

# Bell System Patents: Early Telephone Technology 1875-1885

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IEEE Life Members Affinity Group (San Antonio)

# Purpose of This Talk

- ◆ To show how certain Bell System patents 1875-1885 laid a solid foundation for 130 years of telephony.
- ◆ Fundamental patents
  - Drawings
  - Discussion
- ◆ The inventors and patents are sometimes interrelated
- ◆ Many of the patents still affect us today

# Disclaimer

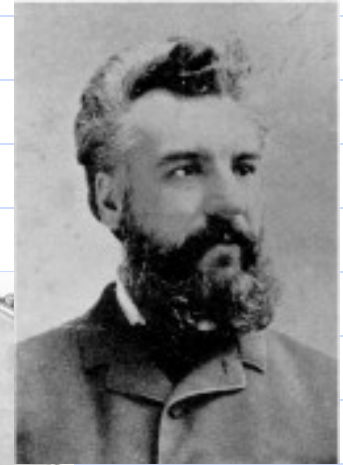
- ◆ This is *not* a scholarly work, either historically or scientifically.
- ◆ Competing inventions (and rejected patent applications) are not discussed.
- ◆ I will try to give an accurate, unbiased narrative of this intriguing story.

# What you might learn from this talk:

- ◆ Who was the aspiring actor?
- ◆ Isn't this period a little early for Frequency-Division Multiplexing?
- ◆ Whose dog is it anyway?
- ◆ Where did Edison's pipe organ come from?
- ◆ Which inventor had the most valuable idea of all?
- ◆ Who invented twisted-pair cable?
- ◆ Who used light as a transmission medium?

# Some of the Inventors

- ◆ Alexander Graham Bell
- ◆ Thomas Alva Edison
- ◆ Hilborne Roosevelt
- ◆ Theodore Newton Vail
- ◆ Thomas A. Watson
- ◆ Emile Berliner

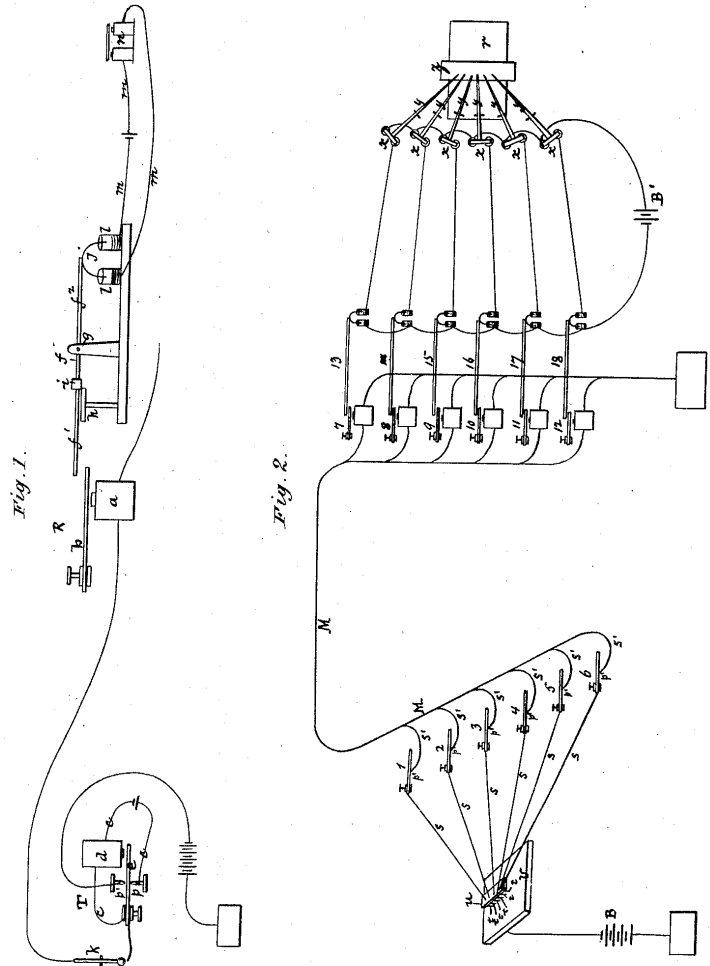


# Some Fundamental Patents

No.	Date	Inventor	Subject
161,739	Apr 6, 1875	Bell	Harmonic Telegraph
174,465	Mar 7, 1876	Bell	Electric Speaking Telephone
186,787	Jan 30, 1877	Bell	Receiver
199,007	Jan 8, 1878	Watson	Buzzer for Signaling
199,141	Jan 15, 1878	Berliner	Induction Transmitter
210,866	Dec 17, 1878	Watson	Polarized Substation Bell
213,013	Apr 30, 1878	Edison	Induction Transmitter
213,016	Apr 30, 1878	Edison	Carbon Transmitter
215,837	May 27, 1879	Roosevelt	Hookswitch
235,199	Dec 7, 1880	Bell	Photophone
244,426	July 9, 1881	Bell	Twisted-Pair Cable
293,198	Feb 15, 1884	Scribner	Jack-Knife Switch
304,667	Sept 2, 1884	Richards	Operator's Head Receiver
322,214	July 14, 1885	Vail	Circuit Protector

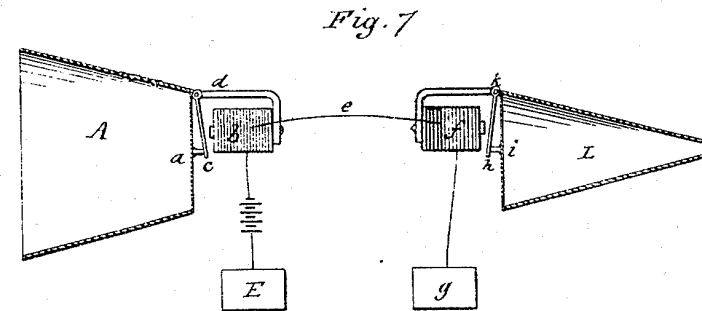
# 161,739 Harmonic Telegraph

- ◆ Alexander Graham Bell
- ◆ One year *before* the telephony patent
- ◆ Frequency-division multiplexing!



# 174,465 Improvements in Telegraphy

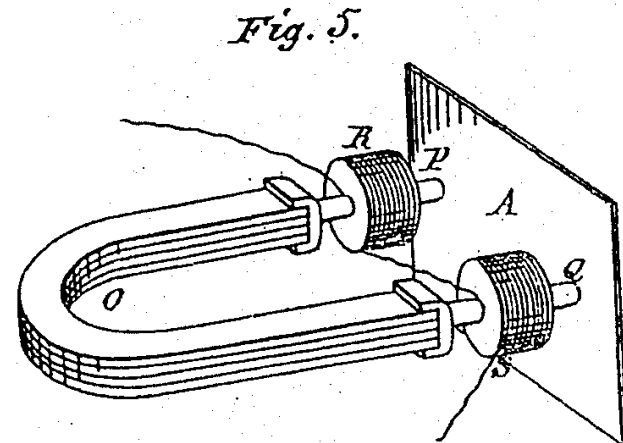
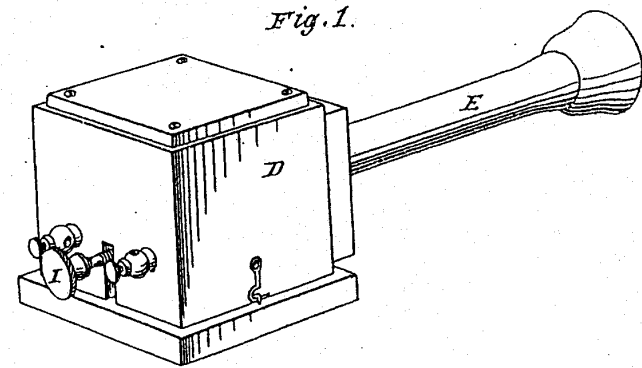
- ◆ The key telephone patent
- ◆ Grew out of Bell's keen observation of sound (as a teacher of the deaf)





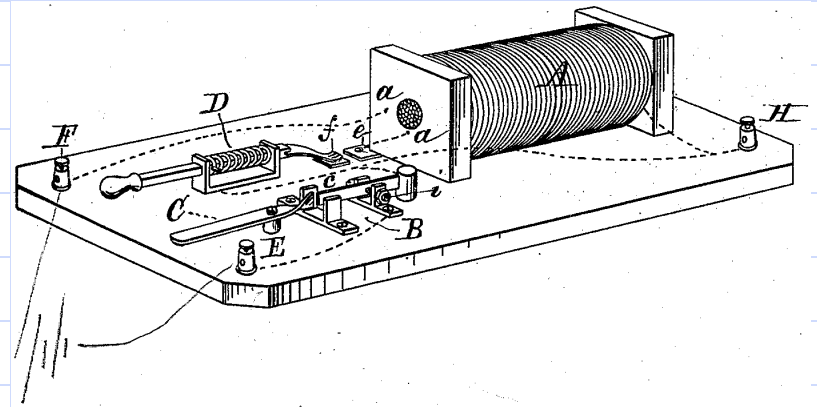
# 186,787 Fundamental Receiver Patent

- ◆ Alexander Graham Bell
- ◆ Permanent magnet and steel diaphragm



# 199,007 Buzzer for Signaling

- ◆ Thomas A. Watson
- ◆ A simple buzzer used to signal through the telephone line.
- ◆ Includes a switch to activate the buzzer
- ◆ “Rheotome” (literally, current-slicer) has roots in Bell’s Harmonic Telegraph

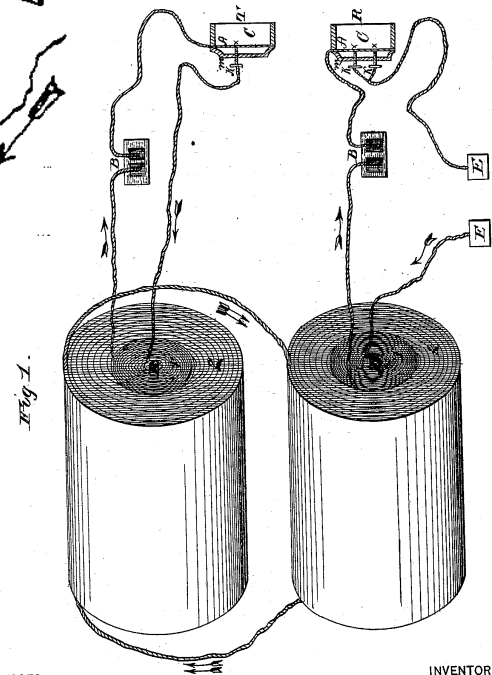
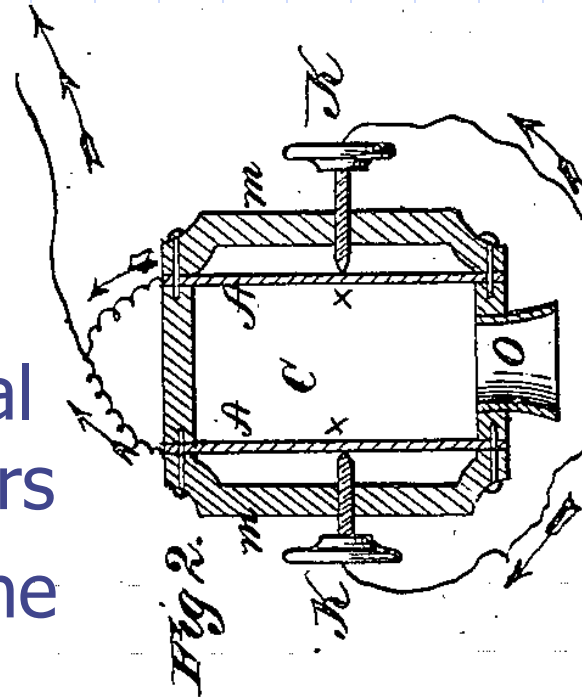


# 199,141 Induction Coil Transmitter

- ◆ Emile Berliner
- ◆ Patented several other transmitters
- ◆ Also invented the gramophone!



"Nipper"



WITNESSES  
Frank L. Orand  
C. R. Ewert

INVENTOR  
Emile Berliner

199,141

“His Master’s Voice”



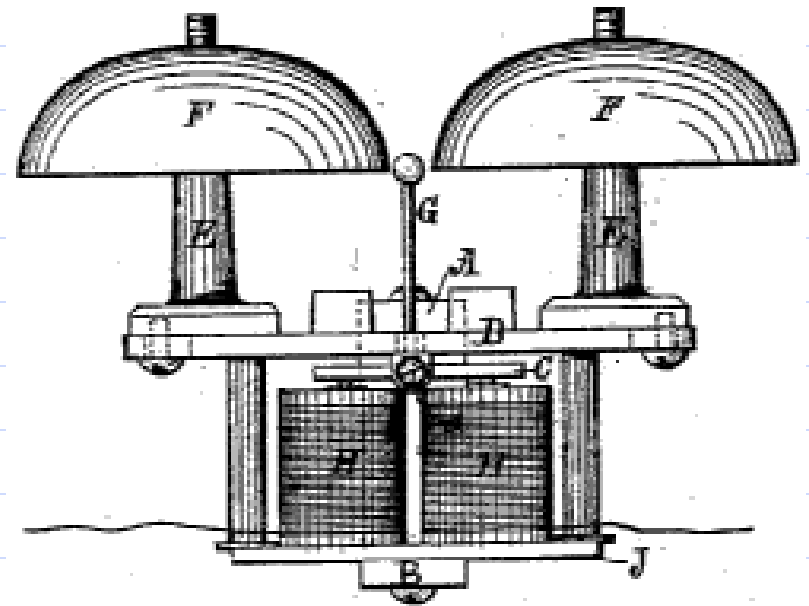
The original 1895 painting by Francis Barraud of Bristol, England, showing Edison's Phonograph



The revised (1897?) painting, showing Berliner's Gramophone

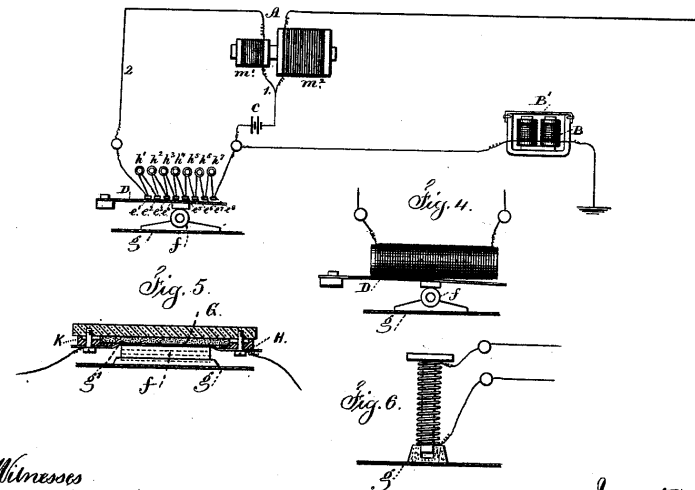
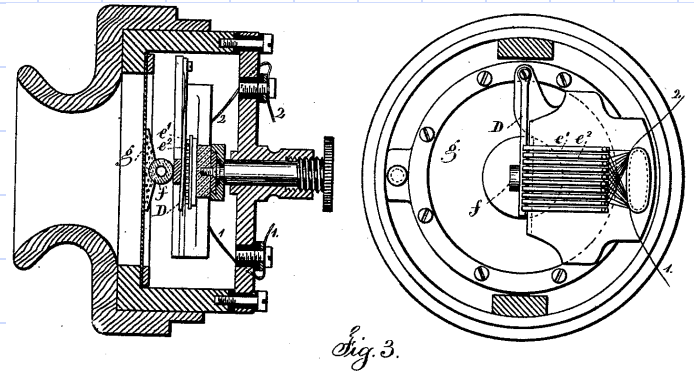
# 210,866 Polarized Bell

- ◆ Thomas A. Watson
- ◆ Used essentially as described for over a century
- ◆ Substation signaling



# 213,013 Induction Coil Transmitter

- ◆ Thomas A. Edison
- ◆ Followed quickly by carbon transmitter
- ◆ Competed with Berliner's patent



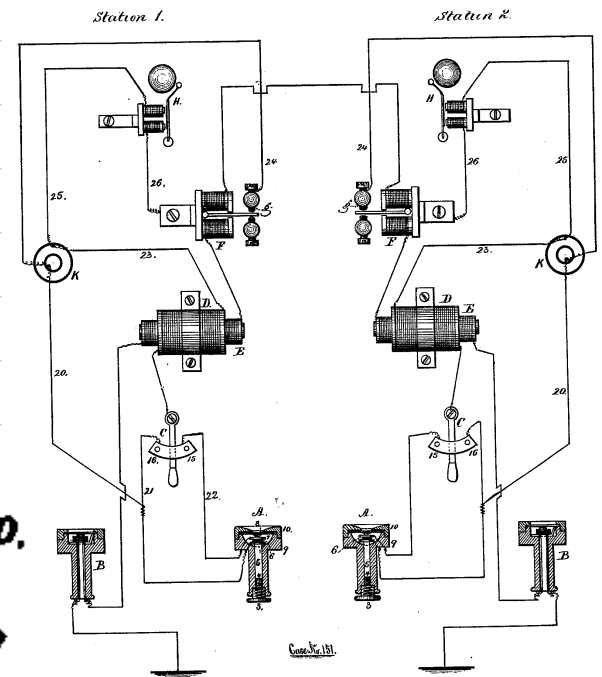
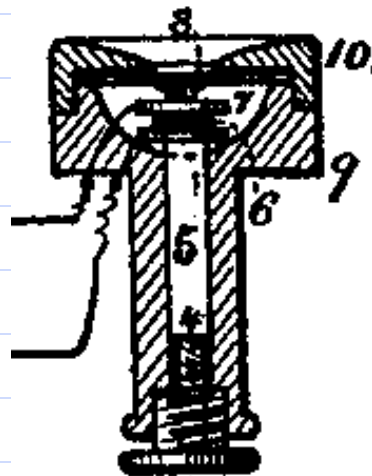
Witnesses

Chas. H. Smith  
Geo. T. Pinckney

Inventor  
Thomas A. Edison  
per Lemuel W. Perriell  
att'y

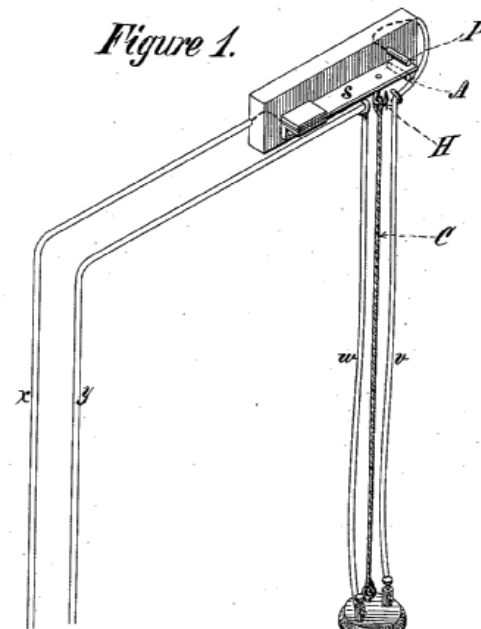
# 213,016 Carbon Transmitter

- ◆ Thomas A. Edison
- ◆ Compressed lamp black
- ◆ Followed by several variations, finally settling on compressed anthracite



# 215,837 Hookswitch

- ◆ Hilborne Roosevelt, builder of fine pipe organs
- ◆ Combines the utility of the movable receiver with the function of a signaling switch
- ◆ Still in use today!



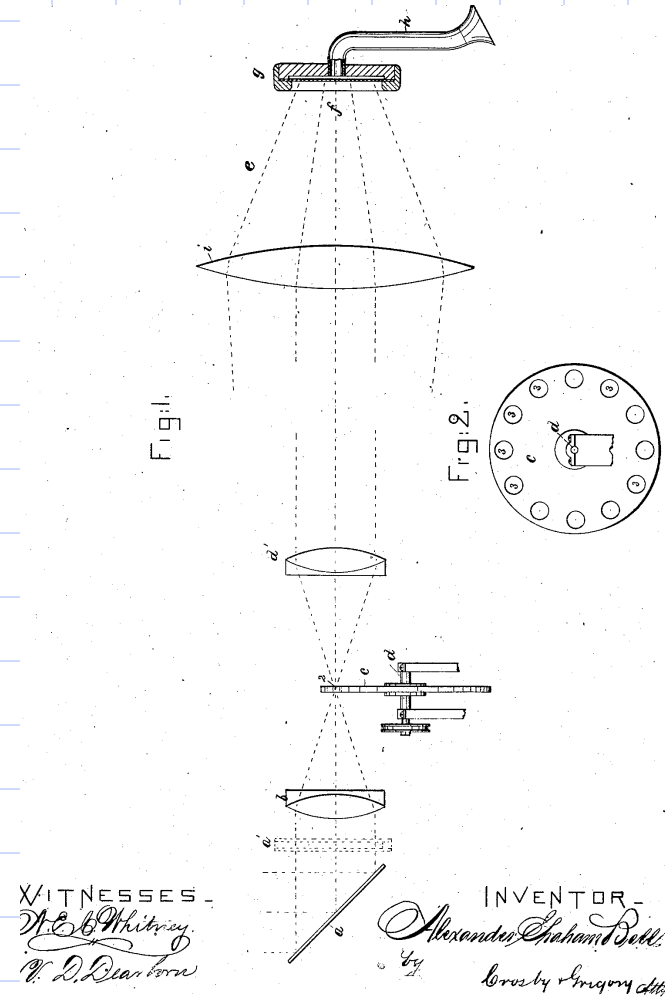
WITNESSES:  
C. H. Evans  
Wm. J. Sawyer

INVENTOR:  
Hilborne Roosevelt  
by his Attorney  
E. N. Dickerson & Co.



# 235,199 Photophone

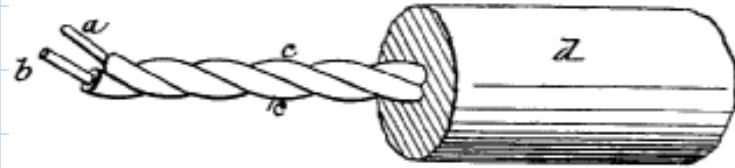
- ◆ Alexander Graham Bell
- ◆ Used light to transmit voice
- ◆ “Chops” the beam to provide a carrier modulated by the voice
- ◆ Related patent: selenium photocell
- ◆ Bell considered this to be his most profound invention



# 244,426 Twisted Pair Cable

- ◆ A. G. Bell
- ◆ Reduces crosstalk (disturbances) in cable
- ◆ Still in use today!

*Fig. 1.*

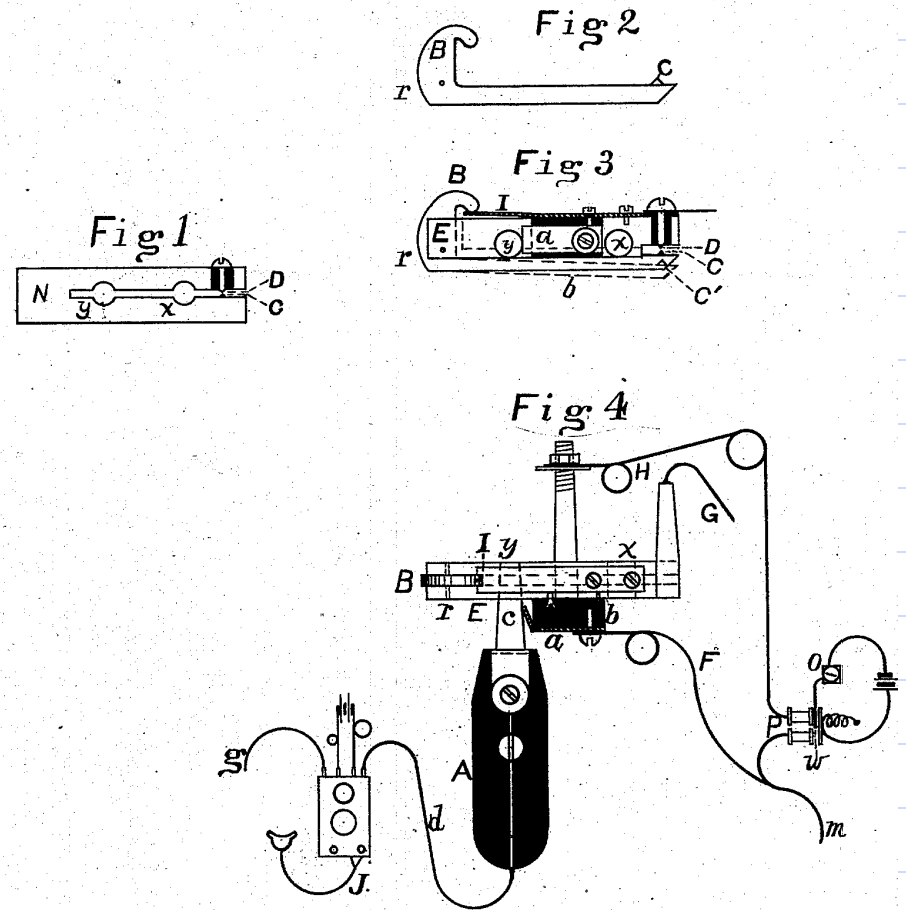


*Fig. 2.*



# 293,198 Jack-knife Switch

- ◆ C. E. Scribner
- ◆ Combination switch and connector
- ◆ Maybe the origin of the term "jack" for this kind of device



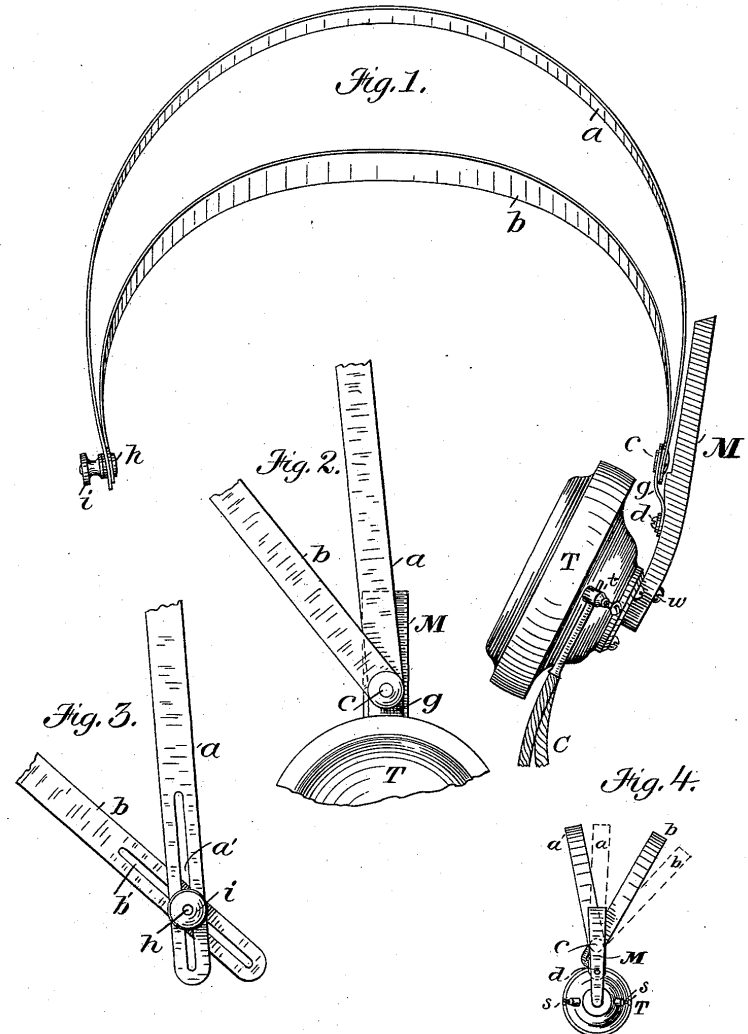
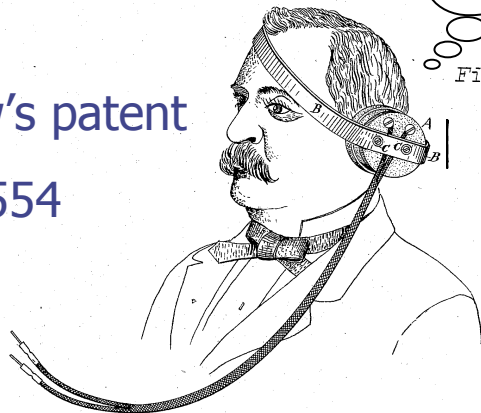
# 304,667 Operator's Head Receiver

- ◆ W. L. Richards
- ◆ Not fundamentally changed in 115 years

Ouch!

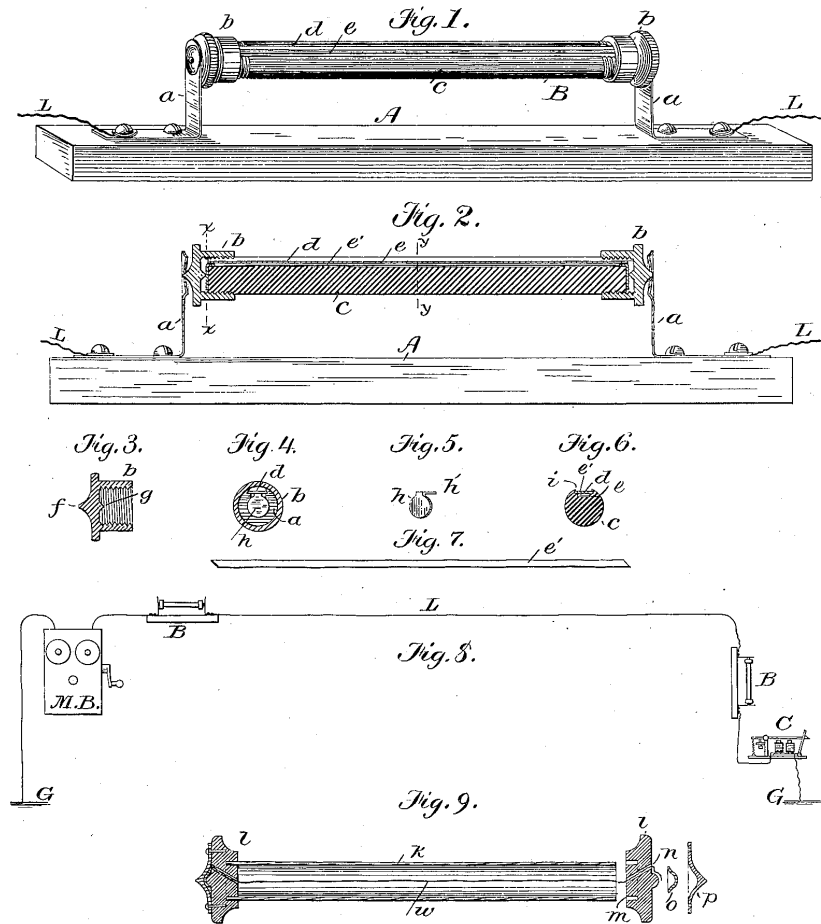
Shaw's patent

268,554



# 322,214 Circuit Protector

- ◆ Theodore N. Vail
- ◆ First of many protective devices
- ◆ Vail's most important contribution was **the business model for the Bell System.**



# Summary

- ◆ Many of the early Bell System inventions are still with us, in some form:
  - Twisted-Pair cable
  - Hookswitch
  - Magnetic receiver
  - Headset
  - Cartridge fuse
- ◆ Some were ahead of their time:
  - Frequency-Division Multiplexing
  - Photophone

# Conclusion

- ◆ What we can see in this small sample of telephone patents is an amazing mixture of:
  - A little luck
  - A lot of intelligence
  - Years of hard work and collaboration
  - An impressive ability to focus on the problems at hand

# Sources

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- ◆ U. S. Patent & Trademark Office database
- ◆ Bieberich, Jim, "Complete Alexander Graham Bell Patent Collection", [www.uspat.com](http://www.uspat.com)
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- ◆ Lienhard, John, "Engines of Our Ingenuity" radio program