

Furnaces Grilling Crockery Pots from the Sasanian Era in Light of the Results of the Excavations of Tel Abu Za'ar

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Furnaces are one of the great priorities that the ancient Iraqi people have sought to take care of since ancient times. The oldest furnace dates back according to concrete physical evidence to the Neolithic period when man realised, at that time, that the clay material that was abundantly available in his natural environment and which can be converted to another material which is more solid and conservative compared to the materials that he needed in his daily life, especially the liquid ones. Such experience led man to conclude that the fragile clay material can be converted to a more solid material (pottery) when exposed to high temperatures. The accumulated experience that he, led to him reaching an important conclusion that this process, i.e. pottery, is carried out according to the control and gradual stages. Of course, it was not an easy process as it was complex, and the one who worked in it must hold great practical experience in this aspect. Through time, the pottery industry had become more widespread than many other industries, especially those which made stone or metal for easy manufacture. It became as such because of the speed of its preparation and its relatively cheap price as well as the availability of its primary material. On the other hand, the disadvantages of using pottery industries are embodied in its fragility and the difficulty of repairing it. So, on the benefits of pottery its use increased, and this naturally increased the spread of furnaces that made it.

Key words: *Furnaces, Crockery, Sasanian Era, Iraq*

An Introduction to the Origin and Development of Pottery Grilling Ovens in Ancient Iraq until the Sasanian Era

Through the return to the early beginnings of making pottery, we found that grilling clay, i.e. the early processes of making it, did not require special ovens. The process was done in the way of burying the pots with sand and then fire was put over the sand. As such, and the convection resulting from the process of ignition will deliver heat to those pots (Al-Dabbagh, 1985). Of course, this explains the fragility and easiness of breaking the pots (Sulaiman, 1991). The evidence available to us about the development of pottery kilns in ancient Iraq, especially during prehistoric times and the beginning of historical times, are almost non-existent. Perhaps, the structures of furnaces, during that time, fell within individual workshops (El-Deeb and El-Gammal, 1959). Over time, pottery kilns began to evolve in ancient Iraq as a result of the urgent need for pottery industries as well as their adaptation to the materials available at the time. Further, we might notice the developments of making pottery especially in the South of Iraq around 5000 B.C. During this time; slaves showed a remarkable interest in the industry of pottery as they presented the most beautiful and best types of pottery technically and technologically (Moorey). One of the signs of the presence is the remains of kilns scattered among the remnants of their archaeological sites in the region. These remnants of the kilns within the earth which are observable by the excavators. However, the excavators did not care about them since their ultimate aim was looking for things and buildings not kilns (Moorey, 2002). Additionally, the nature of the geographical area is represented by the presence of heavy storms loaded with dust and sand which has a great effect on crushing such kilns. Some prospectors in the sites of southern Iraq reported that there were heavy sandy winds that occurred there, particularly during the spring and autumn equinoxes, it may be very likely that the kiln sites were covered with sand and other fine sediments in the past and only recently appeared (Dabbagh, 1958). The processes of excavation, especially those at the locations of Arido and Al Abeed, indicate that the region of kilns is in the two sites located at the edge of the two settlements. This placement gives an indication that these craft activities always occur in special areas away from the residential areas that are located within the centre of the city. (Moorey) Today, the location of the pottery kilns can be observed in the form of clusters on the outskirts of cities so that the city and residential areas are away from smoke and gases produced by furnaces as well as the large amounts of waste and ash that they produced.

During the period between the end of the fourth millennium B.C. and the beginning of the third millennium B.C., several pottery kilns were discovered from the sites of Yarim Tepe and Abu al-Sallabikh and Warka which provided us with important information about the furnace schemes at that time. Furnaces were made by an oval and built of brick or milk of two floors and has an oval courtyard. At the bottom, there is an oval-shaped pit for burning fuel, which is similar to the furnaces still used to this day in southern and central Iraq (photo 1) which is built by bricklaying with an oval form that contains two spouts at the two sides at the bottom of the

kiln for pumping fuel, as shown in (photo 2). The other formation used to organise the order of the status of pots inside the kiln as they appear in (Photo 3) and close this slot bricklaying after the completion of the order and organise pots inside the oven as they appear in (Photo 4).

Picture 1. A furnace for grilling pottery from the modern period in the south of Hilla.



Picture 2. Shows the pottery grill inside the oven and the oval shape of the furnace and the hole used to pump fuel inside the furnace



Picture 3. A picture of a furnace for the pottery grill from the modern period from the south of Hilla depicting by the researcher showing the hole used to organise and arrange the position of the pots inside the furnace before grilling it.



Picture 4. The photo depicted by the researcher shows the method of closing the hole, which is used to regulate the position of pots made of clay inside the oven after filling the oven.



The fuel components used in the furnaces of Yarm Tebeh and Abu al-Sallabekh were mostly animal manure, straw and wood mixed with animal bones, birds and fish to reduce wood consumption. Unfortunately, the up form of the kiln was missed, and thus we cannot get the outside form of the kiln. However, we can imagine the shape of the furnace that has a lid in the form of a dome punctuated by holes at the top for ventilation as it appears in the ovens mentioned above. The kilns, discovered in the ancient city of Ur (the fourteen kilns), give us an image about kilns at that time. They were stoves with a round shape diameter of 90 cm and a depth of 35 cm. They were covered with brick roofs and in the ceiling worked holes for the passage of fire to the upper or second section with a diameter of 10 cm except for the main middle hole which had a diameter of 45 cm. Small conduits were found at the ends of the furnace that were connected to these holes and were intended to deliver air to the outside (Ibid).

In general, the results of archaeological excavations in most of the archaeological sites indicated that the pieces of the walls of the kiln were heavily scattered and spread over large areas. This, gives clear evidence that the kilns installations were associated with pottery

production activities and were large throughout the ages of ancient Iraqi civilisation since the pottery was made in a wide area. The industrial nature of its production during these different eras is clear enough by the large quantities of fragmented pieces found in archaeological sites and cities. However, there has been no evidence of large-scale production facilities so far since pottery kilns are rarely excavated in these archaeological sites.

The best examples of the furnaces of late times in the history of ancient Iraq is from the Sasanian era, specifically from the site of the hill (Abu Zaar). Abu Zaar is a local designation which refers to a small-sized bird. This bird is frequently found on the surface of the hill, so the people of the region called it by this name. The hill has an oval shape located in the centre of Iraq (Map No. 1), specifically in the centre of the city of Hilla, extending from the east to the west, up to an area of 28 Dunums as indicated by the Cadastro map and occupies the plot of 46 and 86 provinces (12 chickens and creed). Its antiquity was announced in the Iraqi Facts newspaper, number 2152 on 14/1/1944. The remaining area, according to the maps, is about 21 Dunums (Plan No. 1) which is located 4,800 km southeast of the ancient city of Babylon (Map 2). It is located within the administrative boundaries of Hilla district within the residential district of Bakarli behind the old grain silo. It is surrounded by residential houses at the southern and western sides. While the north and east are surrounded by palm groves and agricultural land belonging to citizens of the Albu Shatti clan. The geographic nature of it forms a confluent territory of three peaks linked to each other; the highest level is exceeding up to 6.50 m from the adjacent plain which is located in the east, — a part of the site topped by marsh as a result of severe salinity found in the soil. A large section of it abounds on the surface of allied plants and sapiens within the surface layer which has given the cohesion of the soil after being a layer of rather soft soil mixed with broken pottery.

Ancient surveys conducted by WILLIAM, B, SELBY in the surrounding areas of Babylon in 1859 pointed to the site but without a name (William, 1958). It is located southeast of the ancient city of Babylon. On its northern side is a branch of Shatt al-Hilla (Map 3). This is the river from which the area surrounding the site was watered.

The results of the archaeological excavations in the hill revealed a group of kilns located near the large distinctive buildings in the village in the form of clusters. It seems that these facilities had a high degree of craftsmanship at the site. Some of them are used to grill pottery. The traces of fire that was ignited within it indicated that and used to grill the pottery. These furnaces provide great testimony to the size and complexity of pottery production during that time. The archaeological residues of the furnaces uncovered were characteristic of a mature stage in the development of pottery. Most of the discovered potteries were grilled and had very beautiful decoration.

The kilns of grilling pottery were concentrated in Tal Abu al-Za'ar in the excavation boxes at point C (photo 5). They contained a group of discovered rooms, the most important of which was room 3. It was the remains of the walls of the first layer and were almost rectangular in shape. On the north side of it was the first floor level of the first floor of the first layer with the level of the fireplace in room 2 and located north of oven No. 5 at a distance of 3.70 m, measurements used in its eastern wall separating it from room 2 (32 × 32 × 11 cm). This wall built on the ruins of furnace No. 6, as we mentioned earlier, figure No. 4. As well as, regular circular pottery was discovered. The diameter of its nozzle is about 90 cm, from the top attributable 37.50 MA. M. s. B. It is buried under the floor, surrounded by the edge of its crater three will of brick and clay. The fare measurements that are located above the top are 31 x 15 x 8 cm and the basin level is 36.55 m. P. M. s. B 10, which reaches the depth of this basin from the beginning of the nozzle to the bottom 74 cm, and is evident from its shape and proximity to the furnace No. 6 that it was used to preserve liquids or for fermentation. It is clear that furnace number 6 and the sink return to the second floor of the first layer.

Picture 5. Two faces of the endowment species



Room 8, which is located south of Room 5 and Room 6 and which can be accessed to Room 6 by an entrance of approximately 1 m wide, is rectangular up to 3.08 m wide. Circular furnaces were discovered in the form of the hole underneath the earth with a diameter of 40cm and depth of 20 cm. It is within the first floor level of the first floor, as well as kiln No. 9 and kiln No. 10, which were with the level of the first floor (figure No. 4). Reaching to the second floor, a circular basin was detected shaped like a hole inside the ground up to a diameter 1.48 m, depth up to 55 cm. It turned out that it was used to ferment the clay used by Sa P pottery found inside the mass of mud conical shape was placed on the wheel during the work and restore many clay pieces to this basin to re-manufacture later.

Description of Discovered Furnaces

The furnaces discovered at point B or point C of the site, namely room 3 and 8, are pottery furnaces from the Sassanid period. This has been demonstrated by the coin collections found within the first floor and below the second floor. Copper (images 6, 7) or silver (images 8, 9) are the most existed coins which belong to several Sassanid kings, the most important of which was King Shapur I and King Bahram II.

Excavation work on the site, especially in the square E16, revealed the first kilns for the pottery grills attributed from the top of the walls 38.35 m. P.O. SP. It was a remnant of the walls of a medium-sized oven built with clay in the form of a circle with a diameter of 1.30 m, connected to an oval entrance to the west. The remainder of the height of the walls was 60 cm and the effects of fire were visible inside, as the clay reached the degree of barbecue and acquired a brown colour. There was a layer of Al Lutosh on the walls inside it that acquired a green colour because of the intensity of heat (Al-Sakhrij). Some of which fell on the floor of the kiln from the inside. It was shown that it was a layer of Al Lutosh of clay painted walls from the inside. As well as, the floor was painted with it before using and setting fire on it (Picture 12).

Picture 12. Oven No. 1



In front of kiln No. 1, a small kiln was found with a diameter of up to 65 cm, and the height of the remaining 55 cm walls. It was built with broken bricks vertically and painted with mud from the inside. The traces of the burning fire inside it were visible on the walls from the inside, and the oven 's interior was full of broken pottery showing that it was leveled with the remaining height of its walls.

The walls of this furnace overlap with the walls of furnace No. 1. They show that furnace No. 1 was built after the completion of work in furnace No. 2, using that same place to create a new furnace, furnace No. 1 (photo 13).

Picture 13. Oven No. 2



Work continued in block E16. Upon reaching the first level, furnace No. 3 was detected, with the highest wall level remaining 38.36 m. s. B. After the removal of the accumulated debris inside, which is the remnants of the roof that fell in addition to some aspects of its walls which was where clay reached the degree of pride and acquired a green colour from the impact of the heat and many pottery fractures of different shapes and sizes, it became clear after the cleaning process that the shape of the oval pan up to 3.20 m narrows from the side of the entrance to become a diameter of 45 cm. This entrance tilts slightly towards the northwest, built at the beginning of the entrance bricks and vertically measuring $31 \times 31 \times 7$ cm. One above the other to narrow the entrance to 25 cm -This wall was built to be a buffer for the flaming fire inside the oven. The diameter of the centre up to 1.20 m then narrowed down to the entrance, part of its eastern wall built bricks measuring 27×27 and perpendicularly one above the other, raised the heat of the fire is clear on them.

Inside the walls, there are remnants of the curves and they show where the ventilation holes that lead to the outside. There are traces of prominent arches and thickness of 20 cm between each hole and the other. While the effects of Al Lutosh layer of clay on the inside of the walls have acquired a green colour from the intensity of the heat suffered. The highest remains of its walls are 75 cm (Photo14).

Picture 14. Oven No. 3



About 2.40 m from the south-west corner of the E16 square, a pottery kiln was found. The highest remains of its walls appeared within level 37.54 m.s.p. After cleaning the rubble from inside, it was found that there was a layer of ash on the floor, which is the residue of fire, which was igniting the middle and the effect was also clear on the remnants of the walls from the inside about its skeleton inside the outer walls for this furnace (Photo 15).

Picture 15. Oven No. 4



Such skeletons appeared in the previous working seasons on the eastern side of the site and belonged to camels. Measurements of this furnace: From the entrance to the north-side oval diameter 42 cm continues a distance of 90 cm to the south after it opens in the form of a circle diameter from the centre 1.70 cm, the thickness of its walls ranging from 30 to 20 cm.

The excavation works on the southwest side of Block D16, west of room 1, showed the discovery of furnace No. 5. The features of this furnace were visible through the appearance of a brown circle close to the surface where the effect of fire was evident at 39.20 m.s.p. The roof of the kiln, after the expansion of the excavation process with its sides, became clear sidewalls, which acquired a brown colour from the impact of fire as well, and then reached the entrance which was covered with many pottery fractures and after the cleaning process, it turned out that its general shape was almost an oval which starts from the south side. It is an oval shape with a diameter of 80 cm, the inside of the roof was in the form of arches built of clay with an arch thickness of 20 cm. The distance between the arch and another was 18 cm, which are oval forms and the number from the beginning of the entrance to the end of the furnace was five arches (scheme No. 2)., Between these arches are openings leading to the outside of the oven and the ten slots There are four other holes in the oven cap, bringing the number of holes to fourteen slots. This oven has a length of 2.70 m and a depth of 1.50 m. (Fig. 17) In the floor of the furnace from the inside, especially at the the entrance was a thick layer of ash, its walls on the inside are covered with clay material in the form of a hardened layer and became green from the intensity of heat. It is the only oven that has been fully disclosed to give a clear picture of the remaining furnaces (Photo 18).

Picture 18. Oven No. 6



Work continued in room 3 located in block D16 to reach the second floor of the first floor; it turned out that its eastern wall separates it from room 2. It is built with clay measuring $32 \times 32 \times 11$ cm, on the ruins of a small furnace which was given the number 6, where part of it was memorized and the other part was extended under the wall.

It is a small oven left only the outer walls of a height of 70 cm which was built with bricks and breaking bricks of different sizes and then painted with clay material from the inside, which hardened and acquired a green colour after the intense heat, which ranges from 15 to 17 cm as thickness. Inside it, there were a lot of pottery fractures in addition to breaking small bricks of brown colour and the fall of the roof. Then, its floor is buried and levelled with the ruins of breaking pottery, with the level of its remaining walls. To build above it, the walls of the first floor of the same layer, which is similar to furnace No. 2 of where the shape of the oval diameter of 85 cm and then narrowed to 44 cm, and the length of the wall apparent before it enters under the wall 75 cm.

It is clear that it dates back to the second floor of the first floor and is levelled above its walls 37.40 m. P. M. s. B. After the expansion of the furnace north to reach the level of the furnace floor, a circular pottery basin of regular industry was discovered, the diameter of the nozzle 90 cm from the top 37.29 m. M. s. B buried under the floor, surrounded by the edge of its crater three lines of brick and clay. The measurements of the bricks at the top of the lines were $31 \times 15 \times 8$ cm. The basin level is 36.55 m. P. M. s. B, the depth of this basin from the beginning of

the nozzle to the bottom is 74 cm, and it is clear from its shape and proximity to furnace No. 6 that it was used to preserve liquids or for fermentation for the first layer.

The excavation work in room No. 2, especially upon the arrival of the second floor of the first floor, revealed a circular kiln in the form of a hole stained with clay material inside, gained the shape of pottery after the heat, which was exposed to the fire burning in the middle of a layer of ash, and was attributed from the top 37.63 The diameter of the outside is 40 cm, next to it there is pavement slightly higher than the level of the stove 37.72 m. It is located between the burner and another oven that has been detected and given the number 7. This furnace differs in shape from the rest of the furnaces previously disclosed.

It is a cylindrical hole in the regular work up to a depth of 76 cm, and the diameter of the nozzle from the top 1.10 m, in the form of a hole inside the ground, its remaining crater with the level of the floor, its sides of the interior are covered with a layer of pure clay up to 2 cm thick, this acquired the shape of pottery through the impact of heat.

There is a hole in the eastern side of the wall of the oven below, the length of up to 74 cm, which is carved under the ground in the form of a circular hole in of a diameter of 40 cm with the floor level is 75 cm away from the nozzle of the oven and the highest paving of clay up to 85 cm wide. It looks like a roof and then worked in the form of a diagonal galaxy connected to this furnace from the side in the form of a triangular hole, poured into the centre of the kiln cylinder, (scheme No. 3).

The kiln, this cylindrical pit, was filled with many ruins of pottery fractures of different shapes and sizes, which belong to parts of the bodies of jars, plates and utensils. After the rubble was removed, it was found that the floor was covered with a thick layer of ash, the residue of the fire that was ignited inside the furnace (photo 19).

Picture 19. Oven No. 7



At the level of the second floor of the first layer was revealed the eighth furnace discovered in the site and this furnace was buried under the western wall of room No. 5, which is similar in shape to the No. 3. The middle was full of broken pottery in addition to breaking small bricks which are the remains of the roof of this furnace that fell inside it, where it was levelled with the level of the remaining walls to rise later walls of the first floor of the first layer. It was the shape of an oval up to 2.45 m in length narrowed from the entrance to 40 cm from the east. Then it widens from the west to become a circle up to diameter To 1.31 m. The highest remaining height of its walls is up to 85 cm, reaching to its floor. The thickness of its walls was 25 cm, which is built of bricks measuring 29×26 cm stacked perpendicular as well as broken bricks of various shapes and sizes, and painted the walls of the inside of a layer of clay in the form of heathery that is covered by, and acquired a solid brown and green colour from the impact of extreme heat, this floor was covered with a layer of ash, which was also expanded with clay. (photo 20)

Picture 20. Oven No. 8



The furnace No. 9 was different in shape from the rest of the previous ovens and was detected within the level of the first floor, a rectangle in the form of a basin cut inside the floor up to 2.30 m, the width of the interior 40 cm, and a depth of 45 cm, has painted its sides from the inside with a layer of clay in with a thickness of approximately 10 cm irregular, acquired a brown colour mixed with black colour after the heat from the burning materials inside, and the floor was full of broken pottery of a small size, and after the cleaning process there appeared a thick layer of ash, and a large part of a burning palm tree inside it (Photo 21). The highest level was 38.68 m.

Picture 21. Oven No. 9



The tenth furnace was similar to furnace No. 9, and a distance of 1.80 m towards the north and at the same level. It is a rectangular shape located next to the southern wall of room No. 5. The

length of up to 2.25 m widths from the inside of 40 cm, and a depth of up to approximately 45 cm. It is in the form of a rectangular basin cut inside the ground and its sides were smeared from the inside with a layer of clay about 10-15 cm thick, this clay had acquired a brown colour after the heat from the inside, and the floor was expanded with clay material also covered by a layer of ash. (Photo 22).

Picture 22. Oven No. 8



Analysis and Conclusions

It is clear from those as mentioned above that the furnaces that were damaged and could not be used again, that is, after the end of the need was buried with the level of the floor by breaking the pottery and rubble they have to create a new kiln taking advantage of that space. They are similar in form and design.

As for the construction of those furnaces, it seems through the archaeological waste for most of them that the stages of construction were similar to what they are at present, as the manufacturer digs part of the floor on which he wants to build the oven, and then builds a wall and breaks the bricks available to him to pave one over the other to take the required form, which is narrowed from the side of the entrance oval and continues for a distance and then begins to expand into a circle, and after the walls rise to the required height and begin to work to the roof and often the construction created arches made of clay connecting the sides of the furnace from the beginning of the entrance to the end. The manufacturer worked ventilation holes between the brackets, and the other in the ceiling. After completing the roofing process in which he used the clay material in the form of a raft connecting the arches, he smudged it

with a layer of pure clay from the inside and also expanded its floor, then the kiln was available for use.

Therefore, this area is an area of industries and was exploited for the work and manufacture of pottery tools from the earliest stages, that is clay even after grilling. These furnaces are used for grinding pottery. At the beginning of the work, some pottery fractures were discovered during the grilling process and it was found that the delay in the oven caused the discolouration to turn green, which forced the manufacturer to destroy it and other fractures appeared during the manufacture. In the case of warp and irregular shape, this situation appeared in some of the dishes and tractor covers and tractor nozzles and even a complete tractor (Photo 23), and we know that it is not possible to acquire such tools by the user and thus it was buried near the place of manufacture.

Picture 23. Warp during grilling



In addition to this, we found pieces of hulls for jars and covers, which are still clay not placed in the oven, may have been exposed to a certain defect, which forced the manufacturer to destroy and return to the fermentation tank to re-mix with the clay in the fermentation basin to be able to reshape again. This is what we found in a fermentation tank next to oven 3, (photo 24).

Picture 24. Tractor lids pieces of clay



What confirms the validity of our opinion in this, as well, is to find the clay blocks, which the manufacturer was putting on the wheel while in the process of industry and raised his fingers and clear them as he is in the (Moorey); (Parthian); (Mesopotamia) process of recycling to make something like a jar and had a circular base that has not yet been opened. (Photo 25) We found a base for a jar from which part of the body rises, a clay that has not yet been roasted by the manufacturer.

Picture 25. Clay blocks placed on the crockery have not yet been grilled.



Consequently, it is clear that furnace No. 1, furnace No. 2, furnace No. 3 and furnace No. 5, as well as furnace No. 8, are furnaces used to grill pottery, with different levels. Such a furnace model also existed in the Parthian era, and a similar model of furnace 3 appeared in the city of Seleucia.

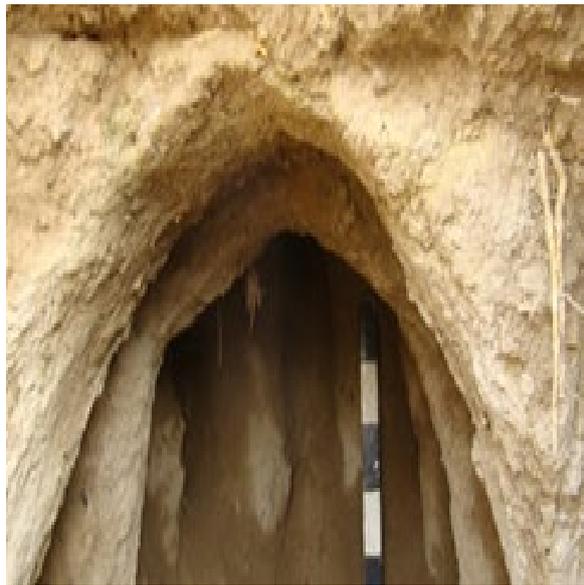


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Picture (16) The outside shape of oven No. 5



Picture (17) The inside shape of oven No. 5



Picture (26): Part of the base of a jar of clay



Picture (27): models of tractor lids that were not registered