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Dial Log

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A Note From Our Director

By Lisa Berquist

I find myself writing this at the start of my fourth week on the job as the new Executive Director of the Telecommunications History Group. As the saying goes, the only thing constant in life is change; and it's always interesting to see what new experiences life has to offer. I wasn't actively looking for this opportunity but when it came my way, I knew I couldn't pass it up. Telecommunications is in my blood and I am excited to be a part of educating others about THG and telecommunications while preserving its rich history.

I come from a family of telephone workers. My mother and aunt spent a few years at Mountain Bell in the business office after moving to Denver from South Dakota in 1952. My father had a long career at Mountain Bell from 1955 until Divestiture. I even married a telephone guy. Jon started his career in Minnesota at Northwestern Bell in 1969 and later moved to Denver in 1997. We married in 1999 and he retired in 2000.

I began my career in 1978 as a temporary part-time Confidential Stenographer in Denver, Colorado. I saw many changes throughout my career. I was secretary to the General Manager of Network and spent most of my career in the operations side of the business including the Centralized Repair Service Answering Bureau (CRSAB), designed services maintenance testing and installation and repair dispatch. I was involved in deploying the mechanized dispatch system, WFA/DO and did a stint in Wireless and then in IT. When I retired in 2009, I was a Director in the Product organization overseeing the process improvement and project management groups. Being able to do a multitude of jobs is one thing I loved about working at Mountain Bell/U S West/Qwest. Another love throughout the years was the interaction with all of the wonderful people I worked with.

Now I find myself working with some of those same types of people in the form of volunteers, staff, donors and Board members. The teams in Denver and Seattle have been a great support to me as I work to get up to speed on the rich history of the THG. Renee Lang and Jody Georgeson have been especially helpful as I immerse myself in the abundance of information available. I am looking forward to getting a chance to meet, in person, the dedicated volunteers and Board located in Seattle at the impressive Herbert H. Warrick, Jr. Museum of Communications.

I am excited to be a part of continuing our Mission to educate, preserve, and publicize the heritage of the telecommunications industry. I truly believe that people make an organization and I am committed to helping grow our numbers in both volunteers and donors. I am humbled and honored to be a part of this amazing organization and I would love to hear your suggestions on how to make the organization and museum even more successful for the years to come. Feel free to reach me at 303-296-1221 or e-mail me at telcomhist@aol.com.

Warmest Regards,
Lisa Berquist

Doors Open Denver a Big Success

Doors Open Denver took place on April 12 & 13, 2014. This free two-day event invited the public to seek out the architecture of Denver's most interesting buildings, take special guided tours, bike to historic places and/or walk through several neighborhoods. CenturyLink generously allowed THG conduct tours of the Mountain States Headquarters building at 931 14th Street.

Volunteers **Andrew Cook, Dave Felice, Jody Georgeson, Renee Lang, Mike Nearing**, and **Jerry Wild** led 80-some people through the historic building, regaling them with historic anecdotes about the building site, telecom history and telephone employees. Feedback indicated that the tours were a great success.

If you haven't had the opportunity to tour the building and/or our archives, please contact us for an appointment. (303-296-1221 or telcomhit@aol.com)

The Edison Transmitter

The telephone, invented by Alexander Graham Bell in 1876, converted the sound waves from the human voice to electric impulses, conducted the impulses through a wire, and converted them back to the human sound at the other end of the wire. Bell's transmitter contained a parchment membrane that vibrated in response to sound. A metal button attached to the membrane sent the varied movements to an electromagnet and electric current corresponding to the vibrations was induced. This induced current traveled to the receiving device where the process was reversed: the electricity caused movement of a magnet which then caused a membrane to vibrate and emit the corresponding sounds. The weakness of the electrical signal limited the quality and distance of the message.

Thomas Edison's approach in 1877 and 1878, was to improve the sensitivity of sound detection at the transmitter by replacing the parchment membrane with a disc of compressed carbon set between metal plates. The electrical resistance of carbon is extremely sensitive to the minute pressure changes caused by sound waves. Along with the Bell receiver, it was used in all telephones until the 1980s.

At the time, Emile Berliner and David Edward Hughes were also working to develop transmitters. Hughes decided not to take out a patent; instead he gave his invention as a gift to the world. In the U.S. Edison and Berliner fought a long legal battle over the patent rights. Finally, in 1882, a federal court awarded Edison full rights to the invention, stating "Edison preceded Berliner in the transmission of speech...The use of carbon in a transmitter is, beyond controversy, the invention of Edison" and the Berliner patent was ruled invalid.

Carbon microphones can also be used as amplifiers. This capability was used in early telephone repeaters, making long distance phone calls possible in the era before vacuum tube amplifiers. In these repeaters, a magnetic telephone receiver (an electrical-to-mechanical transducer) was mechanically coupled to a carbon microphone. Because a carbon microphone works by varying a current passed through it, instead of generating a signal voltage as with most other microphone types, this arrangement could be used to boost weak signals and send them down the line.

Like Theodore Vail, Edison worked in his early life as a telegrapher. Several of his early inventions had to do with telegraphy, including an automatic repeater. In 1874, after his demonstration of the quadraplex telegraph, Edison was not sure that his original plan to sell it for $4,000 to $5,000 was right, so he asked Western Union to make a bid. He was surprised to hear them offer $10,000 ($208,400 in today's dollars.), which he gratefully accepted. It was his first big financial success.

Edison's major innovation was the first industrial research lab, which was built in Menlo Park, New Jersey (today named Edison in his honor) with the funds from the sale of his quadruplex telegraph. Menlo Park became the first institution set up with the specific purpose of producing constant technological innovation and improvement. Edison was legally attributed with most of the inventions produced there, though many employees carried out research and development under his direction. His staff was generally told to carry out his directions in conducting research, and he drove them hard to produce results.

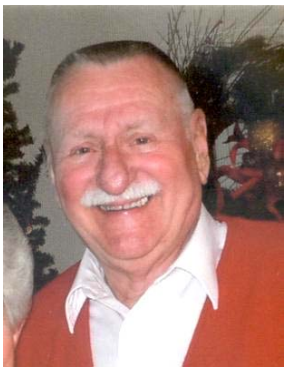
In 1920, Edison set off a media sensation when he told B. C. Forbes of *American Magazine* that he was working on a "spirit phone" to allow communication with the dead, a story which other newspapers and magazines repeated. Edison later said that "I really had nothing to tell him, but I hated to disappoint him so I thought up this story about communicating with spirits, but it was all a joke."

Goals of Mountain States Telephone

Introduced by W. K. Koch, President
December 15, 1965

We shall excel in providing present and future communications services ….
to a discerning public ….
at a reasonable cost and a fair profit ….
through a versatile organization
of resourceful and competent people.

In Memory



Dieter Hantschel, 1941-2014, died on Monday, April 7, 2014 in Delphi, Indiana. Born January 5, 1941 in Komotau, Germany, he was the son of the late Herbert Hantschel and Irmtraut (Katzwendel) Hantschel.

Dieter married Sherry May on July 8, 1990 in Peaceful Valley, Colorado. He retired from the legal department at U S West (formerly Mountain Bell) in 1990 after 35 years.

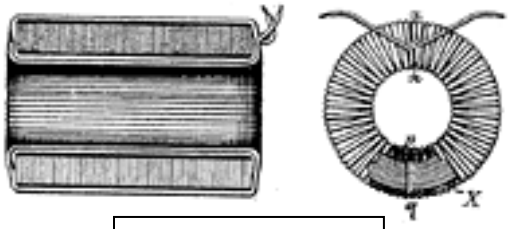
Dieter was a long-time member of THG and frequently corresponded with us with suggestions for the newsletter and with other information. He was also a member of the Civil Air Patrol in Colorado, American Red Cross, Experimental Aviation Association (AOPA), Aircraft Owner and Pilot Association, SCHLARAFFIA German Fraternity, and the Masonic Lodge. He was a volunteer captain of the Delphi at Wabash Erie Canal.

The Transcontinental Telephone Line

June 17, 1914

The telephone was invented in 1875 and by the early 20th century had been put into widespread use. Telephones could only be used over short distances, however, as the signals weakened as they traveled over the lines.

In 1908, Theodore Vail, president of American Telephone and Telegraph Company (AT&T), made developing a transcontinental telephone line a priority. The following year, though he had not yet discovered the technology for such as task, AT&T chief engineer John J. Carty pronounced that the company would have the line completed by the 1915 Panama-Pacific International Exposition in San Francisco.



Pupin’s loading coil

Two inventions were significant in enabling Carty to make good on this boast. Michael Pupin, of Columbia University, patented the “loading coil” in 1899, which first made it possible to telephone cheaply over long distances. AT&T bought an option on Pupin's patent for a yearly fee. By January 1901, he had been paid $200,000 ($13 million in 2011) and by 1917, he had received a total of $455,000 ($25 million in 2011). In New York City alone, the Pupin coils saved the company $3,543,000 a year, because they made possible the substitution of small wires for large ones in telephone cables.

Carty hired a young physicist, Dr. Harold Arnold, to study the question, and let the scientific and electrical engineering community know that AT&T would pay handsomely for an electrical amplifying device.

The technology used to complete the line was developed outside of AT&T by inventor Lee de Forest. In 1907, he patented a three-element vacuum tube he called the “audion.” “He began to experiment with broadcasting speech and music and discovered that he could cause regenerative oscillation by feeding the output of the Audion back into its grid,” explains the Institute of Electrical and Electronics Engineers Global History Network. “This discovery allowed for more powerful and effective signal transmission.

In 1912, de Forest invented a version of the regenerative circuit, which greatly amplified the volume of radio or telephone signals. On Oct. 30, 1912, the inventor brought his invention to AT&T's engineering department and Dr. Arnold realized that if he increased the vacuum, the audion would become a practical amplifier. Carty took the audion technology and used it to construct a telephone line stretching across the country.

By summer 1913, AT&T had tested high-vacuum tubes on the long distance network. By fall, the company began constructing the line west from Denver, and upgrading the line to the east.

Rediscovering the First Transcontinental Long Distance Line - The Genesis of Electronic Telecommunications Is Hiding in Plain Sight

By Jim Hebbein

In 1968, I started working for Mountain States Telephone and Telegraph Company (MST&T) in Fort Collins as a summer job. As a new kid, I pre-wired new homes under construction, and retrieved disconnected telephone sets from homes. All phones were rented from the phone company and the cords were hard-wired to the connecting block on the wall – there were very few phones with jacks.

I soon learned about the iconic line of telephone poles outside town with several cross arms and 30-40 "open wires" strung on insulators which came up from Denver on the south side and left town toward Cheyenne on the north side. The older guys just called it the DSL, short for the Denver-Salt Lake toll line.

I asked several people apparently dumb questions about the DSL's history to no avail:

- Q: What was it for? A: Um, toll calls?
- Q: Where did it go? A: (with an askance look of disdain) Salt Lake City.
- Q: All those wires for calls to just Salt Lake? A: Jeez, don't ask me, I don't know.

Nobody knew. By the 1960s, the long lines had been chopped up into relatively short rural phone lines to farms and ranches outside of Fort Collins. For 40 years, the DSL remained a mystery to me.

On July 31, 2010, suffering from cabin fever of sorts, I grabbed my camera and headed northwest of Fort Collins where I knew several open wire pole lines still were standing. I shot a roll of film.

My first boss, John Drescher, once had told me that it was called the Denver-Laramie Toll Line. Again, it didn't make much sense to me why Denver had so many wires running to Laramie. Sometimes the obvious just isn't obvious.

By this time, I did know that toll lines were generally built with 40 poles per mile, or every 132 feet. If you divide pole #4334 (at right) by 40, you will know that this line is about 108 route miles from Denver. Over time, I realized that these pole numbers would often be the clue to a line's history.

In the 1970s, when Mountain Bell was wrecking out the line, the Wyoming Department of Wildlife asked the crew to leave the poles standing for birds of prey to perch upon – and so these poles still stand.

My Transcontinental Line discovery process was further piqued in October 2010, when I found that Alcatel-Lucent (the present owner of Bell Laboratories' intellectual information) had published their entire set of the 1922-1983 ***Bell System Technical Journal*** (BSTJ) volumes online at http://www3.alcatel-lucent.com/bstj/. Of course, I scanned through all of the titles while experiencing techno-geek nirvana.

But immediately the April 1923 issue entitled ***Practical Application of Carrier Telephone and Telegraph in the Bell System*** at http://www3.alcatel-lucent.com/bstj/vol02-1923/articles/bstj2-2-41.pdf caught my eye. Page 45 has a route map of the new open-wire carrier[1] system showing *only one line* crossing the entire country. It passed through Denver, and then a diagonal line was schematically drawn *northwest* to the next repeater (amplifier) site in Rawlins, Wyoming, 277 miles away.

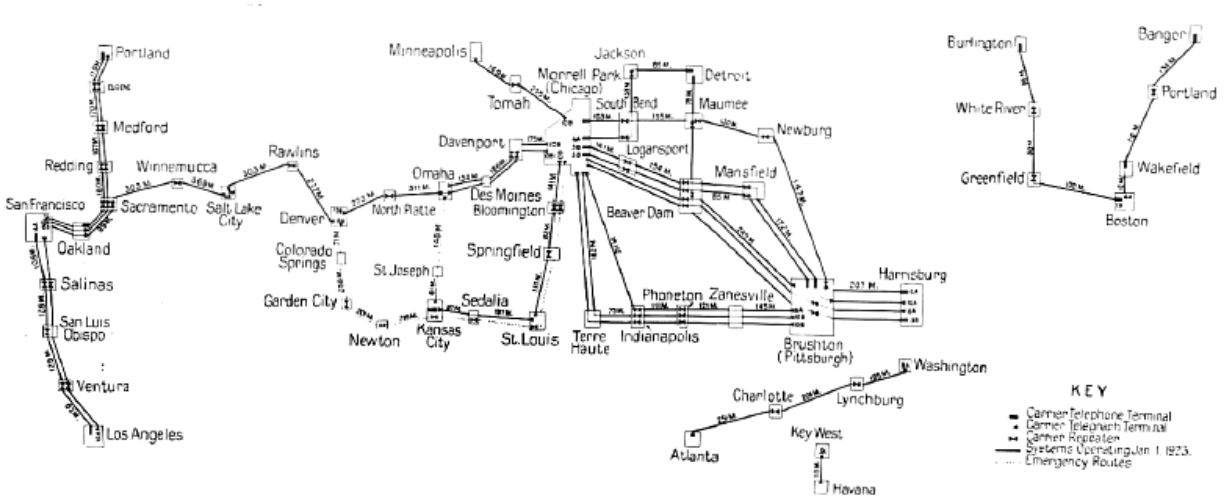


Fig. 4—Carrier System Installations

But a straight-line route from Denver to Rawlins would traverse some of the most treacherous terrain in Colorado, paralleling the Continental Divide of 14,000 foot peaks in Rocky Mountain National Park. No! AT&T and MST&TC could not and would not have routed the lines that way. They had to use an easier route.

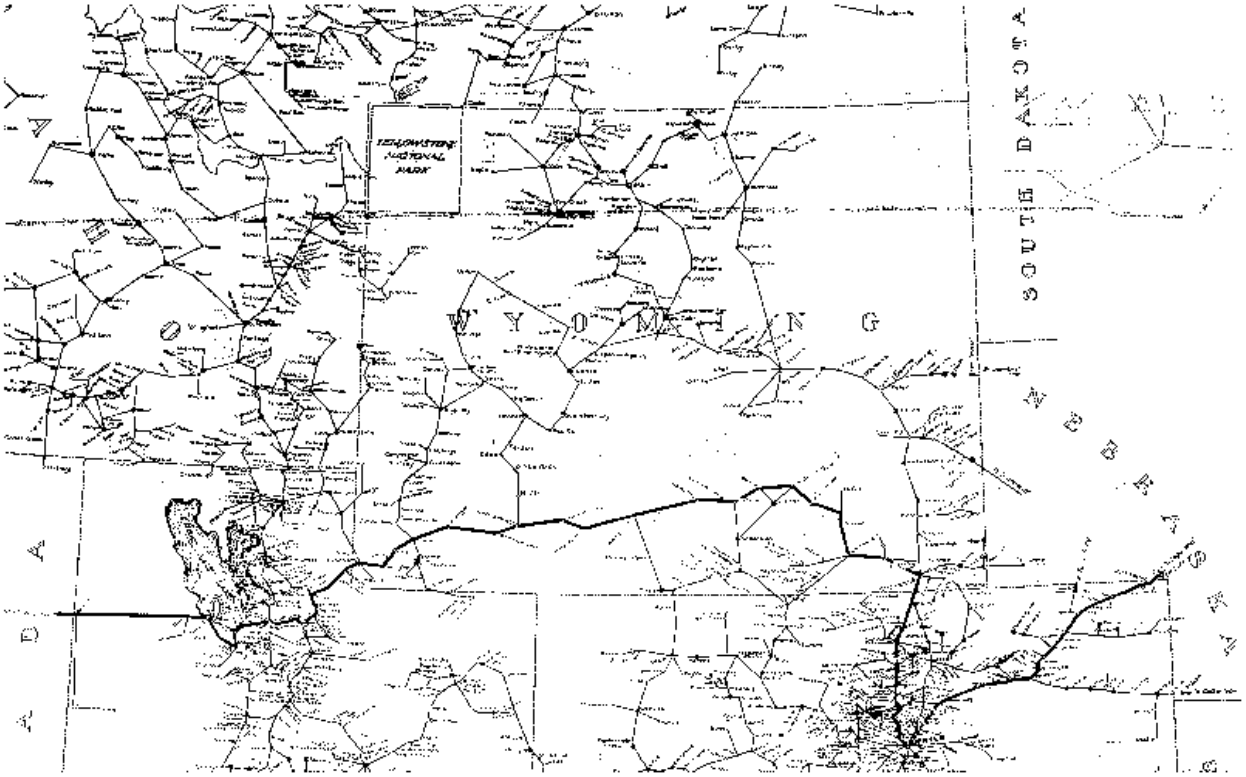
Epiphany in error: Was the Denver-Laramie toll line (*right*) part of this transcontinental carrier system?

I e-mailed **The Telecommunications History Group** (www.telcomhistory.org) in Denver on September 2, 2011, and asked about this. And then I waited…

[1] Carrier systems electronically provide multiple, concurrent, private talking paths or channels over one line. The Bell System engineers, not being marketing people, merely used incrementing letters and numbers to identify newer types of transmission and switching equipment. Hence, A-carrier was followed by B-carrier, but C-carrier was the best economic solution and became the first dominant carrier transmission system. Eventually, newer analog J, K, L, N, and O-carrier systems were developed. Digital T-carrier is still ubiquitous today. Similarly, the very complex computer-controlled telephone switching systems are only identified as #1 ESS, #2 ESS, #3 ESS, #4 ESS, and #5 ESS (Electronic Switching System). The AT&T marketing people did eventually start branding them as 1AESS™, 4ESS™, and 5ESS™ switching systems.

Jody Georgeson, Executive Director of THG, responded about two weeks later with ***The Map*** shown below. To me, it was akin to finding the Holy Grail of Telecommunications.

Route map of the First Transcontinental Long Distance Line through Colorado, Wyoming & Utah



*This map, provided by **The Telecommunications History Group, Inc.**, was scanned from their archived Mountain States Telephone & Telegraph Company 1915 Annual Report.*

The map depicts the somewhat detailed account of the route (thick line) of the original 1915 Transcontinental Long Distance Line from New York City to San Francisco as it passed through MST&T's service area. In 1911, AT&T had extended their lines from Chicago as far west as Denver, but despite using thick 6-guage wire, callers had to yell and voices could barely be heard. The line could go no further west. AT&T tried creating a repeater composed of a receiver mechanically-connected to another transmitter, but that gave poor results.

One method to transmit a long distance message across poor connections was to use repeaters – live operators who listened on line "A" and re-spoke the words into line "B". The listener didn't hear the original caller's voice, but the message – and perhaps even inflection – was almost instantly conveyed.[2]

An Iowa boy from Council Bluffs, however, provided the solution. His name was Dr. Lee de Forest. (*See preceding article, "The Transcontinental Telephone Line"*.) He invented and patented the Audion in 1906. He presented his device to AT&T engineers in 1912, and AT&T quickly purchased his patent rights despite some technical issues that AT&T engineers recognized and corrected. From the Audion, AT&T designed a voice amplifier.

[2] History from ***Goodbye, Central; Hello, World – A Centennial History of Northwestern Bell***, ©1975 Northwestern Bell, page 64, "Operators along the way had to repeat messages…"

AT&T installed three amplifiers (which are still called repeaters to this day) in each of the three trunk circuits between New York City and San Francisco. The last connection was made at Wendover, Utah on June 17, 1914.

The last pole connecting the transcontinental line from New York to San Francisco

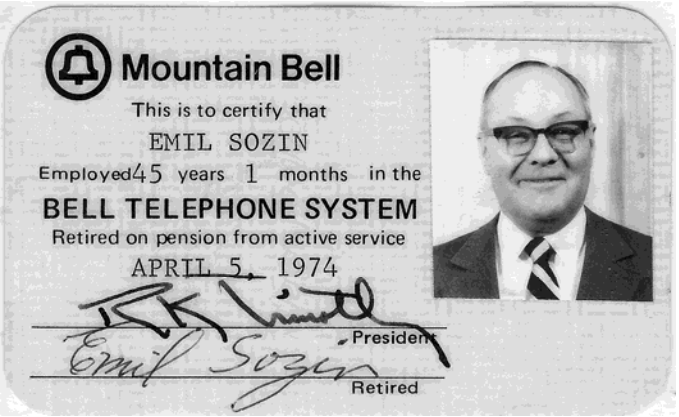
During the summer of 1914, Alexander Graham Bell and other AT&T executives spoke over the line, but the grand opening ceremony wasn't held until January 25, 1915, to celebrate San Francisco's Panama-Pacific Exposition.

AT&T Archives, Warren, New Jersey

I was recently lucky enough to visit the AT&T archives in Warren, New Jersey. We were greeted by archivist George Kupczak who graciously showed us around and displayed many of his treasures. One of the most interesting is the original Patent 174,465, which was issued to Alexander Graham Bell on March 7, 1876, by the U.S. Patent Office. Bell's patent covered "the method of, and apparatus for, transmitting vocal or other sounds telegraphically ... by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sound." Thanks, George!

Emil Sozin

By Renee Lang



Card commemorating Emil's retirement, signed by Robert K. Timothy

In 2013, we received Emil Sozin's scrapbook. He was born in Englewood, Colorado in 1911 to Hungarian immigrant parents, Sigmund Sozin and Eita Sass. After his parents died, he lived at the Colorado Christian Home from 1925 to 1929. He married Maxine A. Blaine in 1937 in Denver.

Emil started working for Mountain States Telephone and Telegraph on April 1, 1929. According to a story he wrote about his early life, he worked in four different "facilities". He also told of working in Leadville, Cheyenne and Casper. Maxine wrote about their life together and said Emil worked at Camp Hale in Leadville. A newspaper article stated he would be moving to Cheyenne to be an Outside Representative for Mountain States Telephone and Telegraph Company after spending two years in Leadville, Colorado. Maxine also wrote that Emil worked at Fort Warren in Cheyenne and then in Casper.

After WWII, the couple moved back to Denver where they remained for the rest of their lives. Emil retired April 1974 with 45 years service, as a Staff Representative in the Administrative Services Department. Emil passed away in August 2000.

If you know more about Emil and his work at the phone company, we would love to hear from you. Just send your stories to us at telcomhist@aol.com, or at THG; PO Box 8719; Denver, CO 80201-8719.

We wish you a busy, safe and happy summer!

THE TELECOMMUNICTIONS HISTORY GROUP, INC