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Mechanical Engineering in Ancient Egypt: Part VI: Jewellery Industry (Royal crowns and Headdresses from 19th to 30th Dynasties)

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Abstract:

This research paper explores the role of Mechanical Engineering in the production of Crowns and Headdresses in ancient Egypt. The ancient Egypt Kings and Pharaohs used a relatively large number of Crowns indicating royalty and power. The paper covers a historical era from to the 19th dynasty to the 30th dynasty of ancient Egypt. Specific types of Crowns and Headdresses continued to appear during this period such as the White Crown, the Red Crown, the Blue Crown, the Nemes Headdress, the Khat Headdress, the Vulture Crown, the Modius Crown, the Cap Crown, the Double Plumed Crown, the Double Crown, the Nemes + Double Crown and the Nemes + Atef crown.

Keywords — Mechanical engineering history, ancient Egypt, jewellery industry, royal crowns and headdresses, 19^{th} to 30^{th} dynasties.

I. INTRODUCTION

This is the 6th research paper in a series of research paper aiming at exploring the history of mechanical engineering in ancient Egypt and its role in establishing one of the greatest civilizations in the ancient world. In the 5th part of this series, the author studied the royal crowns and headdresses industry in ancient Egypt from the predynastic to the 18th dynasty and presented some of the available literatures about the subject [1].

II. 19TH DYNASTY

This is the second dynasty in the New Kingdom lasted from 1292 to 1189 BC [2]. Pharaohs of the 19th dynasty used different types of crowns and headdresses including the White Crown, Blue Crown, Nemes Headdress, Khat Headdress, Nemes plus Atef Crown. A Queen used the Vulture and the Double Plumed Crown. The details are as follows:

- Pharaoh Ramses I, the 1st Pharaoh of the 19th dynasty worn a Khat Headdress as shown in Fig.1 as displayed in the Museum of Fine Arts of Boston [3].

- Pharaoh Seti I, the 2nd Pharaoh of the 19th dynasty worn the White Crown of Upper Egypt as depicted in his inscription in Abydos Temple (Fig.2) [4].



Fig. 1 Ramses I wearing a Khat Headdress [3].



Fig. 2 Seti I wearing a White Crown [4].

- He worn also the Nemes Headdress as depicted in his statue shown in Fig.3 [5].



Fig. 3 Seti I wearing a Nemes Headdress [5].

- Now we move to the 3rd Pharaoh of the 19th dynasty, Ramses II, the great Pharaoh in the ancient Egypt History. He used the following Crowns and Headdresses:
 - The Blue Crown while leading the battle against the Hittite on his military chariot (Fig.4) [6].



Fig. 4 Ramses II wearing a Blue Crown [6].

• The Nemes Headdress as depicted from his setting statue in the Ramesseum Temple (Fig.5) [6].



Fig. 5 Ramses II wearing a Nemes Headdress [6].

• The Khat Headdress as shown in his granite bust located in the Egyptian Museum (Fig.6) [7].



Fig. 6 Ramses II wearing a Khat Headdress [7].

- The Nemes + Atef Crown was worn by Ramses II as depicted in his statue shown in Fig. 7 [8].
- The Nemes + Double Crown was worn by the Pharaoh in his statues at Karnak Temple as shown in Fig. 7 [9].



Fig. 7 Ramses II wearing a Nemes + Atef [8].



Fig. 8 Ramses II wearing a Nemes + Double Crown [9].

- Queen Nefertari, the wife of Pharaoh Ramses II worn two types of crowns: the Double Plumed Crown (Fig.9) and a Vulture Crown (Fig.10) [10].



Fig.9 Nefertari wearing a Double Plumed Crown [10]



Fig.10 Nefertari wearing a Vulture Crown [10]

- The 4th Pharaoh of the 19th dynasty is Merneptah. He worn the classical Nemes Headdress (Fig.11) [11] and the Modius Crown in an offering scene (Fig.12) [11]. This is the first time to see the Medius Crown in the 19th dynasty.



Fig. 11 Merneptah wearing a Nemes Headdress [11].



Fig. 12 Merneptah wearing a Modius Crown [11].

- Pharaoh Seti II, the 5th Pharaoh of the 19th dynasty worn the classical Nemes Headdress depicted in his statue setting in the Rosicrucian Egyptian Museum at USA (Fig.13) and Khat Headdress in his statue standing in the Turin Museum at Italy (Fig.14) [12].



Fig.13 Seti II wearing a Nemes Headdress [12].



Fig.14 Seti II wearing a Khat Headdress [12].

- Pharaoh Amenmesse, the 6th Pharaoh of the 19th dynasty worn the standard Blue Crown as depicted in his head in the Metropolitan Museum of Art at USA and shown in Fig.15 [13].



Fig.15 Amenmesse wearing a Blue Crown [13].

III. 20TH DYNASTY

This is the third dynasty in the New Kingdom. Its famous pharaohs are Ramses III to Ramses XI. Their use of crowns and headdresses was as follows:

- Pharaoh Ramses III worn the Nemes Headdress as depicted in a coloured temple relief and shown in Fig.16 [14]. He worn also the Blue Crown as depicted in the coloured relief in Tomb KV11 and shown in Fig.17 [14].



Fig.16Ramses III wearing a Nemes Headdress [14].



Fig. 17 Ramses III wearing a Blue Crown [14].

Pharaoh Ramses IV, the 3rd Pharaoh of the 20th dynasty worn the Double Crown of unified Egypt as depicted in a limestone inscription shown in Fig.18, the Nemes Headdress as depicted in his statue standing in the British Museum shown in Fig.19 and a Blue Crown as depicted in a wall inscription in Khonsu Temple at Karnak shown in Fig.20 [15].



Fig. 18 Ramses IV wearing a Double Crown [15].



Fig.19 Ramses IV wearing a Nemes Headdress [15].



Fig. 20 Ramses IV wearing a Blue Crown [15].

 Pharaoh Ramses VI, the 5th Pharaoh of the 20th dynasty wearing a Nemes Headdress in an Shabti standing in the Metropolitan Museum of Art and shown in Fig.21 [16].



Fig.21 Ramses VI wearing a Nemes Headdress [16].

 Pharaoh Ramses VII, the 6th Pharaoh of the 20th dynasty wearing a Khat Headdress in an inscription from tomb KV1and shown in Fig.22 [17].



Fig.22 Ramses VII wearing a Khat Headdress [17].

Pharaoh Ramses IX, the 8th Pharaoh of the 20th dynasty worn a Khat Headdres and a Blue Crown. Fig.23 shows an inscription of Ramses IX setting on a chair in the Metropolitan Museum of Art and wearing a Khat Headdress [18]. He worn also the Blue Crown as depicted in the relief shown in Fig.24 in the Karnak [18].



Fig.23 Ramses IX wearing a Khat Headdress [18].



Fig.24 Ramses IX wearing a Blue Crown [18].

- Pharaoh Ramses X, the 9th Pharaoh of the 20th dynasty worn the Blue Crown as depicted in inscriptions in his Tomb KV18 as shown in Fig.25 [19].

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Fig.25 Ramses X wearing a Blue Crown [19].

 Pharaoh Ramses XI, the last Pharaoh of the 20th dynasty worn the Khat Headdress as depicted in the reliefs in the Temple of Khunsu at Karnak as shown in Fig.26 [20].



Fig.26 Ramses XI wearing a Khat Headdress [20].

IV. 21st DYNASTY

This is the first dynasty in the third intermediate period of the ancient Egypt history. Some of the crown and headdresses designs use by some of the Pharaohs of the 21st dynasty are presented below:

Pharaoh Psausennes I, the 3rd Pharaoh of the 21st dynasty worn the Nemes Headdress as depicted in his gold mask shown in Fig.27
 [21] His Nemes had a standard design of Nemes used in the ancient Egypt History [1].



Fig.27 Psausennes I wearing a Nemes Headdress [21].

 Pharaoh Amenemope, the 4th Pharaoh of the 21st dynasty worn the Nemes Headdress as depicted in his gold mask existing in the Egyptian Museum and shown in Fig.28 [22]



Fig.28 Amenemope wearing a Nemes Headdress [22].

- Pharaoh Siamun, the 6th Pharaoh of the 21st dynasty worn the Nemes Headdress as depicted in his bust existing in the Louver Museum and shown in Fig.29 [23]



Fig.29 Siamun wearing a Nemes Headdress [23].

V. 22ND DYNASTY

The 22nd dynasty was founded by Shoshenq I in 945 BC. It was ruled by 11 Pharaohs. They used Headdresses with the designs illustrated below:

 Pharaoh Shoshenq I, the 1st Pharaoh of the 22nd dynasty worn the Nemes Headdress as depicted in his sphinx statue located in the Louvre Museum and shown in Fig.30 [24].



Pharaoh Osorkon II, the 5th Pharaoh of the

22nd dynasty worn a Khat Headdress as depicted in his black granite head shown in

Fig.32 Osorkon II wearing a Khat Headdress [26].

Fig.32 [26].

- Pharaoh Sheshenq III, the 6th Pharaoh of the 22nd dynasty worn the Nemes Headdress as depicted in the relief shown in Fig.33 from his tomb at Tanis [27].



Fig.33 Shoshenq III wearing a Nemes Headdress [27].

Pharaoh Pami, the 8th Pharaoh of the 22nd dynasty worn the White Crown as depicted in his statue shown in Fig.34 [26].



Fig.34 Pami wearing a White Crown [26].



Fig.30 Shoshenq I wearing a Nemes Headdress [24].

Pharaoh Osorkon I, the 2nd Pharaoh of the 22nd dynasty worn a long Khat Headdress as depicted in his bust displayed in the Louvre Museum as shown in Fig.31 [25].



Fig.31 Osorkon I wearing a long Khat Headdress [25].

 Pharaoh Osorkon IV, the last Pharaoh of the 22nd dynasty worn the Red Crown as depicted in the relief shown in Fig.35 [28].



Fig.35 Osorkon IV wearing a Red Crown [28].

VI. 23RD DYNASTY

- Pharaoh Takelot II, the 2nd Pharoah of the 23rd dynasty worn the White Crown as depicted in the wall relief shown in Fig.36 [29].



Fig.36 Takelot II wearing a White Crown [29].

- Pharaoh Osarkon III, the 6th Pharaoh of the 23rd dynasty wor a Khat Headdress as shown in his statue shown in Fig.37[30].



Fig.37 Osorkon III wearing a Khat Headdress [30].

VII. 24TH DYNASTY

- Pharaoh Tefnakht, the first Pharaoh of the 24th dynasty worn a Double Crown as

depicted from his stela as shown in Fig.38 [31].



Fig.38 Tefnakht wearing a Double Crown [31].

VIII. 25TH DYNASTY

Pharaoh Shabaks, the 3rd Pharaoh of the 24th dynasty worn the Double Crown of the Unified Egypt as depicted in his stela in the Metropolitan Musium of Art, USA and shown in Fig.39 [32].



Fig.39 Shabata wearing a Double Crown [32].

- Pharaoh Shebitku, the 4th Pharaoh of the 24th dynasty worn a Cap Crown as depicted in his head shown in Fig.40 [33] and a Double Crown as depicted in his stela shown in Fig.41 [34].



Fig.40 Shebitku wearing a Cap Crown [33].



Fig.41 Shebitku wearing a Double Crown [34].

- Pharaoh Taharqa, the 6th Pharaoh of the 25th dynasty worn:
 - Cap Crown as depicted in his statue shown in Fig.42 [35].



Fig.42 Taharqa wearing a Cap Crown [35].

• Khat Headdress as depicted in his shabti shown in Fig.43 [35].



Fig.43 Taharqa wearing a Khat Headdress [35].

• Double Plumed Crown as shown in the coloured relief shown in Fig.44 [35].



• Nemes Headdress as depicted in the human-animal statue shown in Fig.45 [35].



Fig.45 Taharqa wearing a Nemes Headdress [35].

- Pharaoh Tantamani, the 6th and last Pharaoh of the 25th dynasty worn a Double Plumed Crown as depicted in his head existing in the Ashmolean Museum and shown in Fig.46 [36].



Fig.46 Tantamani wearing a Double Plumed Crown [36].



IX. 26TH DYNASTY

- Pharaoh Psamtik I, the first Pharaoh of the 26th dynasty worn the classical Nemes Headdress as depicted in his statue shown in Fig.47 [37].
- Pharaoh Necho II, the 2nd Pharaoh of the 26th dynasty worn worn also the standard Nemes Headdress as depicted from his statue shown in Fig.48 [37].



Fig.47 Psamtik I wearing a Nemes Headdress [37].



Fig.48 Necho II wearing a Nemes Headdress [37].

- Psamtik II, the 3rd Pharaoh of the 26th dynasty worn a Cap Crown as depicted in his head shown in Fig.49 [38].



- Pharaoh Apries, the 4th Pharaoh of the 26th dynasty worn a Cap Crown as depicted in head in the Louvre Museum and shown in Fig.50 [39].



Fig. 50 Apries wearing a Cap Crown [39].

Pharaoh Amasis II, 5th Pharaoh of the 26th dynasty wearing the Nemes Headdress as depicted in his statue-head located in the Neues Museum of Berlin and shown in Fig.51 [40].



Fig.51 Amasis II wearing a Nemes Headdress [40].

- Pharaoh Psamtik III, 6th and last Pharaoh of the 26th dynasty wearing the White Crown



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as depicted in his statue-head shown in Fig.52 [41].

XI. 30TH DYNASTY

- Pharaoh Nectanebo I, the first Pharaoh of the 30th dynasty wearing a Nemes Headdress as dedicated in his statue in the Egyptian Museum shown in Fig.55 [44].

Fig. 52 Psamtik III wearing a White Crown [41].

X. 29TH DYNASTY

- Pharaoh Nepherites I, the first Pharaoh of the 29th dynasty wearing a Nemes Headdress as depicted in his Lion statue setting in the Louvre Museum and shown in Fig.53 [42].



Fig.53 Nepherites I wearing a Nemes Headdress [42].

Pharaoh Hakor, the 3rd Pharaoh of the 29th dynasty worn a Nemes Headdress as depicted in his statue shown in Fig.54 [43].



Fig.54 Hakor wearing a Nemes Headdress [43].



Fig.55 Nectanebo I wearing a Nemes Headdress [44].

- Pharaoh Nectanebo II, the 3rd and last Pharaoh of the 30th dynasty wearing the Blue Crown as depicted in his statue head located in the Museum of Fine Arts at Boston and shown in Fig.56 [45]. He worn also the classical Nemes Headdress as shown in Fig.57 from a statue in the Metropolitan Museum of Art [46].



Fig. 56 Nectanebo II wearing a Blue Crown [45].



Fig.57 Nectanebo II wearing a Nemes Headdress [46].

XII. CONCLUSIONS

- The use of Crowns and Headdresses by the ancient Egypt Pharaos in the era from the 19th to the 30th dynasties was investigate.
- The White Crown was worn by the Pharaohs: Seti I of the 19th dynasty, Pami of the 22nd dynasty, Takelot II of the 23rd dynasty and Psamtic III of the 26th dynasty.
- The Red Crown was worn by Pharaoh Osorkon IV of the 22nd dynasty..
- The Blue Crown was worn by the Pharaohs: Ramses II of the 19th dynasty, Amenmesse of the 19th dynasty, Ramses III of the 20th dynasty, Ramses IV of the 20th dynasty and Nectanebo II of the 30th dynasty.
- The Nemes Headdress was worn by: Ramses II, Seti I, Merneptah and Seti II of the 19th dynasty, Ramses III, Ramses IVand Ramses VI of the 20th dynasty, Psausennes I, Amenemope and Siamun of the 21st dynasty, Shoshenq I and Shoshenq III of the 22nd dynasty, Taharqa of the 25th dynasty, Nech II and Amasis II of the 26th dynasty, Nepherites I and Hakor of the 29th dynasty, Nectanebo I and Nectanebo II of the 30th dynasty.
- The Khat Headdress was worn by the Pharaohs: Ramses I, Ramses II and Seti II of the 19th dynasty, Ramses VII and Ramses IX of the 20th dynasty, Osorkon I and Osorkon II of the 22nd dynasty, Osorkon III of the 23rd dynasty, and Taharqa of the 25th dynasty.

- The Vulture Crown was worn by Queen Nefertari of the 19th dynasty.
- The Modius Crown was worn by the Pharaoh Merneptah of the 19th dynasty.
- The Cap Crown was worn by the Pharaohs: Shebitku and Taharqa of the 25th dynasty, Psamtic II and Apries of the 26th dynasty.
- The Double Plumed Crown was worn by: Queen Nefertari of the 19th dynasty, Pharaohs Taharqa and Tantamani of the 25th dynasty.
- The Double Crown was worn by Pharaohs: Ramses IV of the 20th dynasty, Tefnakht of the 24th dynasty, Shabato and Shebitku of the 25th dynasty.
- The Nemes + Double Crown was worn by the Pharaoh Ramses II of the 19th dynasty.
- The Nemes + Atef Crown was worn by the Pharaoh Ramses II of the 19th dynasty.

REFERENCES

- [1] G. A. Hassaan, "Mechanical engineering in ancient Egypt, Part V: Jewellery (Royal crowns and headdresses up to the 18th dynasty", World Journal of Engineering Research and Technology, Accepted for Publication, 2016.
- Wikipedia, "Nineteenth dynasty of Egypt", http://en.wikipedia.org/wiki/Nineteenth_dynasty_of_Egypt
- [3] Wikipedia, "Ramesses I", http://en.wikipedia.org/wiki/Ramesses I, 2016.
- [4] Wikipedia, "Seti I", http://en.wikipedia.org/wiki/Seti I, 2015.
- [5] https://www.pinterest.com/pin/364510163565294317/
- [6] Wikipedia, "Ramesses II", http://en.wikipedia.org/wiki/Ramesses II, 2016.
- [7] Getty images, "Bust of Ramesses II", http://www.gettyimages.com/detail/photo/bust-oframesses-ii-black-granite-statue-high-res-stockphotography/185735225
- [8] Getty images, "Colossal statue of Ramesses II", http://www.gettyimages.com/detail/photo/colossalstatue-of-ramesses-ii-cairo-egypt-high-res-stockphotography/479644289
- [9] C. Zarnoch and E. Sullivan, "Colossal statue pf Ramesses II and daughter", http://dlib.etc.ucla.edu/projects/Karnak/resource/ObjectCatalog/1862, 2008
- [10] Wikipedia, "Nefertari", http://en.wikipedia.org/wiki/Nefertari, 2016.
- [11] Wikipedia, "Merneptah", http://en.wikipedia.org/wiki/Merneptah, 2016.
- [12] Wikipedia, "SetiII",

- http://en.wikipedia.org/wiki/Seti-II, 2016.
- [13] Wikipedia, "Amenmesse", http://en.wikipedia.org/wiki/Amenmesse, 2016.
- [14] Wikipedia, "Ramesses III", http://en.wikipedia.org/wiki/Ramessses-III, 2016.
- [15] Wikipedia, "Ramesses IV", http://en.wikipedia.org/wiki/Ramessses-IV, 2016.
- [16] Metropolitan Museum, "Shabti of Ramesses VI", http://www.metmuseum.org/collection/the-collectiononline/search/545924, 2016
 Wikipedia, "Ramesses VII", http://en.wikipedia.org/wiki/Ramesses-VII, 2016.
- [17] Wikipedia, "Ramesses IX", http://en.wikipedia.org/wiki/Ramessses-IX, 2016.
- [18] Wikipedia, "Ramesses X", http://en.wikipedia.org/wiki/Ramesses-X, 2016.
- [19] Wikipedia, "Ramesses XI", http://en.wikipedia.org/wiki/Ramessses-XI, 2016.
- [20] Wikipedia, "Psusennes I", http://en.wikipedia.org/wiki/Psusennes-I, 2016.
- [21] M. Abo-Elyazid, "A grave mask of Pharaoh Amenemope of the 21st dynasty", https://www.pinterest.com/pin/456482112200816549/
- [22] Wikipedia, Siamun", http://en.wikipedia.org/wiki/Siamun, 2016.
- [23] "History of ancient Egypt",

 http://www.histoire-fr.com/egypte troisieme periode intermediaire 2.ht
 m
- [24] A. Dodson, "Twelve great dynasties of Egypt gallery", http://www.bbc.co.uk/history/ancient/egyptians/great_dynasties_gallery_10.shtml, 2011.
- [25] D. Sitek, "XXIIth dynasty", www.narmer.pl/dyn/22nd.htm, 2016.
- [26] Wikipedia, "Shoshenq III", http://en.wikipedia.org/wiki/Shoshenq-III, 2016.
- [27] Wikipedia, "Osorkon IV", http://en.wikipedia.org/wiki/Osorkon-IV, 2016.
- [28] Wikipedia, "Takelot II, http://en.wikipedia.org/wiki/Takelot-II, 2016.
- [29] Crystalinks, "Twenty third dynasty of Egypt",
- [30] Wikipedia, "Tefnakht", http://en.wikipedia.org/wiki/Tefnakht, 2016.
- [31] Wikipedia, "Shabaka", http://en.wikipedia.org/wiki/Shabaka, 2016.
- [32] Egypt search, Egyptian pharaohs", www.egyptsearch.com/forum/ultimatebb..cg?ubb, 2014.
- [33] Wikipedia, "Shebitku", http://en.wikipedia.org/wiki/Shebitku, 2016.
- [34] Wikipedia, "Taharqa", http://en.wikipedia.org/wiki/Taharqa, 2016.
- [35] Wikipedia, "Tantamani", http://en.wikipedia.org/wiki/Tantamani, 2016.
- [36] Real histoey, "Ancient man and his first civilization", www.realhistory.com/world_history/ancient/Egypt_3aa. htm

- [37] Britannica, "Psamtik II King of Egypt", www.britannica.com/biography/Psamtik-II
- [38] Wikipedia, "Apries", http://en.wikipedia.org/wiki/Apries, 2016.
- [39] Flickr, "Head of a statue of Pharaoh Amesis II", www.flickr.com/photos/hen-magonza/6162943795
- [40] Wikipedia, "Psamtik III" ' http://en.wikipedia.org/wiki/Psamtik III, 2016.
- [41] Wikipedia, "Nepherite I", http://en.wikipedia.org/wiki/Nepherites-I, 2016.
- [42] Files-google, "Ancient Egypt Pharaohs", <u>http://sites.google.com/site/ancientegyptpharaohs/dynasties/dynasty-29/3-hakor</u>
- [43] G. Wood, "Museum piece 4 MMA", http://egyptianemporiumwordpress.com/2012/07/20/museum-piece-4-mma-2008-454/, 2012.
- [44] Wikimedia, "Nectanebo II statue head in Museum of Fine Arts, Boston", http://commons.wikimedia.org/wiki/file:Nectanebo-II, 2015.
- [45] M. Adams, "Pharaoh timeline images or statues", www.pinterest.com/pin/231372499583264316/
- [46] M. Adams, "Pharaoh timeline images or statues", www.pinterest.com/pin/231372499583264316/

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