Previous Designs of Cranes

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Link to this SSA

`https://www.overleaf.com/read/yfkfdvpjftcw#ab8557`

Goals

To understand designs of cranes historically and how they are designed in the present day and age.

Summary

Cranes were first invented in Greece. They used manpower, were built from weaker materials and a simple winch powered the lifting mechanism. Modern day cranes are built from strong metals such as cast iron and steel. They also utilize truss structures to minimize their weight, increase stability and be desirably scaled.

1 Elaboration

History

A short history lesson [7] [8] about cranes would teach you that cranes were first used by Ancient Greeks for construction. They were powered by animals (such as donkeys) as well as men.

The Romans then took the design of Greeks and made it more effecient, as displayed in figure 1 [4], *Trispastos*.

Figure 1: Working of Trispastos

Trispastos, although a simple structure (as seen in figure 2) , allowed a **SINGLE MAN** to be able to lift **150 kg.**. The structure itself could be scaled to a much larger size.

The wheels visible on the side of the crane were used to move a given weight up or down, the anchors were used to provide structural integrity and a pulley was used to facilitate the rope to the winch mechanism.

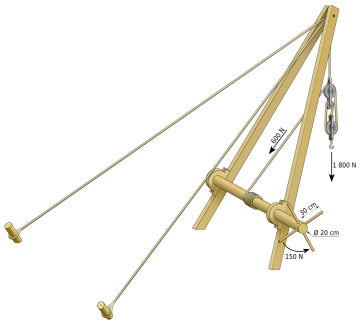

Figure 2: Trispastos

Modern-Day Cranes

Nowadays, we demand a lot more from cranes than before. We need them to be

- Mobile
- Lightweight
- Easy to set-up
- Cheap
- Have the ability to carry upto 20,000 tonnes(on average) consistently

To solve these problems, mechanical engineers have employed a variety of solutions. Such as:

- Adjustable Counter-Weights
- Using cables made of steel,iron, bronze, etc. [3]
- Adjustable mast sections to gain a desired height [6]
- Use of Truss Structures in the mast and the jibs to reduce weight and cost of the crane itself
- Use of Truss Structures also allows the crane to be completely deconstructed and transported easily
- Use of hydraulic systems, combustion systems, or electric motors to power the crane allowing it to carry the heaviest loads imaginable. [1]

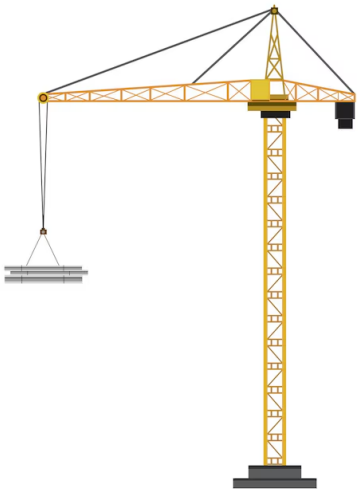

Figure 3: [2]A Modern-Day Crane

However, not all cranes use the same vanilla design. We also have cranes(as seen in fig. 4[5]) that maximize the strength of the mast by having a wider foundation, and using multiple, widely spaced anchor points.

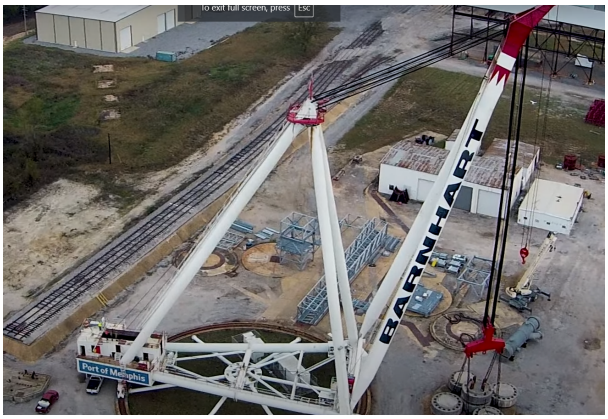

Figure 4: Modern-Day Crane Design

References

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[5] *History of Cranes*. URL: https://www.youtube.com/watch?v=jUlwN-PAOiQ. (accessed: 08.09.2024).

[6] *How do cranes build themselves?* URL: https://www.youtube.com/watch?v=oSyC8pxJdeQ&pp=ygUYaG93IGRvIGNyYW5lcyBnZXQgcHV0IHVw. (accessed: 08.09.2024).

[7] *The History Of Cranes*. URL: https://altida.co.uk/the-history-of-cranes#:~:text=Although%2C%20many%20historians%20also%20believe,is%20still%20the%20purpose%20today.. (accessed: 08.09.2024).

[8] *The History Of Cranes*. URL: https://www.lagrangecrane.com/blog/when-were-cranes-invented-a-history-of-construction-cranes/#:~:text=Before%20long%2C%20Romans%20improved%20upon,lift%20a%20remarkable%206%2C000%20kg.. (accessed: 08.09.2024).