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Pull Quote: In 1872, Meucci reproduced a pair of his “telettrofono” from parts that Fleming left behind and parts he could afford to buy and gave them to Grant, who did not seem to know the merit of these instruments.

Running Title: Antonio Meucci

ANTONIO MEUCCI, THE SPEAKING TELEGRAPH AND THE FIRST TELEPHONE,

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Bell was two years old when Antonio Meucci, Figure 1, came to the United States in 1850. Born in 1809 in Florence, Italy, he attended the Accademia di Belle Arti there, studying mechanical arts, chemistry, physics including electrology. In 1833 he became assistant chief mechanic of Teatro della Pergola in Florence, where he also built a stage house air-tube intercom. Involvement in Risorgimento plots put him in jail for a time, then he married stage costumer Ester Mochi, leaving Florence in 1835 with the Italian Opera Company troupe bound for Havana’s Teatro de Tacon where he became the principal “mechanician.”

American historian-writer Giovanni Schiavo¹ documented Meucci’s life in 1958. Basilio Catania, a retired Italian Telecommunications engineer, performed in-depth research from 1989 to 2,000^{2,3} on Meucci’s works. Details from the works of both these authors were used as the foundation of this article.

Teatro Tacon was under construction when Meucci arrived. The theatre’s first-performance and inauguration was in 1838. Antonio and Ester lived in an apartment near Teatro de Tacon, were paid well, including artist’s gifts to Ester who scrupulously accumulated their small fortune. Their summers were free. In 1842-1844 he obtained and read treatises on galvoplastics (electroplating) and galvanism by Bequerel, Jacobi, Mesmer and others. Their only child, Juanita, was born in around 1844. About that time, he obtained a contract to electroplate army supplies, acquiring a bank of 60 Bunsen electrical wet cells. Meanwhile the first public demonstration of Morse’s telegraph occurred in 1838 in Baltimore MD, evolving rapidly after 1844.

About 1849 -1850, Meucci collaborated with a local doctor in electrotherapy using the Bunsen cells. He had already applied some electrotherapy to Ester who was developing arthritis. Meucci’s method comprised two cork insulated metal contacts (Figure 2, #1)¹, wired to and from the battery room, where the cells could be connected in series to apply any voltage up to 114 volts DC, though lesser voltage with fewer cells was usually sufficient for effective therapy. One contact was to be held in the patient’s left hand, while the second was to be placed wherever the affliction might be. To treat a migraine headache, Meucci chose to have the patient place the second contact in his own mouth when commanded.⁴ Three rooms away, by the Bunsen cells, Meucci called out

commands to the patient. He could connect himself as well as any number of cells in series with the wires to and from the patient. Details of this event were later recorded in the “Globe” trial where Meucci submitted an affidavit as well as trial testimony. In his own (translated) words; “...I held a similar instrument in my left hand. As soon as the person placed the contact on his lip, he received a discharge and shouted out. At the same time, I thought I heard this sound more distinctly than natural. I then put the copper of my instrument to my ear and heard the sound of his voice through the wire.”

To continue his testing of this sudden discovery while avoiding injury by flesh contact, Meucci added a cardboard bag (i.e. a funnel, See Figure 2, #2) around each copper contact. Meucci testified that he ordered the sick person to speak freely into the funnel, relating that “He put the funnel to his mouth, and I put mine to my ear. At each moment that said individual spoke, I heard sound of a word, not distinct, a murmur, an inarticulate sound.” This was repeated several times that day, and several times on days thereafter. In his words; “From those moments on, I recognized that I had attained the transmission of human words by means of a wire conductor with a battery of electrical cells, and so named it the Speaking Telegraph.”

After 1847, public attendance at the Teatro Tacon diminished, and the owner was considering closing it permanently. From 1847 to 1852 the Havana Opera Company then engaged in tours to Charleston, SC, Philadelphia, New York and Boston, introducing opera to the United States. Antonio’s third 5-year contract with Teatro Tacon was also expiring. His friends suggested that he should move from Cuba where venture capital went only to sugar, to the US where business opportunities for his inventions should be better, and where his disposition toward supporting revolutionaries was more accepted. By early 1850 he was convinced to do so. The Meucci family made travel plans to accompany the Havana Opera Company in their next US tour when Juanita suddenly died of yellow fever. They delayed their journey for a month, hoping to bring Juanita’s body with them to bury in their new land, but the captain of the *Norma* refused to do so. They sailed alone in April, 1850 on the frigate *Norma* to New York bringing with them Antonio’s laboratory supplies and their life savings of twenty-six thousand ‘pesos fuertes’ (about \$500,000 in modern funds) that should serve them for years. He planned to continue his experiments, to develop and sell any and all of his chemical and electrical discoveries, despite his lack of knowledge of the English language, so vital in navigating the complex New York business and financial worlds.

They settled on Staten Island buying a house that stands today as the Garibaldi-Meucci Museum on Tompkins Street. Giuseppe Garibaldi, later hero of the Italian Risorgimento came to live with Meucci between campaigns, encouraging him to employ other exiles to make stearic candles based on Meucci’s original chemical compounds that predated those of Proctor & Gamble. When Ester’s arthritis confined her to her third floor bedroom, he improved on his Speaking Telegraph (#3, #3x), installing an intercom from there to his laboratories by the kitchen and in their yard.

Following Galileo’s teaching to “*provando e reprovando*” (*try and try again*), he tried diaphragms of animal material and of metal, first located above then below a metal tongue,⁵ with wire windings on a tube filled with steel filings or a metal rod, both magnetized with a loadstone. He found them all to “react with the noise of the word,” resulting in successive instruments. See Figure 2¹, #3, #3x, #4 (1853). He next inquired about manufacturers of Morse telegraph equipment in 1852 then in widespread use, where he could buy such materials, being referred to a “Mr. Chester that lived on Centre Street.” In 1854, “... I obtained bobbins and other utensils from Mr. Chester... he (Chester) showed me all the things necessary used then in the telegraphic art ... my memory was opened to build some new instruments. after some reflection, I constructed a first instrument.” Instrument (#4, 1854) used a magnetized rod, with a diaphragm “a” with a strange hole and a metallic tongue “b” which he thought necessary to produce a voice signal. He cited a platinum metal tongue, now known as slightly ferromagnetic especially with a nickel impurity. The sound receiver/transmitter he evolved was in essence a reversible variable reluctance transceiver. He varied between animal diaphragms with a central metal “valve” and a metallic diaphragm set

very close to the magnet. In 1856, he switched to a horseshoe magnet with a helical winding (#5, 1856), then back to a magnetized steel bar powered by a bobbin of wire (#6, 1859) procured from Chester.

In 1857-58, apparently ready to move forward with his invention, he asked New York artist Nestore Corradi to make a drawing from his sketch showing “a man in a sitting position holding in his hands two small apparatuses of concave form, attached to electric wires to be used one by the mouth in order to speak into it, the other to be placed to the ear to receive sounds of the human voice, so constituting a speaking telegraph” that he called a telephone.⁶ In 1860, Meucci wrote an article for publication in “L’Eco d’Italia” in New York detailing his Speaking Telegraph.

He asked business acquaintance, Enrico Bendelari, who was to spend some time in Naples on business, to seek an Italian backer there since Naples already had an extensive telegraph network. Meucci either gave Bendelari copies of his L’Eco article, or sent them to him later. By then Garibaldi had “liberated” Naples, the ruling Bourbon regime was failing, and backers that Bendelari approached were reluctant to proceed due to the revolving political situation in that region.

During the 1850’s the Meucci’s obtained ownership of their cottage and adjacent land, but Meucci then dissipated their Havana fortune in poor business decisions and speculative chemical ventures including the candle factory and a brewery. Between 1858 and 1862, their lots were sold at public auction, but they were permitted to live in the cottage indefinitely. In December, 1859 he wrote to his dear friend Garibaldi now on campaign in Italy, “.I have reduced myself to working like a garzone to 15\$ to the week, shame for me.”⁷ Kerosene from Pennsylvania petroleum oil discovered in 1859 diminished the candle business. His 1860 candle patent only brought him the opportunity to work for William Rider (“New York Parafinne Candle Co.”), to whom he had assigned it. Meucci also obtained patents on bright kerosene lamp (1862), paint oils from kerosene (1863), paper pulp from wood and/or vegetables (1865), wicks from vegetables (1865) and a vitamin drink (1871), a meat sauce (1873) and a Lactometer (1875 predating the Babcock test by 15 years). He was encouraged in 1865 to make better records of his telephone experiments, obtaining a bound memorandum book given to him by Mr. Rider⁸ from the Rider & Clark office on Broad Street in Manhattan, where his candles had been merchandised.

For the 1880’s trials, exhaustive searches by all parties for a copy of the Meucci-telephone article in L’Eco and related information failed to uncover it. In 1880 the Globe Company offered a \$100 reward for “all the numbers of the Eco d’Italia which speak of the telephone of Mr. Meucci from 1859 to 1862.” In 1885, the private collection of L’Eco by Dr. John Citarotto of New Orleans was sold to the Bell Company for \$125. That 1857-1881 collection had many issues missing, especially through the era from 1859 to 1863. To this day, copies of L’Eco d’Italia from and including December 1860, all of 1861, 1862 and 1863 are not to be found anywhere.

Details about Meucci from this era were brought out during the 1886 trial where the defendant, Globe Telephone Company, to which Meucci had then recently pledged his patent rights, was being sued by Bell Telephone Company for patent infringement. In a 214 page deposition by 77 year old Meucci was described twelve of his 30-odd telephone devices created between 1849 (#1) and 1865 (#12) (Figures 2-4). When asked at one point in cross-examination “What business did you undertake after you gave up the candle factory?” his answer (#355) was “Nothing; what I have done all my life—experiments.” (It was within these and other obscure but detailed records in clear Italian and English, including an English translation for another trial of his memorandum book,⁹ where Dr. Basilio Catania discovered in 1994 conclusive proof that Meucci had priority in the invention of the telephone.)

Bell later recalled in a 1922 National Geographic article¹⁰ that in the 1860’s, in addition to formal schooling in Scotland, he observed his father and grandfather in their physiological experiments on speech utterances and “vibrations” and in the teaching of deaf students to produce sounds with their vocal organs. Alexander became aware of Helmholtz’s works on tone sounds with

an electric tuning fork, and those of Wheatstone who had reconstructed a speaking machine suggested by Baron von Kempelen. Alexander and his brother, Melville, attempted to build the same device from artificial vocal cords driven by the wind chest of their parlor organ. Later they caused a dog to produce words by their manipulation of the dog's mouth and throat. In Scotland and London, as of age 18 (circa 1864), Bell was unaware of electricity and magnetism. He then immigrated to Boston, MA to eventually become professor of Vocal Physiology at Boston University. While in America, he undertook the study of electricity.

Meucci's fortunes turned decidedly for the worse on the ferry steamer *Westfield* on 30 July 1871 en route from Manhattan to Staten Island when the boiler exploded, killing many on board. Meucci was seriously scalded. Skin soon peeled from his entire body and his hair and beard scalded off. Convalescence exhausted his finances in this post-Civil War depression. For that decade, Meucci and his invalid wife lived a frugal existence. They were given charity by their friends and coal, groceries and a dollar a week by the Supervisor of the Poor of Staten Island as late as 1880.

His next effort was to form an agreement, validated by a Notary on 12 December 1871, founding the "Telettrofono Company" in partnership with acquaintances Italian Consulate Secretary A. Z. Grandi, contractor A. A. Tremeschin and cigar stand operator S. G. P. Breguglia. That Agreement predated by four years an analogous February 1875 agreement between Alexander Graham Bell, Thomas Sanders and Gardiner Hubbard (Bell's future father-in-law). The US Patent office "Caveat," an announcement of intent to patent for fee of \$10, had become available in July of 1870. On 28 December 1871, Meucci filed a one-year Caveat on his "Sound Telegraph", requiring a \$10 fee plus another \$10 for the lawyers' effort (no drawings). A full patent including the attorney's fee and drawings would cost \$250, which his partners would not offer. Figure 5 is a photocopy of an 1887 certificate testifying to the existence, date and Number (3335) of that Caveat.¹¹ Figure 6 is an 1880's recreation of the 1859 Corradi drawing[12], which could have been submitted with an 1871 patent, were it to have been filed then. Figure set 7-9 are photocopies of Caveat pages on display at the Garibaldi-Meucci Museum in Staten Island, NY[12], possibly the "copy" referenced in the Certificate. Within the Caveat text, it is clear that Meucci had a vision of the system necessary for two-way vocal communication across considerable distances, including the need for quiet.

Since two of his partners left New York in less than a year, in 1872 he approached Edward B. Grant of the American District Telegraph Company on Broadway in New York with a request that his "telettrofono" be tested on the Company's telegraph lines. Meucci explained that his July 1871 injuries had confined him to bed, near death at times, and that his wife sold most of his electrical instruments to a Mr. Fleming for money to pay medical expenses and for the necessities of life. Grant said that he would, in Meucci's words "put at my disposal the telegraph lines needed provided I would bring in an exact explanation of the mode of operation of the affair, and some drawings, and also some instrument to speak."¹³

Meucci reproduced a pair of his "telettrofono" from parts that Fleming left behind and parts he could afford to buy and gave them to Grant, who did not seem to know the merit of these instruments. Two years passed ('72-'74) where nothing was reported to Meucci. In 1874, Meucci demanded "restitution of the descriptions and given designs,¹⁴" to which Grant replied that he had mislaid them. Lacking even the \$10 to renew the Caveat, Meucci allowed it to lapse on 28 December 1874.

Enter Western Union electricians Frank L. Pope and George Prescott, and brother Henry Pope, a superintendent in the American District Telegraph Company, contractor to Western Union. What happened after 1872 is still a matter of speculation. Frank had the duty¹⁵ "to examine the novelty and utility of the various new inventions relating to telegraphy, which were constantly being presented to the officers of these companies (Western Union and the old Stock Telegraph Co.) for approval or adoption." George "had to act as a barrier to a flood of inventions brought to the company for attention."¹⁶ According to sworn depositions, it was not until 1877 that Henry brought "some Bell instruments that were placed in the hands of the American District Telegraph Company

for I don't know what purpose" to Frank's house for testing on a telegraph line between the brothers' homes near Elizabeth, NJ. The instruments are said to have "worked well, and they spent two or three hours talking."^{15,16}

Bell's quoted recollection of the foundation for his famous invention was only "my crude telephone of 1874–1876."¹⁰ Review of the now known facts of that time indicates that it would have been created while teaching at Boston University and despite urgings from his associates Messrs. Saunders and Hubbard that "multiple telegraphy" (transmission of several simultaneous telegraph messages over a single wire line) had a much greater pecuniary value. Bell had made it known in October, 1874 of his intent to patent a telephone.¹⁷ Both Bell and Elisha Gray had used the New York facilities of Western Union in March, April and May of 1875 for their telephone experiments. Bell was assisted by Pope and Prescott. In May of 1875 Bell announced the addition of variable resistance to his initial telephone conception. Bell signed his "Improvement in Telegraphy" patent application on 30 January, 1876, which included "...causing electrical undulations, similar in form to the vibrations of air accompanying said vocal or other sound..."

Both Elisha Gray and Alexander Graham Bell filed applications on Feb 14, 1876. Gray's was for a Caveat, while Gardiner Hubbard's lawyers filed a patent for Bell. On March 7, 1876 Patent #174,465 was issued to Alexander Graham Bell for his "Improvement in Telegraphy", aimed at performing multiple message telegraphy. Here, an armature moving near the pole of a small electromagnet produced an undulating current. Bell also cited "another mode... where motion to the armature (is) by the human voice or musical instrument" and a corresponding claim. On March 10, 1876 Bell demonstrated converting words into electrical current using the variable-liquid resistance documented in a second patent.¹⁸ His assistant, in an adjoining room in Boston, heard Bell say over the experimental device the soon-to-be-famous words: "**Mr. Watson, come here, I want to see you.**"

After learning of Bell's actually receiving the March 1876 patent on the transmission of voice over wires, Meucci demanded his priority in the matter. Technically this could be possible on the basis of Meucci's 1871 Caveat, renewed for a total of three years through 28 December, 1874 while Bell, as he later declared under oath, had his first idea of the (electromagnetic) telephone the summer of 1874. Years later, precedence would be based on the fact that Bell's patent did **not** constitute "*new and useful art... not before known or used in this country, and not patented or described in one whichever printed publication, in this or other countries, and that has not been publicly used or sold for more than two years from the date in question*".

On June 25, 1876, Alexander Graham Bell demonstrated his telephone at the Centennial Exposition in Philadelphia. The Bell Telephone Co. was formed in 1877. On March 13 1879, New England Telephone and Bell Telephone merged to become the National Bell Telephone Co. On April 17, 1880, National Bell reached a settlement with Western Union and became the American Bell Telephone Company. In March of 1885 the American Telephone and Telegraph (AT&T) was incorporated as a subsidiary of Bell Telephone to build and operate a long distance telephone network.

When Meucci had heard of Bell's patent in 1876, he increased his efforts to capitalize on his rightful invention. After 1880, there were widespread complaints of poor service by the Bell company. With the aid of Meucci, a syndicate was formed in 1883 by Messrs Rogers, Berwind, Quintard and Wilds, and named the Globe Telephone Company. Globe "(was) formed for the purpose of carrying on some part of its business out of the State of New York ... and the names of the town and county in which the principle part of the business of said Company within this State is to be transacted are the City and County of New York." Using Meucci's inventions as the basis, Globe planned to build and sell Meucci telephones to that market as well as "... wire, switchboards, insulators, &c., at low rates." Globe apparently paid Meucci a salary of \$150/month until 1886. Ester had died in 1884.

Globe had by then obtained Meucci's rights and inventions, securing such evidence as it believed would convince (at the proper time) the highest tribunal in the land of the truthfulness of the statements

made in a Complaint filed with the US Justice Department by Globe late in 1885, disputing the Bell patents on the basis that the Meucci Caveat filed five years prior to Bell had rendered the Bell Patents as worthless. The ensuing trial led to the Meucci deposition and exhibits supporting his prior discoveries and inventions. The case went to US Federal Court. Affidavits by many Staten Island and New York persons attested to the existence of and experience speaking with the Meucci telephone instruments. Bell then sued Globe for infringement in the Southern District Court of New York, presided by Judge William James Wallace. The belabored testimony by Meucci was in Italian, translated to English, then frequently misinterpreted and challenged by the testimony of MIT Professor-Engineer Charles R. Cross. In the end, Judge Wallace ruled in favor of Bell, accepting MIT Professor Cross's interpretations, declaring in his judgment brief that that Meucci's devices were little more than a toy "string telephone."

There followed over several years a series of complaints by Meucci *et al* against Bell, and demurs by the US Government,¹⁹, ending with case abandonment in 1897, as it had become then "moot" since Bell's 1876 questioned patent expired in 1893: Such US Government actions were: ***March 1886- Bill of complaints in Southern Ohio; December 1886- Ohio Case dismissed; January 1887- Bill of Complaints filed in Massachusetts; Judges sustain demurrer by Bell lawyers; November 1887- Government appeals to Supreme Court; November, 1888- Supreme Court reverses verdict, rejects demurer and remands the case for trial; October 18, 1889- Meucci died on Staten Island (a detailed obituary was published in the Baltimore Sun on 19 October, 1889); November 1897- The US Supreme Court Trial was closed by consent as moot.*** In all, some 18,000 pages of testimonies and information – never formally published – resulted from these trials over a 12-year period. Neither Bell nor the Bell Telephone Company ever won any of these trails. Much of this information is still available in major libraries throughout the US^{11, 12}.

In H. A. Frederick's 1931 JASA paper on microphone development,²⁰ Meucci was not mentioned alongside the 19th century works of Reiss, Dolbear, Blake, Drawbaugh and others, as Meucci never developed a variable resistance transmitter, later called a "microphone." It was not until 1933 that Guglielmo Marconi, "Father of the Radio", in celebrating contributions to communications ("Century of Progress") at the World exhibition in Chicago displayed models of Meucci's 1857 and 1867 earpiece-transmitters.⁸ These were like #6 and #8, but with a handle. Marconi had commissioned the Galileo Workshops in Florence, Italy to construct four telephone pairs from Meucci's notes and sketches (Figure 10). One pair remained at the Museum of Science and Industry in Chicago, another in the National Science Museum in Milan, Italy, a third in the SIRTl Telecommunications Museum. More reconstructions have been made by the Galileo Workshops. Photographs of a pair of these handsets and a rare copy of the famous caveat are on exhibit at the Garibaldi-Meucci museum on Staten Island, NY.

In our times, Giovanni Schiavo published research on these matters in his 1958 book¹ on Antonio Meucci. In 1998, an Italian telecommunications engineer Basilio Catania,^{3,8} noticed a newspaper article about one Antonio Meucci claimed to have invented a "Sound Telegraph" before 1870. He found articles about Meucci in his company's library, and more unpublished information about Meucci in the libraries in Florence and Rome. Catania began serious research on Meucci on retirement in 1990 through a grant from his employer, visiting Havana, Washington, Staten Island and Bayonne, NY. He found historical trial documents at the US National, New York and New England Archives. It was not until 1994 that he identified convincing evidence of Meucci's inventive priorities in a 1885 translation of Meucci's laboratory memorandum book by Michael Lemmi,⁹ a New York attorney and acquaintance of Meucci.

Most convincing was a sketch created by Meucci about his telephone tests in 1862 that showed a large wire coil midway along a long transmission line. Meucci had testified that this coil made long distance voice reproduction stronger and clearer.²⁰ This phenomenon (inductive loading) was rediscovered by Pupin some 30 years later; 18 years after the 1883 trial. In all, there were four noteworthy discoveries or observations by Meucci: 1- Inductive loading of long transmission lines will "increase the strength and clearness of the voice" Memorandum Book Page 35, 1870 (patented

by Pupin in 1900), 2- Thicker wires and preferably multiple copper wires wrapped in cotton or paper for insulation were needed to transmit the voice more clearly (realized today as the measure required to counteract the rise in wire resistance to high frequency currents via the “skin effect”) and to obtain a distance of about one mile,²⁰ Memorandum Book, August 1870; 3- The need for quiet when listening to the transmitted voice; 4- An anti-side tone circuit, represented by the second and separate transmission wire in Corradi’s drawing, Figure 6. Items 2- and 3- were quoted in his 1871 Caveat. Item 3 is linked to the hidden benefit of the telephone; confidential privacy is more assured since no one else sees or hears the messages transmitted; a fact overlooked by most or all 1860-1870 financial backers.

Catania met a New York Supreme Court justice in 1999, who had Catania give a lecture on Meucci at New York University in 2000[21]. Speaker of the New York City Council Peter Vallone learned of this and introduced City Council resolution No. 1556, to recognize the priority of Meucci’s invention of the telephone, passed unanimously. Then Representative Eliot Engel, from New York introduced US House Resolution No. 269 to acknowledge Meucci as the true inventor of the telephone. On June 11th, 2002, Jo Ann Davis of Virginia moved to suspend the house rules and agree to Resolution 269. After commemorating statements of several other representatives, H269 was passed with a two-thirds majority.²² In Catania’s words “This Florentine takes his place among others such as Dante, Michaelangelo, Galileo, Lorenzo Ghiberti and Machiavelli.” In Jo Ann Davis’s words; “Meucci should be remembered with other innovators, like Edison, the Wright Brothers, and Marconi whose vision and tenacity changed our lives for the better.”

Post-Notes:

Since the initial phono-electric effect was first discovered in Havana by accident in 1849, Cuban authorities can claim Havana to be the birth place of telephony.

In 1881, after the cottage lot was sold to a brewery that already had bought the adjacent lots, the cottage was moved to the easterly side of Forest Street, keeping its orientation unchanged. Later, around 1905 it was moved again to its present location at the corner of Chestnut Avenue and Tompkins Street.²³ The Order of the Sons of Italy in America now maintains the Garibaldi-Meucci Museum at there, 420 Tompkins Street, Staten Island, NY 10305. See <http://www.garibaldimeuccimuseum.org/>.

A few copies of Schiavo’s book on Meucci might be found for sale on the internet.

Catania has available a CD³ with all his data, document copies and his presentations in English, Italian and Spanish. He has also published a fascinating biography of Antonio Meucci in three phases; Florence, Havana, and New York with comments on the scientific knowledge and social conditions of those times.²³

References

1. “Antonio Meucci, Inventor of the telephone”, Giovanni Schiavo, 1958, The Vigo Press, New York City (OCLC # 2528762).
2. Basilio Catania, Director General of CSECL Torino, Italy (retired), “Antonio Meucci: how electrotherapy gave birth to telephony” European Transactions on Telecommunications. 2004; 14:539—552 (DOI: 10.1002/ett.953), Historian ‘s Corner.
3. Catania, B., “Meucci Twin CD”, Available on request..
4. Catania, B., *Antonio Meucci: How electrotherapy gave birth to telephony*, ETT—European Transactions on Telecommunications, Vol. 14, No. 6, November/December 2003, p. 539-552. Errata Corrige of Fig. 12 on Vol. 15, No. 3, May/June 2004, p. 293

5. Deposition of *Antonio Meucci*, rendered Dec. 7, 1885 - Jan. 13, 1886, National Archives and Records Administration, Northeast Region, New York, NY - Records of the US Circuit Court for the Southern District of New York - The American Bell Telephone Co. et al. vs. The Globe Telephone Co. et al. Also 'Deposition of Antonio Meucci,' New York Public Library (Annex), Ans. 14-17 and Meucci deposition of 11 September 1886, answers 626-630.

6. Affidavit of *Antonio Meucci*, sworn 9 October 1885, National Archives and Records Administration, Northeast Region, New York, NY - Records of the US Circuit Court for the Southern District of New York - The American Bell Telephone Co. et al. vs. The Globe Telephone Co. et al. - Deposition of Antonio Meucci, Defendant's Exhibit No. 120. Also 'Deposition of Antonio Meucci,' New York Public Library (Annex), Part 2, pp. 10-32.

7. Basilio Catania, www.comunicazioni.it/, extract from a 26 December Meucci letter to Garibaldi, computer translation into English.

8. Catania, B., *Antonio Meucci's "Teletrofono"—The True Story Behind the Invention of the Telephone*, Accenti, The Canadian Magazine with an Italian Accenti periodical, Montreal, Cover Story, Vol. 1, No. 3, July-August 2003, p. 16-28. Also reproduced in "Puglia Review" (Canada), from Vol. V, No. 4, Winter 2003, Vol. VI No. 2 Summer 2004, p. 6-8, pp 17, 30-32. Also see [5] 11 September 1886 deposition answer #3.

9. Affidavit of *Michael Lemmi* (Translation of Meucci's *Memorandum book*), sworn September 28 1885, National Archives and Records Administration, College Park, MD - RG60, Year Files Enclosures 1885-6921, Box 10, Folder 1, 230/3/46/6 (originally filed at the Interior Department file 4513-1885, Enclosure 2).

10. "Prehistoric Telephone Days", Alexander Graham Bell, the National Geographic Magazine, XLI, No. 3, March, 1922.

11. **Meucci, A.**, *Sound Telegraph*, U. S. Pat. Off. Caveat No. 3335, filed Dec. 28, 1871; renewed Dec. 9, 1872; Dec. 15, 1873. File wrapper kept at the National Archives and Records Administration, College Park, MD (USA) - RG60, File 6921-1885, Box 10 (or Massachusetts-Box 137), Folder. Also "Deposition of Antonio Meucci" (Defendants' Exhibits No. 111, 122 & 123), Part 2, pp. 1-9, New York Public Library. Also "Deposition of Thomas D. Stetson" (Defendants' Exhibit 141 1/2), Records of the US Circuit Court for the Southern District of New York, "American Bell Telephone Co. et al. vs. Globe Telephone Co. et al.," National Archives and Records Administration, Northeast Region, New York, NY. Also Records of the Circuit Court of the United States, District of Massachusetts, "United States of America vs. American Bell Telephone Co. and Alexander Graham Bell," Exhibit from Defendants, National Archives and Record Administration - New England Region, 380 Trapelo Road, Waltham, MA (USA)

12. Caveat as recorded in the Records of the Supreme Court. Possibly referenced by [8]. Reproduced with the permission of the Garibaldi-Meucci Museum.

13. Meucci testimony, Bell v Globe, Answer #94. See Schiavo, G. E., *Antonio Meucci, Inventor of the Telephone*, The Vigo Press, New York City, NY (USA), 1958.

14. See [5], Ans. 94.

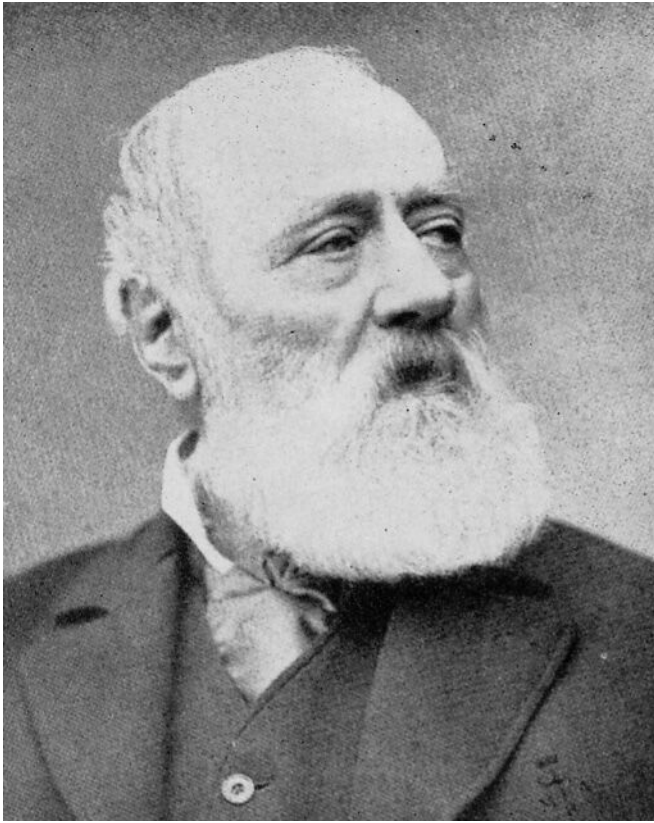


Figure 1: Antonio Meucci, 1885.

MEUCCI AFFIDAVIT.

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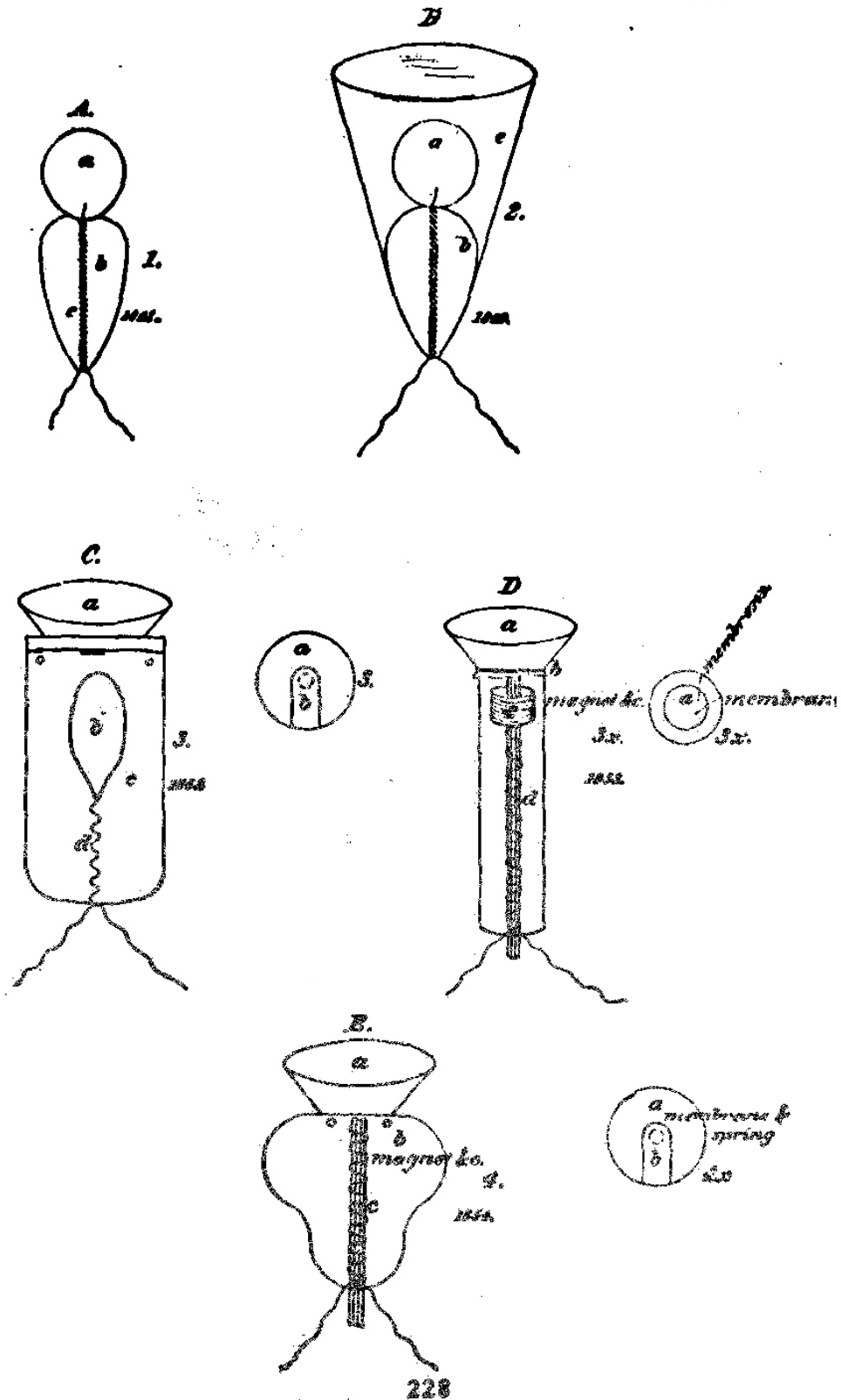
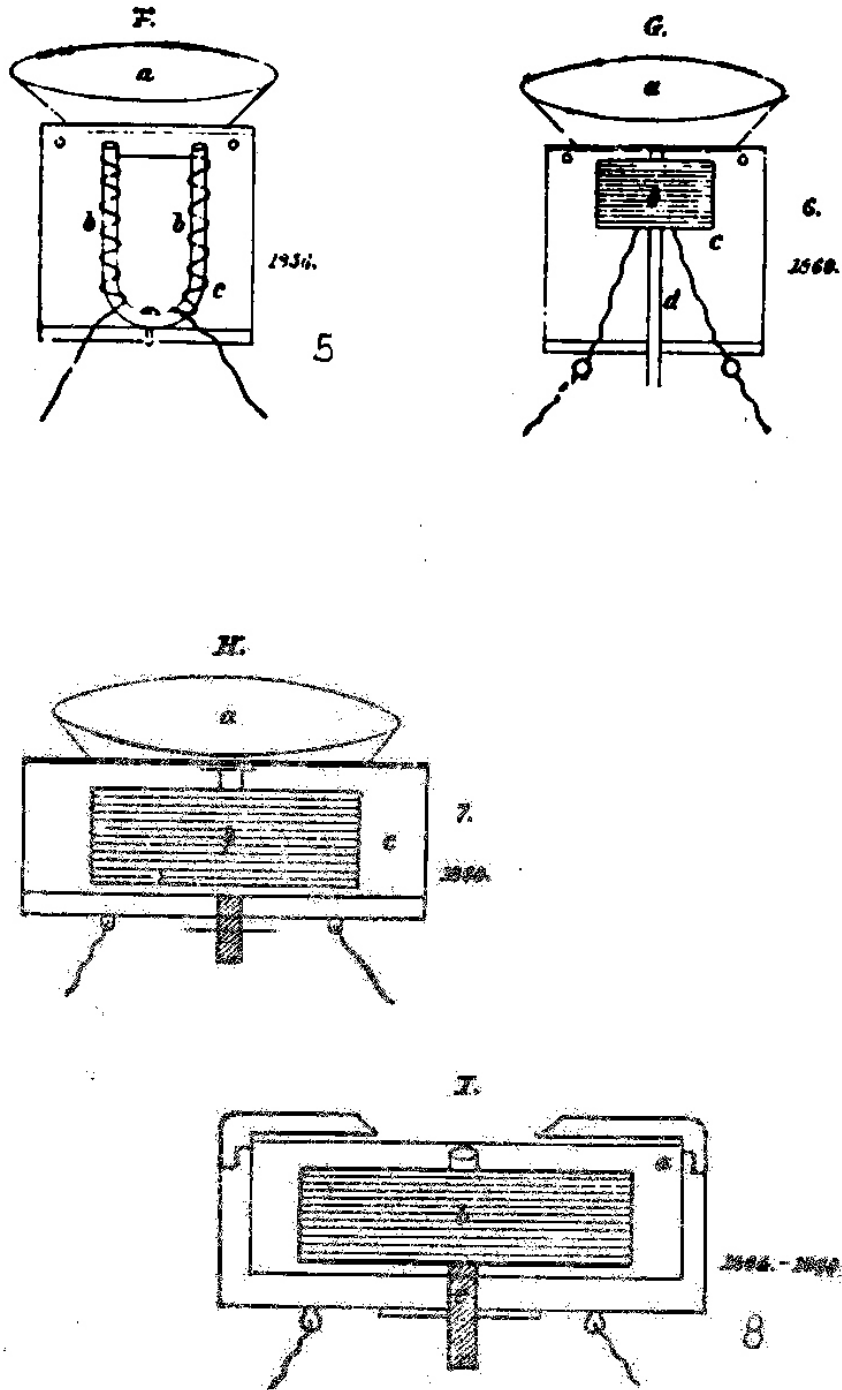


Figure 2: Phones #1 - #4. Permission to reproduce being sought from the Vigo Press.

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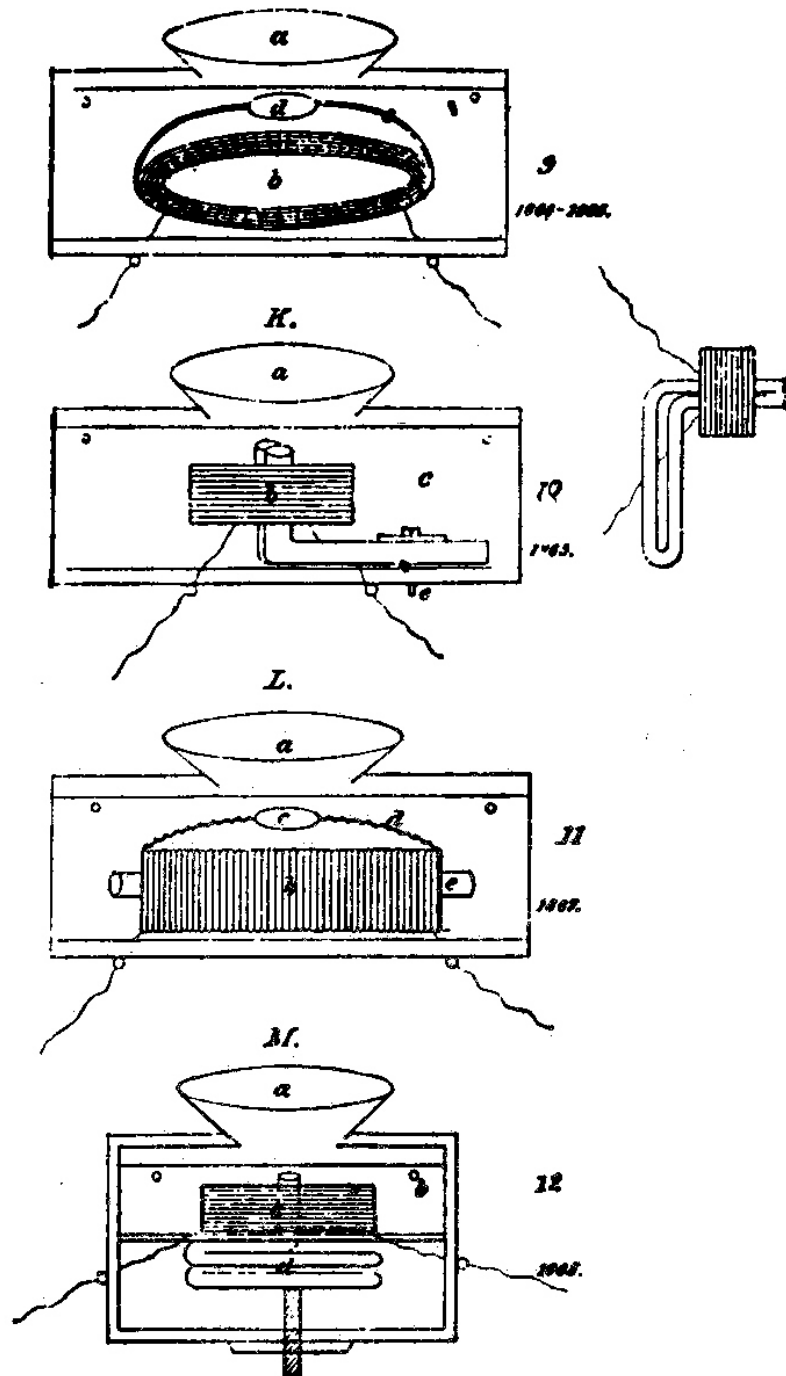


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Figure 3: Phones #5 - #8 Permission to reproduce being sought from the Vigo Press

MEUCCI AFFIDAVIT.

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Figure 4: Phones #9 - #12 Permission to reproduce being sought from the Vigo Press.

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of Antonia Meucci, for "Sound Telegraphs"
and of renewals, filed, December 9th 1872,
and December 15th 1873, in the matter of
the same.

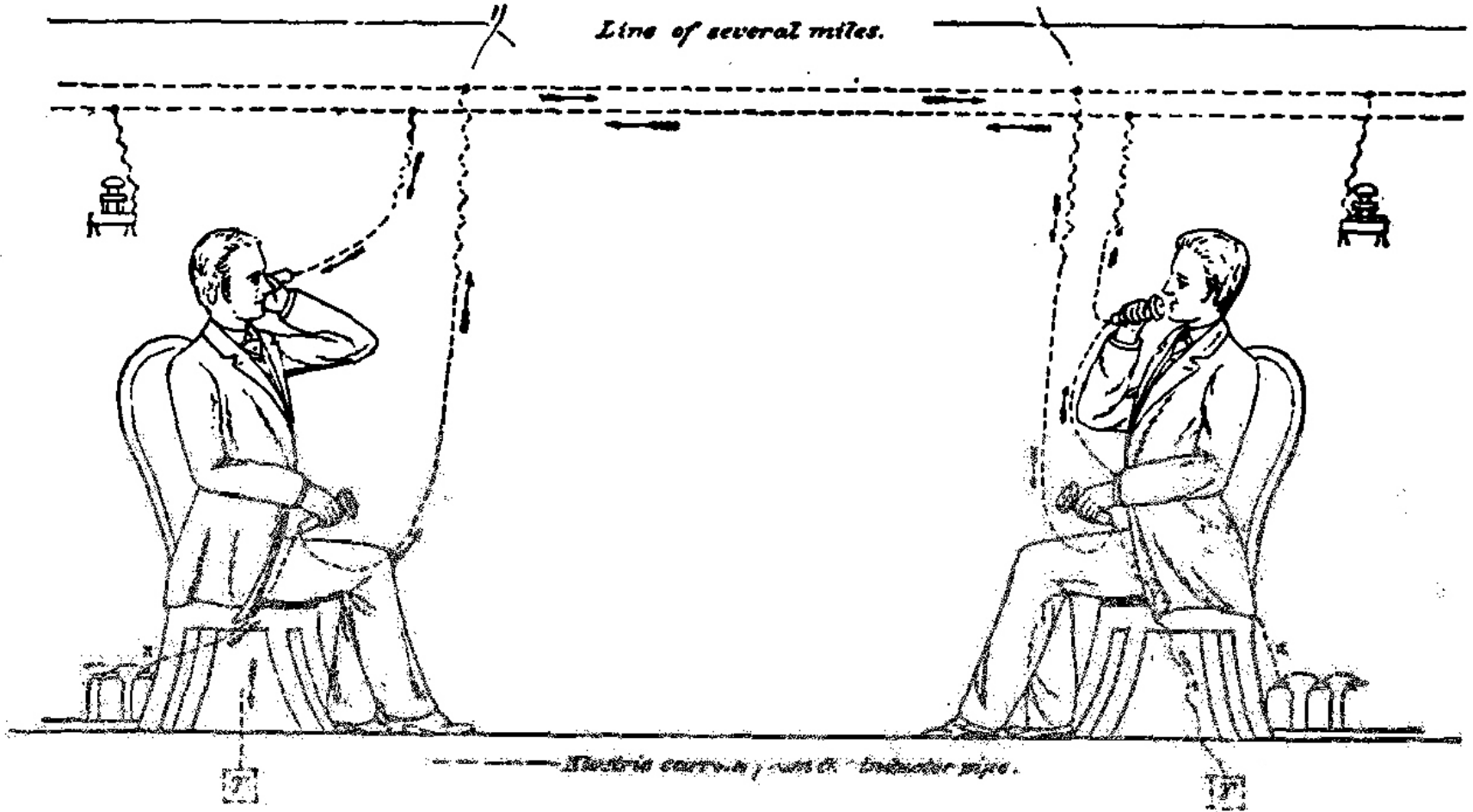
In testimony whereof *L. Benton J. Hall*
Commissioner of Patents, have caused the Seal
of the Patent Office to be affixed this 26th
day of April, in the year of our
Lord one thousand eight hundred and eighty-
NINE, and of the Independence of the United
States the one hundred and Eleventh.

Benton J. Hall
Commissioner.

(9045-1,600.)

Page 14 Figure 5: Certificate verifying the 1871 Caveat, providing an official copy [11].
Permission being sought from the National Records Administration, New England Division.

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DEPENDANT'S EXHIBIT

Figure 6: Corradi's 1883 recreation of the drawing he furnished Meucci in 1858
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DEFENDANTS' EXHIBIT

CAVEAT.

PETITION.

The petition of Antonio Meucci, of Clifton, in the County of Richmond and State of New York, respectfully represents:

That he has made certain improvements in Sound Telegraphs, and that he is now engaged in making experiments for the purpose of perfecting the same preparatory to applying for Letters Patent therefor.

He therefore prays that the subjoined description of his invention may be filed as a Caveat in the confidential archives of the Patent Office.

ANTONIO MEUCCI.

OATH.

STATE OF NEW YORK.

COUNTY OF RICHMOND, ss.

ANTONIO MEUCCI, the above named petitioner, being duly sworn, deposes and says that he verily believes himself to be the original and first inventor of the improvement in Sound Telegraphs described and claimed in the foregoing Specification; that he does not know and does not believe that the same was ever before known and used; and that I am a citizen of the United States.

ANTONIO MEUCCI.

Subscribed and sworn to before me, this twenty-third day of December, 1871.

JOSEPH DOYLES, *Justice of the Peace.*

The following is a description of the invention, sufficiently in detail for the purposes of this caveat.

I employ the well-known conducting effect of continuous metallic conductors as a medium for sound, and increases the effect by electrically insulating both the conductor and the parties who are communicating. It forms a Speaking Telegraph, without the necessity for any hollow tube.

I claim that a portion or the whole of the effect may also be realized by a corresponding arrangement with a metallic tube.

Figure 7: First text page of the 1871 Caveat copy.
Reproduced by permission of the Garibaldi- Meucci Museum.

I believe that some metals will serve better than others, but propose to try all kinds of metals.

The system on which I propose to operate and calculate consists in isolating two persons, separated at considerable distance from each other, by placing them upon glass insulators; employing glass, for example, at the foot of the chair or bench on which each sits, and putting them in communication by means of a telegraphic wire.

I believe it preferable to have the wire of larger area than that ordinarily employed in the electric telegraph, but will experiment on this. Each of these persons holds to his mouth an instrument analogous to a speaking trumpet, in which the word may easily be pronounced, and the sound concentrated upon the wire. Another instrument is also applied to the ears, in order to receive the voice of the opposite party.

All these, to wit, the mouth utensil and the ear instruments, communicate to the wire at a short distance from the persons. The ear utensils being of a convex form, like a clock glass, enclose the whole exterior part of the ear, and make it easy and comfortable for the operator. The object is to bring distinctly to the hearing the word of the person at the opposite end of the telegraph.

To call attention, the party at the other end of the line may be warned by an electric telegraph signal, or a series of them. The apparatus for this purpose, and the skill in operating it, need be much less than for the ordinary telegraphing.

When my sound telegraph is in operation, the parties should remain alone in their respective rooms, and every practicable precaution should be taken to have the surroundings perfectly quiet. The closed mouth utensil or trumpet, and the enclosing the persons also in a room alone, both tend to prevent undue publicity to the communication.

I think it will be easy, by these means, to prevent the communication being understood by any but the proper persons.

It may be found practicable to work with the person sending the message insulated, and with the person receiving it, in free electrical communication with the ground. Or these conditions may possibly be reversed, and still operate with some success.

Both the conductors or utensils for mouth and ears should be in

Figure 8: Second text page of the 1871 Caveat Copy.
Reproduced by permission of the Garibaldi- Meucci Museum.

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DEFENDANTS' EXHIBIT

fact I may say must be, metallic, and be so conditioned as to be good conductors of electricity.

I claim as my invention, and desire to have considered as such, for all the purposes of this Caveat,

The new invention herein set forth in all its details, combinations and sub-combinations

And more especially I claim

First. A continuous sound conductor electrically insulated.

Second. The same adapted for telegraphing by sound or for conversation between distant parties electrically insulated.

Third. The employment of a sound conductor, which is also an electrical conductor, as a means of communication by sound between distant points.

Fourth. The same in combination with provisions for electrically insulating the sending and receiving parties.

Fifth. The mouthpiece or speaking utensil in combination with an electrically insulating conductor.

Sixth. The ear utensils or receiving vessels adapted to apply upon the ears in combination with an electrically insulating sound conductor.

Seventh. The entire system, comprising the electrical and sound conductor, insulated and furnished with a mouthpiece and ear pieces at each end, adapted to serve as specified.

In testimony whereof, I have hereunto set my name in presence of two subscribing witnesses.

ANTONIO MEUCCI.

Witnesses :

SHIRLEY McANDREW.

FRED'K HARPER.

Endorsed : Patent

Dec. 28, 1871.

Office.

Figure 9: Last text page of the 1871 Caveat.
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= Page 19 of 19 =



Figure 10: Marconi's Reconstruction of Meucci 1857-67 Telephone [3].
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