

Mechanical Engineering in Ancient Egypt, Part 79: Obelisks Inscription

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Abstract— The use of obelisk surfaces as inscription media in ancient Egypt is investigated as activity in the study of evolution of mechanical engineering in ancient Egypt. The use of obelisks in the ancient Egyptian society was traced during the periods between Old Kingdom and Late Period emphasizing their use to register documentation. Material, height, weight (if known), inscription script and present location are outlined for each obelisk.

Index Terms— Mechanical engineering history, ancient Egypt, obelisks inscription, Old Kingdom to Late Period.

I. INTRODUCTION

The ancient Egyptians used all kinds of structure surfaces to record their history and personal information. They produced huge structural obelisks since the time of Senusret I (1971-1926 BC) up to the time of Queen Cleopatra (51-30 BC).

Weisse (1880) in his book about obelisks and freemasonart presented the inscriptions on the four sides of New York obelisk with English translation of its hieroglyphic texts [1]. Gorringe (1885) in his book about Egyptian obelisks studied the technique used in the transportation of an Egyptian obelisk from Egypt to the USA and its erection in the Central Park at New ork. He showed an image of the obelisk standing in its final position in New York showing clearly its inscriptions on one of its sides [2]. Englbach (1923) in his book about the problem of the obelisks presented the Senusret I obelisk at Mataria of Cairo and the obelisk of Ramses II at the Temple of Amun at Luxor. He explained hoe the ancient Egyptians cut an obelisk from the rock and how they erected it [3]. Abdel-Gawwad, El-Kady and Shalaby (2011) applied a three dimensional analysis of three ancient Egyptian obelisks (Hatshepsute, Thutmose III and Ramses II) to investigate their behavior under Aqaba earthquake. They presented an actual image for the Thutmose III obelisk [4].

Packer (2012) in his Ph. D. Thesis presented a line drawing for the obelisks at Rome before 1938 and in 1773 including a number of inscribed Egyptian obelisks. He presented also the Egyptian obelisk in Piazza del Popolo erected in 1589 [5]. Van Aerde (2013) in his paper about concepts of Egypt in Augustan Romw presented the Egyptian obelisk erected by Augustus in 10 BC and set at Piazza del Popolo of Rome and the Egyptian obelisk at Trinitadai Monti and the Egyptian obelisk in the J. Paul Getty Museum

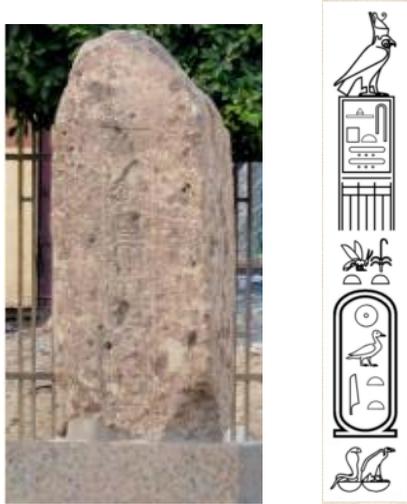
in California [6]. Clausen (2015) in her Ph. D. Thesis presented the Egyptian obelisk in the Piazza Navona of Rome and the two obelisks erected at Rome by Augustus in 10 BC. She presented also the Egyptian obelisk in the Piazza della Minerva and Piazza della Rotanda [7].

Simmons (2015) in his Bachelor's Thesis investigated the erection of the New York obelisk which was one of Pharaoh Thutmose III obelisks. He explained in details how the Americans erected it near the end of the 19th century [8]. Hoare (2017) in her Ph. D. Thesis presented the obelisk of Senusret I, the Egyptian obelisk brought from Alexandria by Caligula and erected in the Circus Vaticanus of Rome and the Egyptian obelisk of Thutmose III erected in New York [9]. Wikipedia (2018) wrote an article about the female Pharaoh Hatshepsut who ruled Egypt between 1479 and 1458 BC. They presented the fallen obelisk of Hatshepsut at Karnak [10]. Hassaan (2018) in his investigation of the development of Mechanical Engineering in ancient Egypt outlined the used of many products and structures as media for inscription. This included stelae [11], labels and tags [12] and statues and scenes authorizing the marriage in the ancient Egyptian society [13].

II. OLD KINGDOM OBELISKS INSCRIPTION

The ancient Egyptians knew the carving of stone obelisks since the time of the Old Kingdom during the reign of King Teti of the 6th Dynasty (2345-2333 BC). We have two ancient Egyptian obelisks from this era depicting their stone-carving and inscription:

- The first example is a one meter height quartzite fragment of an obelisk belonging to King Teti, the founder of the 6th Dynasty (2345-2333 BC) in display in Matariya of Cairo and shown in Fig.1(a) [14]. This was the top fragment of the obelisk. It was inscribed by the Serekh and Cartouche of King Teti as shown in Fig.1 (b) [14].



(a) Obelisk fragment. (b) Inscription
Fig.1 Quartzite obelisk fragment of King Teti [14].

- The second example is a 2.5 m length granite fragment of an obelisk belonging to Queen Ankhnespepi II, mother of King Pepi II, the 5th Pharaoh of the 6th Dynasty (2278-2184 BC). It was excavated in her funerary complex at Saqqara and shown in Fig.1 [15]. The obelisk fragment has an inscription on one side only for the name and titles of the Queen [15].



Fig.2 Granite obelisk fragment of Ankhnespepi II [15].

III.MIDDLE KINGDOM OBELISKS INSCRIPTION

The second King of the 12th Dynasty, Senusret I (1971-1926 BC) ordered his stone carving specialists to cut and inscribe a number of obelisks as follows:

- The first example is a 20.7 m height and 120 ton red granite obelisk of Senusret I, the second King of the 12th Dynasty (1971-1926 BC) erected in Matariya at Cairo and shown in Fig.3 [16]. It was inscribed using the hieroglyphic script with text carved in one un-bounded column per side.
- The second example is a 13 m height red granite obelisk of King Senusret I erected in Fayoum of Egypt and its bottom part is shown in Fig.4 [17]. It was inscribed using an Arabic hand writing by recent Egyptian boys !!.



Fig.3 Granite obelisk of Senusret I from the 12th Dynasty in Matariya [16].



Fig.4 Granite obelisk of Senusret I from the 12th Dynasty in Fayoum [17].

IV.NEW KINGDOM OBELISKS INSCRIPTION

The new kingdom was one of the powerful and wealthy periods during the ancient Egyptian history. Therefore we expect to have extensive production on inscribed obelisks during the New Kingdom as will be depicted by the following examples:

- The first example is a 19.5 m height and 143 ton weight granite obelisk of Thutmose I, the third Pharaoh of the 18th Dynasty (1503-1493 BC) erected in the Great temple of Amun at Karnak and shown in Fig.5 [18,19]. It was inscribed using the hieroglyphic script with text carved in three un-bounded columns / side. The central text-column belonged to Pharaoh Thutmose I while the two text-columns beside the central one belonged to Pharaoh Ramses IV of the 20th Dynasty (1155-1149 BC) carved with smaller script.
- The second example is a 28.58 m height and 343 ton weight granite obelisk of Hatshepsut, the fifth Pharaoh of the 18th Dynasty (1479-1458 BC) erected in the Great temple of Amun at Karnak and shown in Fig.6 [20]. hieroglyphic script with text carved in three un-bounded columns / side including the Cartouches of the Pharaoh.
- The third example is an obelisk top fragment of Pharaoh Hatshepsut of the 18th Dynasty laid down in Karnak at Aswan and shown in Fig.7 [21]. The

obelisk fragment was inscribed using the hieroglyphic script on the face of the view shown in Fig.7 on the whole surface and on the pyramid on the top of the obelisk. Of course any researcher has a logical question: Why the present Egyptians left it laid on the ground and didn't erect it vertically as it was in the days of great Pharaoh Hatshepsut ?. I am as an Egyptian don't have an answer, but sure Egyptian in power have an answer.



Fig.5 Granite obelisk of Thutmose I from the 18th Dynasty in Karnak [18,19].



Fig.6 Granite obelisk of Hatshepsut from the 18th Dynasty in Karnak [20].



Fig.7 Granite top obelisk fragment of Hatshepsut from the 18th Dynasty in Karnak [21].

- The fourth example is an obelisk top fragment of Pharaoh Thutmose III, the 6th Pharaoh of the 18th Dynasty (1479-1425 BC) laid down in the Temple of Amun at Karnak and shown in Fig.8 [19]. The obelisk fragment was inscribed using the hieroglyphic script on the face of the view shown in Fig.8 on the whole surface and on the pyramid on the top of the obelisk. Text was carved in short columns including the Cartouches of the Pharaoh.



Fig.8 Granite top obelisk fragment of Thutmose III from the 18th Dynasty in Karnak [19].

- The fifth example is a long obelisk fragment of Pharaoh Thutmose III of the 18th Dynasty laid down in the Temple of Amun at Karnak and shown in Fig.9 [19]. The obelisk fragment was inscribed using the hieroglyphic script on the face of the view shown in Fig.9 on the whole surface. This part of the obelisk was cut longitudinally by stupid human beings while the recent Egyptians didn't pay any effort in erecting it again in Amun Temple.



Fig.9 Granite obelisk fragment of Thutmose III from the 18th Dynasty in Karnak [19].

- The sixth example is a 21 m height and 200 ton red granite obelisk of Pharaoh Thutmose III erected after transfer from Egypt in the Central Park at New York and shown in Fig.10 [22]. The obelisk was inscribed using the hieroglyphic script with text carved in three unbounded columns per side.
- The seventh example is an over 30 m height and 380 ton pink granite obelisk of Pharaoh Thutmose III erected after transfer from Egypt in Istanbul of Turkey and shown in Fig.11 [16]. The obelisk was inscribed using the hieroglyphic script with text carved in one unbounded columns per side.



Fig.10 Granite obelisk of Thutmose III from the 18th Dynasty in NY [22].



Fig.11 Granite obelisk of Thutmose III from the 18th Dynasty in Istanbul [16].

- The eighth example is a 21 m height and 224 ton weight red granite obelisk of Pharaoh Thutmose III erected after transfer from Egypt in London and shown in Fig.12 [18]. The obelisk was inscribed using the hieroglyphic script with text carved in three unbounded columns per side. The central column text was carved during the reign of Pharaoh Thutmose III while the other two columns were carved during the reign of Pharaoh Ramses II of the 19th Dynasty (1279-1213 BC).
- The ninth example is a 37.2 m height and 300 ton weight red granite obelisk of Pharaoh Thutmose III erected after transfer from Egypt in the Piazza SanGiovann at Rome and shown in Fig.13 [23]. The obelisk was inscribed using the hieroglyphic script with text carved in three unbounded columns per side.



Fig.12 Granite obelisk of Thutmose III from the 18th Dynasty in London [18].



Fig.13 Granite obelisk of Thutmose III from the 18th Dynasty in Rome [23].

- The tenth example is 2.335 m height and 430 kg weight red granite obelisk of Amenhotep II, the 7th Pharaoh of the 18th Dynasty (1425-1398 BC) in display in the Oriental Museum, Durham University of UK and shown in Fig.14 [24]. It was inscribed by a scene in its top part and a hieroglyphic script text carved in one un-bounded column. The scripts are wonderful and look as if they are colored in yellow over a pink background.
- The eleventh example is a 24 m height and 263 ton granite obelisk of Pharaoh Seti I, the 2nd Pharaoh of the 19th Dynasty (1290-1278 BC) erected in the Piazza del Popolo at Rome and shown in Fig.15 [25,26]. It was nicely inscribed by deep hieroglyphic scripts carved in three columns per side. Three sides of the obelisk were inscribed during the reign of Pharaoh Seti I and the 4th side was inscribed during the reign of his son Great Pharaoh Ramses II

(1279-1213 BC) [26].



Fig.14 Granite obelisk of Amenhotep II from the 18th Dynasty in Durham [24].

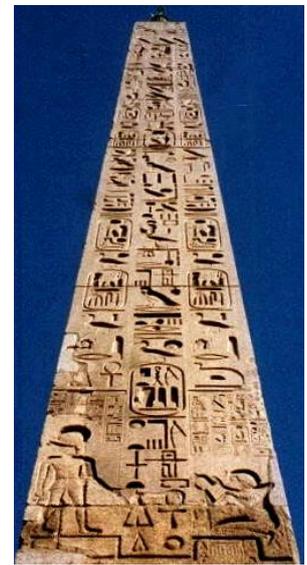


Fig.15 Granite obelisk of Seti I from the 19th Dynasty in Rome [25,26].

- The twelfth example is 6 m height red granite obelisk of Pharaoh Ramses II of the 19th Dynasty in display in the Piazza della Rotonda at Rome and shown in Fig.16 [27]. It was inscribed by a scene in its top part and a hieroglyphic script text carved in one un-bounded column.
- The thirteenth example is 13.91 m height red granite obelisk of Pharaoh Seti I in display in the Piazza Trinita Monti at Rome and shown in Fig.17 [28]. It was inscribed by hieroglyphic scripts carved in three un-bounded columns per side.



Fig.16 Granite obelisk of Ramses II from the 19th Dynasty in Rome [27].



Fig.17 Granite obelisk of Seti I from the 19th Dynasty in Rome [28].

- The fourteenth example is 6.34 m height red granite obelisk of Pharaoh Ramses II of the 19th Dynasty in

display in the Terme di Diocleziano at Rome and shown in Fig.18 [29]. It was inscribed by hieroglyphic scripts carved in one un-bounded column per side.

- The fifteenth example is 13.5 m height red granite obelisk of Pharaoh Ramses II of the 19th Dynasty in display in the Gezira Island at Cairo and shown in Fig.19 [30]. It was inscribed by hieroglyphic scripts carved in one un-bounded column per side.



Fig.18 Granite obelisk of Ramses II from the 19th Dynasty in Rome [29].



Fig.19 Granite obelisk of Ramses II from the 19th Dynasty in Cairo [30].

- The sixteenth example is 17 m height red granite obelisk of Pharaoh Ramses II of the 19th Dynasty in display in Cairo International Airport and shown in Fig.20 [31]. It was inscribed by hieroglyphic scripts carved in one un-bounded column per side.
- The seventeenth example is 3 m height and 1.8 ton weight grey granite obelisk of Pharaoh Ramses II of the 19th Dynasty in display in the Poznan Archaeological Museum at Poland and shown in Fig.21 [32]. It was inscribed by hieroglyphic scripts carved in one un-bounded column per side.



Fig.20 Granite obelisk of Ramses II from the 19th Dynasty in Cairo Airport [31].



Fig.21 Granite obelisk of Ramses II from the 19th Dynasty in Poland [32].

- The eighteenth example is 23 m height and 250 ton weight red granite obelisk of Pharaoh Ramses II of the 19th Dynasty in display in the Place de la Concorde of Paris and shown in Fig.22 [33]. It was inscribed by hieroglyphic scripts carved in three un-bounded columns per side.
- The nineteenth example is 2.68 m height red granite obelisk fragment of Pharaoh Ramses II of the 19th Dynasty in display in the Villa Cilemontana at Rome and shown in Fig.23 [34]. It was inscribed by hieroglyphic scripts carved in one un-bounded column per side.



Fig.22 Granite obelisk of Ramses II from the 19th Dynasty in Paris [33].



Fig.23 Granite obelisk of Ramses II from the 19th Dynasty in Rome [34].

- The twentieth example is a 4.87 m height red granite obelisk of Pharaoh Ramses II of the 19th Dynasty in display in the Boboli Gardens, Florence, Italy and shown in Fig.24 [35]. It was inscribed by hieroglyphic scripts carved in one un-bounded column per side.
- The twentieth first example is 2.5 m height sandstone obelisk of Pharaoh Ramses II of the 19th Dynasty erected in Abu Simbel of Aswan and shown in Fig.25 [36]. It was inscribed by hieroglyphic scripts carved in one un-bounded column per side besides a scene in the top of the text.



Fig.24 Granite obelisk of Ramses II from the 19th Dynasty in Florence [35].



Fig.25 Granite obelisk of Ramses II from the 19th Dynasty in Rome [36].

- The twentieth second example is a 25 m height and 254 ton weight red granite obelisk of Pharaoh Ramses II of the 19th Dynasty erected in Luxor Temple and shown in Fig.26 [37]. It was inscribed by hieroglyphic scripts carved in three un-bounded columns per side.
- The twentieth third example is 3.3 m height obelisk of Pharaoh Seti II, the 5th Pharaoh of the 19th Dynasty (1203-1197 BC) erected in the Great Temple of Amun at Karnak and shown in Fig.27 [19]. It was inscribed by hieroglyphic scripts carved in four un-bounded columns per side.



Fig.26 Granite obelisk of Ramses II from the 19th Dynasty in Luxor [37].



Fig.27 Granite obelisk of Ramses II from the 19th Dynasty in Rome [19].

- The twentieth fourth example is an 0.955 m height red granite obelisk of Ramses III, the 2nd Pharaoh of the 20th Dynasty (1186-1155 BC) in display in the Luxor Museum at Luxor and shown in Fig.28 [38]. It was inscribed by hieroglyphic scripts carved in one un-bounded column per side.



Fig.28 Granite obelisk of Ramses III from the 20th Dynasty in Luxor Museum [38].

V. LATE PERIOD OBELISKS INSCRIPTION

The great civilization of the ancient Egyptians continued to produce and erect obelisks up to the time of the 30th Dynasty (380-343 BC) as depicted by the following three examples:

- The first example is a 21.8 m height red granite obelisk of Psamtik II, the third Pharaoh of the 26th Dynasty (595-589 BC) in display in the Piazza di Montecitorio at Rome and shown in Fig.29 [39]. It was inscribed using the hieroglyphic script with text deeply and nicely carved in two un-bounded columns per side.
- The second example is 5.47 m height red granite obelisk of Apries, the fourth Pharaoh of the 26th Dynasty (589-570 BC) in display in the Piazza della Minerva at Rome and shown in Fig.30 [40]. It was inscribed using the hieroglyphic script with text carved in one un-bounded column per side.
- The third example is 2.565 m height siltstone obelisk of Nectanebo II, the last Pharaoh of the 30th Dynasty (360-343 BC) in display in the British Museum at London and shown in Fig.31 [41]. It was inscribed using the hieroglyphic script with text carved in one bounded column per side.



Fig.29 Granite obelisk of Psamtik II from the Late Period in Rome [39].



Fig.30 Granite obelisk of Apries from the Late Period in Rome [40].



Fig.31 Siltstone obelisk of Nectanebo II from the 30th Dynasty in British Museum [41].

VI. CONCLUSION

- The inscription of obelisks as writing media in ancient Egypt during the period from Old Kingdom to Late Period was investigated.
- The ancient Egyptians carved obelisks using different types of granite, quartzite and siltstone.
- They started inscribing their obelisks since the time of the 6th Dynasty (more than 4350 years ago).
- They produced obelisks of height in a range from 0.955 to 30 m.
- They produced obelisks of weight in a range from 430 kg to 380 ton.
- They inscribed obelisks by carving their four sides.
- They used the hieroglyphic script and carved text in columns ranging from one to four per side.
- Most of the text columns on the obelisk sides were un-bounded while one example was found bounded during the Late Period.
- Egypt has obelisks erected in Matariya, Fayoum, Luxor, Gezira Island and Cairo International Airport.
- Obelisks as high as 20.7 m were produced during the 12th Dynasty of the Middle Kingdom.
- King Teti and Queen Ankhnesepi II erected obelisks during the Old Kingdom.
- King Senusret I erected obelisks during the Middle Kingdom.
- Pharaohs Thutmose I, Hatshepsut, Thutmose III, Amenhotep II, Seti I, Ramses II, Seti II and Ramses III erected obelisks during the New Kingdom.
- Pharaohs Psamtik II, Apries and Nectanebo II erected obelisks during the Late Period.
- Most of the Egyptian obelisks were transferred from Egypt and erected in a number of foreign cities such as: London and Durham (UK), Rome and Florence (Italy), Paris (France), New York (USA), Istanbul (Turkey) and Poznan (Poland).

REFERENCES

- [1] J. Weisse, "Obelisk - freemasonry", *J. Barton*, New York, 1880.
- [2] H. Gorringer, "Egyptian obelisks", *J.C. Nimmo*, London, 1885.
- [3] R. Engelbach, "The problem of the obelisks", *T. Fisher Unwin Ltd*, London, 1923.
- [4] A. Abdel-Gawwad, H. El-Kady and A. Shalaby, "Three dimensional dynamics of ancient Egyptian obelisks to investigate their behavior under Aqaba earthquake", *International Journal of Emerging Trends in Engineering and Applied Sciences*, vol.2, issue 2, pp.266-272, 2011.
- [5] J. Packer, "Influences of ancient Egypt on architecture and ornament in Scotland", *Ph. D. Thesis*, The University of Edinburgh, 2012.
- [6] M. Van Aerde, "Concepts of Egypt in Augustan Rome: Two case studies of cameo glass from the British Museum", *British Museum Studies in Ancient Egypt and Sudan*, vol.20, 2013, pp.1-23.
- [7] K. B. Clausen, "The appropriation of Egyptian and Egyptianising art in imperial Beneventum and Rome", *Ph. D. Thesis*, University of Copenhagen, 2015.
- [8] G. Simmons, "Centerpiece to empire: Understanding the New York obelisk", *Bachelor's Thesis*, The University of Michigan 2015.
- [9] K. Hoare, "Understanding Egyptianizing obelisks: Appropriation in Early Imperial Rome", *Ph. D. Thesis*, University of Southampton, May 2017.
- [10] Wikipedia, "Hatshepsut", <http://en.wikipedia.org/wiki/Hatshepsut>, 2018.
- [11] G. A. Hassaan, "Mechanical Engineering in ancient Egypt, Part 64: Stelae industry (Early Dynastic to Middle Kingdom)", *International Journal of Advanced Research, Management, Architecture, Technology and Engineering*, vol.4, issue 3, pp.1-9, 2018..
- [12] G. A. Hassaan, "Mechanical Engineering in ancient Egypt, Part 71: Labels and tangs inscription", *International Journal of Advanced Research, Management, Architecture, Technology and Engineering*, vol.4, issue 9, pp.7-12, 2018..
- [13] G. A. Hassaan, "Mechanical Engineering in ancient Egypt, Part 75: Married couples authorization", *International Journal of Advanced Research, Management, Architecture, Technology and Engineering*, vol.4, issue 11, pp.1-14, 2018.
- [14] Obelisks, "King Teti obelisk", <http://www.obelisks.org/en/heliopolis.htm>.
- [15] Ancient Origins, "4000 years old inscribed obelisk dedicated to ancient Egyptian Queen unearthed in Saqqara", <https://www.ancient-origins.net/news-history-archaeology/breaking-4000-year-old-inscribed-obelisk-dedicated-ancient-egyptian-queen-021644>
- [16] Wikipedia, "Obelisk", <https://en.wikipedia.org/wiki/Obelisk>, 2018.
- [17] EtI Travel, "Senusret I obelisk, Fayoum", <https://www.etitravel.com/senusret-i-obelisk-fayoum/>, 2018.
- [18] Pharaoh, "The obelisks of ancient Egypt", <https://pharaoh.se/obelisks>, 2018.
- [19] Obelisks, "Obelisks in Amun Temple", <http://www.obelisks.org/en/karnak.htm>.
- [20] Iiton Online, "The obelisk of Hatshepsut", <https://www.litosonline.com/en/articles/en/84/obelisk-hatshepsut>
- [21] The Great Courses Daily, "Erecting an obelisk: A monument of Egyptian Grandeur", <https://www.thegreatcoursesdaily.com/erecting-an-obelisk/>

- [22] Wikipedia, "Cleopatra's needle (New York City), [https://en.wikipedia.org/wiki/Cleopatra%27s_Needle_\(New_York_City\)](https://en.wikipedia.org/wiki/Cleopatra%27s_Needle_(New_York_City)) , 2018.
- [23] Wikipedia, "Lateran obelisk", https://en.wikipedia.org/wiki/Lateran_Obelisk , 2018.
- [24] Obelisks, "Amenhotep II obelisk, Durham University", <http://www.obelisks.org/en/durham.htm>
- [25] C. Mariottini, "The obelisk of Ramses II", <https://claudemariottini.com/2017/03/16/the-obelisks-of-ramses-ii/> , 2017.
- [26] Wikipedia, "Piazza del Popolo", https://en.wikipedia.org/wiki/Piazza_del_Popolo , 2018.
- [27] Pharaoh, "17 Macateo, Ramesses II, Piazza della Rotonda", <https://pharaoh.se/obelisks> , 2018.
- [28] Pharaoh, "20 Sallustiano, Seti I, Amenemope, Piazza Trinita dei Monti", <https://pharaoh.se/obelisks> , 2018.
- [29] Pharaoh, "22 SallustianoDogali, Ramses II, Via della di Diocleziano", <https://pharaoh.se/obelisks> , 2018.
- [30] Obelisks, "Ramses II obelisk (Gezira Island, Cairo)", <http://www.obelisks.org/en/gezira.htm>
- [31] Obelisks, "Ramses II obelisk (Cairo International Arport)", <http://www.obelisks.org/en/cairoAP.htm>
- [32] Obelisks, "Ramses II obelisk (Poznan Archaeological Museum)", <http://www.obelisks.org/en/poznan.htm>
- [33] Wikipedia, "Obelisk", <https://en.wikipedia.org/wiki/Obelisk>, 2018.
- [34] Pharaoh, "23 Matteiano, Ramses II, Villa Celimontana", <https://pharaoh.se/obelisks> , 2018.
- [35] Pharaoh, "24 Boboli, Ramses II, Boboli Gardens, Florence, Italy", <https://pharaoh.se/obelisks> , 2018.
- [36] Pharaoh, "31 Abu Simbel obelisk", <https://pharaoh.se/obelisks> , 2018.
- [37] Obelisks, "Ramses II obelisk", <http://www.obelisks.org/en/ramses.htm>
- [38] Obelisks, "Ramses III obelisk , Luxor Museum", http://www.obelisks.org/en/luxor_museum.htm
- [39] Pharaoh, "16 Solare, Psamtik II, Piazza di Montecitorio", <https://pharaoh.se/obelisks> , 2018.
- [40] Pharaoh, "18 Minerveo, Apries, Piazza della Minerva", <https://pharaoh.se/obelisks> , 2018.
- [41] British Museum, "Obelisk", https://www.britishmuseum.org/research/collection_online/collection_object_details.aspx?objectId=111508&partId=1&people=86879&peoA=86879-3-9&page=1 , 2017.

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