Edison's Quadruplex Telegraph:
Increasing Bandwidth before the Internet

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Individual Website
Process Paper: 423 words
Video Length: 30 seconds
Website: 1103 words

I completed this project individually. I always had an interest in electronic devices and understanding how they worked. Doing a project related to the telegraph connected to these interests. I picked the quadruplex telegraph because it was a specific innovation that led to a large improvement and achieved that using interesting electrical techniques. As an added bonus, it was invented by Thomas Edison, so I already knew some background knowledge about him.

With my research, I focused on three main areas: the historical context of the quadruplex telegraph, the inner workings of the quadruplex telegraph, and the historical effects of the invention. For historical context, I was able to find primary sources, including newspaper articles, which discussed problems with existing systems. Many different websites also had general telegraph history. I also used a biography of Thomas Edison's life that discusses the invention. I found the patent drawings and an analysis by an electrical engineer that helped me understand how they worked. Finally, I found detailed descriptions of modern communication inventions that used similar techniques to the quadruplex telegraph.

I have an interest in web design, so picking the website was an easy choice. I tested out different designs until I had a modular system that made it easy to add additional text, images, and quotes. It is divided into 7 pages: home, context, means, message, impact, significance, and sources. I additionally used an electrical circuit design software to create a simulation to demonstrate how the quadruplex telegraph and recorded it for my website. I used animations to show how some of the technology worked. These made the invention much easier to understand.

My topic directly relates to the theme of "Communication in History: The Key to Understanding" because it is an invention that improved communication. I looked specifically at how this invention allowed the telegraph to be accessible to more people for lower costs. By enabling four times as many messages to be sent without significantly increasing infrastructure

cost, the quadruplex telegraph opened up the industry to individuals and not just governments or large companies. The quadruplex telegraph also pioneered techniques such as data compression, encoding, and signal multiplexing that would appear in many communications devices in the future. These are especially necessary for modern internet communication. As evidenced, the quadruplex telegraph responded to flaws with the cost and efficiency of sending telegrams and combined technological innovations to revolutionize the way multiple messages could be sent at one time, making telegrams significantly cheaper and paving the way for many modern forms of communication.

Annotated Bibliography

Primary Sources

Edison, Thomas. Improvement in Sextuplex Telegraphs.

This patent shows how the sextuplex telegraph worked. It was useful for finding information about when this invention was created and includes a document that provides detailed descriptions about the innovations that Edison used for this invention.

"EDISONS NEW SUIT.: The Right to One of His First Inventions to Be Tried Here." The Washington Post, 13 Mar. 1879, p. 1, search.proquest.com/docview/137745428/pageviewPDF/BF1FAD81FF2C4B61PQ/9?accountid=9899.

This newspaper article covers the start of the patent court cases. It was useful for finding how perspectives on the court cases changed overtime.

"Edison's Quadruplex Telegraph." New York Times, 3 Sept. 1875, p. 5. ProQuest, search.proquest.com/docview/93475436/pageviewPDF/BF1FAD81FF2C4B61PQ/1?accountid=9899.

This newspaper article covers the disagreements over patent rights that occurred after the invention. It was useful for seeing who benefited from this innovation.

"WINS A 37-YEAR SUIT: Telegraph Company Is Victor Over Thomas A. Edison. PATENTS SOLD TO JAY GOULD." The Washington Post, 1877, p. 11, WINS A 37-YEAR SUIT: Telegraph Company Is Victor Over Thomas A. Edison. PATENTS SOLD TO JAY GOULD.

This newspaper article covers the result of the court cases regarding patent rights. It provides a different perspective from the earlier articles and helps to provide a more complete overview.

"WONDERFUL NEW ELECTRICAL INVENTIONS WHICH ANNIHILATE TIME AND SPACE." Chicago Daily Tribune, 15 Aug. 1897, p. 37, search.proquest.com/pagepdfpagination/175450640/pageviewPDF/BF1FAD81FF2C4B61PQ/17?accountid=9899&t:lb=t.

This newspaper article gives an overview on many different telegraph innovations from that time. It was useful for finding connections between the quadruplex telegraph and further inventions.

Secondary Sources

Baldwin, Neil. Edison: Inventing the Century. University of Chicago Press, 1995.

This biography on Thomas Edison's life provides a general background on Thomas Edison. It was useful for finding information on the context around the development of the quadruplex telegraph.

Charlieplexing - Reduced Pin-Count LED Display Multiplexing, Maxim Integrated, 2003, web.archive.org/web/20160813012356/www.maximintegrated.com/en/app-notes/index.mvp/id/1880.

This technical article describes how Charlieplexing works. It helped find connections between the quadruplex telegraph and modern technology.

"Development of the Telegraph Industry." Encyclopædia Britannica, Encyclopædia Britannica, Inc., 2020, www.britannica.com/technology/telegraph/Development-of-the-telegraph-industry.

This encyclopedia entry provides an overview of the history of the telegraph industry. It contained useful details about different innovations in telegraph technology.

Fulton, Don. "Telegraph." Twinkle Toes Engineering, www.twinkletoesengineering.info/telegraph.htm.

This website gives a detailed description of how the quadruplex telegraph works. It was useful for understanding how the quadruplex telegraph combines previous innovations.

"Introduction to Computer Networking." CS101 Introduction to Computing Principles, 2020, web.stanford.edu/class/cs101/network-1-introduction.html.

This course overview covers the basics of how modern computer networking works. It contained information for connecting the quadruplex telegraph to modern communication systems.

Krambeck, Donald. "An Intro to Multiplexing: Basis of Telecommunications." All About Circuits, EE Tech Media, 2015, www.allaboutcircuits.com/technical-articles/an-intro-to-multiplexing-basis-of-telecommunications/.

This technical article goes in depth on the history of multiplexing in communication. It was useful for determining the significance of the technology used in the quadruplex telegraph.

"Morse Code & the Telegraph." History.com, A&E Television Networks, 9 Nov. 2009, www.history.com/topics/inventions/telegraph.

This historical overview focuses on the development of morse code in regards to telegraph communication. It was useful for learning the capabilities of the telegraph, as well as communication before the telegraph.

Nonnenmacher, Tomas. “History of the U.S. Telegraph Industry.” EHnet, 2020, eh.net/encyclopedia/history-of-the-u-s-telegraph-industry/.

This article gives background about the economics behind the telegraph industry. It was useful for finding information about Western Union and patents.

Roberts, Steven. *Distant Writing*, 2012, distantwriting.co.uk/index.htm.
This article contains detailed information on the history of the development of the telegraph. It was useful for finding information about problems with existing telegraph systems.

“Thomas A. Edison Papers.” Quadruplex - The Edison Papers, edison.rutgers.edu/quad.htm.

This brief article gives some details about Edison’s relationship with Western Union. It was useful for finding information about how Edison worked with Western Union and some context about Edison’s life.

“Today in History - May 24.” The Library of Congress, 2020, www.loc.gov/item/today-in-history/may-24.

This historical article focuses on the early history of the telegraph. It was useful for finding the first telegram sent, as well as some more information about morse code.

Images:

Barr, Chas. B. Telegraph stations in the United States, the Canadas & Nova Scotia. [S.l, 1853] Map. Retrieved from the Library of Congress, <www.loc.gov/item/97683602/>.

This map shows telegraph lines in the United States and is used on the context page of the website.

Brady, Matthew. “Samuel Morse.” Library of Congress, 2013, www.loc.gov/pictures/item/2001700118/.

This image shows Samuel Morse next to a telegraph and is used on the context page of the website.

Edison, Thomas. Improvement in Duplex Telegraphs.

This patent shows how the duplex telegraph worked. It was useful for finding information about when Edison created this invention.

Edison, Thomas. Improvement in Quadruplex-Telegraph Repeaters.

This patent shows how the quadruplex telegraph worked. It was useful for finding information about when Edison created this invention.

“First Telegram.” Library of Congress, www.loc.gov/item/today-in-history/may-24/.

This image shows the first telegram. It is used on the context page of the website.

“Multiplexing Techniques.” *Socratic Electronics*, commons.wikimedia.org/wiki/File:Telephony_multiplexer_system.gif.

This animation shows how a multiplexer works. It is used on the significance page of the website.

“Patent Model of Edison's Sextuplex Telegraph.” Henry Ford Museum, www.thehenryford.org/collections-and-research/digital-collections/artifact/78369.

This image shows a model of Edison’s sextuplex telegraph based off of his patent. It is used on the impact page of the website.

“Quadruplex Telegraph.” Getty Images, www.gettyimages.com/detail/news-photo/quadruplex-telegraph-invented-by-thomas-alva-edison-in-1874-news-photo/534259036.

This image shows an engraving of a physical model of the quadruplex telegraph. It is used on the homepage of the website.

“Thomas Edison.” *Library of Congress*, www.loc.gov/pictures/item/92522138/.

This portrait of Thomas Edison is on the message page of the website.