Investigating the Technological Aspects of Bell Metal with Special Reference to West Bengal

Diya Mukherjee

1. Department of A.I.H.C. and Archaeology, Deccan College Postgraduate and Research Institute, Pune – 411 006, Maharashtra, India (Email: dia.arch89@gmail.com)

Received: 19 July 2018; Revised: 25 September 2018; Accepted: 16 October 2018

Abstract: Some of the traditional crafts are ‘vanishing into the Sunset’ and the Bell metal craft though is an age-old craft of India is facing a similar fate. Before the craft’s extinction the author chooses to understand the changing nature of the craft as it is struggling to survive its alternative and cheaper and more durable products. The aim of the paper is to understand the current status in terms of the occupation of the bell metal craftsmen in West Bengal and their technology. For the above-mentioned reason the present author has undertaken an ethnographic survey in Bankura and Murshidabad districts of West Bengal. The author has interviewed the hereditary craftsmen working on bell metal in both the regions. The aim of this paper is to understand crafting as a process and craftsmen giving a shape to that process. Manufacturing processes and their challenges have been investigated through an ethnographic survey to understand how a craft becomes the identity of a group of artisans and how a craft loses its identity with the craftsmen.

Keywords: Bell Metal, Kānsā, Bengal, Craftsmen, Technology, Ethnoarchaeology, Manufacturing

Introduction
Bell metal industry is an indigenous and traditional industry which has had a glorious past. It is a cottage industry by nature and mainly concentrated in the central and eastern part of India due to the availability of raw materials (copper, zinc and tin) in the plateau region of eastern India. In modern India across villages and urban fringes in the most unlikely places ancient craft and weaving technologies are practiced and preserved often transmitted orally from father to son and mother to daughter. The anonymous nature of India’s craftsperson’s, their dexterity and skill, their use of indigenous and ecologically viable to create, to weave, smelt, mould, sculpt, engrave, paint, build and a cultural landscape that bound together and shaped its history, mythology and legend. Bell metal as a craft has survived for ages yet there seems to be a very little transition in the method of preparing bell metal items. The main raw materials used in this industry are clay, wax, castor oil, firewood, coconut shells, coconut husks, cow dung and metals. They are mixed in the ratio of about 4:1 (78% copper, 22% tin), and even though they are soft and formable metals, their joining creates sturdy, slightly elastic, nicely vibrating, hard, less
ductile and long wearing alloy that can resist oxidation and weathering, all properties that are perfect for bells. Verdigris that forms on their surface with the interaction to atmosphere creates a very useful protective patina that protects the bell against the further oxidation (Mukherjee 1978).

**History of Bell Metal in Undivided Bengal**

Until 19th-century Indian village had a rich heritage of cottage industries. Village handicrafts of the rural areas were quite popular in urban centres. There were guilds in urban areas and were governed by their own rules (Desai 2002). The Greek traveler, Megasthenes also wrote about the fineness of Indian textiles, jewellery and other manufacturing industries of that period. Fa Hien, the Chinese traveler also wrote about the textiles, leather, ivory works and metal works of the Gupta Emperor. The Mughal Emperors also encouraged the production of those items in the state of “Kankshanás” where high-quality goods were manufactured (Fuste and Mehta 1976). Utensils and artefacts made of Kaansha occupied a special place in the 18th century. Handed down by artisans through generations these products in Bengal were meant for specific domestic and religious occasions. The traditional ‘Kaanshari’ artisans made handcrafted metal wares and artefacts from scrap metals.

![Map of study areas](image)

**Figure 1: Study Areas (Birbhum and Murshidabad)**

As a migratory craft, the utensil manufacturing in Bengal had its early growth in the western part of the province, related to the early development of metallurgical skill in this region. The proximity of this region to Dhalbhum-Singhbhum, the source of copper
and its easier trade link with the agricultural plains of Bengal had actually encouraged its growth. A number of early medieval Sanskrit texts written in this region also refer to the Kânsâris as one of the thirty-six castes of Bengal (Sarkar 1998). The migratory craft later became a flourishing industry in Bengal. It is difficult to trace the date of transition but the changes are clearly evident.

**Study Areas**
The study areas (Figure 1) selected for this paper are Birbhum and Murshidabad districts of West Bengal. The reasons behind the selection of these areas are in West Bengal there are only a handful of places where bell metal products are manufactured. Bankura district is located in the western part of the state of West Bengal. It is a part of Bhardhaman Division of the State and is included in the area known as “rarh” in Bengal. Bankura district is situated at 23.25°N – 87.07°E. The Damodar River flows along the northern boundary of the district. Murshidabad (24.18°N – 88.27°E) is a town in Murshidabad district of West Bengal state in India. The city of Murshidabad is located on the eastern bank of the Bhagirathi, a distributary of the Ganges River.

**Methods**
The research methods adopted for this paper are the following:

**Review of Literature:** This addresses previous work done on the subject. A detailed review of their work noting minute details that can be found from the reference but has been lost in the modern day. For example, Meera Mukherjee in her book entitled ‘Metal Craftsmen of India’ she has mentioned quite a number of places where bell metal and other metal crafts were practised in Kolkata (West Bengal) but those no longer are functional. The present author had tried to trace craftsmen working in those areas but was not been able to find. Even the craft practice in those areas has ceased to exist. Furthermore, sometimes it is found the technology that the current craftsmen use have evolved in terms of less time consuming and reducing pressure on manual labour. Therefore, it is imperative to refer to the literature so that it becomes visible and can be compared the changes that took place over the time.

**Ethnographic Survey in Birbhum District:** A survey was undertaken by the present author to understand the changes as well as the technology of the craft. Workshops have been visited by the author and the craftsmen were interviewed along with photographic documentation.

**Ethnographic Survey in Murshidabad District:** Similar methodology was followed for this survey also. The data collected from these surveys along with the literature review are presented here.

**Technology**
The technology of manufacturing bell metal is quite simple using simpler tools. The technology will be discussed in detail in the following section.
Collection of Raw Material
Bell metal is made from a combination of copper, zinc, tin, iron and mercury. 1kg of copper is mixed with 270 – 300gms of tin, 50gms of zinc, 5gms of iron, and a pinch of mercury. The metals are mixed together and worked into ingots. The raw material is often collected either from Burra Bazar area in Kolkata or local market. The craftsmen still follow the indigenous process of melting the raw material. The raw material is often purchased in the form of old used bell metal items such as bowls, drinking glass or plates.

The Process of Manufacturing of Bell Metal
The plates are cut out from a bell metal sheet. Then it is heated and dipped in water. This is followed by continuous hammering. The ingots are heated time to time to make it soften while hammering. They are hammered one at a time on an anvil. The hammering is around the edge. Under this treatment the edge of the circle lifts. When the edge is ready that is it has an upward tilt along the border the artisan turned his attention towards the one-fourth from the border. This gives a fluted edge. Hereafter, the final shape to the object is given by hammering on either side in order to make even curve around the edge. This method is called sinking down method. Sinking, also known as doming, dishing or dapping, is a metalworking technique whereby flat sheet metal is formed into a non-flat object by hammering it into a concave indentation. It is a common method followed in the metalworking process (Figure 2).

Designing
It is an integral part of the manufacturing process as it attracts the buyer. In earlier day days designing used to be simply more often found less designing since it was for daily
purposes. But today new and intricate designs are found. Designs are made by the artisans with the use of chisels of different sizes and shapes (Figure 3).

Figure 3: Designing of Bell Metal

Figure 4: Polishing and Finishing of Bell Metal
Polishing and Finishing

Once the final shape is given by the artisan; the next step is to give its final touches. In this stage, the artisan scrapes the inner surface giving a clean polished look (Figure 4). In earlier days the artisan takes a noali (scraping tool) and the point of his noali was pressed against the inner edge of the plate, swinging it all the time like a pendulum, backwards and forwards, thus scraping the inner surface (Mukherjee 1978). But in modern day it is done lathe machine which reduces time consumption. Final polishing is done by iron filer manually. In this context, mention may be made of the division of labour. In some workshop areas division of labour is observed where a group of artisans work for the owner of the workshop. In such a situation some are appointed only for a particular job; for example, a group of artisans only work on hammering the object and giving it shape while the others are appointed for polishing.

![Figure 5: Tools Using for Bell Metal Manufacturing](image)

Tools

The tools used for manufacturing bell metal objects (Figure 5) are the following. (1) Hammer: it is used for beating the ingots and shaping them. (2) Tongs: it is used for holding ingots for inserting into the furnace and taking out from the furnace. (3) Hand blower/ machine blower: it is used to charge the furnace. Tuyere is often attached to the machine. It is often one tuyere but sometimes two tuyeres are also found. (4) Anvil: It is used to provide support while beating the ingot hammer for giving shape. (5) Polishing machine: it is used to smoothen the surface and add shine to the object and (6) Iron filer: it used for manual polishing giving it a final touch to the object.
Furnace
The furnace (Figure 6) is made up of bricks. Length of the furnace is 2ft or 0.6096 m and the depth is 3.5ft or 1.0668m. One hand blower is attached to the furnace and one tuyere is also attached; the size of which is 9.5ft or 2.8956m.

Figure 6: Furnace

Repairing and Polishing
Minute works are done by hand with the help of a file and the remaining works are done through the lathe machine. The next step is to heat the bottom of the object and after that; the object is fitted to the polishing machine with the help of gala. Gala is made by mixing 200gm of dhup, 100gm of clayey soil and 25ml of mustard oil. The final stage is polishing either by an electrical machine or by hand polishing machine (Figure 7).

Reason for Degeneration of the Craft
With globalization setting in, like other cottage and small-scale industries this industry is also degenerating and the artisans are worst affected by it. Substitute products which are available in abundant in market cheaper in prices are also one of the reasons for its degeneration. Moreover, this industry runs on the hereditary basis from fathers to sons and the younger generation has lost interest in this profession due to instability and thus opting for other lucrative opportunities and career options.

Observations
There have not been many technological changes in this field over time. With the introduction of machinery that reduces the time and increases the speed of production artisans have opted for those machines. It is noteworthy, here that thought artisans are
opting for modern machines yet they have to balance the traditional knowledge with modern times. However, new mechanical blowers are being introduced to blow into the kiln. Also earlier, polishing was done by scratching the ware with a knife-like instrument called ‘neheni’ in the local language. Also, the lathe machines for polishing also fall in this category.

Bell metal is dominantly used for making cooking ware, which is now supplemented with some decorative items. The metal is called bell metal because the sound that it generates on hitting is similar to the sound of a bell. The reason for traditionally making cooking ware and other kitchenware from the bell metal alloy is that this alloy has several medicinal properties, which the food or water kept in them acquires.
As concern to South Asian, the technique of Bell metal has given knowledge of various aspects of human behaviours and their settlement such as transformation of traditional form of craft, development of socio-economic in society, trade of different manufacturing materials and final production of bell metal. But the above research to understand the techniques of bell metal in particular region.

In the present era of globalization, liberalization and privatization, the Indian bell metal industry, which is the most important components of the metal craft, is facing tough competition in the emerging manufacturing scenario due to its conventional indigenously developed technology in producing the traditional types of bell metals production.

Thus, it can be concluded that globalization has massive impact on the local identities such as the artisans of bell metal industry by providing new prospects but also bringing new problems with the existing one. Hence, it is the need of the hour to take adequate steps towards conservation and prevention of the industry and its workers so that it can be developed and also the heritage and culture of West Bengal gets preserved while taking up the best out of globalization. Also it is to be kept in mind cottage industries are the intangible heritage of India. Therefore, it is the need of the hour to save these cottage industries so that it can be prevented from vanishing into sunset.

Acknowledgement
I express my sincere gratitude to Mr. Samar Mukherjee, Mrs. Subhra Mukherjee, Mr. Tamal Sengupta, Mr. Hironmoy Roy, Mr. Susanta Karmokar and Mr. Arabindo Haldar for their support in various stages of this work.

References