Invention Matters

Joint Meeting IEEE Life Member, Consultant Network and Licensing Executive Society Austin/Hill Country Chapter

Edison vs Tesla:

When IP Ruled … Still Does

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CEO

May 19, 2020

An Aalbun Member Company

Edwin De Angel

Invention Matters: “We use deep understanding of technology and licensing expertise to identify key opportunities through intellectual property assets.”

- **Current**:
  - CEO/Founder Invention Matters, a firm focused on licensing and strategic positioning of intellectual property portfolios.
  - Co-Chair Licensing Executive Society – Austin/Hill Country Chapter
  - Board member at Quantum Interface

- **Experience**
  - Subject matter expert advising Fortune 500 companies and law firms on patent valuation, data mining, claim chart development
  - Inventor with more than 30 patents issued and multiple pending
  - VP Engineering RFMicron
  - Design Manager Cirrus Logic
  - More than 20 years working as an Engineer working for Crystal Semiconductor, Qualcomm, Freescale, Honeywell, Ideal Power and Intel

- **Education & Licensees**
  - MSEE Stanford University
  - Ph.D. Electrical Engineering University of Texas at Austin
  - Professional Engineer registered in Texas
  - Certified Licensing Professional
  - Project Management Professional

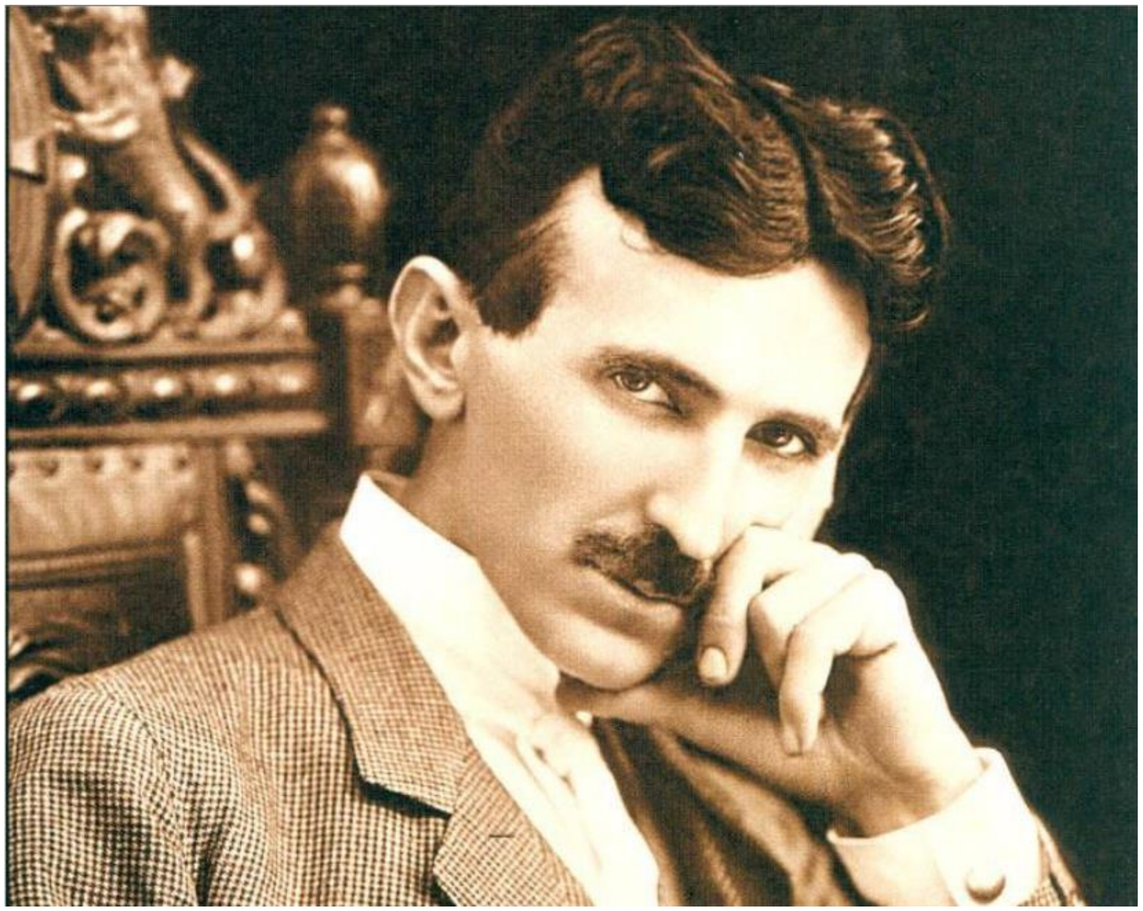
A Tale of two Electrical Engineering Geniuses

Thomas Edison is born

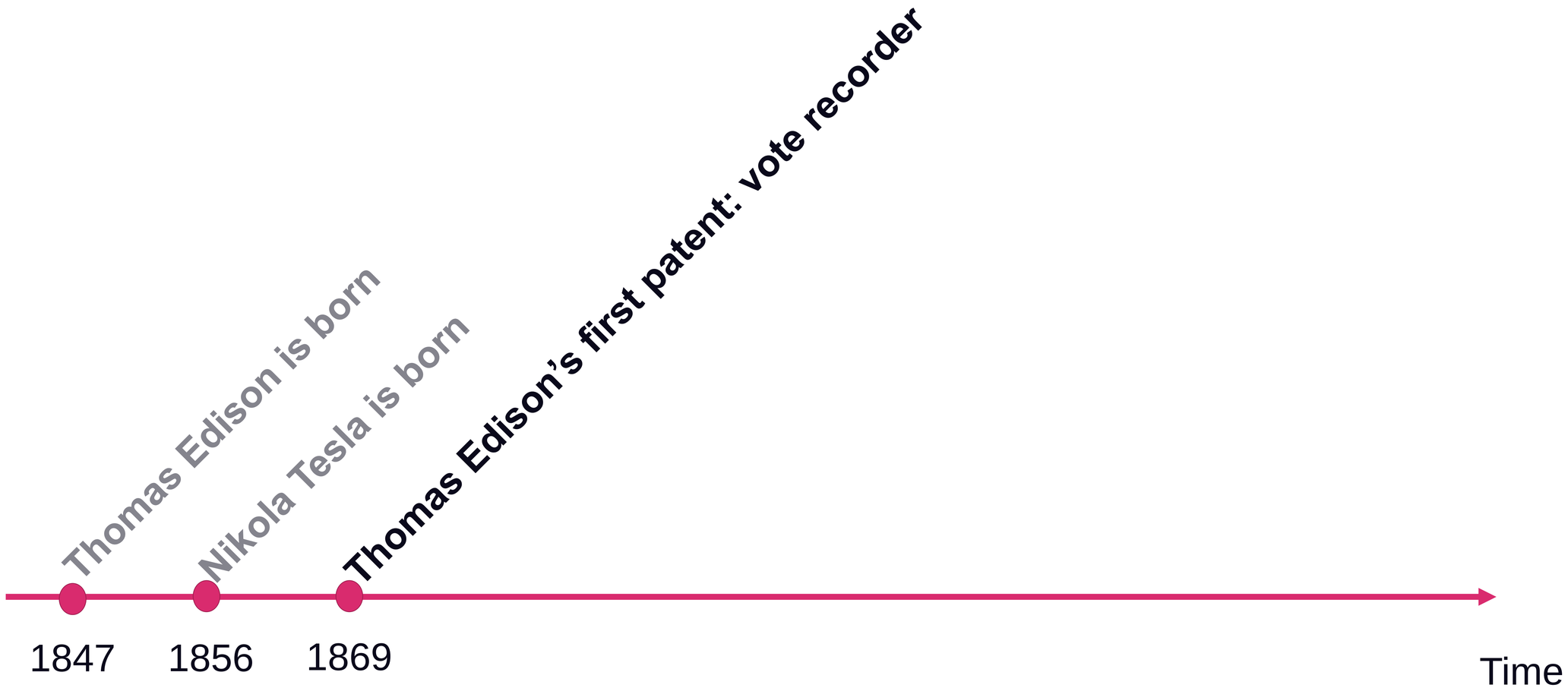
1847

Time

A Tale of two Electrical Engineering Geniuses



A Tale of two Electrical Engineering Geniuses: Edison



State of Affairs: A matter of distance

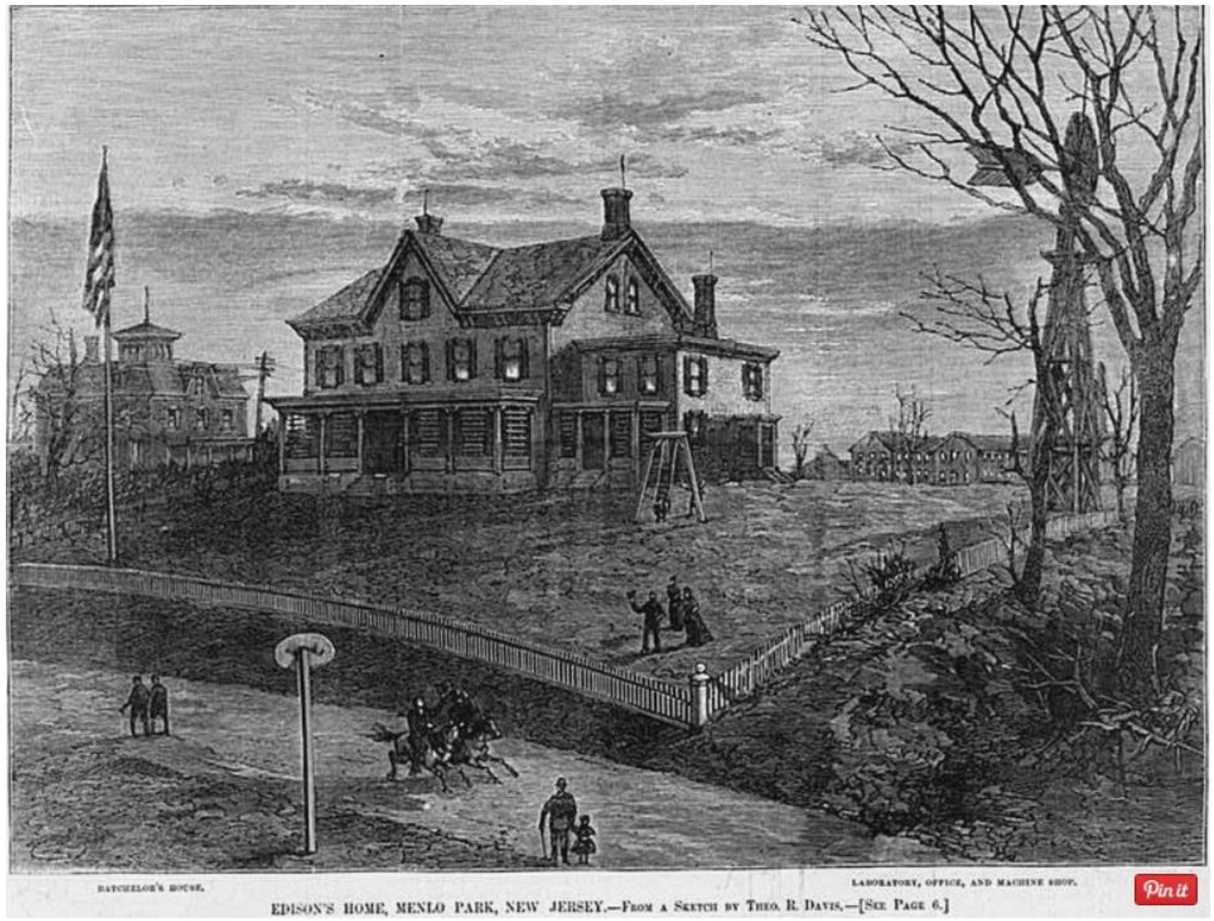
Present Solution:

- Arc Lamp Systems: Used high voltages (above 3,000 volts) to supply current to multiple Series-connected lamps, some ran better on alternating current.
- Incandescent lighting for business and residential indoor lighting

Problem:

Transmission of power at low DC voltage over a significant distance made the I^2R loses too high or the cable cost impractical.

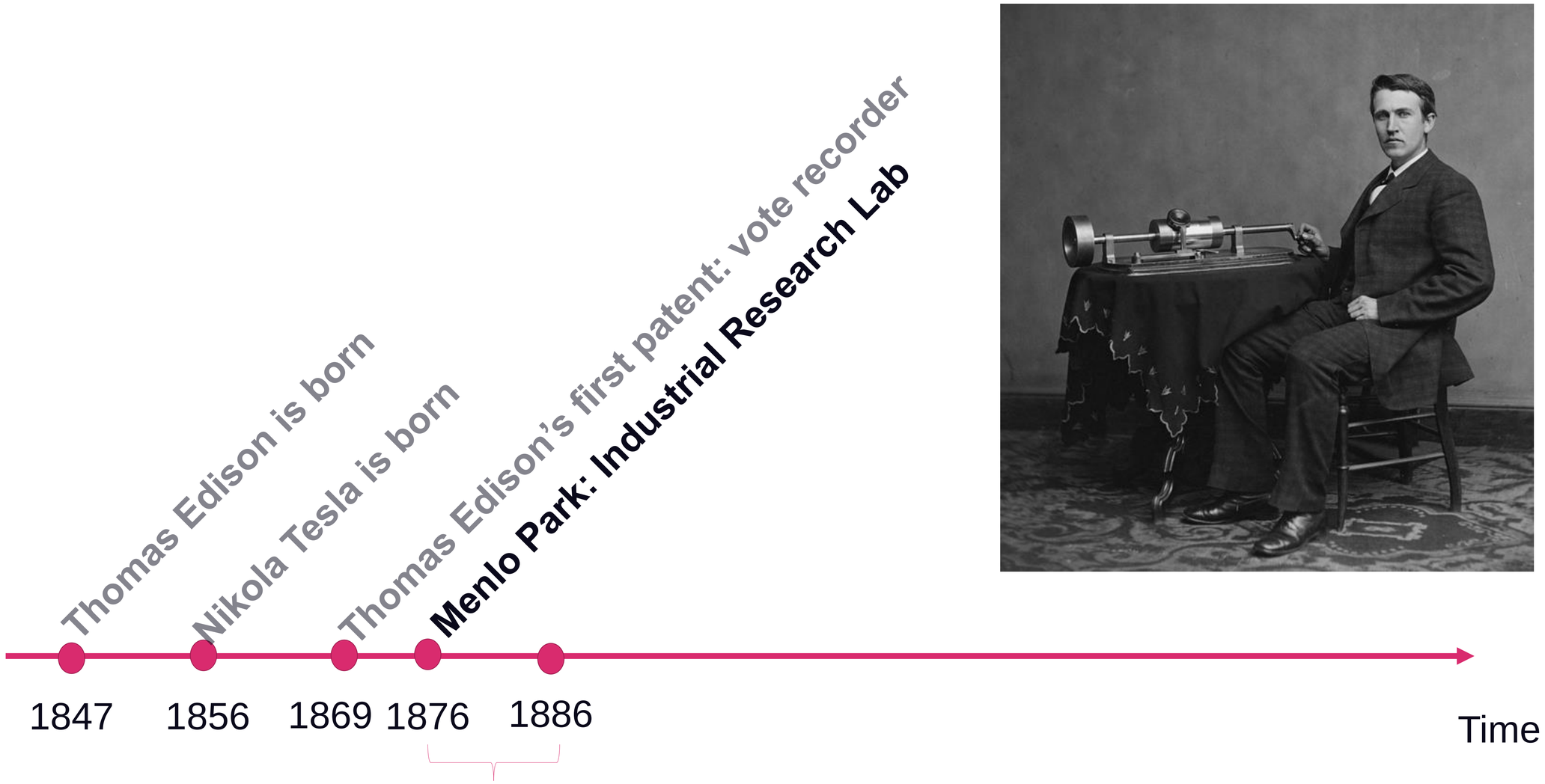
A Tale of two Electrical Engineering Geniuses: Edison



Edison's complex at Menlo Park, showing house, laboratory, office and machine shop.
Theo. R. Davis

Menlo Park – First industrial research laboratory. A place where a team of inventors would work together to create new inventions. This site later became known as “Invention Factory”

A Tale of two Electrical Engineering Geniuses

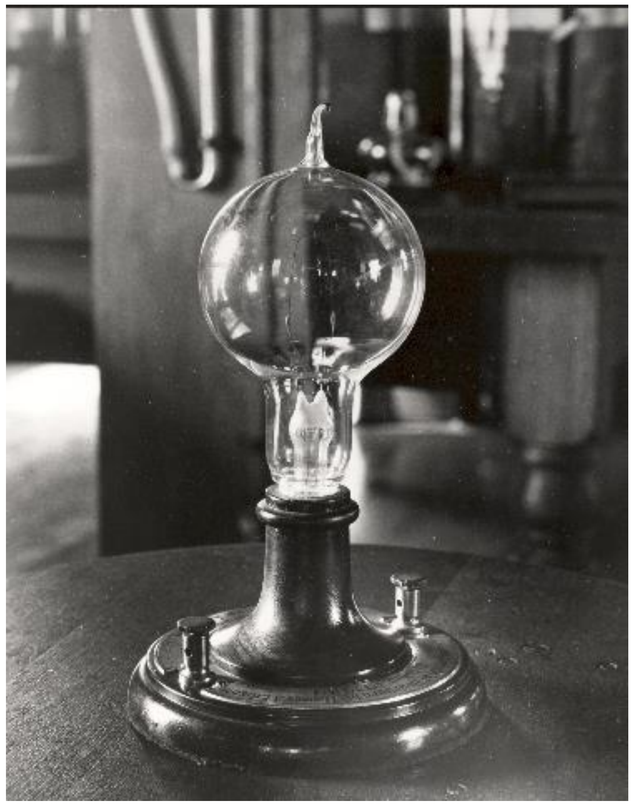


The Wizard of Menlo Park

Inventions:

- Automatic repeater
- Improved telegraphic devices
- Phonograph (“record player”) - 1877

A Tale of two Electrical Engineering Geniuses

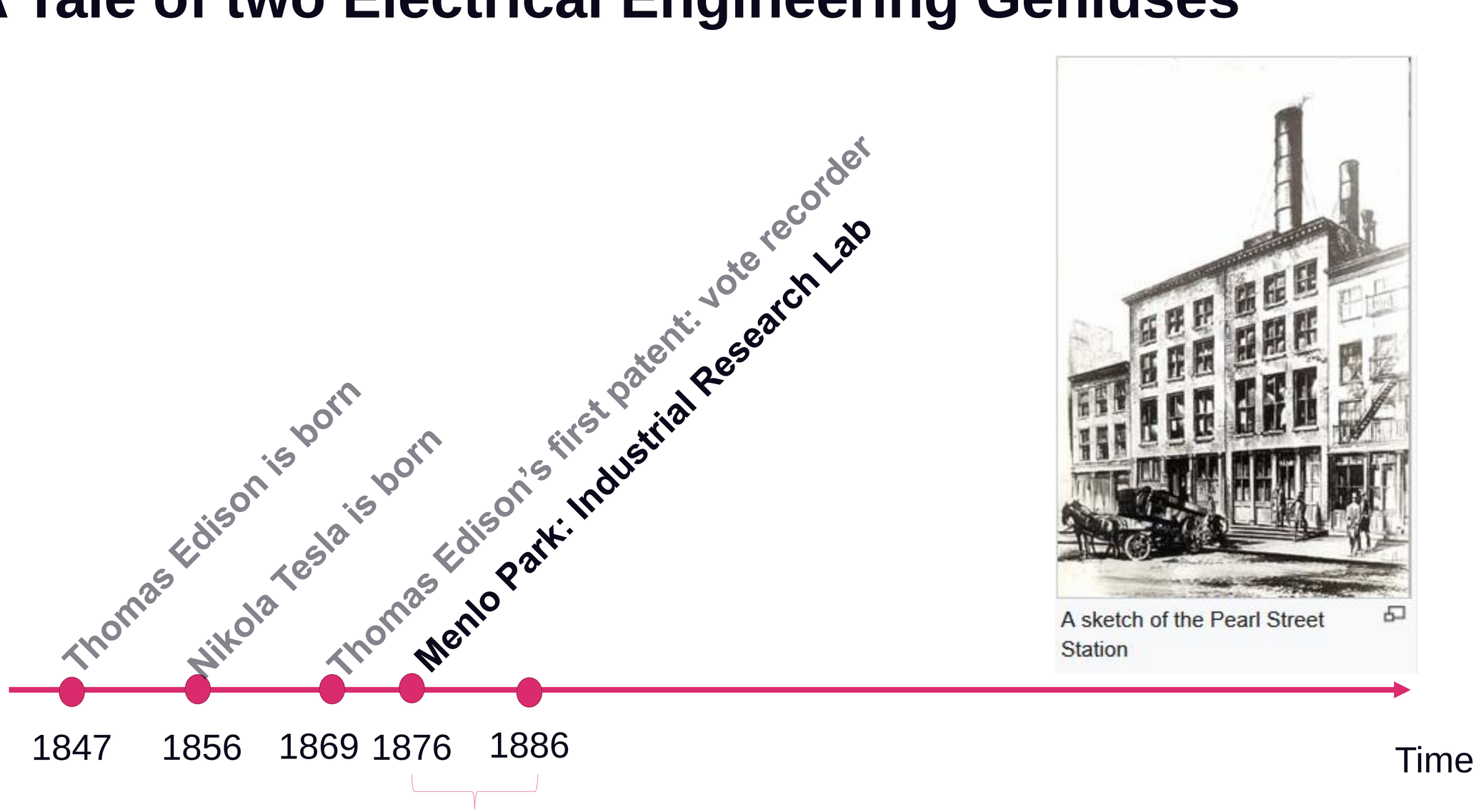


The Wizard of Menlo Park

Inventions:

- 1877 – Improved telephone for Western Union
- 1878 - Patent: 223,898 – first commercially practical incandescent light
- 1879 - Edison forms Edison Electric Light Company – Backed by J.P Morgan and others.

A Tale of two Electrical Engineering Geniuses



A sketch of the Pearl Street Station

The Wizard of Menlo Park

Inventions:

- 1880 – Edison founds Edison Illuminating Company – During the 1880's he patents a system for electricity distribution.
- 1882 – Edison switches his generating station (Pearl Street Station) electrical power distribution system: Provides 110V DC 82 customers in Lower Manhattan.

A matter of distance: A Game changer on Sight

Present Solution:

- Arc Lamp Systems: Used high voltages (above 3,000 volts) to supply current to multiple Series-connected lamps, some ran better on alternating current.
- Incandescent lighting for business and residential indoor lighting

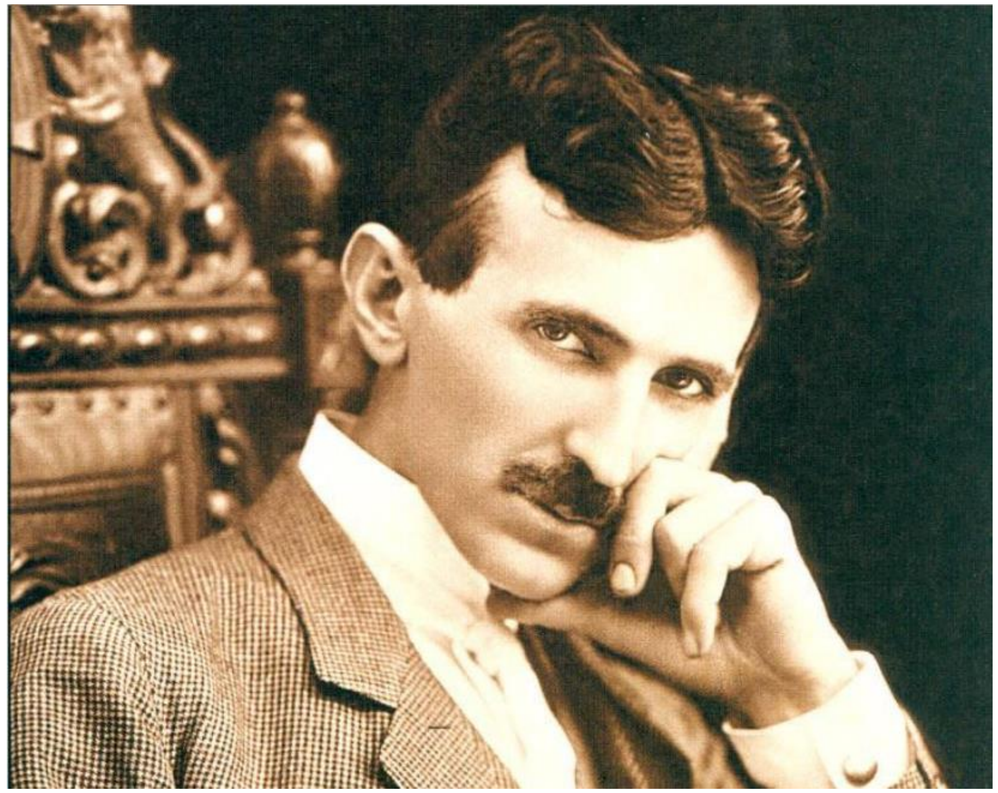
Problem:

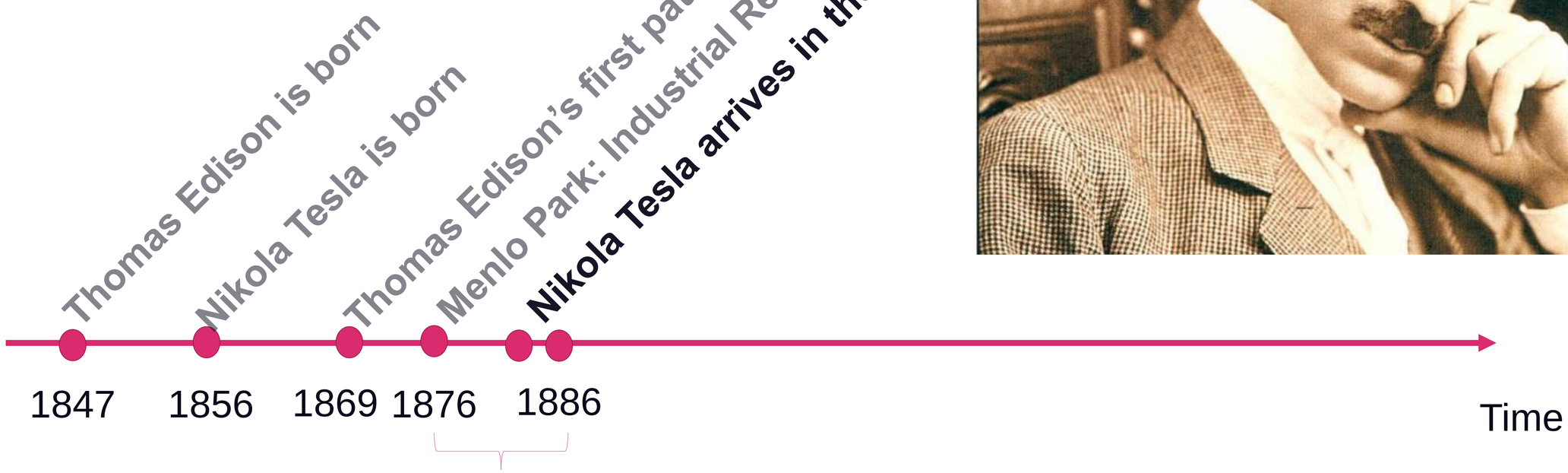
Transmission of power at low DC voltage over a significant distance made the I^2R loses too high or the cable cost impractical.

1880's – Functional AC transformer development became a reality.

William Stanley Jr. will design and build the first practical transformer in the US

A Tale of two Electrical Engineering Geniuses



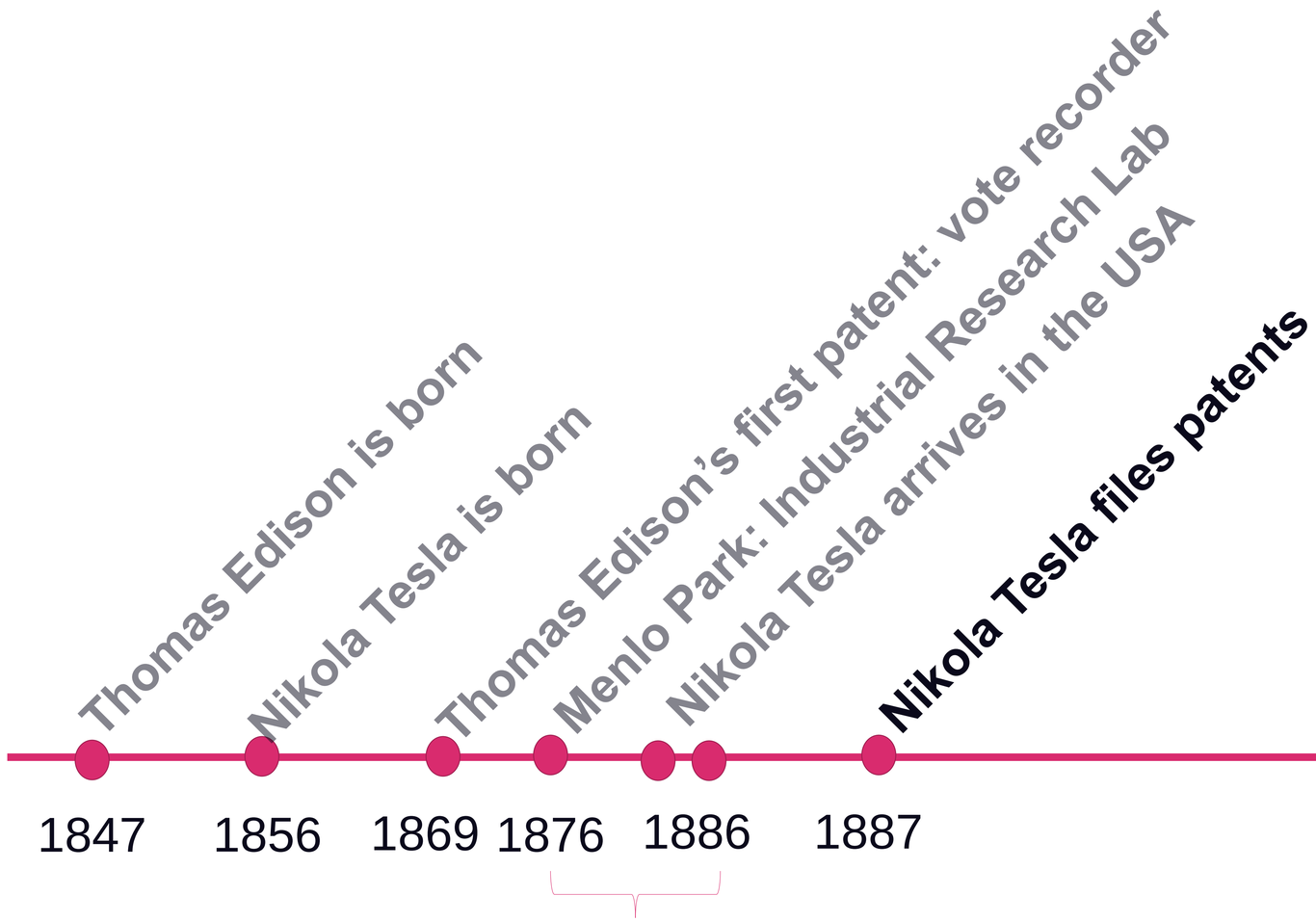


The Wizard of Menlo Park

Nikola Tesla:

- 1884 - Arrives to USA – start working for Edison/George Westinghouse starts working on electricity
- 1885 – Parted ways with Edison, funded Tesla Electric Light Company – forced out by investors
- 1887 – Gains interest in his AC electrical system and fund a new Tesla Electric Company

A Tale of two Electrical Engineering Geniuses



The Wizard of Menlo Park

Nikola Tesla:

- 1887 – Tesla files for seven U.S patents in the field of polyphase AC motors and power transmission.
- 1888 – Westinghouse buys Nikola Tesla patents

Nikolas Tesla: A Genius Is Discovered

1888 — 1898 — Time

Thomas Commerford Martin

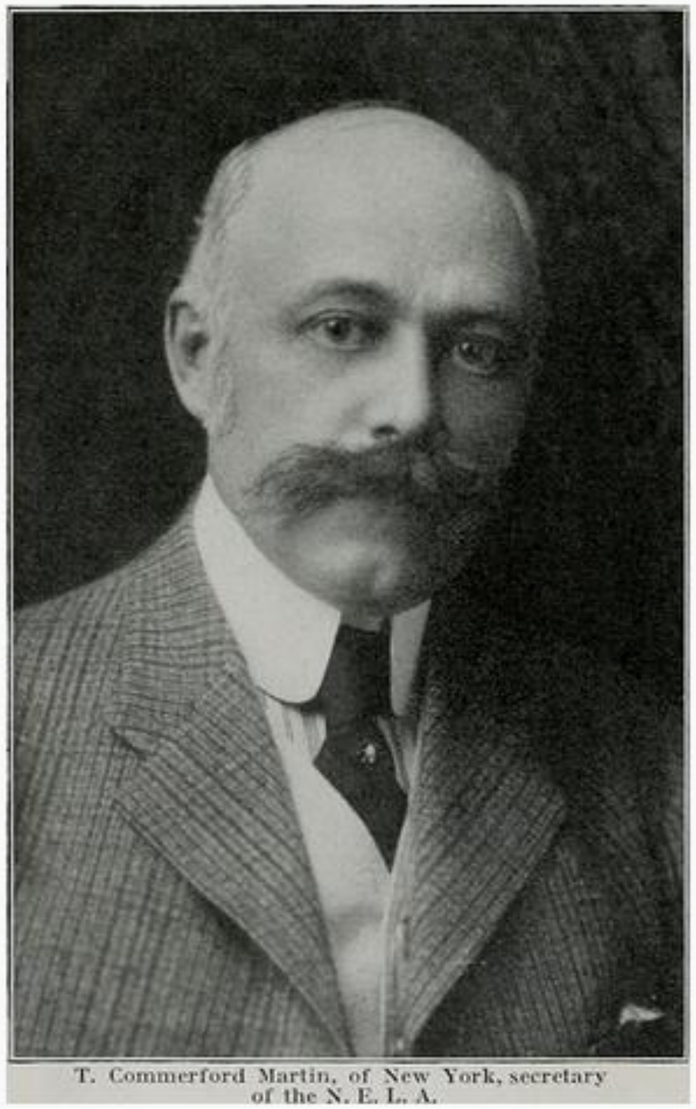
- Editor of *Electrical World*
- President of the prestigious American Institute of Electrical Engineers (AIEE)

AIEE Technical Committees (1884):

- Lighting Committee:
  - Arc Lamps: Edwin Houston
  - Incandescent Lamps: **Thomas Edison**

- Communications
  - Telephones: **Alexander Graham Bell**

Thomas Commerford Martin

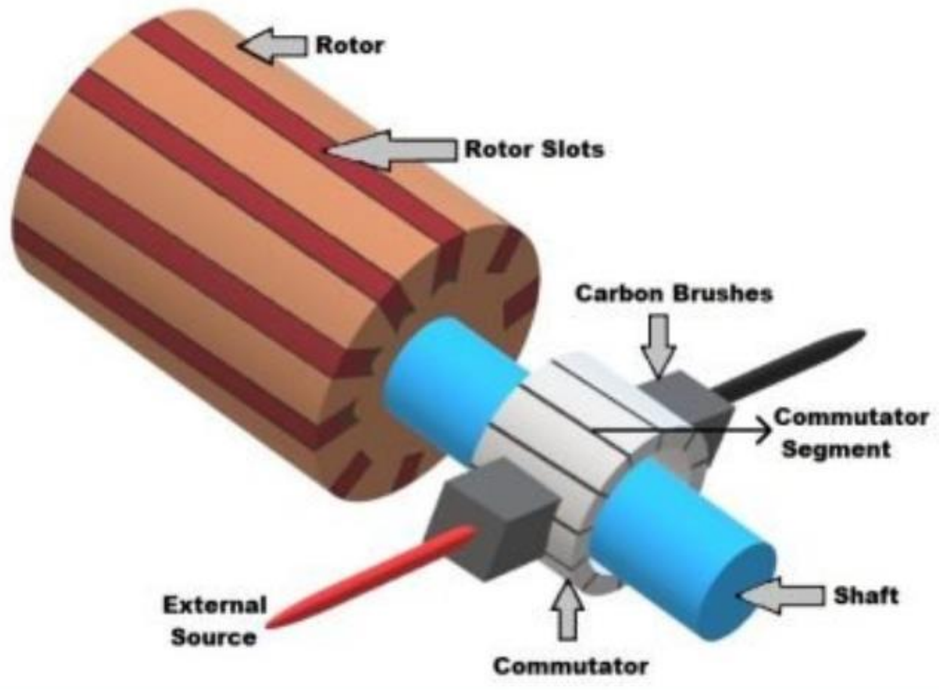


T. Commerford Martin, of New York, secretary of the N. E. L. A.

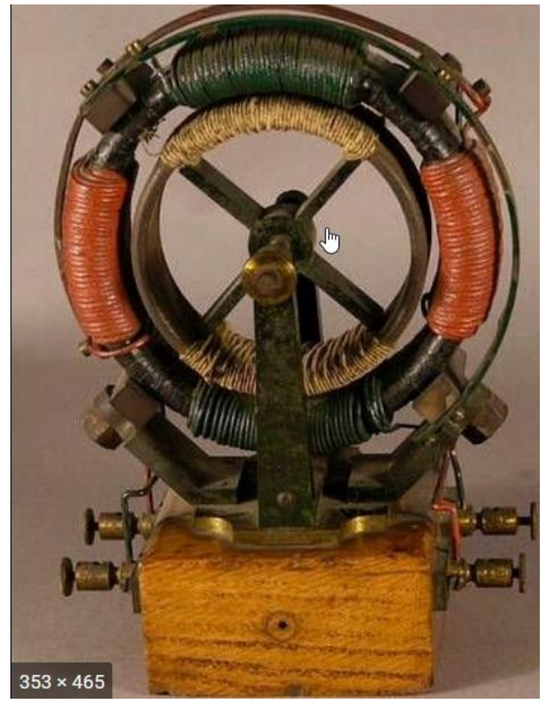
“A New System of Alternate Current Motors and Transformers”

1888 — 1898 — Time

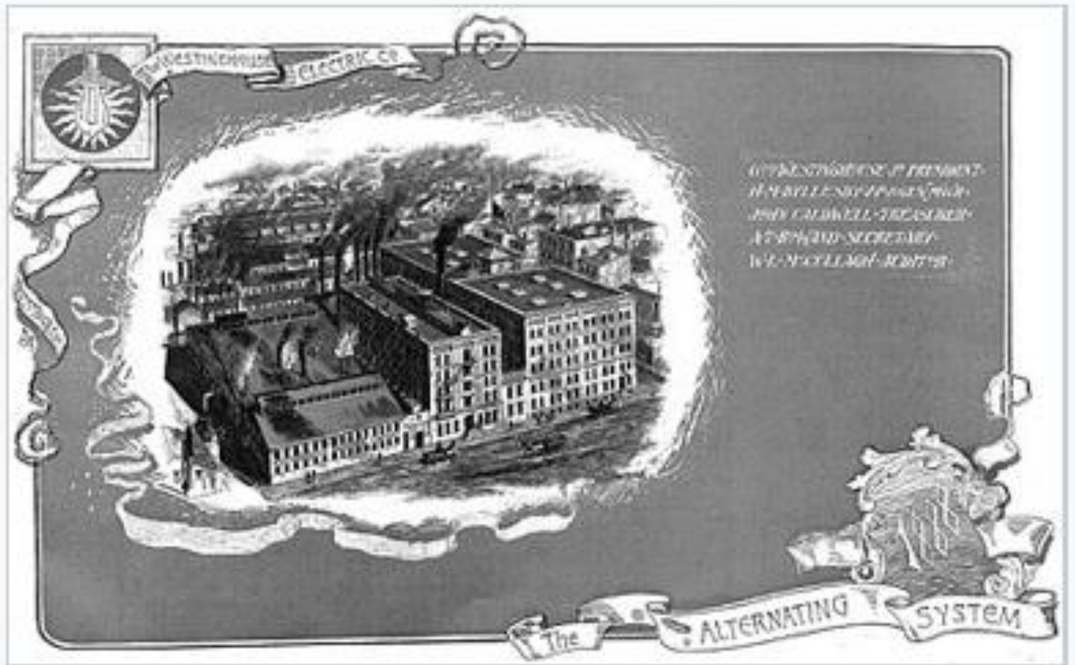
Traditional DC Motor



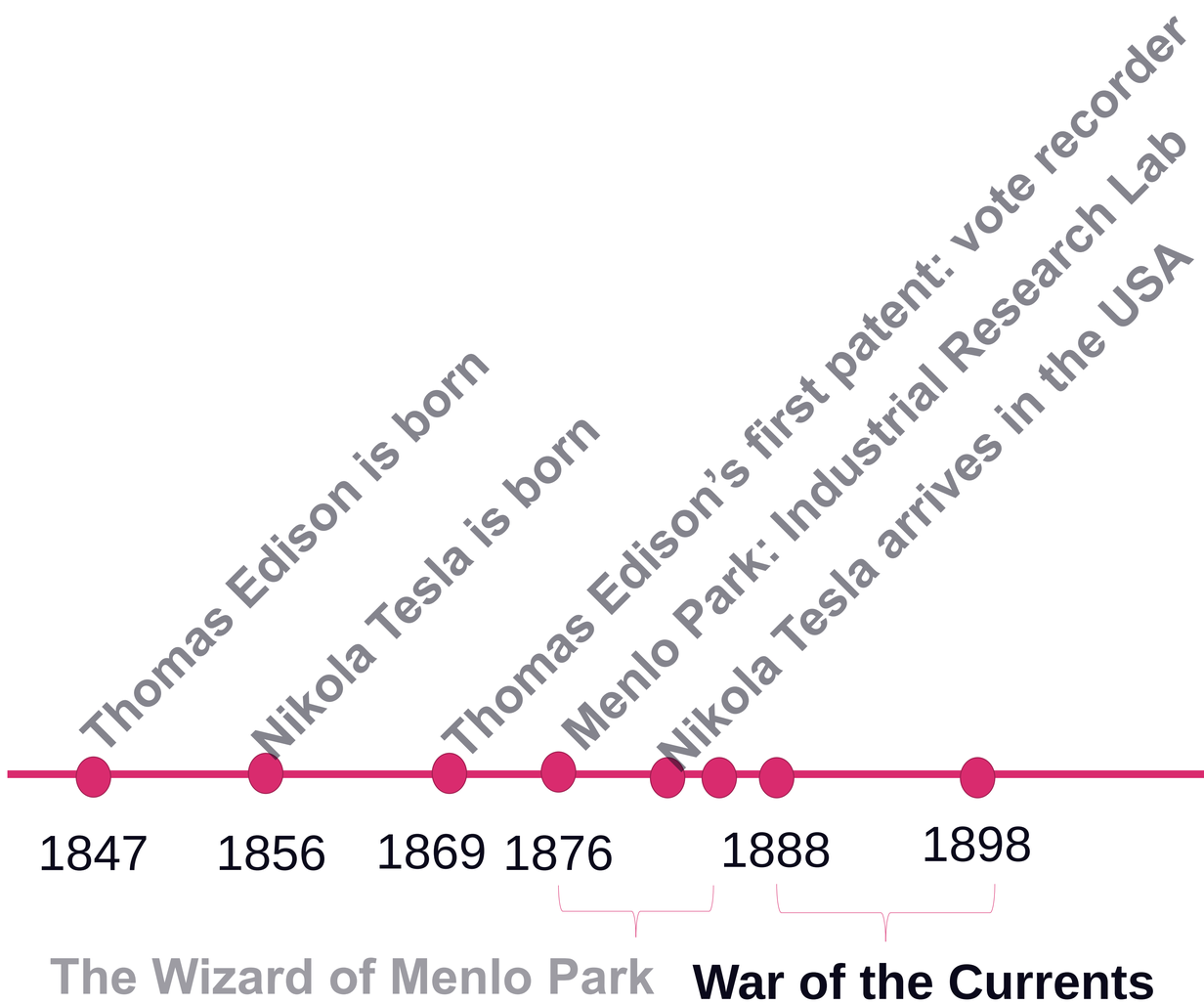
Two phase Tesla AC motor



War of the Currents: AC vs DC



Westinghouse Electric Company 1888 catalog advertising their "Alternating System".



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War of the Currents: AC vs DC

Market Prize:
A system that could bring electric lighting directly into a customer's business or home.

Edison Vision/System:
- DC current generator
- 110V DC driving a high resistant

Incandescent lamp.
- Electric meters billing customer proportional

to their consumption.

Disadvantage:
- 110V DC from generation to destination giving

It a short useful transmission range.

Tesla/Westinghouse Vision/System:
- AC Systems
- Use of transformers: Step up - Transmit – Step

Down
- The Edison DC system of centralized DC plans with

Short transmission range left a lot of un-supplied Customers.

Challenge:
* Thomas Edison

War of the Currents: AC vs DC

Market Prize:
A system that could bring electric lighting directly into a customer's business or home.

Edison Vision/System:

- DC generator - patented
- 110V DC driving a high resistant Incandescent lamp (17 patents).
- Electric meters (patented) billing customer proportional to their consumption.

Disadvantage:

- 110V DC from generation to destination giving it a short useful transmission range.

Tesla/Westinghouse Vision/System:

- Polyphase AC Systems – (7 patents)
- Use of transformers: Step up - Transmit – Step down
- Westinghouse acquires Sawyer-Man lamp patents
- Westinghouse develops induction meter to measure customer electricity – patented
- Westinghouse obtains patent on induction motor
- The Edison DC system of centralized DC plans with short transmission range leaves a lot of un-supplied customers.

Challenge:

- Thomas Edison empire
- Short on cash: Exposed to take over by J.P Morgan

War of the Currents: The Case of Patent No. 223,898

1888 — 1898 — Time

“Electric Lamp”

The Trial of the Century – The Billion Dollar Lawsuit

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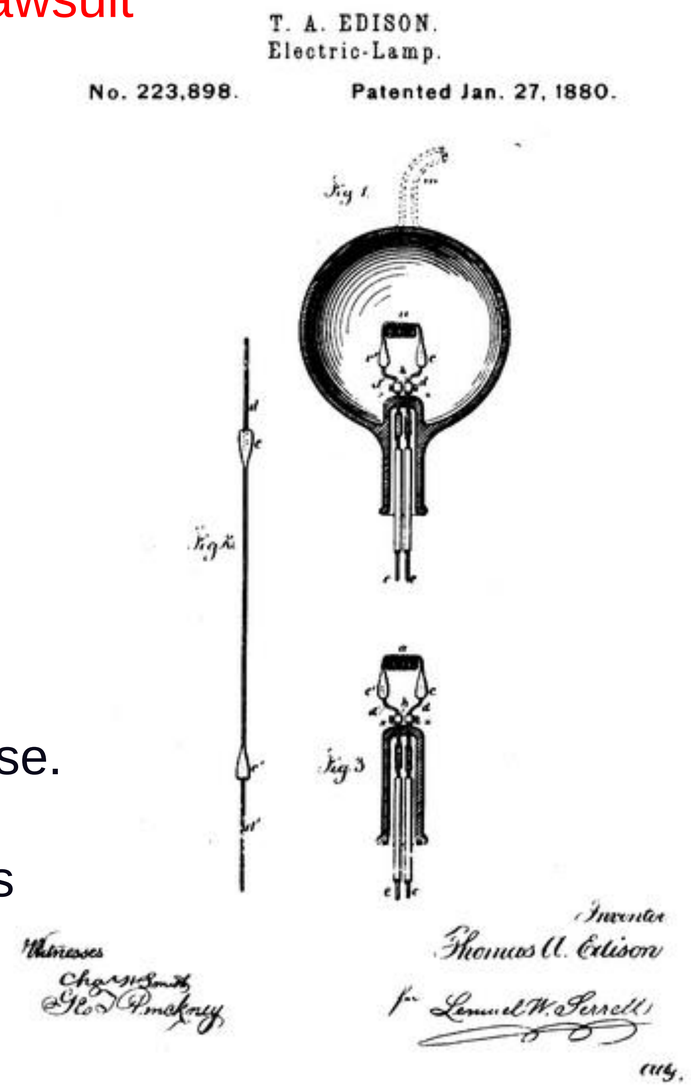
Issue at Hand:
Edison invented the incandescent electric lamp. However Westinghouse improved and patent his own invention. Is his Improved superior method infringing?

*Situation:

- Edison General Electric (EGE) s 10X the size of Westinghouse.
- Edison has a 7-year lead on the competition.
- EGE is suing Westinghouse and its customers – 312 lawsuits


T. A. EDISON.
Electric-Lamp.
No. 223,898. Patented Jan. 27, 1880.
Fig 1.
Fig 2.
Fig 3.
Witnesses
Chas. H. Smith
Geo. P. Makepeace
Inventor
Thomas A. Edison
per Lemuel W. Serrell
Atty.

War of the Currents: The Case of Patent No. 223,898

1888 — “**Electric Lamp**” — 1898 — Time

The Trial of the Century – The Billion Dollar Lawsuit

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Paul Cravath – Hired by Westinghouse as his lead litigator.
Insane or Brilliant move?

Questions at Hand:

- Did Edison invent <u>the</u> electric lamp?
- <u>Who</u> is the inventor of patent 223,898?
- If patent 223,898 covers, as it seems incandescent light itself, does Edison has the industry and the country hostage with this patent?

Paul Drennan Cravath

War of the Currents: “Fake News” – AC More Dangerous Than DC

1888 1890 1898 Time

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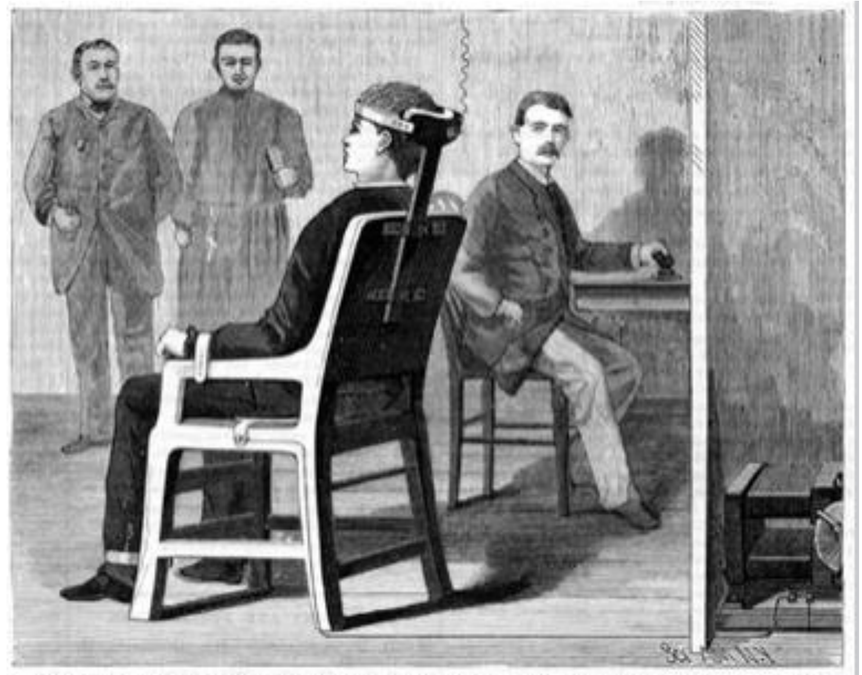
- 1887 - Although opposed to the death penalty. Edison suggests to Southwick (“the father of the electric chair”) it would be best to use: “‘alternating machines’, manufactured principally in this country by Geo. Westinghouse”

- Electric chair first used August 6, 1890



EXECUTION BY ELECTRICITY, SHORTLY TO BE INTRODUCED IN N. Y. STATE.

Westinghousing was a late 19th century slang term for the death penalty administered by electrocution in the electric chair.

War of the Currents: “Fake News” – AC More Dangerous Than DC

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- Feb 1888 – Edison Electric sends an 84-page pamphlet titled “*A Warning from the Edison Electric Light Company*” to newspapers and to companies that had purchased or were planning to purchase Electrical equipment from Edison competitors:

- Harold Brown’s crusade: The case of the “unbiased” expert
  - Time after, it was discovered that Brown had **colluded** Thomson-Houston paid for the generators and that Edison General Electric participated in the specification of the motors.

- “Its volts that jolts, but mils that kills.”

War of the Currents: “Fake News” – AC More Dangerous Than DC

1888 1891 1898 Time

- Presentation to the American Institute of Electrical Engineers:

Experiments with Alternate Currents of Very High Frequency and Their Application to Methods of Artificial illumination.

Electrical World: “one of the most brilliant and fascinating lectures that I has ever been our fortune to Attend.”

End of the War

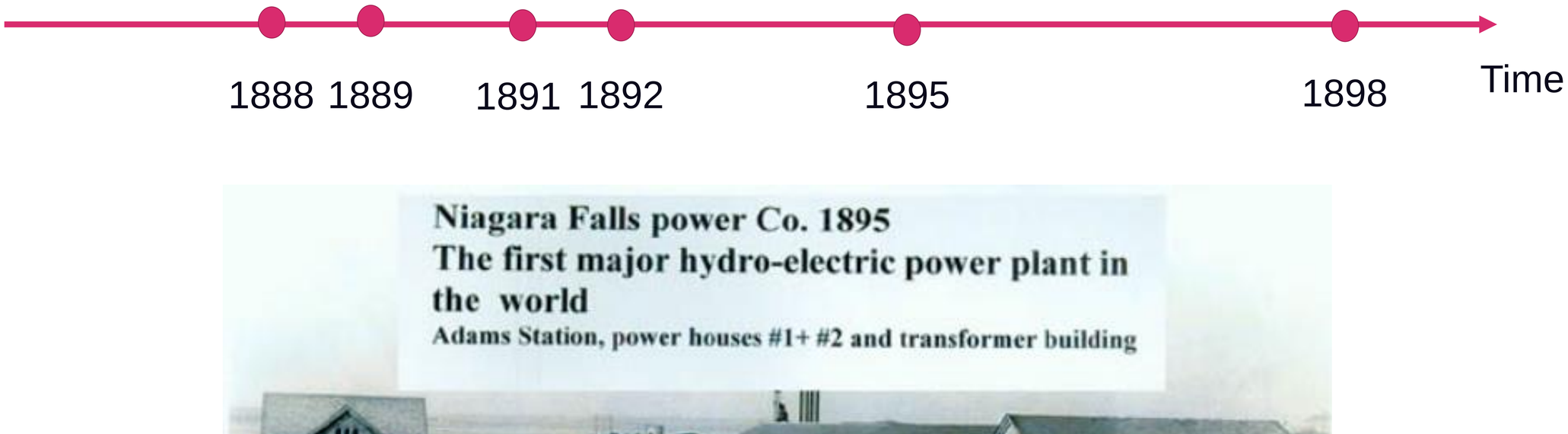
- .1889 – Edison loses majority control in merger forming Edison General Electric
- 1891 – Edison General Electric merges with Thomson-Houston (AC patents)
- 1892 – Edison General Electric becomes General Electric controlling 75% of the US market
  - Edison Incandescent light patent is upheld by the Supreme court
  - As Edison biographer Matthew Josephson wrote, “To Morgan it made little difference so long as it all resulted in a big trustification for which he would be the banker.” – Edison had been, in the vocabulary of the times, ***Morganized***
- 1892 – Westinghouse underbid General Electric and win contract to electrify World’s Columbian Exposition

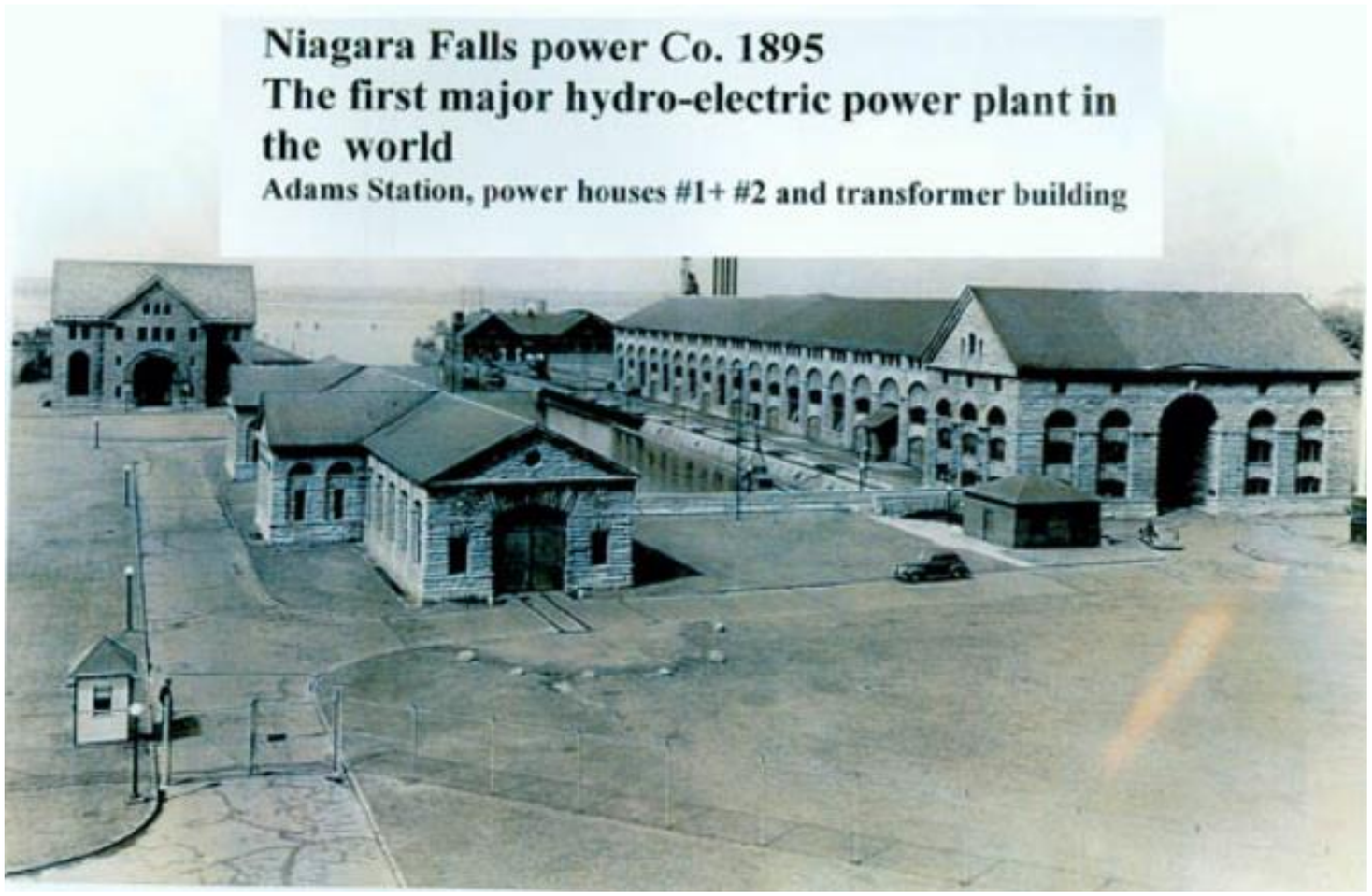
End of the War: World's Columbian Exposition

Electricity was used to decorate the buildings with incandescent lights, illuminate fountains, and power three huge spotlights.

The Columbian Exposition leads to winning the bid at the end of that year to build an AC power station at Niagara Falls

End of the War: Niagara Falls Power Station





The hydro-electric power plant became one of **Nikola Tesla's** greatest achievements

End of the War: Peace at Last

- 1896 – Paul Cavrath convinces J.P. Morgan license agreement between Westinghouse and General Electric

- 1897 – Edison sold his remaining stock in Edison Electric Illuminating of New York to finance His iron ore refining prototype plant.

- 1907 – Tesla tore up the original contract with Westinghouse ($60,000, 150 shares, $2.50 royalty per Horsepower generated plus a $2000 monthly salary).

- 1908 – Edison said to George Stanley, son of AC transformer inventor William Stanley: "Tell your father I was wrong,"

End of the War: Peace at Last

- 1914 – Westinghouse died with a net worth of $50 million (his companies we worth ~200 million)
- 1931 – Edison died as the most prolific inventor with 1093 patents. His net worth was $12 million.
- 1943 – Tesla died penniless (he got many other projects on wireless transmission and other topics but they were half funded and were not completed). Although bitter at times of how things turned out, he was satisfied that AC had been delivered to the world. Westinghouse paid him a pension of $150/month.

… Still Does

"Bill is basically unimaginative and has never invented anything, which is why I think he's more comfortable now in philanthropy than technology"

"He doesn't know anything about engineering, and 99% of what he says and thinks is wrong."

… Still Does

Apple vs Microsoft

Year	Revenue		
1988	4B	590M	5.5B Lawsuit
1997	7.1B (-1B net loss)	11.4B	Microsoft saves Apple 150M
2019	260B	125B	
	3B	~2B	IP licensing

Devil is in the Details:
Apple’s legal team didn’t catch the fact that the agreement was written to license the use of Apple features in Windows 1.0 *and all future Microsoft software programs*.

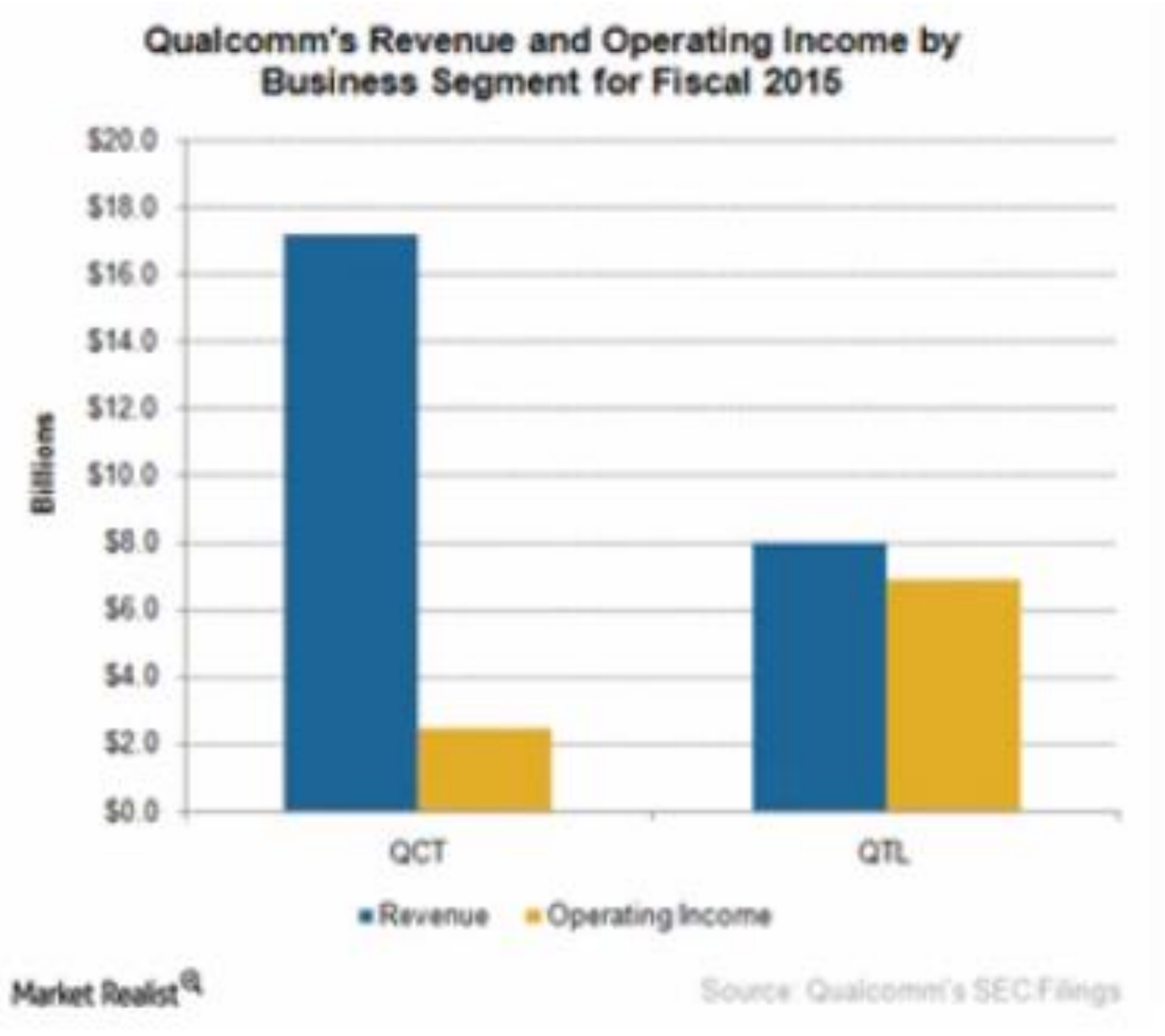
… Still Does

Qualcomm: A Different Tech Company

Qualcomm's business segments

Qualcomm operates through two major segments:

- QCT (Qualcomm CDMA Technologies) – manufactures wireless semiconductors
- QTL (Qualcomm Technology Licensing) – licenses its IP (intellectual property) to handset makers in return for royalty payments



… Still Does

- ARM is a chip design firm that does NOT manufacture or sell any chips.

… Still Does


Count Of Newly Minted Unicorns, By Year
Based on the year in which a company on the Unicorn board first achieved a billion-dollar post-money valuation.
61
107
82
96
151
2014
2015
2016
2017
2018

When IP Ruled … Still Does

Lessons

1. “… the worst enemy you can meet will always be yourself;” – Friedrich Nietzsche

2. “… A Man’s GOT to Know His Limitations.” - Clint Eastwood as Harry Callahan (Magnum Force)

Inventor/Entrepreneur **Licensing Options**

“An Man’s GOT to Know His Limitations.”

3. Inventing the future always cost more than you think

4. Can David still defeat Goliath? … IP is the game changer

5. “Those who cannot remember the past are condemned to **repeat** it.”

“Nothing is stronger than an idea whose time has come. ” – Victor Hugo