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Groundhog Kilns—Rectangular American Kilns of the Nineteenth and Early Twentieth Centuries

Georgeanna H. Greer

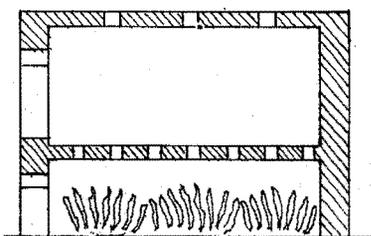
Remains of old kilns of a rectangular form with certain specific attributes are encountered in many areas of the southern United States. These were wood fired kilns used primarily in the manufacture of utilitarian stoneware vessels by small potteries in rural areas and are most often called groundhog kilns. A few kilns of this form are still being used today in the deep south at the Jugtown and Seagrove potteries, North Carolina; the Meaders Pottery, Cleveland, Georgia; and the Norman Smith Pottery, Lawley, Alabama. At least 2 of these kilns have been modified during the past few years to burn fuel oil rather than the time honored wood: one at the Jugtown Pottery and the Meaders Pottery kiln for a period about 1973. The kilns were used for salt-glazed, alkaline-glazed, and slip-glazed stonewares in these areas and were also frequently employed in areas such as North Carolina for the firing of earthenwares. I have no knowledge of the frequency of these kilns in the Northern or Middlewestern states. It was the prevalent kiln in the deep South until at least the third quarter of the 19th century and has remained in use in certain areas up until the present day. I should like to note that my previous description of this kiln was not entirely correct (Greer 1970).

Historically rectangular kilns have been used by European potters since the period of the Roman Empire. Rectangular Roman kilns with parallel flues have been excavated in Great Britain (Sheldon 1975) as well as on the continent. These kilns were used for the burning of brick and tile while round kilns seem to have been preferred by the Romans for the burning of their earthenware vessels. Medieval and even later tile and brick kilns have been found in England (Musty 1976; Dale 1974) and on the continent, constructed in the rectangular form (Jean and Claudine Cartier 1976, pers. comm). The Skove

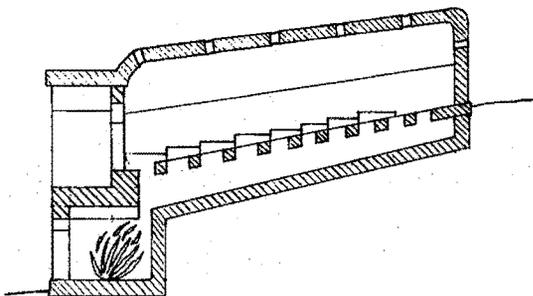
or Clamp kiln used for firing brick for many centuries, even today in less industrialized countries of the world such as Mexico, is a variation of the rectangular, multiflued kiln form.

In 1579 Cipriano Piccolopasso described an above ground kiln of a rectangular form used at that time for the firing of Italian majolica wares (Piccolopasso 1934:31-35). This kiln, as the previous rectangular kilns, was of the simple updraft type. In this instance the roof is illustrated as a permanent structure, probably not the case in many earlier rectangular kilns. The firebox was beneath the entire length of the kiln and no formal flues were present. The ware was stacked above a perforated floor and a series of openings in the vault of the roof allowed the heat and smoke to flow directly upward (Figure 1 A). The portholes in the vault were undoubtedly opened and covered alternately to regulate the draft and the temperature elevation. This basic kiln form remained popular with both the Dutch and English delftware potters.

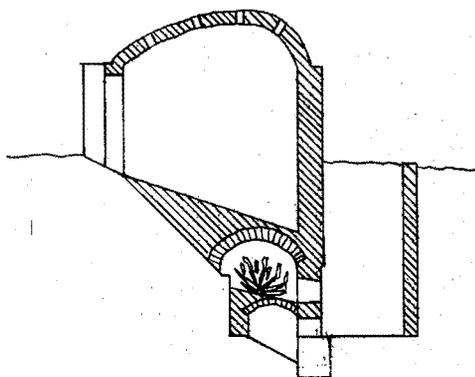
One of the earliest indications of the use of a rectangular kiln for the firing of stoneware is the sketch of a kiln from Raeren, one of the early Rhenish centers for the manufacture of salt-glazed stoneware (von Bock 1976). Raeren was an active center as early as the 16th century, but no definite date is given for this kiln. It has an anterior firebox with ascending flues rising from this and passing the length of the loading area (Figure 1 B). Whether these flues were covered with separated tile and much of the ware sat upon a solid platform or whether all of it was on a perforated platform is not clear. At least there is an elongation of the area for the setting of the wares or firing chamber. The firebox was anterior and depressed. No reports are presently available on excavation at Seigburg, and no kilns have yet been found in Cologne. A copy of the section on kilns



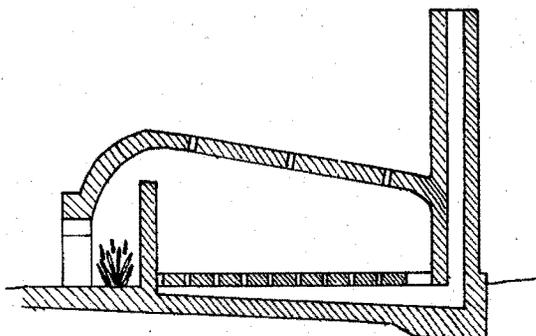
A. SECTION OF ITALIAN MAJOLICA KILN ILLUSTRATED BY PICCOLOPASSO-16th CENT.



B. SECTION OF GERMAN SALT-GLAZE STONEWARE KILN AT RAEREN-16th CENT.



C. SECTION OF GERMAN SALT-GLAZE STONEWARE KILN AT FRECHEN - 19th CENT.



D. SECTION OF GERMAN MODIFIED CASSEL KILN - 19th CENT

Figure 1. European kilns: A, modified from Piccolopasso, 1934; B, von Bock, 1977; C, Goebels, 1971; D, Cardew, 1969.

from Carl Göbels' *Reinisches Töpferhandwerk* (1971:92-99) sheds light upon the structure of the kilns at Frechen, another early Rhenish stoneware center. Göbels presents the plans of a 19th century kiln found in the Frechen Archives, but states that he feels that the kilns were much of the same form from the 16th century onward to the latter portion of the 19th century. He discusses the remains of the base of a kiln in Frechen, probably built during the 17th century, which were exposed a few years ago when a house, known to have been built in the year 1800, was torn down. The lower portion of the kiln was dug into the earth as the drawings from the Archives illustrate only the vault of the roof having been exposed. It had an oval form and 3 ascending flues bridged by tile; each separated only a few centimeters from the next and 2 solid loading platforms between. These features are identical with the early 19th century plan. The

firebox in these kilns was dug into the earth and was beneath the first portion of the firing chamber only. This second chamber narrowed toward the rear and the door for loading the wares was at that end. The vaulted roof was constructed with a series of portholes which could be adjusted to control the draft and temperature and also used in the salting process (Göbels 1971). The early Frechen kilns, as the Raeren kiln, were up-draft kilns. A mid-19th century kiln at Frechen of a more advanced plan also illustrated by Göbels was of the same oval form, completely buried and with no portholes in the roof. A tall chimney at the rear of the kiln was entered by a single flue from the rear of the firing chamber. This chimney was both to help the draft and permit the emission of the chlorine fumes higher into the atmosphere in an attempt to control that problem. The draft was, however, still all updraft.

Very large rectangular kilns are still in use to-

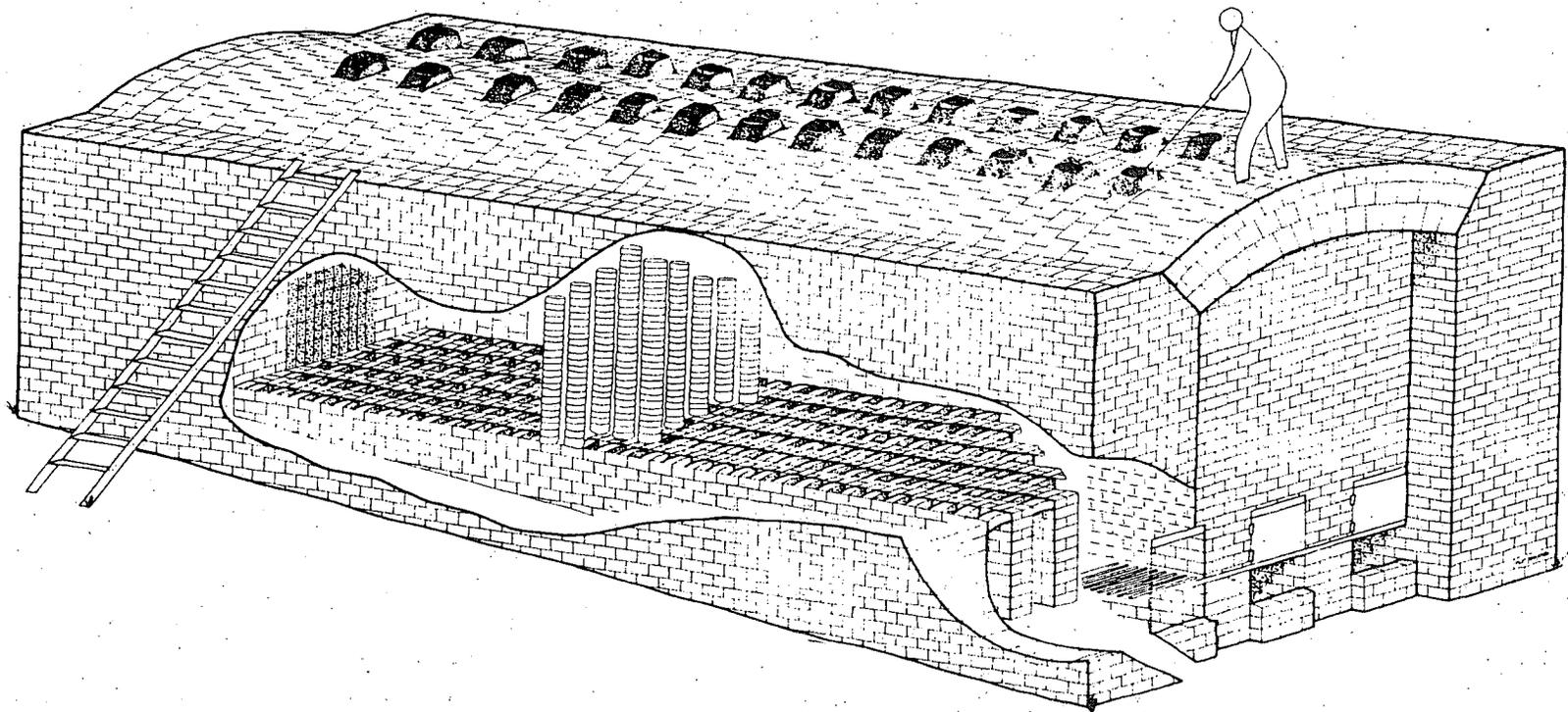


Figure 2. A 20th century salt glaze kiln in Adendorf, Germany. Drawing made by N. R. Pope, Montana State University, Bozeman, Montana. After description and measurements by Troy 1977.

day in the Westerwald area of Germany for salt glazing. They appear to be of a type related to the earlier Rhenish kilns. The modern kilns, however, are all above ground. The firebox is lower than the firing chamber, and bridged flues ascend from the firebox. The superstructure consists of low parallel side walls with a vaulted roof containing portholes (Figure 2). These are still used as they were used in the previous centuries for the adjustment of draft and temperature and admission of the salt (Troy 1977:27-37).

A most interesting kiln floor was found at Woolwich on the outskirts of London in 1975. Found beneath the ruins of an 18th century round kiln, the only reliable dating material in association with its wasters was tobacco pipes of the 1610-1640 period. The kiln was oval in form with a pair of loading platforms in what was once the firing chamber and 3 ascending flues between and to the sides of the platforms (Figure 1). The area described as the firebox area appeared small, and I feel that an unexcavated firebox may have been beneath this area as shown in the plans of the Frechen kilns, with which this kiln appears to relate closely. A pit excavated in front of the kiln suggests that it once was a "foxhole" for the stoker as was present in the Frechen Kilns. Fragments of salt-glazed stoneware were imbedded in a thick salt deposit on the loading platforms. Jugs fashioned after the German "Bartmann" or Bellarmine type were present with mask-like decorative embellishments and some seal-like medallions (Pandrich 1976, 1977). Drinking mugs of a type resembling the early Rhenish style with incised and applied decoration, including cobalt slip painting, were found (Pandrich 1976). This kiln is now presumed to have preceded the well known pottery which John Dwight established at Fulham in 1671. Many artifacts, but no kiln from the early period, have been found at Fulham during excavations (Christophers et al 1977).

The English modification of the Cassell (German) kiln and its close relative the Newcastle kiln were described by E. Bourry in his *A Treatise on Ceramic Industries*. Both Michael Cardew (1973: 179-80) and Daniel Rhodes (1968:43-45, 47) quote Bourry on this type of kiln, but I have never read the original article. The fourth edition of this treatise was printed in English in 1926 which leads me to presume that the kiln was being used during the 19th century. This would make it contemporary with the use of the groundhog type in the United States rather than antecedent to it. The presence of a chimney at the terminal end makes this kiln form very close to that of the groundhog. The main variation was the presence of a formal flue structure beneath or

running through the firing chamber. A constriction of the flue entrance into the chimney so that the opening was near the floor and the presence of a bag wall at the front of the firing chamber produced a sort of cross draft rather than a pure up or down draft (Figure 10). Cardew reports these kilns as having been used primarily in the brick industry.

The kiln of the "Poor Potter of Yorktown" is the earliest American stoneware kiln excavated so far. It is more square than rectangular in form, and the remains do not indicate any formal chimney structure. A firebox at the front, and ascending arched flues under the firing chamber seem to place this kiln in close relationship to the early Rhenish stoneware and English and Dutch delftware kilns. One may conjecture that portholes in a vaulted roof were used to control draft and temperature as well as to introduce the salt. Jugs and mugs produced in this kiln are almost identical to English stonewares of the period (Barka 1973).

All of these previously mentioned kilns show some relationship to the American Groundhog kiln. All are rectangular with a firebox at the anterior end and an elongated loading platform in the firing chamber. All 19th and 20th century American rectangular kilns which I have observed or had described to me have had a chimney at the rear. Portholes over the vault of the roof may still be seen in some of these kilns and are used today only for the admission of salt and as spy holes. Where and when the addition of a chimney first occurred, I do not know. This is a missing link. A formal flue structure may be seen in some of our taller kilns. This structure beginning only in the latter part of the loading shelf and descending toward the rear, functions to draw the heat and flames downward at the rear of the kiln so that they may exit through a low chimney flue opening (William Gordy 1977, pers. comm.). In this way the flues serve to create a downdraft rather than an updraft as they do in the German salt-glaze kilns. Whether the above changes represent a regression or a development in the design of the kiln is difficult to say, but they do aid in the development of higher temperatures while using somewhat less fuel.

The American 19th century kiln common in the deep south and humorously called a groundhog was generally built into a low hillside or slope and placed so that the firebox was on the lower ground level at the front of the kiln. The side walls were banked with earth and the ground level at the rear of the kiln was approximately at the top of the kiln walls. The roof vault remained exposed. The banking with earth and, in some in-

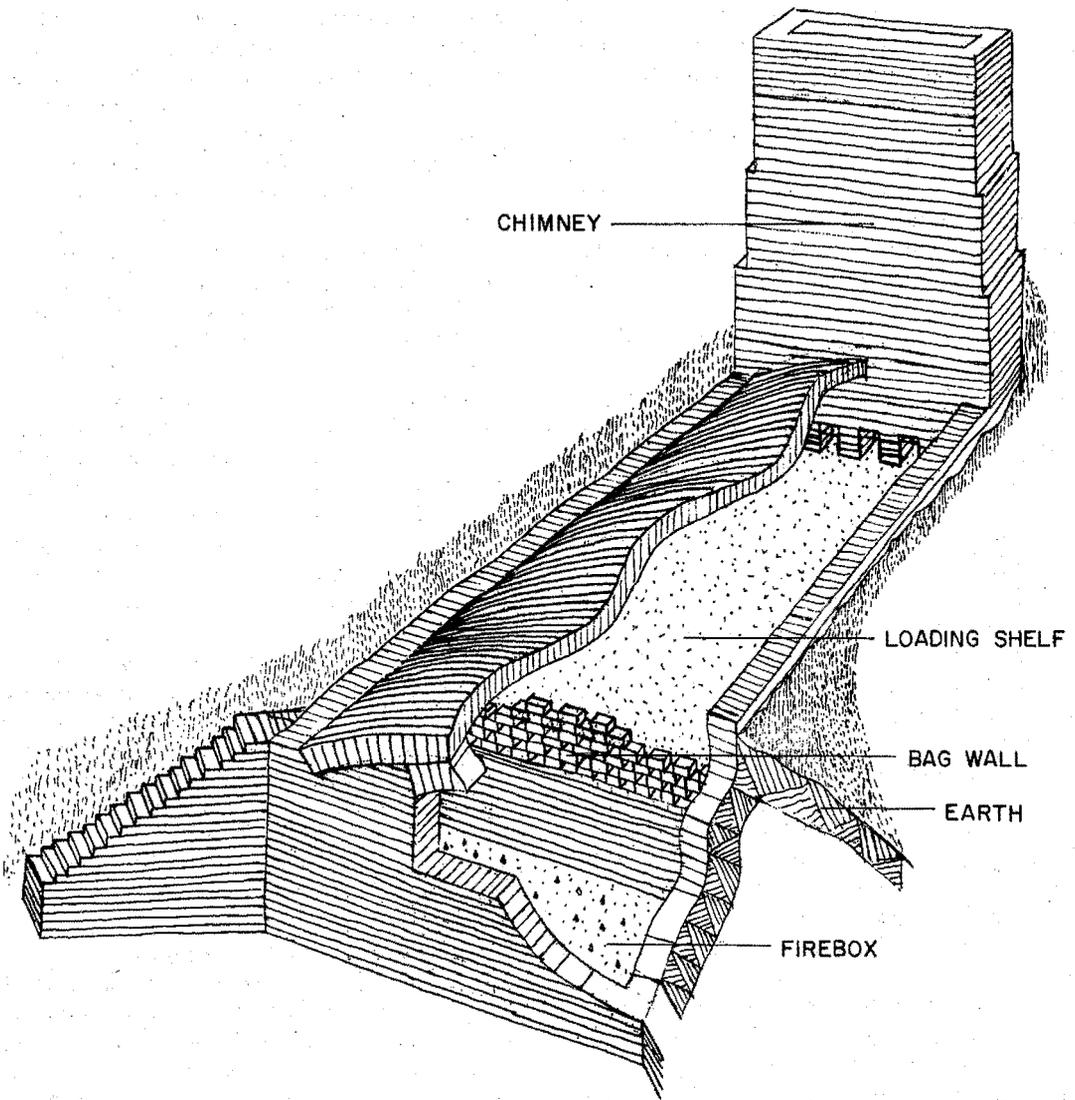


Figure 3. Typical Groundhog kiln.

stances, rock served both to give strength to the long side walls and as insulation to conserve heat. The appearance of the kiln with its low form, front opening, and earthen banking resembles an animal burrow and surely was a factor in the development of the name (Figure 3). During the 20th century kilns of the same form have been constructed on top of the ground with heavier side walls or timber bracing. Names such as "Railroad Tunnel" (Burrison 1973) and "Hog-back" (J. E. Richter 1972, pers. comm.) as well as Groundhog have been applied to these kilns. Sometimes these kilns were built in pairs; I have seen one example which appeared to be 2 pairs of "Siamese Twins." The firing chambers of this kiln were not fully excavated, but there seem to have been 2

kilns side by side, each of these having firing and loading mouths at each end and the remains of a chimney structure in the middle (Sandra Myres 1977, pers. comm.).

Constant features of these kilns are a firebox at the front end; a single flat shelf for loading the wares and forming the floor of the firing chamber, this being raised at least 18-24 inches above the floor of the firebox; and a true chimney structure terminating the kiln at the rear. Several variations in the structure of the constant features can be seen in the small group of kilns which I have been able to study. A discussion of these known variations may be helpful to others studying this type of kiln.

The most typical Groundhog kilns ranged from

approximately 16-20 feet in length overall and 6-8 feet in width. The brick walls were 10-12 inches in thickness and laid in a common bond. Buttresses, usually flaring away from the front at an angle, served to hold the earthen banking of the sides away from the front of the kiln (Figure 3). The first chamber of the kiln was the firebox. A single door in the front face served for both loading and unloading wares and also as a stokehole for the firebox. Small vents at the bottom of the front wall were usually present to aid in producing a draft to help in burning the fuel in the firebox. The firebox itself was commonly 8 feet in width and 4 feet in depth. The rear wall of the firebox was a permanent brick structure of 18-24 inches in height. This stopped at the floor level of the loading shelf. During the firing process a temporary wall of unmortared brick was placed at the top of the back wall of the firebox; it extended upward at least 12 inches in the lowest kilns. This wall was placed so that it deflected a large amount of the flame and heat upwards to the top of the kiln. It was frequently structured in a lattice like or checker formation so that some of the heat also passed through into the firing chamber at its floor level. This was to aid in the heat distribution and avoid a cold floor at the front of the kiln which is a frequent problem in these kilns. This temporary wall is called the bag or baffle wall.

A single earthen platform at the level of the top of the back wall of the firebox extended to the mouth of the chimney. This was generally 10-12 feet in length. It forms the shelf for the loading of the wares and is the floor of the firing chamber. The shelf is often built with a gradual rise in grade to the chimney mouth, usually no more than 8-12 inches in an average kiln. This slope also helped produce a more even temperature. The platform was smoothed and covered with a layer of fine clean sand or tiny bits of a quartz-like rock which had been crushed after being heated. The ware was usually placed directly upon this prepared floor. After each firing and unloading, this shelf was raked clean and smoothed, new covering material being added when necessary. The roof over this section was, as over the firebox, vaulted with a low arch ranging from 24 inches high at the sides to 36 inches in the center. Loading was accomplished by a man in either the prone position or on his hands and knees. Smaller pieces were placed at the sides and taller ones in the middle. The arch of the roof vault springs from the side walls of the firebox and firing chamber and consists most often of bricks arranged in a "header" fashion—the end of the brick being placed downward. Occasionally a

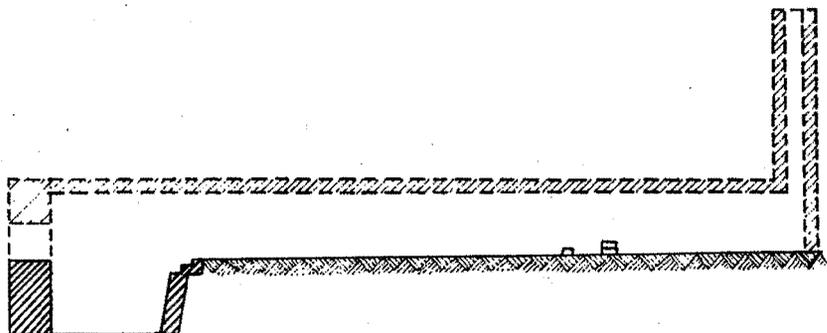
brick or 2 at the point of origin was shaped to aid in the formation of the arch, but the curve of the arch was mainly accomplished by filling the spaces between the brick with a mortar of fire clay and sand (Owen 1974).

Several chimney variations shall be discussed later, but a formal chimney structure, usually 10 feet in height, rose at the back of the kiln. This terminated the firing chamber and was generally the same width as the kiln itself at the base.

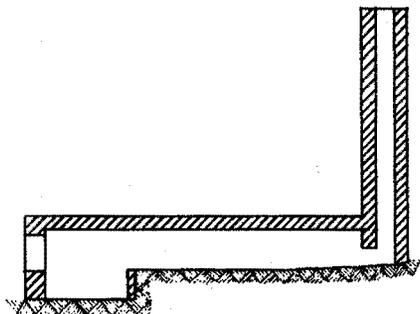
The simple form of this kiln made it possible for it to be constructed by 1 or 2 men with a few tools and almost no special materials. Brick could be formed at the site out of the available clay and fired in clamps. Occasionally the brick was only dried in the sun and hardened during a tempering fire in the kiln. The parallel walls were laid in common bond with a little sand and fire clay mortar. The arch was constructed by inscribing the desired curve upon a board which was then cut along this curve. Several boards were prepared to match this board, and they were attached together with lath work to form the arch board. This was placed on legs of proper height within the kiln walls and the arch brick arranged in either stretcher or header fashion and mortared in place over this frame. The frame was usually only 3 or 4 feet in length and moved along as the completed section of the roof became firm. It was finally dismantled or burned out within the kiln (Harding Black 1977, pers. comm.). The chimney, lower sections of which were completed as the kiln walls rose, was then finished to the proper height. An open but roofed protective structure was often constructed over the kiln, but the chimney projected uncovered above the roof.

Differences in size are the first major variations. The rectangular form is maintained, but volume variations are tremendous. The smallest kiln of which I have measurements was constructed about two years ago in Seagrove, North Carolina (Dorothy Auman 1977, pers. comm.). It is 12½ feet in total length and 4 feet wide on the interior. It was built according to the measurements of an earlier kiln in the area which is now in ruins. The Kirbee kiln in Montgomery County, Texas, is the longest kiln excavated to date. It measured 39 feet in total exterior length without the buttresses and 8 feet 10 inches in exterior width. A second small firebox within the firing chamber made this kiln functional (Greer 1976).

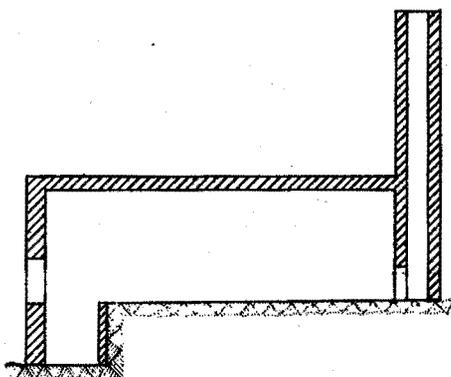
The height of the side walls is one of the greatest variables (Figure 4). The usual 18-24 inch side walls produced a very low firing chamber in which the ware was mainly placed on the floor of the chamber and no stacking was done. These



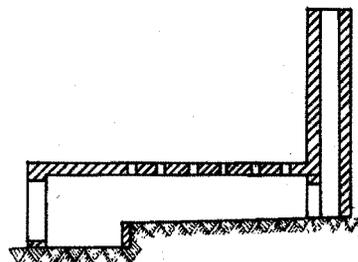
KIRBEE KILN - MONTGOMERY CO., TEXAS c.1850



BURNS KILN - MEANSVILLE, GA. c.1930



SMITH KILN - LAWLEY, ALA. c.1950



SEAGROVE POTTERY - SEAGROVE, N.C. 1975

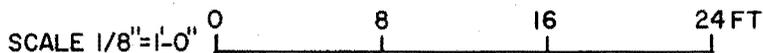


Figure 4. Comparative sections of several known Groundhog kilns.

are sometimes referred to as "single-shot" kilns for this reason (E. J. Brown 1973, pers. comm.). Little discarded kiln furniture is found at sites where this type of kiln was used, and the vessels show almost no rim scars when they were fired in such a manner. Later versions, especially those kilns placed on level ground, may have side walls up to 5 feet in height. The ware in this instance was stacked in tall columns, much the same as it was in round kilns and kiln furniture is usually plentiful at these sites. I feel that some of these kilns have really outgrown the Groundhog category and should be termed "Hog-backed" kilns.

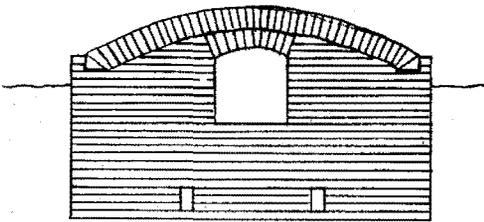
Major variations in the firebox besides those of height, width, and depth are represented by the number of loading doors and stoke holes and their position. One door serves both of these purposes in many small kilns. Accessory small air vents are frequently present near the base at the front of the kiln. The second main variation has one loading door above and a stoking door below. The loading door in this instance is bricked up during the firing. The second John Hunt kiln in Rusk County, Texas, shows a very complicated arrangement with three loading doors above and two stoking doors beneath the outer loading doors. This same front form was present in the

Hilton Kiln in North Carolina (William Gordy 1977, pers. comm.). Both were early 20th century kilns (Figure 5 C).

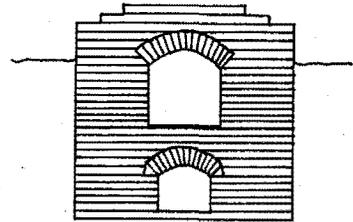
A front loading door with 1 or 2 stoking doors on the sides was another common variation. These side doors are sometimes called "eye" fire holes. They were helpful in that long timbers could be used for firing and less wood cutting was necessary (Arthur & Weymon Cole 1973, pers. comm.).

Arches were at times constructed within the firebox to add stability. These occur both parallel to the length and at right angles to the length. The latter form was used when the stoke holes were on the front of the kiln and a separate loading door is present. The first variation was used with the lateral or "eye" stoke holes. Increased wall thickness is also often seen around the firebox, for these are the walls which take the greatest stress during firing. The firebox walls of the Kirbee kiln are 24 inches wide while those of the firing chamber were only 12 (Figure 6).

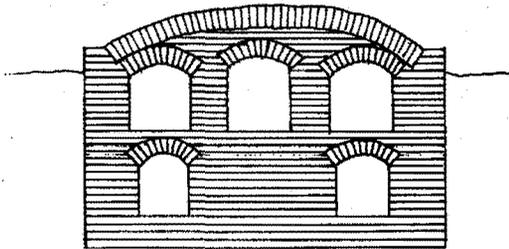
Few variations are present in the firing chamber besides increase in volume primarily accomplished by making the side walls higher. The previously mentioned removable brick in the roof vault which form vents over the firing chamber



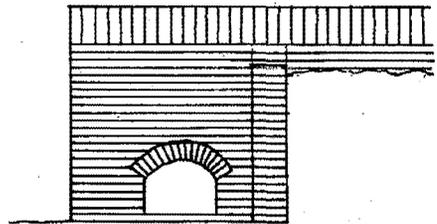
A - SINGLE FRONT DOOR FOR
LOADING AND FIRING



B - UPPER LOADING DOOR AND
LOWER FIRING DOOR



C - THREE LOADING DOORS AND
TWO FIRING DOORS



D - SIDE FIRING DOOR
(LOADING DOOR IN FRONT)

Figure 5. Variations of firing and loading doors of Groundhog kilns.

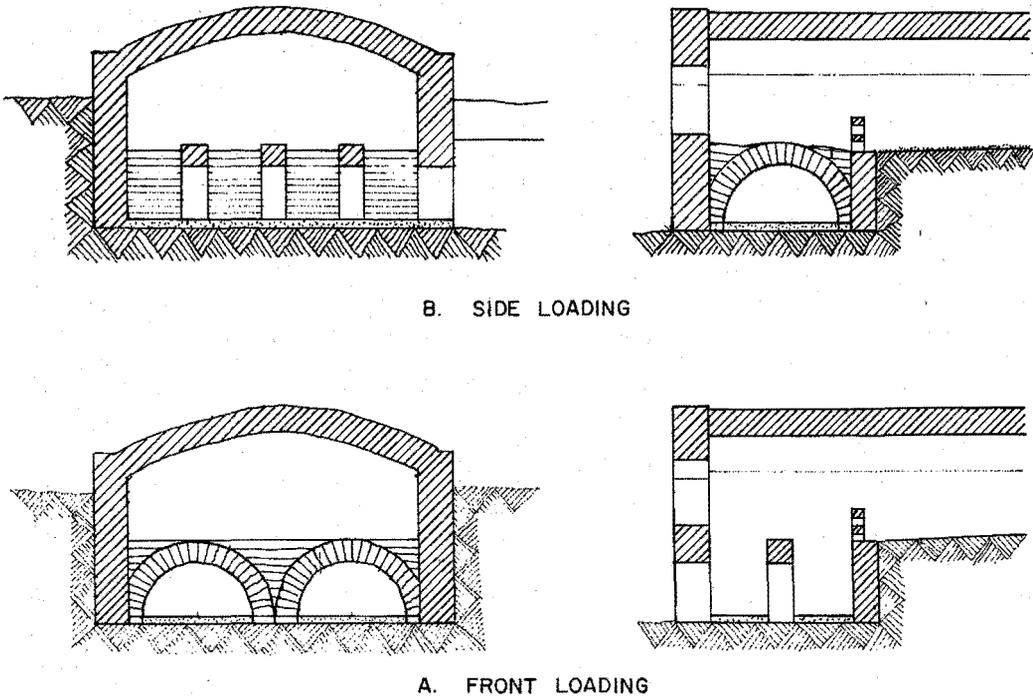


Figure 6. Two methods of arching the firebox of Groundhog kilns.

may be present in kilns used for salt-glazing. When present, there are usually 2 or 3 rows on either side of 8-10 bricks each. In the low roofed kilns there is usually a gradual rise in grade of the floor from front to back, sometimes this does not start until about midway in the length of the chamber. In the very tall kilns 3 flues may be dug into the floor beginning about 1/3 of the way from the front. These are usually about 1 foot wide and 8 inches deep and serve to create a downward draft, pulling the heat and flames down to the floor to maintain the temperature in that area. They feed into a low or even pit-like chimney flue (William Gordy 1977, pers. comm.).

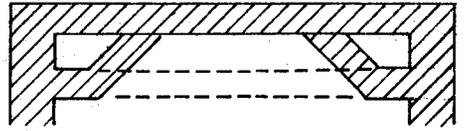
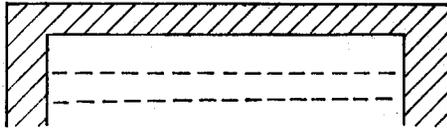
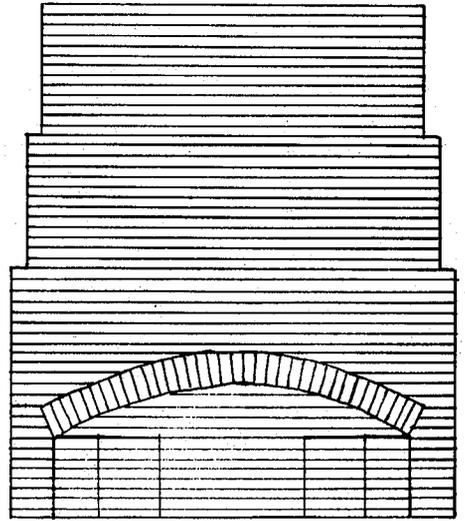
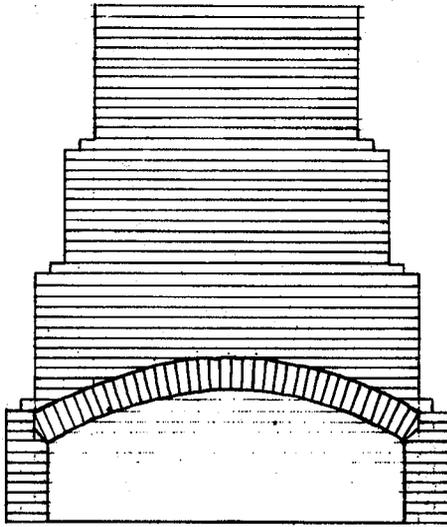
The variations in the chimney structure fall into 2 main types. In the first instance there is no separate footing for the chimney and its front wall rests upon the arch of the kiln. The mouth to the chimney is in this instance as high and as wide as the interior of the firing chamber. In order to regulate the draft in such a structure the wares were usually stacked all of the way within the mouth of the chimney (Arthur & Weymon Cole 1973, pers. comm.). A variation of this form is seen in the Kirbee kiln where the sides of the chimney mouth angle in and produce a fireplace-like opening. The entire chimney may have narrowed as it went upward (Figure 7, Type A).

The second major variation in the structure of

the chimney is the use of a new footing for both front and rear chimney walls, thus the chimney bears no weight on the kiln roof. The entrances from the firing chamber into the chimney mouth are smaller and often multiple. These may consist of 2 or 3 small arched openings in the base of the chimney or a series of small openings accomplished by supporting brick piers with openings between placed across the whole width of the chimney base (Figure 7, Type B). Although I have never seen such a structure, the digging of a pit inside of the base of the chimney the length and width of the chimney to a depth of about 8 inches has been mentioned as one method used to improve the draft and warm the floor at the rear. This is sometimes used alone and sometimes in conjunction with the flues in the floor of the firing chamber (Weymon Cole 1973, pers. comm.; William Gordy 1977, pers. comm.; and Vernon Owens 1974).

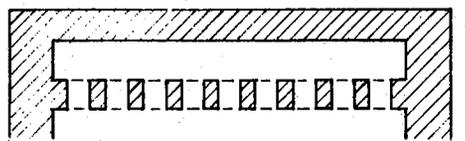
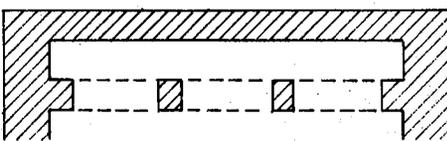
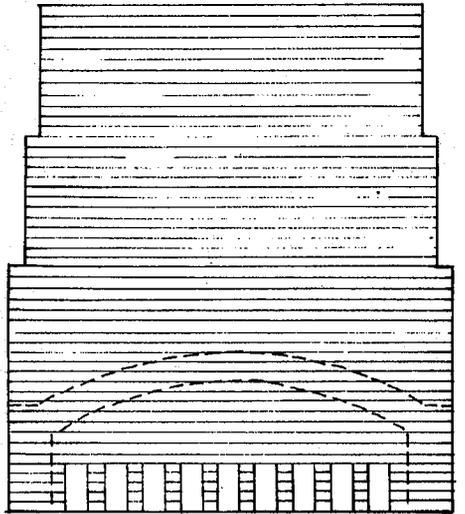
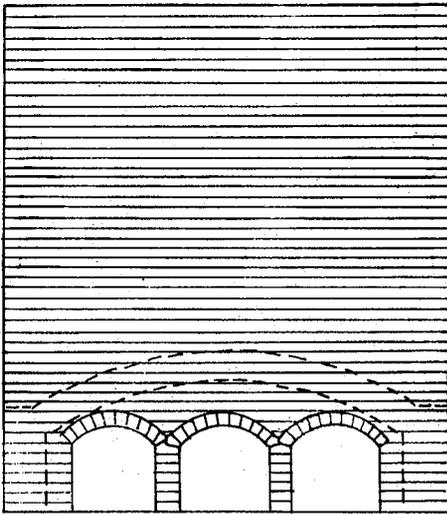
The presence of a second firebox is rare, the only such structure so far excavated being the Kirbee kiln which was excavated by the Texas Historical Commission, 1973-1974. A second loading door placed either in the side of the firing chamber or in the back wall of the chimney is another variation which should be kept in mind (Figures 8 and 9).

Buttressing may vary greatly. I am sure that the natural slope of the site as well as the under-



TYPE A-1

TYPE A-2



TYPE B-1

TYPE B-2

Figure 7. Variations in the chimney structure of Groundhog Kilns.

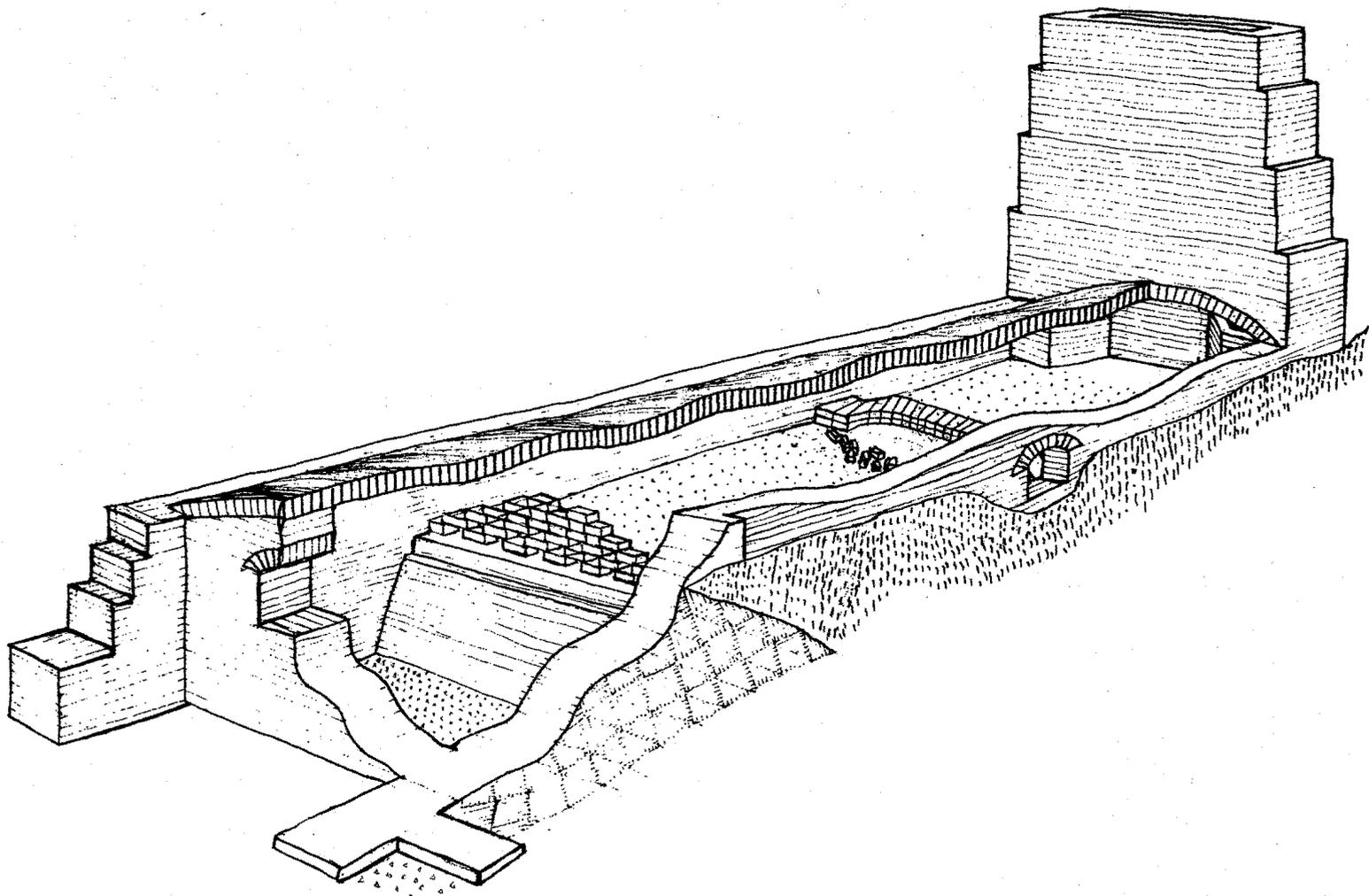


Figure 8. Conjectural view of the original structure of the Kirbee Kiln.

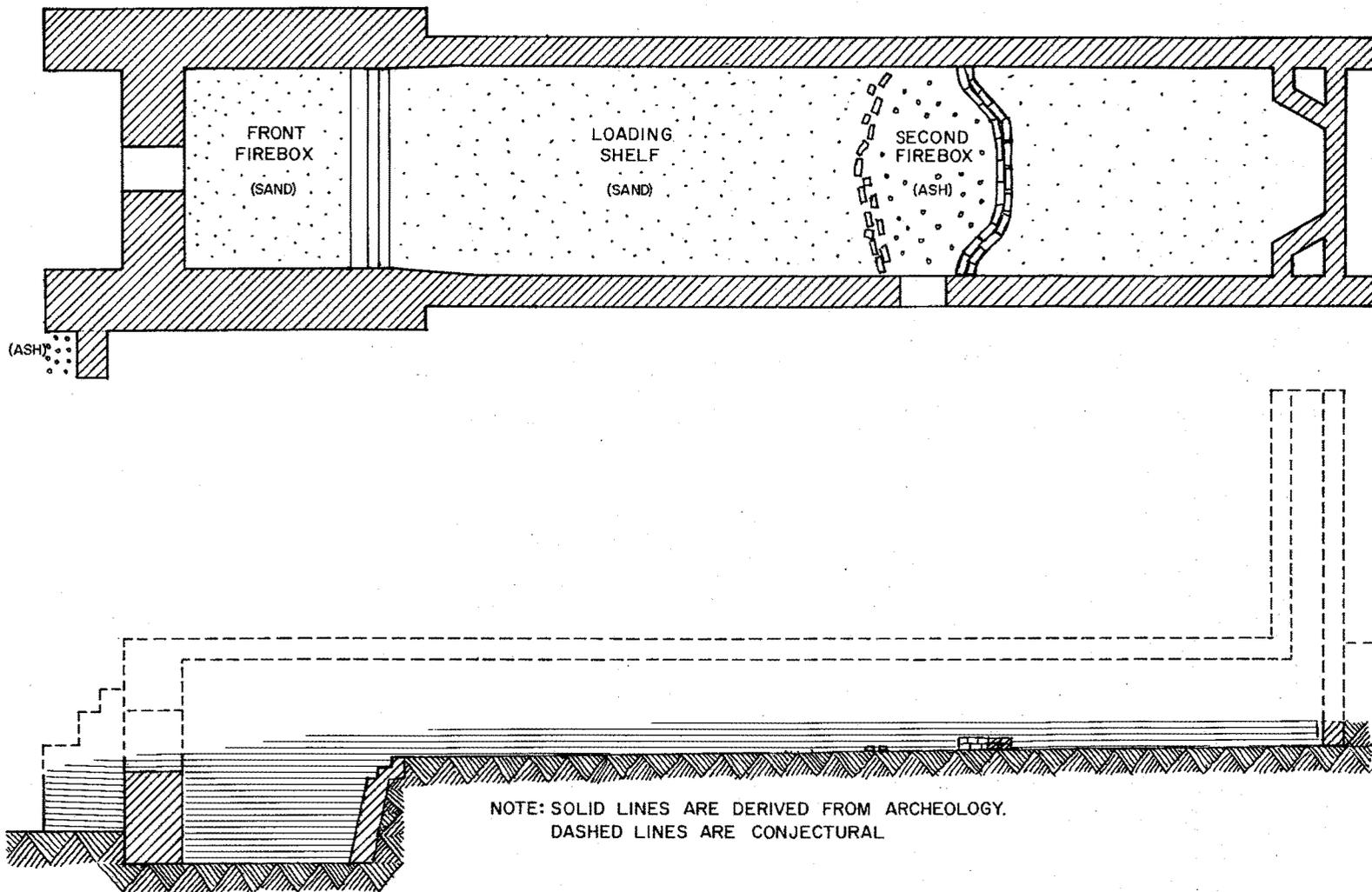


Figure 9. Top: Plan of the Kirbee Kiln. Bottom: section of Kirbee Kiln from information obtained from excavations done by the Texas Historical Commission, 1973-1974.

lying soil conditions influenced this. The usual buttresses are small angled buttresses at the front which serve as retaining walls as well. Large parallel front and rear buttresses as those seen in the Kirbee kiln are rare. The size of the kiln, the slope of the site, and the very sandy nature of the soil in the area may have influenced the architect to attempt to stabilize this kiln by increased buttressing.

I have seen diagnostic remains standing of a 19th century Groundhog kiln. Most of these structures have long ago been robbed of any brick above ground surface and the roof has collapsed, leaving a low earth-covered mound in which brick rubble may be seen. The remaining 20th century structures and the archeological excavation of a few of the older kilns have furnished much of the information for this paper and I am sure that other variations will be discovered as more of these kilns are excavated.

REFERENCES

- Barka, Norman
1972 "The Kiln and Ceramics of the Poor Potter of Yorktown." in *Ceramics in America* edited by Ian Quimby, pp. 291-318. University of Virginia Press, Charlottesville.
- Bock, Gisela R. von
1976 *Steinzeug 2nd Edition*. Kunstgewerbemuseum, Cologne, Germany.
- Burrison, John
1973 "Georgia Jug Makers." Unpublished PhD. dissertation, University of Pennsylvania.
- Cardew, Michael
1973 *Pioneer Pottery*. St. Martin's Press, London.
- Christophers, V. R., Haselgrove, D. C., and Percy, O. H. J.
1977 *The Fulham Pottery, A Preliminary Account*. Fulham and Hammersmith Historical Society, London.
- Dale, L. C.
1974 "A Post-Medieval Tile Kiln at Bexley." *Archeologica Contina* 89:25-32.
- Göbels, G. H.
1971 *Rheinisches Töpferhandwerk*. Frechen, Germany.
- Greer, G. H.
1970 "Preliminary Information on the Use of the Alkaline Glaze for Stoneware in the South." In *Conference on Historic Site Archeology Papers, 1970*, Vol. 5, edited by Stanley South, pp. 155-70.
- Greer, G. H.
1976 "The Kirbee Kiln." Paper presented at the Conference on Historic Site Archeology, Tuscaloosa, Alabama.
- Musty, John
1976 "Medieval Kilns." Paper presented at the London Kiln Conference, London.
- Owens, Vernon
1974 "Building and Burning a Groundhog Kiln." In *Studio Potter*, Summer issue: 41-44.
- Pandrich, Alice
1976 "Excavation Near Woolwich Old Ferry Approach." London, Preliminary Report.
1977 "Woolwich Kilns." Paper presented at the London Kiln Conference, London.
- Piccolopasso, Cipriano
1934 *Three Books of the Potters Art, 1579*, Book 2, pp. 31-35. Albert and Victoria Museum, London.
- Rhodes, Daniel
1968 *Kilns*, Chilton, Philadelphia.
- Sheldon, Harvey
1976 "Highgate Wood Roman Kilns." Paper presented at the London Kiln Conference, London.
- Troy, Jack
1977 *Salt Glazed Ceramics*. Watson-Gupthill, New York.