with the beehive design, somewhat conical as it tapers upward, and with a parabolic dome. This kiln is on U. S. Highway 41 South where it crosses the Carp River. (Image by author.)

**Figure 6.** CONICAL CHARCOAL KILN. The reconstructed charcoal kiln at the Fayette Historic Townsite has a conical shape without a parabolic dome. (Image by author.)

The Marquette kiln represents an inventory of 43 charcoal kilns that once supported the Carp River Furnace.[19] Fayette provides an example of the early use of rectangular (13 square kilns) charcoal kilns in 1867, which proved to be unsatisfactory and were replaced with a better design in 1872.[20] When the Fayette Furnace was abandoned in 1890 there were 72 beehive charcoal kilns in the area producing charcoal for the works.[21] Exhaustion of timber for charcoal production near Marquette and new railroad connections were the main reasons the Jackson Iron Company chose Fayette as the location for a new blast furnace.[22] Following the same pattern, the primary reason the Fayette Furnace was abandoned in 1890 was a timber shortage for producing charcoal.[23]

The term “beehive charcoal kiln” has become a generic term for most masonry charcoal kilns. Sometimes conical kilns, and even round kilns, are considered beehive kilns. The confusion results from the dome-type top of round kilns and the conical nature of the beehive kiln. Formal discussion by charcoal burning industry experts usually defined the beehive charcoal kiln as a unique design. Other times the beehive kiln was coalesced into the conical kiln design. Thus, the beehive kiln is more a general design, rather than a well-defined standard kiln design.[24]

Discussions by charcoal kiln experts contain interesting categorizations of charcoal kiln types. One of the most thorough discussions of charcoal kiln type in 1879 identified only three kiln design types: round, rectangular, and conical. However, the discussion seems to place the

beehive type kiln as a type of conical kiln.[25] About the same time, another leading industry expert, John Birkinbine, identified four kiln classes: rectangular, round, beehive, and conical.[26] Ten years later the same industry expert identified three kiln classes: rectangular, beehive, and conical. Both the beehive and round kiln classes had domes and, for that reason, both seem to have been combined.[27] The parabolic dome defines the beehive charcoal kiln. Birkinbine provided figures that illustrated the parabolic dome and the differences between conical and beehive kilns (Figure 7). In 1888 he gave an interesting observation that 80 percent of charcoal was still being produced in charcoal pits (earth-covered mounds of wood), rather than kilns.[28]

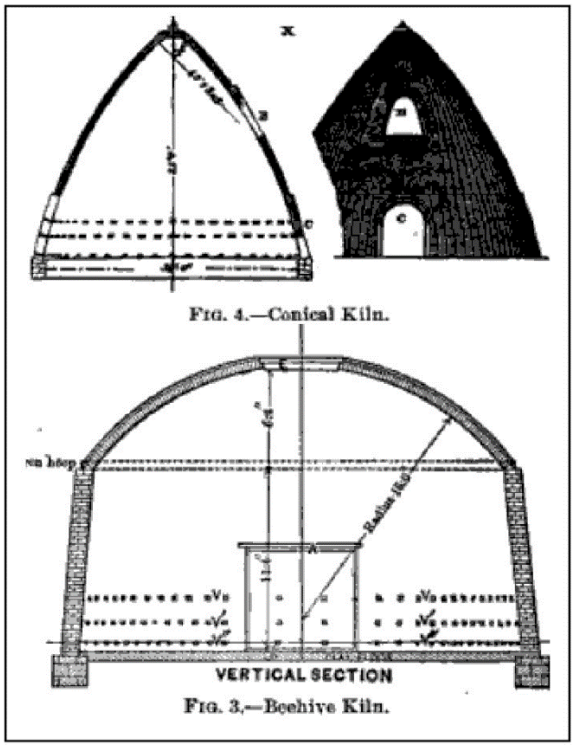



**Figure 7.** Design of beehive and conical kilns from John Birkinbine, note the parabolic dome on the beehive kiln.[29]

The beehive kiln shape clearly predates Cameron's "invention," which had to be incorporating an existing design into the standard conical charcoal kiln shape then in use. Coke ovens in the United States, for example, made use beehive type kilns in the mid-nineteenth century.[30] There are many variations of the parabolic dome and slope on the side of the kiln, so it is more likely Cameron's beehive charcoal kiln is more of a variation of a general beehive design.

By 1874 charcoal making in the Upper Peninsula was a mixture of pit production and kiln production. The kilns were square (rectangular) and mostly beehive kilns. *The Engineering*

*and Mining Journal* described the situation and seemed to muddle up the terminology, calling some kilns round with a coned top, appearing to be beehive kilns. Charcoal production in 1874 was described as:

> The Manufacture of Charocal [sic] in the Upper Peninsula, Mich., is carried on in square and coned kilns, and in pits. The square kilns in this district vary in size to suit circumstances. The round kilns are usually 22 feet high, with cone top, holding 25 to 40 cords. They are usually built against a bank, and fed through an aperture near the top of the cone, which aperture is closed by an iron door located at the joints with a paste of lime. After being properly filled and fired, the door through which the charge is finally drawn is sealed, and the kiln allowed to burn an average of seven days, before the vents around the base are closed and the mass within allowed to cool off.[31]

In a discussion at a meeting of the United States Association of Charcoal Iron Workers, John Birkinbine, secretary of the organization and charcoal expert, commented on the differences between conical kilns with straight side and ones with curved sides (beehive kilns with a Gothic arch):

> The advantage claimed for the conical charcoal kilns, with curved sides, is that they are less apt to open crevices in the brick work by reason of expansion and contraction due to alternate heating and cooling. This form of kiln is generally constructed by tracing arcs of circles of such radii that the centers from which they are described are at or below the foot of the kiln on the opposite side. Thus a kiln 30 feet in diameter would, if formed with radii of 30 feet, be in section a Gothic arch, but generally somewhat larger radii are used, and the center from which they are described is an imaginary point placed at a distance of about one third of the diameter of the kiln, directly under the foot of the opposite wall. This form of kiln is cheaply constructed, requiring but thin walls and no iron bands. It produces satisfactory results, and is, I think, better than the straight conical kiln, giving less trouble and requiring few repairs. The expansion or contraction being less apt to throw the walls.
>
> The first of this form of kiln which I noticed was constructed by one of our deceased members, Mr. Evans, for the furnace of the Paulding Iron Company, Cecil county, Ohio, and, in this connection, I desire to disclaim the originality of the special design which I learn was credited to me in the metallurgical press during absence in Mexico. I am entitled only to having made some modifications in the shape and details in construction.[32]

John Birkinbine had an extensive background on charcoal kilns and it is interesting in the quote above that he notes the first form of a conical charcoal kiln he noticed was in Ohio and that he deserves some credit in design of such kilns. A focus of this article is the origin of the curved conical kiln, or the “beehive” form. This comment should alert the reader that the origin of

inventions often involves many interrelated "inventions," and surely the beehive kiln is a combination of inventions over time.

The rectangular charcoal kiln is well-defined. The round charcoal kiln is fairly distinct, but occasionally categorized as beehive kilns due its dome top. The true beehive charcoal kiln and conical charcoal kiln are more commonly confused. Any analysis of historical discussions of charcoal kilns should recognize that the term "beehive charcoal kiln" can be misused. Not all charcoal kilns are of the beehive design and beehive is not a general term for a charcoal kiln.

In 1885 an article in the *Mining Journal* gave a history of charcoal pits and kilns in the Upper Peninsula:

> It is probably that they [brick charcoal kilns] were first introduced in the west from the east, by the late S. R. Gay, Esq., and first located at or about the Pioneer furnaces, Negaunee, Mich., about the year 1858. Since then they have come into quite general use, and have almost entirely superseded the ancient coal pit.
>
> The shape as first adopted for the structure was somewhat that of a truncated cone, the plane of division at about one-sixth of the altitude, measuring from the vertex, and which shape seems to have proved the most satisfactory, as it now appears to be the most common in use. The theory acted upon would appear to have been that of the coal-pit covering, and openings were left in the walls for draft and vent, as in the coal-pits. There were usually three sets of holes in height, and extending around the kiln: the lower tier at the base, and the upper tier about four feet above, with others between. The lower of these served for the purpose of draft, while the upper ones filled the office of vent, and at the end the lowest acted in a dual capacity till the charring was done. It was found that in using these kilns the wood could be ranked in cord-wood shape within, and with a doorway at the bottom and another near the top in connection with an elevation of ground at the rear, the kilns could be readily and easily filled. The openings were closed with sheets of iron, of, say, three-sixteenths of an inch in thickness. . . .
>
> Various other patterns of brick kilns have been tried, and some adopted from time to time, and in many cases involving greater or less expense in bracing and banding to overcome the pressure of weight, and to resist the force of expansion and the detrimental effects of consequent contraction; also in many cases stone has been used in place of brick. But of whatever style, as used in this way, they were found to be a great improvement on the venerable coal-pit.[33]

James C. Cameron, Jr. might be considered the "Johnny Appleseed" of the beehive charcoal kiln, as he planted the seeds of "Paul Bunyan's beehives" throughout the Northeast, Upper Midwest, and Far West, giving Marquette, Michigan as the seed source. An example is Frisco, a hugely prosperous mining district in Utah, a couple hundred miles southeast of Salt Lake City. [34] The Frisco Mining and Smelting Company built kilns in Frisco and the San Francisco Mining District ended up with 36 charcoal kilns, in eight groups, one of the largest

concentrations in the United States.[35] Federal mining reports often describe the charcoal kilns and the immense charcoal burning activity that supported the smelter, and usually included the footnote: "It is said that this style of kiln [beehive charcoal kiln] was first made by J. C. Cameron, in Marquette county, Michigan, in 1868."[36]

The beehive charcoal kiln was extremely common near Utah's smelters and the Cameron/Marquette connection to the Upper Peninsula of Michigan was a popular fact, so much so that the familiar name for the kilns was the "Cameron beehive charcoal kiln." The charcoal kilns were so identified with their inventor that an 1883 tourist guide for the Union Pacific railroad route noted that "just to the right of the [Hilliard, Wyoming] station are located rows of the J. C. Cameron bee-hive kilns, for burning charcoal."[37]

**Cameron in the Lake Superior Region**

James C. Cameron entered the charcoal industry picture when he moved to the Upper Peninsula, just as iron furnace and charcoal kiln building began near Marquette, to work on planning for the Pioneer Furnace. An article in the *Mining Journal* outlined his early history: "He built one [blast furnace] at Detroit, another at Depere, and planned the Pioneer furnace at Negaunee."[38] He was a mining engineer and his reputation was based on building iron furnaces and their related charcoal kilns.[39] He gained early experience in iron smelting at Foundryville, Lancaster County, Pennsylvania, where he managed to gain mining engineer credentials.[40]

About the time Cameron arrived in the Upper Peninsula, charcoal kilns were first being established as a replacement for the traditional charcoal pits, earth-covered mounds of wood "burned" in the forest to produce charcoal, with the product transported to the furnace. Producing adequate supplies of charcoal to fuel the iron smelters was an early problem and charcoal kilns were an advancement in technology that allowed for more efficient production. One newspaper summary of the development of the charcoal iron industry noted:

> The pioneers of the iron mines were all possessed with the idea that the peninsula was the logical place for making pig iron. They all attempted it, but the obstacles against its successful manufacture were insuperable. One of the causes was the impossibility of keeping a sufficient stock of charcoal on hand to keep the forge running. The charcoal in those days was all burned or charred in pits. Such a thing as a charcoal kiln of brick or stone was unknown.[41]

While in Michigan Cameron worked on planning for other charcoal iron furnaces. About 1868 he would relocate to Northeastern Wisconsin work on building charcoal iron furnaces there to smelt Lake Superior ores. A local newspaper described the charcoal kilns he would introduce to Wisconsin, while giving more history of where Cameron worked while in Michigan:

> They [charcoal kilns] will be built of brick in the form of a Parabolic Dome, resembling an old fashioned bee hive. These were invented and introduced by J. C. Cameron at the Collins, Bancroft & Iron Cliffs furnaces at Lake Superior, and have been found practically, so far, superior to the rectangular kilns . . .[42]

Part of Cameron's planning responsibilities for the Michigan blast furnaces involved planning for the associated charcoal kilns that would provide the fuel for the blast furnaces, giving him the opportunity to observe the effectiveness of various charcoal kiln designs, seeing what would work and what would not. He reported later that had "been engaged in this branch of industry [charcoal production], and has succeeded in the introduction of the Bee-hive Charcoal Kilns."[43] He was referred to as the "inventor" and the kiln as a "Cameron patent bee-hive charcoal kiln."[44] A thorough review of United States patents from 1855-1870 does not reveal a patent for a charcoal kiln awarded to James C. Cameron. However, there is an interesting patent for an "Improvement in Charcoal Kilns" awarded to C. T. Harvey (Patent No. 36,090, patented August 5, 1862).[45]

Charles T. Harvey was prominent in the development of the Upper Peninsula, including its iron industry. He and two others organized the Pioneer Iron Company in 1857, including hiring its furnace builders. The Pioneer Furnace went into blast in early 1858. Soon Harvey was organizing and involved with other iron furnaces.[46] That involvement would create familiarity with fuel requirements of the iron furnaces, meaning charcoal kilns. Likely he may have interacted with James C. Cameron, also involved with those charcoal kilns. The possible interconnectedness between the two iron industry men bears examination of the Harvey charcoal kiln. That kiln was based on a metal shell, making it definitely not a beehive kiln. But it did have a general beehive form (Figure 8). Harvey designed it in 1859.[47] The sketch included in the patent documents create an image of something that could have easily influenced the charcoal kiln "experiments" of Cameron. The patent information described Harvey's charcoal kiln:

> The object of this investigation is to combine a kiln for the manufacture of charcoal, so as to secure portability, exclusion of air, strength, and durability in a novel and useful manner. To do this, construct an outer shell or covering of convenient form and size, of metal divided into convenient segments, sections, or parts, composed of one or more sheets of metal and prepared with bolts or other fastenings, so that when each segment or part is placed in position it can be securely fastened to and with other segments or parts, so as to form, collectively, a complete metallic kiln, covering, or outer shell strong and durable. Then lay upon the inside a thin wall of brick or stone, having a space left between it and the metallic covering. Then fill in the space between the masonry lining and metallic covering with cement or grout formed of fire clay or other fluid mortar hardening in due time, which when accomplished, renders the kiln complete and ready for use.[48]

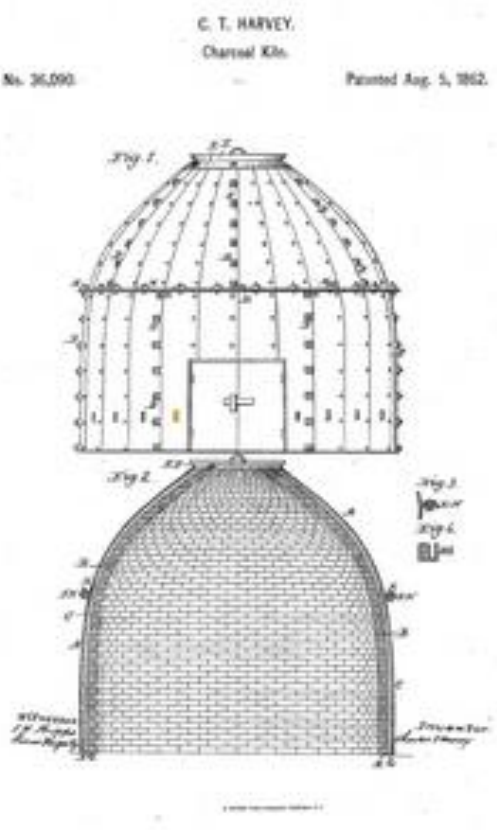



**Figure 8.** The specifications of the C. T. Harvey kiln, approaching the beehive shape, suggesting a design used in the region.[49]

The Collins Iron Company, Bancroft Iron Company, and Iron Cliffs charcoal iron furnaces, going into blast in 1858-1861, were some of the Upper Peninsula's earliest blast furnaces.[50] The Iron Cliffs furnace referred to by the newspaper was the Pioneer Furnace (Pioneer Iron Company); Iron Cliffs acquired control of the Pioneer Furnace in 1866.[51] The Pioneer Furnace, the first blast furnace on the Upper Peninsula, was built at Negaunee in 1857-1858 and began operation with pit-produced charcoal.[52] The Collins Furnace had kilns constructed adjacent to the furnace. These had doors at the bottom sides and could be filled form the top, indicating the first kilns were not conical- or beehive-shaped. The Bancroft Furnace had charcoal kilns scattered in the nearby hardwood forests.[53] By 1873, the Collins Furnace operated 16 charcoal kilns, the Bancroft Furnace operated 20 kilns, and the Iron Cliffs Furnace operated 54 kilns.[54] That same year the Collins Furnace would be abandoned due to a failure in the charcoal supply,[55] and the Bancroft Furnace would follow within a few years.[56]

Many of the earliest blast furnaces in the Lake Superior region and specifically the Pioneer, Collins, and Bancroft Furnaces, had the same builder—Stephen R. Gay (with Lorenzo D. Harvey co-builder on the Pioneer Furnace).[57] Recall that Gay was credited with introducing the brick charcoal kiln, to replace the earthen pits, from east to west (west being Marquette County) and that the introduced shape for the charcoal kiln was approximately a truncated cone.

While Cameron was not a builder of the first furnaces, he was a planner (as a mining engineer) and must have interacted with Gay. That interaction likely affected the design direction for the beehive charcoal kiln.

In 1878 a detailed summary of the Lake Superior charcoal industry confirmed that the beehive charcoal kiln had become the standard design. Cameron was interacting with many pioneers in Marquette County and undoubtedly had the opportunity to experiment and invent a new charcoal kiln design. Later he clearly introduced the new design into Wisconsin's and the Far West's smelting regions, but surprisingly he gets little credit in the Upper Peninsula for the new beehive charcoal kiln. In 1869, in a discussion on whether or not to form The Marquette Iron Association, a key question that would interest potential members is "What is the best form for charcoal kilns?" It noted that: "There are certainly men in the country who have ideas and facts on this subject, which would be most instructive not only to ourselves, but to the whole industrial world."[58] Surprisingly, the issue of charcoal kiln design was unsettled in 1869 in the Upper Peninsula.

Certainly, Cameron was well-known in the Upper Peninsula, with a high professional reputation. Also, evidently a type of beehive charcoal kiln was developed there and Cameron does get full credit for introduction of the beehive kiln to Northeastern Wisconsin and the Far West. The 1878 summary of charcoal in the Lake Superior region stated:

> Of late years a large amount of charcoal has been delivered by rail, and the kilns may be seen scattered along the railroads at the points where the tracts of hard wood are met with. Most of the furnaces have a few kilns quite close to them as a reserve, to which wood is hauled, but as a rule the main supply comes from kilns in the woods.
>
> The kiln ordinarily used is the "bee-hive," with a diameter at the bottom of from 28 to 30 feet; a diameter of from 15 to 20 feet at a height of from 16 to 18 feet above the hearth, and from 24 to 28 feet high, holding from 30 to 45 cords each.[59]

In December of 1868 Cameron had relocated to Northern Wisconsin and wrote a letter to the *Appleton Post* from De Pere, "having promised your readers an account of the furnace erected here for the manufacture of Charcoal Iron." He suggested a short sketch of how charcoal iron was manufactured "in the neighboring district of Lake Superior, Mich., may be as interesting." The short sketch noted smelting Lake Superior ore requires about 125 bushels of charcoal per ton and provides an excellent description of the charcoal kiln he introduced to the Upper Peninsula:

> The Charcoal is made entirely in Kilns. The favorite form being that of a Parabolic dome 27 or 30 ft diameter at the base resembling an old fashioned bee hive, capable of burning 45 or 50 cords of wood into Charcoal in fifty days, 20 to 25 of these kilns are used by each furnace and are located in groups of 7 to 9, throughout the company's lands, the greatest distance from the furnace being five miles. Maple, Birch and Beech being the woods preferred for

> Charcoal, Hemlock and other wood being sometimes used, 2 1-2 cords of wood required to make 100 bushels Coal. The construction of kilns being necessary from the long winters and the amount of snow during the winter months in this region, their economy over pits is variously estimated from 10 to 20 per cent.[60]

On July 10, 1865 J. C. Cameron wrote a testimonial letter to the President of the Improved Brick Company in Detroit, Michigan from the "Office of Bancroft Iron Company" in Marquette, listing his title as "Furnace Builder." The letter illustrates his relationship with the Bancroft and Collins Furnaces:

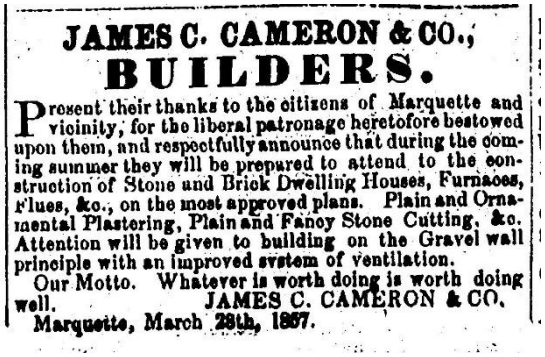
> Dear Sir: The 100,000 bricks sent to Collins Iron Company are on the docks at Marquette, as you request my opinion of them in contrast to others used by me, at this place and elsewhere, I can say that I consider them superior to any sent to this port for furnace work, and also for use in the construction of charcoal kilns and hot-blast ovens in a higher degree than any others I have seen. They will resist the penetration of acetic acid, so abundant in charcoal kilns, and other destructive agents, well known to the manufacturers of charcoal; they are in better condition than any lot of common bricks sent here, and for all uses to which common bricks are applied, would recommend them as a first-class building material.[61]

Cameron was a bit of a self-promoter, making one wonder if his claim to the beehive charcoal kiln is exaggerated. He wrote many letters to the newspapers, many of them containing braggadocios. In June of 1870 he asked the *Mining Journal* to publish a short technical article. The editor was happy to publish it, saying "J. C. Cameron, Esq., former of this county, has sent us the following letter, which we most cheerfully print, because it proposes something new in the economy of the blast furnace." Two weeks later, the editor was obviously upset when he found out Cameron had republished something from a research journal in his newspaper. The editor's note read: "QUEER?—The *Bulletin of the American Iron and Steel Association*, of the 15th, publishes the Negaunee Plaindealer's original communication of the 25th signed J. C. Cameron. We published the same thing on the 18th."[62] Even so, by 1871 the *Mining Journal* identified him as one "whose name is closely identified with the history of many of the most successful furnaces in the northwest [Northwest Territory]."[63]

In July, 1857, Capt. G. D. Johnson, the first Superintendent in charge of the Lake Superior Mine, arrived at Ishpeming in company with J. Cameron, and assumed direction of work at the Lake Superior Mine. At first, they were compelled to go to Col. Whittlesey's for food and shelter, and not unfrequently were obliged to camp by the side of a "smudge fire," to prevent the stinging insects from tormenting them to death.[64] During the summer of 1857 Capt. Johnson helped construct the first building in Ishpeming by mixing the mortar and carrying the brick, while James Cameron, "well-known in the county, built the chimney."[65]

J. C. Cameron shows up in the 1860 U. S. Census as living in the Township of Marquette, aged 27, born in Scotland, with bricklayer as his occupation. In the Census, he was associated with David W. Hoag, Superintendent of Charcoal Burning. In the 1870 U. S. Census he is listed as living in the Village of Marquette and with the occupation of stone mason. In the 1880 U. S.

Census his age is listed as living in Ely and McIntyre Mills, Juab County, Utah Territory, about 50 southwest of Salt Lake City. His occupation was mining engineer.[66] A business directory confirms the Ely Mills location and occupation.[67] Based on Cameron's name in the 1860 U.S. Census for Marquette County, the Cameron who accompanied Johnson was likely James C. Cameron, Jr. In 1857 and 1858 "James C. Cameron & Co., Builders" advertised in the *Lake Superior Journal* on a regular basis that the company was "prepared to attend to the construction of Stone and Brick Dwelling Houses, Furnaces, flues, &c, on the most approved plans," suggesting Cameron was casting a wide net to begin a construction business in Marquette area (Figure 9).



JAMES C. CAMERON & CO.,

BUILDERS.

Present their thanks to the citizens of Marquette and vicinity, for the liberal patronage heretofore bestowed upon them, and respectfully announce that during the coming summer they will be prepared to attend to the construction of Stone and Brick Dwelling Houses, Furnaces, Flues, &c., on the most approved plans. Plain and Ornamental Plastering, Plain and Fancy Stone Cutting, &c. Attention will be given to building on the Gravel wall principle with an improved system of ventilation.

Our Motto. Whatever is worth doing is worth doing well.

JAMES C. CAMERON & CO.

Marquette, March 28th, 1857.

**Figure 9.** Advertisement from the *Lake Superior Journal* [Marquette] of August 15, 1857 for providing building services by James C. Cameron & Co.[68]

**New York/Vermont**

Cameron did not identify where his design was utilized in northern New York. While charcoal kilns in New York were generally rectangular and round shaped, there were beehive charcoal kilns in northern New York. One major historical study of the New York iron industry noted that beehive charcoal kilns were "commonly used in many areas of the Adirondack-Lake Champlain region."[69] Perhaps, some of these were of Cameron's design. Nearby Vermont followed the same pattern, with rectangular and round charcoal kilns being most common, with small conical kilns slowly replacing the earlier designs after the late 1870s. An extensive archeological study there made little mention of beehive charcoal kilns.[70]

An interesting figure from that region's charcoal kiln history and legends is Isaac Doolittle. In late 1829 he wrote a letter to a science journal explaining that he had seven years of experience observing "the manner in which charcoal is made in our woods and mountains," something he "always considered as an exceeding laborious, wasteful and slovenly operation." It is possible that this would be the introduction of the round charcoal kiln to the region. Observing charcoal being burned in a pit in the ground, with an iron cap that must be removed for each burning and tubes leading to the bottom to serve as vents, he originated a better method:

> It occurred to me that, by building kilns above ground, so that all the vents could be come by with facility, and arching the top over in the form of a dome, leaving one or more openings in the side for the admission of wood and the extraction of coals, (which are closed during the operation of charring),) they might be constructed of almost any size that might be desirable. The result of the experiment justified my most sanguine expectations. A kilns of thirty feet diameter, and nine feet high to the spring of the arch, and which holds fifty cords of wood, has been several times filled and charred, and has uniformly yielded from fifty five to sixty bushels of coals to the cord,* of a quality, far, very far superior to coals made in the ordinary way. From the manner of making these coals, they must be entirely free from stones and dirt, which are highly detrimental in most uses to which charcoal is usually applied—and of which it is almost impossible to avoid raking more or less among coals made in pits covered with earth.
>
> In addition to the economy of wood, and the improvement in the quality of coals—there is also an immense saving of labor in the use of the kins, which moreover, possess the advantage of operating at all seasons of the year, and in any weather.
>
> *Colliers, in the woods, usually compute the yield of coals at the rate of one hundred bushels to two and a half cords of wood, or forty bushels to the cord—but I believe that, as a general average, one hundred bushels to three cords of wood, would be nearer the truth.[71]

The *Manchester Journal* of May 18, 1871 gives a brief history of charcoal kilns in the state and traces back to the Isaac Doolittle introduction. "According to the best information obtainable on the subject this mode of manufacturing charcoal dates no further back than 1829," when Isaac Doolittle developed it as one of the general managers of the Bennington Iron Works. He failed to get a patent and the kiln design became common throughout the United States. Charcoal kilns based on that description would be basically round:

> Coal kilns are constructed of fire-proof brick; are invariably circular in form; presenting a great similarity in outline and appearance. They are built of different dimensions, generally varying from twenty-four to thirty-two feet in diameter. The upright wall is about one foot in thickness and from twelve to fourteen feet in height. The roof or "crown" is built in the form of an arch rising about four feet from base to center, with the foot resting against a strong band inclosing the kiln, and made of heavy bar iron six inches wide, which also seems to strengthen the main wall. Timbers fourteen feet in length, eight inches square at the bottom and four by eight inches at the top, are firmly set in the ground twenty-eight inches apart and placed in an upright position against the kiln. These are grasped by two more iron bands, which by a liberal application of the blacksmith's sledge, are forced down these tapering timbers, one to

within four the other eight feet of the ground, giving to the entire structure an appearance of great solidity, strength and durability.[72]

The discussion of New England charcoal kilns provides insight into early designs of American charcoal kilns. One of the most thorough descriptions of charcoal kiln designs was by Thomas Egleston.[73] His description of conical charcoal kilns did not differentiate the beehive charcoal kiln as a distinct design. He presented four representative conical charcoal kilns, located at smelting works at American Fork Canyon in Utah, at Norton's Iron Works in Plattsburg, New York, at Wassaic, New York, and at Readsboro, Vermont. Included in his group of conical charcoal kilns is one from the West and it is one of Cameron's beehive charcoal kilns, the first battery of kilns he built in American Fork Canyon upon moving to Utah.

The conical charcoal kilns in Wassaic, New York, still stand. The Hagley Museum and Library Digital Archives contains a photograph of them.[74] These are most clearly of the truncated cone design, without a parabolic dome. The kilns at Norton's and Readsboro are diagrammed by Egleston and are fairly standard conical kilns. He discusses the main differences in angle from the bottom and placement of doors. Of his four examples, Cameron's beehive charcoal kiln is distinguished for its parabolic dome, something the others conspicuously do have possess (Figure 10).

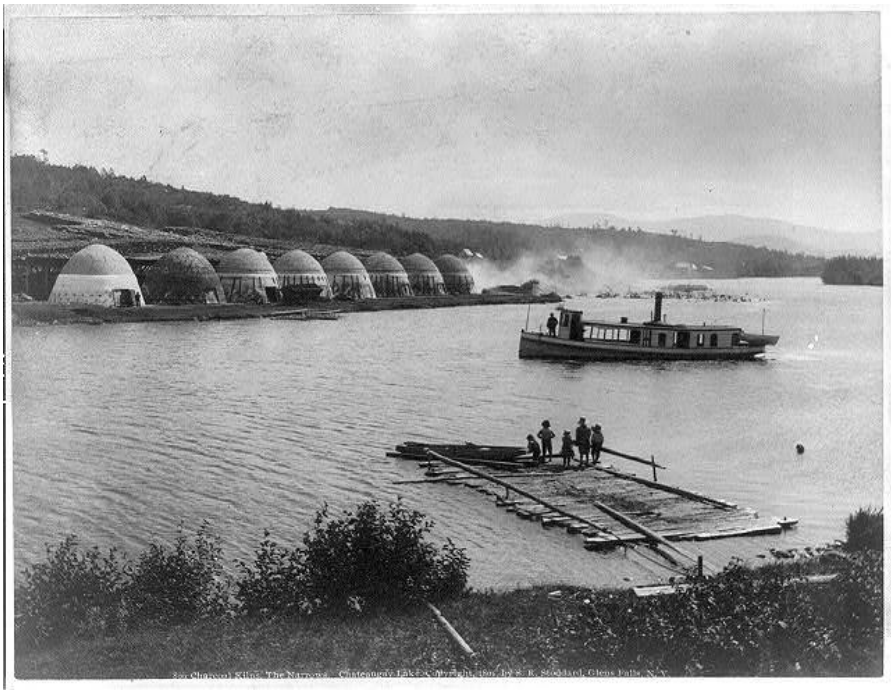


**Figure 10.** Charcoal kilns, the Narrows, Chateaugay Lake, Adirondack Mountains, New York. Beehive charcoal kilns were common in northern New York, supporting the view that they may have been introduced from the Upper Peninsula.[75]

While the charcoal kilns of New England and New York tend to be round and conical, there definitely were beehive charcoal kilns scattered across northern New York, especially close to the Adirondack Mountain-Lake Champlain iron regions. The kilns at the Narrows on Chateaugay Lake, for example, were built in 1873-1874 to supply the Chateaugay Iron and Ore Company.[76] While, unlike Wisconsin and the Far West where Cameron's name is associated with beehive charcoal kilns, there does not seem to be a history of where kiln designs originated (except Isaac Doolittle in 1829). However, the timing of the introduction of beehives kilns to New York and the geography of where they are common, are in temporal alignment with Cameron's kiln introduction chronology.

**Lake Superior Ores Smelted in Wisconsin**

Between 1868 to 1874 charcoal iron furnaces were built in Northeastern Wisconsin to process Lake Superior iron ore in the Fox Winnebago Valley at West De Pere, De Pere, Green Bay, Appleton, and Fond du Lac.[77] Those iron furnaces would be an extension of the Lake Superior iron industry, the source of the iron ore which was being smelted. The new charcoal iron furnace activity would attract Lake Superior men and J. C. Cameron was engaged to assist in developing and superintending furnaces in Wisconsin, and his new charcoal kiln design would become common in the region. As in Michigan, he did not start out as the builder of furnaces. In June of 1868, as the first furnace was nearing completion, the *Negaunee News* reported that:

> Chas. H. Lovelace, Esq., one of our oldest and most experienced iron makers, has gone to Depere, Wisconsin, to superintend the completion of the iron works commenced at that place some years ago. Depere is a flourishing town, having a fine water power, on the Fox River, four or five miles above Green Bay city. We understand that the works are to be hurried to completion, and will put into operation at as early a day as possible.[78]

J. C. Cameron most likely relocated from Michigan to Wisconsin in 1868. In the fall of 1867, the *Mining Journal* reported him supervising construction of an edifice at St. Paul Catholic Church in Negaunee.[79] Cameron was involved in the Wisconsin furnaces sufficiently in late 1868 to have promised an explanation to the *Appleton Post* of why northeastern Wisconsin had become a smelting region for Lake Superior ores. His letter explained:

> The success of manufacture of Charcoal Iron in the Northern Peninsula of Michigan is attracting the attention of capital and inducing it to look for a new field along the Bays and navigable rivers of Northern Wisconsin. The abundance of fuel and the appreciation of the lands when cleared for farming purpose will offer an inviting field to the Iron maker as well as to the farmer.[80]

By March of 1869 Lovelace wrote to the *Mining News* and reported "Depere in splendid condition and making iron at a less expense, and consequently larger profit, than the furnaces here [at Marquette].[81] That first charcoal iron furnace, owned by the Fox River Iron Company, was built on the west side of Fox River. Later, in March of 1869 the *Mining Journal* reported that a company was being formed to build a second blast furnace on the east side of the Fox

River. An expert had been obtained to supervise the work: "The work will be commenced as soon as the frost is out of the ground. The company have secured the services of Jas. C. Cameron, of Negaunee, and the work will be under his supervision."[82] He selected the furnace and kiln sites and supplied the plans for the furnace. The charcoal kilns would be made of brick and "of the Cameron's Bee-hive form, and of the same size and capacity as those built by him last summer and now in successful operation at the furnace at Depere."[83]

Cameron apparently was involved in the construction of the first furnace at Depere also, as the *Mining Journal* credited him as "builder of the two Depere furnaces and formerly of Lake Superior."[84] Late in 1869 he would list his address as "Depere, Brown County, Wis."[85] Early in 1870 a correspondent from Green Bay reported on the new furnaces at Green Bay to the *Mining Journal* and noted that "Lake Superior men have a big finger in the pie," and that men with "familiar names to all Lake Superior men, and they are all more or less engaged in iron mining." J. C. Cameron was one of Lake Superior men mentioned.[86] It is interesting that the Marquette newspaper consistently credited Cameron with the beehive design, reporting on the new furnace planning to "erect as soon as possible, six of the Cameron patent bee-hive charcoal kilns," giving them "24 of these kilns, in all, which it is thought will keep the furnace fully supplied with coal."[87]

In August of 1869 the Marquette *Mining Journal* reported on Cameron's activities in Wisconsin, noting that: "J. C. Cameron is the presiding genius at the First National." He is a practical man, "well schooled in the science of iron smelting, an education obtained by long years of experience in the iron district of Lake Superior." The Depere Furnace "intends to build during the fall six more kilns of the Cameron bee hive form." At the First National (Figure 11):

> Work has been commenced on eighteen charcoal kilns, of a capacity of 53½ cords each, of the "Cameron bee-hive" form—one group on the Fox River, five miles from Depere, and one on the East River, 2½ miles south-east, in a heavily wood section of the county. The coal will be transported to the furnace in barges during the summer, and by teams on the ice in winter"[88]

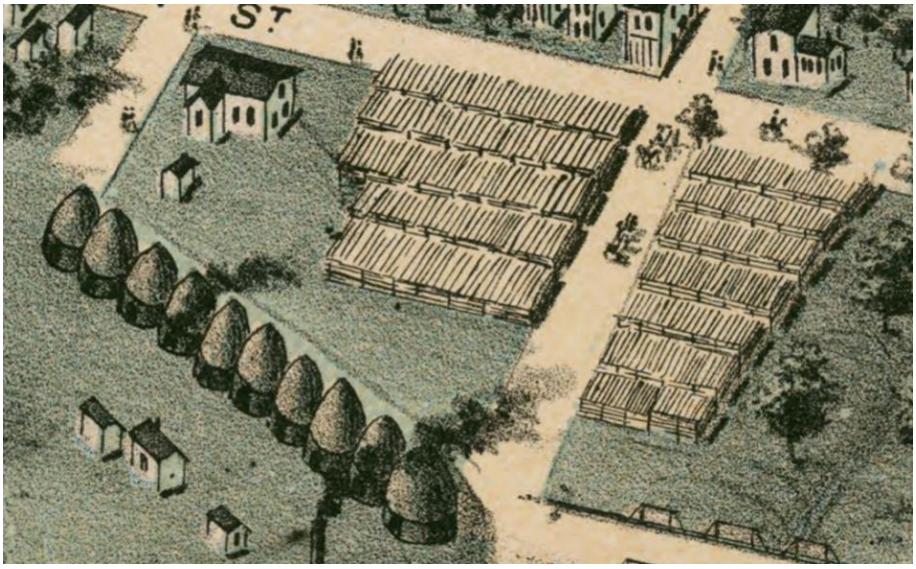


**Figure 11.** A bird's eye view map of De Pere, Wisconsin shows an artist's image of Cameron's beehive charcoal kilns at First National Iron Company.[89]

Cameron's design was the common design used by the other new iron furnaces in Northeastern Wisconsin. Early in 1870 a new charcoal iron blast furnace was under construction in Fond du Lac and the *Mining Journal* reported: "The work is progressing rapidly under the supervision of our old Lake Superior friend, J. C. Cameron, Esq., and it is the intention to complete and put it into operation at as early a day as possible."[90] The Appleton Iron Furnace, with two stacks built later in 1871 and 1872, also manufactured "their own coal in bee-hive kilns."[91]

The Upper Peninsula connection to Northeast Wisconsin eventually connected back to the Upper Peninsula. Wisconsin iron furnaces would eventually look to the Upper Peninsula as local wood supplies became tight.[92] The Fox River Furnace of West Depere built a battery of ten charcoal kilns at Nadeau, about 35 miles north of Menominee in Michigan.[93] In addition, the Fox River Furnace had plans for batteries of charcoal kilns nearby at Bagley and Kloman.[94] In 1872 a new blast furnace was being constructed in Menominee, Michigan "under the auspices of the National Iron Company of Depere."[95] Charcoal kilns were built near the furnace, but in 1875 charcoal demand resulted in the firm erecting six charcoal kilns west of Stephenson, about 22 miles north of Menominee.[96] The beehive charcoal kiln design moved back to its origins.[97]

J. C. Cameron's reputation in the iron smelting region of Wisconsin was well-established; he was identified in a Milwaukee newspaper as "well known in this state as a practical blast furnace builder, and inventor of the bee hive charcoal kilns."[98] There is little question that he was the influence that led to the beehive charcoal kilns being adopted as the accepted design in the region.

**The Beehive Charcoal Kiln Introduced to the West**

The reputation and popularity of Cameron's new beehive charcoal kiln design grew and soon interest developed in the mining regions of the American West. The Miller Mining and Smelting Company of Salt Lake City employed Cameron to plan the construction of a set of beehive kilns for their Sultana Smelter Works in American Fork Canyon, about 25 miles southeast of Salt Lake City.[99] He arrived in Utah in the spring of 1871, accompanied by charcoal burners Hugh McAllister and John Ross, both formerly employees of the National Iron Company in Wisconsin and who would operate the American Fork kilns.[100] Not surprising is that Mr. McAllister was noted as being Italian, a most common nationality for a charcoal burner.[101] The new charcoal kilns at American Fork were described in a local newspaper as: "recently erected by the Miller mining company, known as the Bee Hive kiln, a kind entirely new to this part of the country, has proved an entire success."[102] Another newspaper described them shortly after construction:

> The kilns are constructed of substantial masonry, either of stone or brick, the last mentioned being preferred. They are in the form of a semi-gothic dome, and resemble an old fashioned bee-hive, from this similarity they are known as "The Bee-hive Charcoal Kiln." They are the invention of J. C. Cameron, Jr., a mining engineer who introduced them first to the Charcoal Iron Manufacturing Region of Lake Superior, Michigan, and Northern Wisconsin, subsequently in Northern New York, and other districts. M. H. Hunt, Esq., Secretary of the National Iron Company of Wisconsin, one of the largest iron works in that State, in writing of them, says: They are superior to any charcoal kiln now in use, affording a savings in construction over the rectangular form 50 to 75 per cent; in cost of manufacture 25 to 50 per cent, and a very favorable profit in quality and quantity of coal produced, while over the pit process they possess very decided advantage. During the winter season, when snow abounds, they can be worked with almost as great economy as during the summer months. . . .
>
> The kilns erected in American Fork Canyon have given entire satisfaction, and are in every particular a success. They are built under a contract by Evans & Morris, of this city, who have the inventor's right to build in Utah, Nevada, and California.[103]

Morris & Evans established the first marble monument business in Salt Lake. Mining and smelting soon developed as major economic endeavors throughout the Territory and Mr. Morris had extensive experience in furnace construction, creating furnace building opportunities across Utah and the adjacent Territories. The firm also manufactured brick and Cameron's assignment of inventor's rights created a demand for firebrick to build kilns in Utah, Nevada, and California.[104] Cameron's charcoal kiln design travelled across the West.

By the summer of 1872 eleven kilns had been constructed at American Fork Canyon, with several more in progress. Each kiln could turn out 1,000 bushels of charcoal over ten

days.[105] A second set of charcoal kilns designed by Cameron were being constructed at Hilliard Station in Wyoming, near the Utah state line (Figure 12).[106]

**Figure 12.** The Cameron charcoal kilns at Hilliard, Wyoming, illustrating the design and looking like smoking beehives (from historical marker at site, unknown artist).

J. C. Cameron described his early charcoal kiln construction in Utah and the form of his new kiln design as:

> Charcoal obtained from California at twenty-five cents to thirty cents per bushel, and coke from Pennsylvania at thirty-five dollars per ton, delivered at the reduction works in Salt Lake Valley, must sooner or later necessitate the adoption of a substitute for these precarious and expensive articles of fuel.
>
> Charcoal as fuel for the reduction of metals undoubtedly stands unrivaled. The scarcity of timber, and the expense attending its manufacture by the pit process, in consequence of the snows during the winter season and the absence of suitable covering material, are almost prohibitary [sic] provisions against its general use west of the Rocky Mountains. The production of this article could be carried on at less expense by the erection of kilns suited to the manufacture. For many years the writer has been engaged in experiments in this branch or industry, and has succeeded in the introduction of The Bee-hive Charcoal Kilns. The universality of their adoption in the iron manufacturing districts of Michigan, Wisconsin and New York, where they are dependent upon charcoal as fuel, is perhaps the best recommendation of their economy. Within the past two years they have been introduced in Utah at the American Forks Smelting Works and at Hilliard Station, on the line of the Union Pacific Railroad, with good results. . . .

> These kilns are in the form of a parabolic dome, with a base of twenty to twenty-four feet in diameter and altitude of nineteen to twenty-two feet. This size is known as a thirty cord kiln, which is found in practice to produce the greatest economy. The material best adapted for their construction are common bricks, closely laid in brown lime mortar. Although limestone, sandstone or other country rock has been used successfully where bricks are not attainable except at every extra expense. These kilns may be erected in groups of such numbers as the supply of timber and the demand for charcoal may warrant; their maximum cost need not exceed $700 each in any of the timber districts of Utah.[107]

Cameron's Northern and Midwestern experience is obvious when he reports that in the Clifton Mining District in Tooele County there was an ample timber supply "consisting chiefly of white and red pine of excellent quality, admirably adapted for the manufacture of charcoal."[108] He was mistaking the conifers on Utah's mountains with tree species common to northern Michigan and Wisconsin.

Two of the best-preserved and most prominent remaining beehive charcoal kilns in the West are located at the Ward Charcoal Oven State Historic Park in Nevada and the charcoal kiln complex in Wildrose Canyon in Death Valley National Park in California. Construction of these kilns can be traced back to the Hilliard kilns and from there to the Upper Peninsula and James C. Cameron. A charcoal kiln builder, Mr. Morrison, traveled from Hilliard, Wyoming to Ward[109] and on to Death Valley with Cameron kiln design.

In July of 1876 the *Mining and Scientific Press* reported on the charcoal kilns at Ward and Mr. Morrison's role in their construction:

> The Martin White company have contracted for the erection of six charcoal kilns of a capacity of 800 bushels of coal each daily. The construction of the kilns is under the immediate superintendency of Mr. Morrison, late of Wyoming Territory, who has had a life long experience in the coal business. Mr. Morrison has entered into a contract to supply the company, as soon as the kilns are completed, which will be within a month, all the charcoal that may be required to run the two furnaces, at 13 cents per bushel, at the kilns. The hauling of the coal from the kilns to the furnaces has been contracted for at two cents per bushel, thus costing the company only 15 cents per bushel for coal, delivered at the furnaces. It is said by those who have had experience in such matters that charcoal burnt in kilns is superior for smelting purposes to that burnt in pits or heaps, and it is certain much freer of stone or dirt.[110]

Then in 1877 Mr. Morrison completed the Wildrose charcoal kilns in Death Valley for the Modoc Consolidated Mining Company. A National Park Service history of those charcoal kilns credits "Mr. Morrison' who built—and probably also designed—the kilns."[111] Of course, the designer was actually James C. Cameron, Jr. The Mining and Scientific Press in May of 1877 reported on the Wildrose kilns: "The new kilns, erected under the supervision of Mr. Morrison are

giving entire satisfaction, and are already furnishing a large amount of clean, hard coal, very much superior to that made in the ordinary pits."[112]

**Cameron's Kiln Design Influences Charcoal Burning Across Nation**

James C. Cameron, Jr. developed his design for the beehive charcoal kiln in Marquette County. The kiln was adopted throughout the Upper Peninsula, and also across much of the iron and precious metal smelting furnace areas of the United States. His influence on charcoal kiln design was profound enough to be credited in federal- and state-level reports. Parts of the Northeast, Midwest, and the Far West still contain examples of his design. It is a contribution to the smelting industry not much recognized in the Upper Peninsula. The historical heritage the charcoal kilns represent is preserved in the "resurrected" Marquette and Fayette charcoal kilns. However, much of the history of the hugely important charcoal burning industry is long forgotten.

The beehive charcoal kiln is widely recognized for its distinctive shape. So much so, the adjective is generally thought to refer to most all charcoal kilns. It is common enough to even be part of a sight-seeing quiz for the general public in 1964 (Figure 13). The date of the quiz is telling; over 50 years ago charcoal kilns along the highway were common sights, especially in places like the Upper Peninsula. Today, the resurrected ones will have to suffice. When Yoopers explain what that big thing is along the highway at the Carp River mouth, they can add, "You know, that thing was invented here."

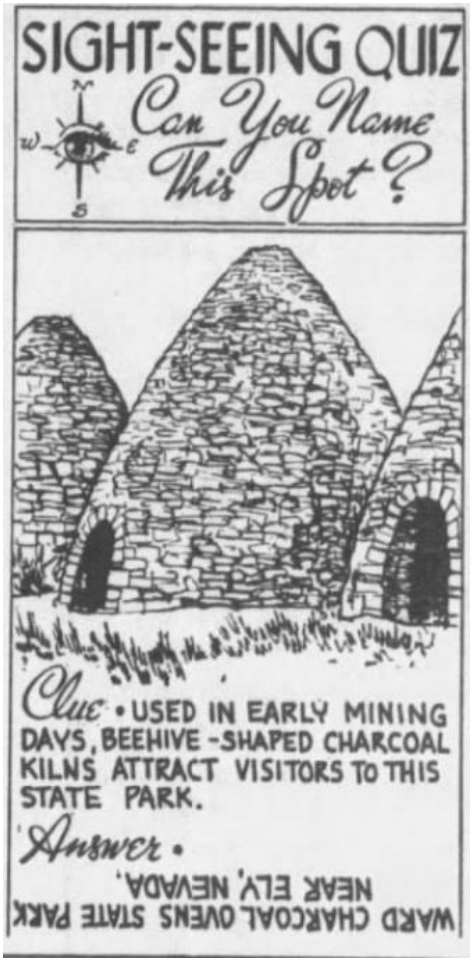



**Figure 13.** Cameron's beehive shaped charcoal kiln is in a state historic park in Nevada and in Death Valley National Park. It is common enough to have ended up in a nationally syndicated sight-seeing quiz.[113]

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[77] Thomas J. Straka and Lawrence A. Gueller, "Fuel for Northeast Wisconsin's Iron Smelting Industry: A History of Charcoal Kilns," *Voyageur: Northeast Wisconsin's Historical Review* 30, no. 2 (Winter/Spring 2020), 32-41.
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[79] "Negaunee," *Mining Journal*, May 28, 1870, 3.
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[81] "Personal," *Mining News*, March 10, 1869, 3.
[82] "Another Furnace at Depere," *Mining Journal*, March 31, 1869, 2. The first furnace had been built by the Fox River Iron Company at what would become West De Pere and this second furnace was being built by the First National Iron Company of Depere (later the National Furnace Company).
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[84] "Review of the Fox River Furnaces," *Mining Journal*, January 7, 1871, 2.
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[86] "All About Green Bay—Its Furnaces—New Buildings, Etc.," *Mining Journal*, March 5, 1870, 3.
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[88] "Fox River Furnaces—Depere Iron Company—First National Furnace—Green Bay Iron Co.," *Mining Journal*, August 21, 1869, 2; "Fox River Furnace," *Green Bay Gazette*, August 28, 1869, 3.

[89] "De Pere, Wis. 1871," drawn by H. H. Bailey, Chicago Lithographing Company.
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[92] Straka and Gueller, "Fuel for Northeast Wisconsin's Iron Smelting Industry," 32-41.
[93] "Town of Nadeau," *Green Bay Advocate*, May 19, 1881, 3.
[94] "Depere Matters," *Green Bay Advocate*, April 29, 1880, 3.
[95] *Mining Journal*, August 17, 1872, 2.
[96] LaFayette, *Flaming Brands*, 43-44.
[97] "Old U.P. Charcoal Kilns Sought as Historical Parks," *Green Bay Press Gazette*, February 20, 1972, A4. This newspaper article contains an excellent photograph of the beehive charcoal kilns at Stephenson, Michigan.
[98] *Daily Milwaukee New*s, June 10, 1870, 4.
[99] "The Sultana Smelting Works," *Utah Mining Gazette* [Salt Lake City], November 29, 1873, 1; "Charcoal Kilns," [Provo, UT] *Daily Herald*], February 18, 2007, B4.
[100] "New Charcoal Kilns," *Utah Mining Journal* [Salt Lake City], July 16, 1872, 3; "American Fork," *Salt Lake Daily Tribune*, November 19, 1872, 2; "American Fork," *Salt Lake Daily Tribune*, November 21, 1872, 2.
[101] "American Fork Canon," *Salt Lake Daily Herald*, September 14, 1873, 2.
[102] "American Fork," *Salt Lake Daily Herald*, September 14, 1872, 3.
[103] "Resources of Utah. Statistics of Progress for the Year 1872. Number Thirteen. Charcoal Burning," *Salt Lake Daily Tribune*, January 14, 1873, 2. The construction company was most likely Morris & Evans, a well-known brick manufacturer and construction company in Salt Lake City.
[104] Edward W. Tullidge, *History of Salt Lake City and Its Founders*, Biographies (Salt Lake City, UT: Star Printing Company, 1886), 153.
[105] *Utah Mining Journal*, July 16, 1872, 3.
[106] *Utah Mining Gazette*, July 25, 1874, 381; "Hilliard, "*Salt Lake Daily Tribune*, January 1, 1878, 10; "Our Charcoal Supply," *Utah Mining Gazette*, February 14, 1874, 196.
[107] *Utah Mining Gazette*, July 25, 1874, 381.
[108] J. C. Cameron, Jr., "Tooele. Clifton Mining District," *Utah Mining Gazette*, June 27, 1874, 346.
[109] Nathan D. Thomas, "Pinyon-Juniper Woodland Resource Development at the Ward Historic Mining District, 1872 – 1888," *Nevada Archaeologist*, 22 (2007), 22-32.
[110] "Charcoal Kilns at Ward," *Mining and Scientific Press*, July 15, 1876, 46.
[111] Merrill J. Mattes, *Charcoal Kilns: Wildrose Canyon, Death Valley National Monument, California*, Historic Structures Report (San Francisco, CA: National Park Service, Western Service Center, 1970), 33-34. A comment on page 5 states: "A company man named Morris built the Wildrose Kilns." This likely is referring to Mr. Morrison, or perhaps to Morris & Evans in Salt Lake City, the source of the kiln design plans.
[112] "Lookout," *Mining and Scientific Press*, May 19, 1877, 46.
[113] "Sight-Seeing Quiz," *Gazette* [Ville Platte, LA], October 15, 1964, 4.