

**LITERARY REFERENCES TO IRON INDUSTRY****G. Chitra**

Assistant Professor in History, Arignar Anna Arts College for Women, AAA College for Women, Walajah, Vellore, Tamilnadu



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The early Sanskrit literature *yuktikalpataru* and *Rasaratna – samuchchaya* mentions about the *mundra* (Cast-iron), *tikshna* (sharp iron or steel) and *kanta* (wrought iron) (Neogi: 1914:45). At present three principal varieties of iron are recognized according to the composition carbon in it viz. wrought iron steel and cast iron.

Early Tamil Literature, popularly known as *sangam* literature, mentions various kinds of iron and their different properties. From this literature we learn about iron viz. *irumbu* (wrought iron) (*purananuru*, v.170) *urukku* (steel) (*purananuru*: v.130) *irumbu* (v.72.2-6) and *urukku*. *Purananuru* differentiates ordinary iron from steel by emphasizing the superiority of weapons made of steel (*urukku*) (v.13) and weapons made of steel (v.62-13,304.4-5) were always referred to as "ekku or" *ekkam*". The data from *Sangam* literature was used by *Vaithilingam* (1977:268) in his monograph on fine arts and crafts in *pattuppattu* and *Etuttokki*. He vividly illustrates the black smith forge, iron industry, the furnace, the hand worked and pedal type bellows, the blowpipes, the anvil, sledgehammer and the tongs.

Apart from the reference to iron, steel and black smith forge mentioned above, the *Sangam* Literature abounds with references to the iron smelting operation and the importance of ironsmith in the ancient war loving Tamil society. Different classes of people were engaged in smelting of iron from ore and converting it into steel and manufacturing of weapons from it. The relative position of the ironsmith in the society is mentioned in *purananuru* (v.287.1-3, v.170). People of low caste carried out the iron smelting operation and the black smith converted them into steel and produced other value added products.

The excavations at *Koduman* brought to light, the living quarter of the iron smelters, which was a simple structure with mud flooring and it was on the periphery of the habitation area, while the well-paved floor of the steel manufacturers was found in the midst of the habitation area. This information tallies with the description of the working place of these two types of artisans found in the *Sangam* literature.

The blacksmith formed an integral part of the early historic society, assignable to the first century BC to 3<sup>rd</sup> century AD. He was a state that it is the duty of the blacksmith to manufacture *vel* or *dart* for the gallant soldiers.

The blacksmith, his forge and instruments are also referred to in the classical literature in different contexts: the *kollan* or iron-maker or iron-monger cum blacksmith: *karumkaikollan*, the skilled worker in iron: *ulai* or his furnace: *turutti* or *visaiturutti*, the hand worked or pedal bellows; and *kuruki*: the blow pipe or nozzle; *ulaikkal*, the stone anvil (P1.1:1); *kudam*, the sledge hammer: and *kuradu*, the tongs are mentioned in the classical literature (*Kuppuram*: 1989:259). The blacksmith's forge with all its equipment is mentioned in *Ahananuru*. (v.202.3-8). It further refers to the sparks flying off the blacksmith furnace (*ibid*, v.72.2-6) and the fire in it blown through the blowpipe or nozzle (*ibid*, v.224.2-5). The *perumpanarrupadai* (v.207-8) and *Narrinai* (v.125.1-5) mention the operation of blast furnaces by the pedal bellows. From *Purananuru* (v.170.15-16), we learn that the black smith operated the bellows with an assistant who repeatedly tread on it with his foot. We also understand that the anvil (P1.1:1) (*ulaikkal*) receives all the shocks when the powerful hammer strikes the object of work on it

We are also told that while preparing the wrought iron from the bloom, sparks flew in all directions when the smelter hammered the red-hot iron on an anvil to remove the non-metallic inclusions (*ibid*, v.202./3-8). Iron smelted from the ore was a pasty semi-solid mass with lot of non-metallic inclusions. The iron thus produced required further treatment to remove non-metallic inclusions. Hammering the red-hot sponge iron on an anvil did this. When hammered, the sparks flew in all directions from the sponge iron, and when sparks ceased, the blacksmith knew that the metal had become homogeneous.

*Purananuru* also refers to the quenching of iron piece held by the tongs and heated red first in the fire and then plunging into the water (v.21.7-8). Other than the weapons of offence and related articles (the ferrules covering the tusks of elephants are generally made of iron) objects of daily use like knife and chisel were all made of steel. Another classical literature *Kurunthokai* refers to the artifact of iron by casting. It mentions that iron lamps and bells were by *cire-perdue* (lost wax) process in the blacksmith foundry (v.155). The excavations at *Guttur* brought to light, an iron foundry and the iron artifact made of cast iron from those place as early as c.500 BC. The recovery of hollow terracotta ring mould with a hoe or spout like thing from iron smelting industrial sites at *Nattukkallpalayam* and *Kannarappalayam* for metal casting further support the early literary reference on iron artifact produced in ancient Tamilnadu by metal casting (*Rajan*: 1994:97). These terracotta rings might have been used to, make cast iron rings. The molten iron was poured inside the mould through the hole or spout and the mould were splashed with water for fast cooling, as evidenced from the analysis of artifact from *Guttur* (*Raghunatha Rao, et al.*, *I.N.S.A*: 32(4) 1997:354). From the cooled mould the metal was removed by breaking the terracotta ring.

The excavation (period II, 500-200 BC) at *Ujjain* brought to light, remains of a Blacksmith forge consisting of all the necessary equipment such as a groove for the introduction of nozzle of a bellows, an improvised stand made from the large of a broken vessel to support a water jar to store water for quenching, the use of an anvil and iron tools like pincers (*Banerjee*: 1965:179). Through *Ujjain* were known and sought after by the early Tamil people. (*Manimekalai*: XIX,II,107-9).

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