Mechanical Engineering in Ancient Egypt, Part XXVII: Models Industry (Weavers, Carpenters, Troops, Human Being)

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Abstract:
This paper is the 27th research paper in a series investigating the evolution of mechanical engineering in ancient Egypt. It tries to achieve this purpose through investigating the production of ancient Egyptians models for weavers, carpenters, troops and human being. Each model is presented chronically with present location if known and with engineering analysis showing its creativity. The materials used in producing the models are assigned.

Keywords — Mechanical engineering, ancient Egypt; weavers models; carpenters models; troops models; human being models

I. INTRODUCTION

Ancient Egyptians produced models to be located in the Tombs of some of their Nobles for religious believes. Those models carried information about those subjects in the real life and hence their characteristics and features. Kemp (1991) in his book about ancient Egypt discussed the presence of models in the Tombs of high officials of the Middle Kingdom. This included the models in Meketre Tomb including weaving workshop and carpentry shed [1]. Bard (1999) in her book about the encyclopedia of the archaeology of ancient Egypt studied the Tomb of Meketre at Deir el-Bahri who was a Chancellor and Steward during the 11th Dynasty. She explained the complete set of Tomb models prepared for the owner including cattle, carpenter and weaving models [2]. Nicholson and Shaw (2000) in their book about ancient Egyptian materials and technology presented a model for spinning and weaving workshop from Middle Kingdom Tomb of Meketre [3]. Mwanika (2004) in her Master of Arts Thesis presented a marching army model from the 11th Dynasty official Mesehti at Asyut [4].

El-Shahawy (2005) presented too many artifacts in display in the Egyptian Museum in Cairo. Her presentation covered weaving, carpenter and troops models [5]. Lloyd (2010) in his book about ancient Egypt presented a complete chapter by A. Spalinger about military institutions and warfare in ancient Egypt showing a model for Nubian soldiers from the Middle Kingdom Tomb of Mesehti at Asyut [6]. Kroenke (2010) in her Ph.D. Thesis presented models from Late Old Kingdom to Late Middle Kingdom for humans, fish and duck [7]. Tour Egypt (2012) presented a wooden model for carpentry workshop from Tomb of Meketre (TT280) of the 11th Dynasty excavated by the Metropolitan Museum of Art excavations in 1919/1920 [8]. Wikipedia (2016) in an article about military of ancient Egypt presented a wooden figure found in the Tomb of Mesehti of the 11th Dynasty showing that the Nubians were used in the Egyptian Army in the Late Old Kingdom [9]. Hassaan (2016) investigated the evolution of mechanical engineering in ancient Egypt through the study of ancient Egypt models for boats, ploughing, bakery and brewery [10] and also through the models of cattles, butchers, offering bearers and houses [11].

II. WEAVERS MODELS

May be the only models for weavers in ancient Egypt are those found in the Tomb of Meketre, the chancellor and high steward during the reign of Mentuhotep II, of the 11th Dynasty. Fig. 1 shows one of Meketre models as displayed in
the Egyptian Museum of Cairo [12]. The model is
produced from wood and painted by multi-colors.
All the operating staff are women busy in yarn
spinning and weaving using horizontal looms. Such
model authorizes the role of the ancient Egypt
women in building one of the greatest industries in
ancient Egypt, the textile industry [13]. The model
comprises two horizontal looms, a team of working
women busy in spinning yarn, weaving the yarn
and doing another jobs. The model was produced
from a colored wood and has a door in the far left
corner and the team consists of 10 workers in their
dress and operation role in the workshop.

Fig.1 Weavers model from Meketre Tomb [12].

- Another weaving model from the 11th
Dynasty is in display in the Metropolitan
Museum of Art and shown in Fig.2 [14].
The model is for a horizontal loom with two
women in operation on it and other two
supporting women may be preparing the
yarn through weaving.

Fig.2 Weavers model from the 11th Dynasty [14].

III. CARPENTERS MODELS

Carpenters have an important role in any
society anywhere. Specially in the ancient Egyptian
society carpenters could produce outstanding
furniture for pharaohs, nobles and normal people
[15]. The available carpenter models are
investigated as follows:

- Fig.3 shows a carpentry workshop from the
Tomb of Meketre of the 11th Dynasty in
display in the Egyptian Museum in Cairo
and shown in Fig.3 [16]. The model is
produced from a painted wood and
comprises a complete team of carpentry
operations. All the team members are males.
One worker cutting wood using a saw. The
cut wood is held vertically in a fixed vertical
stand while the worker is setting and
holding the saw by his two hands. There is a
white tool box and a team of three workers
beside the box (may be sharpening the tools).
The three members team in the left of
the model are using the adze in shaping a wood
block. A two members team in the front of
the model may be shaping another wood
block. At the left-back end of the model
another team is performing certain
operations.
To produce carpentry units, tools are required. Ancient Egyptians succeeded to produced working tools from copper from their early Dynastic Periods. The adze blade and axe head shown in Fig.4 are from about 5000 years ago (1st Dynasty) are found in the ancient Nubian city Faras which is now under the water of Nasser Lake [17].

- More ancient Egyptian carpentry tools models from the 12th Dynasty are in display in the Metropolitan Museum of Art and shown in Fig.5 [18]. They comprise axe, adze, chisels of various designs saws and borers.

- The genius materials engineers of ancient Egypt could invent a stronger alloy to replace the copper which is the bronze. They used it in too many applications including carpenter tools as those found in Thebes, manufactured during then 18th Dynasty and in display in the British Museum as shown in Fig.6 [19]. They comprise axe, adze, chisels of various designs saws and borers.

IV. TROOPS MODELS

Egypt has distinct position between three continents: Africa, Asia and Europe. Besides its outstanding economic position. All this made ancient Egypt ambition for all its Neighbors in the three continents. Therefore, ancient Egypt rules were forced to build strong army to defence Egypt from the attack of its neighbors. This was authorized by model builders in the 11th Dynasty.
through putting some of the models of military troops in some of the Tombs of its high officials as illustrated below:

- Fig. 7 shows a military brigade from the Tomb of Mesehty the provincial governor of Asyut which is in display in the Egyptian Museum at Cairo and shown in Fig. 7. The models comprises 40 soldiers armored with shields and spears. The whole model is produced from painted wood, the shields are covered by cow hide and the spears have leaf-shaped blades [20].

Fig. 7 Model of soldiers from the 11th Dynasty [20].

- The second troops model is for a Nubian Arrows-Troup from the 11th Dynasty in display in the Nubian Museum in Aswan of Egypt and shown in Fig. 8 [21]. The soldiers are arranged in two rows, carrying arrows in the right hand and bow in the left hand. The model is produced from painted wood and reflects the characteristics and nature of the Nubian soldiers.

Fig. 8 Model of Nubian soldiers from the 11th Dynasty [21].

- Another model for the Nubian soldiers is in display in the Nubian Museum in Aswan and shown in Fig. 9 [22]. It is manufactured from wood and the soldiers are arranged in four rows carrying arrows and bow in their hands. All the soldiers have white band on their heads and red belt on their waist.

Fig. 9 Model of Nubian soldiers from the 11th Dynasty [22].

V. HUMANS MODELS

Human models carry a lot of information about the ancient Egyptian people and their daily life including dress, work, amusement, character, hair style and too many things related to the human being. They produced human models since very early periods, since Badarians (4400-4000 BC) and continued to produce human models up to the Late Period (1085-332 BC). There are a lot of models available in the International Museums all over the world for ancient Egypt human models. We will take only one model from each Period or Dynasty.

- Fig. 10 shows a standing woman model from Badari (4400-4000 BC) in display in the British Museum [23]. It is produced from ivory and shows the ancient Egyptian women during this period with a very little cloth.

- Fig. 11 shows a standing woman model from Naqada I (4000-3500 BC) in display in the British Museum [24]. The model is manufactured from bone and has lapis lazuli eyes. Again, the dress is very limited as in the Badari Period. This an amazing artifact since carving of bone is very difficult than
wood carving because the hardness of bone is about 125 N/mm² [25], while that of beech wood is about 60 N/m² [26] (i.e. about half that of bone). The carving process is very neat and the dimensions are almost symmetric about a vertical axis through the head of the product.

Fig. 10 Woman model from Badari [23].

Fig. 11 Woman model from Naqada I [24].

- Now, we move to the period of Naqada II (3500-3200 BC) where we have a model for a standing woman raising her hands in display in the Brookyn Museum at NY and shown in Fig. 12 [27]. The model is produced from terracotta and the woman model is dressed by a long Schenti (skirt).

- From Naqada III of the Predynastic Period (3200-3000 BC) we have an ivory figure for a mother and her baby in display in the Egyptian Museum at Berlin and shown in Fig. 13 [28]. She is wearing a modified Schenti (trouser) without any cloth on the top part.

- A human model from the Early Dynastic Period (3100-2686 BC) is for a setting boy manufactured from hypo tusks in display in the Egyptian Museum at Cairo and shown in Fig. 14 [29]. The boy may be in an eating position. The settling position is difficult to carve, but there is nothing difficult for ancient Egyptians who produced amazing artifacts.

- The next human model is man model from the 4th Dynasty manufactured from quartzite and in display in the Metropolitan Museum of Art as shown in Fig. 15 [30]. In this model the carver used a stone material and succeeded to show all the characteristics of a young man in a striding position.

Fig. 12 Woman model from Naqada II [27].

Fig. 13 Woman and child from Naqada III [28].

Fig. 14 Woman and child from Naqada III [28].
The next model is from Dynasty 5 (2649-2100 BC) for a male beer maker carved from limestone in display in the Metropolitan Museum of Art and shown in Fig.16 [31]. Even limestone is a soft stone, but the design of the model is very complex because of the position taken and the basin with its support profiled table.

- A wooden model for Overseer Tjeteti from the 6th Dynasty (2278-2181 BC) is in display in the Metropolitan Museum and shown in Fig.17 [32]. It is carved in a striding position showing the serious character of the overseer. This unit is displayed in London sale dated 24th October 2013 for a price of about 111000 US$ !! [33].
- From the 1st Intermediate Period (2150-2100 BC) we have a model for a women in display in the Metropolitan Museum of Art and shown in Fig.18 [34]. It is carved from wood and in a The model is in a standing position in an exacting symmetric elevation about the vertical axis across the head.
- From the 11th Dynasty of the Middle Kingdom we have a wax ushabti in display in the Staatliches Museum Agyptischer of Munich and shown in Fig.19 [35]. This may be the first time for the ancient Egyptians to use wax as a raw material to produce such models. The model is in standing position and holding something in his both hands.
Fig.18 Woman model from 1st Int. Period [34].

Fig.19 Wax ushabti from the 11th Dynasty [35].

- From the 12th Dynasty of the Middle Kingdom we have a female figure produced during the period 1991-1450 BC from cedar wood in display in the Metropolitan Museum of Art and shown in Fig.20 [36]. The women is in a standing position and naked completely.

- From the 18th Dynasty of the New Kingdom, we have a ushabti model of Pharaoh Akhenaten (1353-1336 BC) in display in the Metropolitan Museum of Art and shown in Fig.21 [37]. The Pharaoh is in a standing position full dressed, carved from granite and holding the symbols of power and wealthy.

Fig.20 Model from the 12th Dynasty [36].

Fig.21 Usbabti of Akhenaten of the 18th Dynasty [37]

- From the 19th Dynasty of the New Kingdom, we have a ushabti model of Pharaoh Seti I (1294-1279 BC) in display in the Metropolitan Museum of Art and shown in Fig.22 [38]. The Pharaoh is in a standing position full dressed, manufactured from faience and holding the symbols of power and wealthy.

- From the 20th Dynasty of the New Kingdom, Fig.23 shows an ushabti of Pharaoh Ramses IV () in display in the Louvre Museum of Paris [39]. The model is manufactured from wood and painted with multi-colors.
including inscriptions on his dress. The Pharaoh is holding an adze in each hand indicating the agricultural power of ancient Egypt.

- From the 25th Dynasty of the Third Intermediate Period, Fig.25 shows a stone Ushabti of Pharaoh Taharqa [41]. The Pharaoh is holding an adze in each hand as in the model of Pharaoh Ramses IV of the 20th Dynasty (Fig.23).

Fig.22 Model of Seti I from 19th Dynasty [38].

Fig.24 Model of Pinudjem II from 21st Dynasty [40].

- From the 21st Dynasty, Fig.24 shows an ushabti of Pinudjem II (the High Priest of Amun at Thebes 990-969 BC) in display in the University of Pennsylvania Museum [40]. It is produced from blue faience inscribed in black color.

Fig.23 Figurine of Ramses IV of the 20th Dynasty [39]

Fig.25 Ushabti of Taharqa from the 25th Dynasty [41]

- The last model is a painted wooden model from the Late Period (664-332 BC) for a female harpist shown in Fig.26 [42]. The lady is playing on the harp in a standing vertical position with very nice details of the harpist and the harp itself.

- From the 21st Dynasty, Fig.24 shows an ushabti of Pinudjem II (the High Priest of Amun at Thebes 990-969 BC) in display in the University of Pennsylvania Museum [40]. It is produced from blue faience inscribed in black color.
VI. CONCLUSIONS

- Ancient Egyptians were pioneers in building models.
- They authorized the activities of weavers, carpenters, troops and human beings through models.
- They used wood, copper, ivory, bone, terracotta, hypo tusks, stone, wax and faience.
- Weaver models appeared in the 11th Dynasty.
- Carpentry workshop models appeared in the 11th Dynasty.
- Models of carpenter tools existed in the 1st, 12th and 18th Dynasties.
- Troops models were found in some of the Tombs of the 11th Dynasty.
- Human models were found in the Tombs of the Badarian Period and continued to be placed in some of the Tombs through the Periods of Naqada I, Naqada II, Naqada III, Early Dynastic, 4th Dynasty, 5th Dynasty, 6th Dynasty, First Intermediate, 11th Dynasty, 12th Dynasty, 18th Dynasty and 19th Dynasty.
- Women models with Schenti appeared in Naqada II and Naqada III Periods.
- The ancient Egyptians could design and produce models with very difficult positions as early as the 5th Dynasty.
- They succeeded to produce models using hard materials such as bone and granite.

REFERENCES


**BIOGRAPHY**

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