

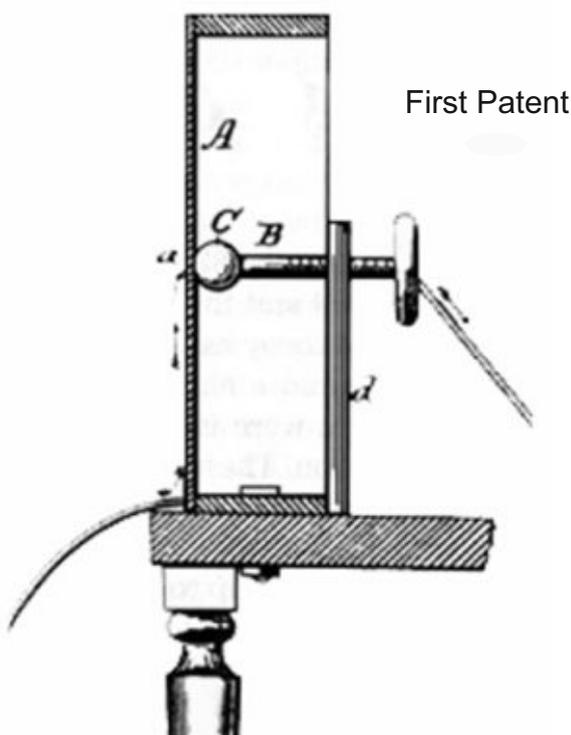
Emile Berliner

by Bob Estreich



Alexander Graham Bell invented the telephone. Well, he invented one that worked, but not very well. Bell's eventual success rested on the work of other inventors who fixed the problems or found a better way. Emil (he later changed it to Emile) Berliner was one such.

Berliner was born in Hanover, Germany on May 20, 1851. In 1870 he left Hanover for the United States. He had been offered a job with a family friend, and he left Germany to avoid military service. He worked as a shop assistant for some years, then got a job as cleanup man in the laboratory of Constantine Fahlberg, who invented saccharine. This fired his interest in science and inventing. He furthered his education at a night school run by the Cooper Institute, and learnt basic physics from a textbook given to him by a local drugstore owner, but the direction of his work was not determined until he attended the American Centennial celebrations in Washington.



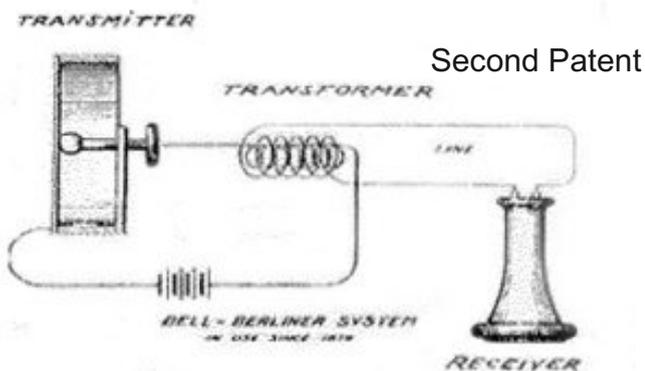
There he saw Bell's telephones. There was general amazement at the new device, but Berliner noticed its faults as well. Although the Centennial phone and its later derivatives were adequate receivers if they had a strong enough signal, they were poor transmitters. They were faint, noisy and clumsy. Watson described using the phones as like holding a packing case in each hand. They were based on the induction principle - a varying electric current passed through a coil and influenced a nearby diaphragm (receiver), or the movement of the diaphragm influenced the current flowing through the coil (transmitter). The signal dropped off quickly with increasing distance. The receiver part was also the microphone, so any outside noise interfered with the received voice.

Berliner came up with two improvements. The first was an improved transmitter. He knew that if a wire was not screwed down tight on a terminal, the loose contact would give a variable high resistance. He used this property to design a "loose-contact" transmitter. Considering his basic knowledge of physics, the transmitter was vastly better than Bell's. It increased the volume dramatically, thus extending the range over which a telephone could work. He set up a working system between his rented room and his landlady's rooms, so he was able to refine the transmitter into a good working model. He filed for a patent on 4 June 1877. The patent described a vertical metal diaphragm with a metal ball held against it by adjustable screw pressure. The important word here is "metal". It caused Berliner problems in the years to come. Because of similar patents, the application was delayed by the Patent Office for some years.

The patent application came to the notice of the Bell company, and Watson was sent to investigate. It is a measure of Bell's concern for

the poor performance of his transmitter that they hired Berliner and bought the rights to his invention for \$50,000 as soon as Watson returned with a glowing recommendation (*both of the invention and of the man*). During the next seven years, Berliner worked out problems associated with the new telephone industry for the Bell company.

His second major contribution was the use of the induction coil. This greatly increased the voltage out of the transmitter. This in turn increased the range so the telephone could be used over practical distances. It also stopped the dropouts that the loose contact transmitters were prone to if the voice was too loud. Berliner's coil was based on earlier work done by Page in the United States and probably by Callan in Ireland. Until this point the induction coil was mostly used for scientific research and dodgy electrical "medical" treatments



A third but greatly unrecognized contribution occurred in the early 1880s. Another young inventor, Francis Blake, built a transmitter that had more potential than Berliner's. He offered it to the Bell company in exchange for shares, an arrangement that Bell took up. Blake's invention was somewhat similar to Berliner's but used a pellet of platinum and a bead of carbon for the electrodes, and was self-adjusting by spring pressure. Blake had run into a dead end trying to refine the transmitter into a good workable model. Berliner, with his knowledge of loose-contact transmitters, refined it into the production version that kept Bell in business through the early years. It was here that things started to go wrong for Berliner. The transmitter was originally known as the Blake-Berliner, but eventually his name was dropped from the production version because of patent conflicts with Edison's loose-contact carbon transmitter.

Thomas Edison filed for a transmitter patent on 27 April 1877. His application described a loose contact between "plumbago or similar inferior conductors", as opposed to Berliner's metal electrodes. The Patent Office ruled that the Edison and Berliner patents were "in interference" - that is, they conflicted with each other. To further confuse the issue, Daniel Drawbaugh applied for a similar patent in 1880. Eventually Drawbaugh's patent was rejected, as Edison's invention had already been in use for two years before Drawbaugh applied. The interference between Berliner and Edison was then decided, eventually. The American Bell management delayed the patent for years by being slow providing information to the Patents Office and other delaying tactics. Their intention was to use the Berliner patent, when finally awarded, to extend their control over the telephone for a further seventeen years after Bell's and Blake's patents expired. Berliner finally got his patent in 1891 and Edison got his in 1892 - fourteen years after the patents were applied for. Until then, the Blake transmitter boxes were stamped with the names of all relevant patent holders.

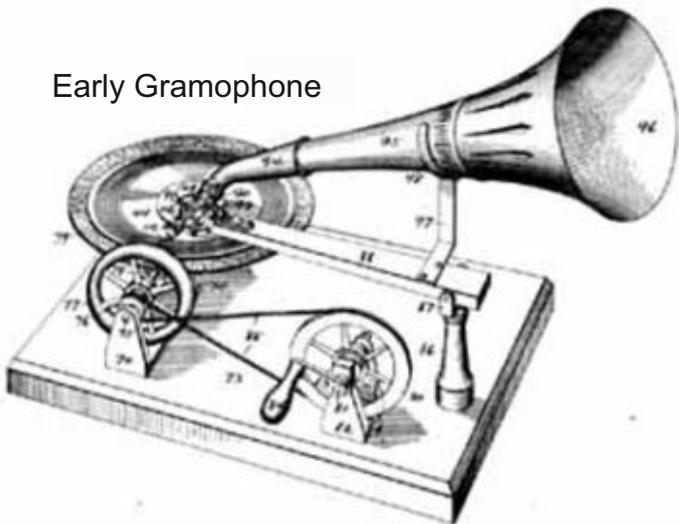
Berliner's patent description was pretty broad and open to interpretation. Although he specifically mentioned metal electrodes, his description covered the entire principle of variable resistance generated by varying pressure. This could be read to include carbon transmitters, but Berliner did not at this point develop multiple-contact transmitters. It did, however, leave Edison's patent open to legal problems. In the late 1893 the U.S. Attorney General started a case against Berliner and the American Bell company over the patent. The case was politically motivated by Bell's commercial enemies, who wanted to have the broad patent annulled and clear up any legal problems to allow them to use the Edison transmitter. The patent was initially overturned, but it was then upheld again in the Supreme Court. The outcome was the restriction of Berliner's patent to metal electrodes only, which left Edison's patent to cover the rest.

Meanwhile Berliner married Cora Adler in 1881, and became an American citizen. He was disappointed by the legal ending to what was his

first invention, and in 1884 he resigned from American Bell to become a private researcher and inventor.

In 1886 Berliner started on the invention that was to gain him the most glory, the gramophone. He probably discovered this interest through working with Bell, as both Bell and Edison developed sound recording systems using cylinders of wax (*in Bell's GraphoPhone*) and tinfoil (*in Edison's Phonograph*). The disadvantage of these was that the cylinders could not be easily duplicated, and in Edison's machine they could only be played once before the delicate tinfoil covering was damaged. Berliner developed a flat disc to hold the sound grooves. Some friends financed him to set up the United States Gramophone Company to produce the device in 1893, but sales were slow and it mostly sold as a toy. From the start he set out to produce a system that would be practical to bring entertainment to people, but the sound was poor due to the variable speed of the handcranked turntable.

Early Gramophone



He was fortunate to meet engineer Elridge Johnson at this time. Johnson designed a steady rotation clockwork motor that solved the problem and made the Gramophone a commercial proposition. Johnson liked Berliner, and introduced him to friends who provided financial backing for the two of them to form the Victor Talking Machine Company. Johnson took over distribution for Berliner. Other parts of Berliner's invention were equally important. His flat discs were made initially of coated glass, then zinc, and finally of longer-lasting shellac, and so could be easily reproduced by pressing

copies from a master disk. He devised a master disk cutter that packed the grooves closer together, allowing more music to fit on a disk. (*Edison's Phonograph could only hold about two minutes of sound*). He designed a playback needle that used the side of the stylus rather than the tip. This reduced the wear on the needle and the disk. If fine slate dust was added to the shellac mixture, the disks lasted longer, were stronger, and could "sharpen" the stylus as they were played.

The Gramophone was popular. It brought reliable music reproduction to the masses, and Berliner, who made friends easily, persuaded many popular artists to record for him. These included Dame Nellie Melba and Enrico Caruso. Berliner loved music himself, and played piano as a backing musician on some of the earliest recordings. Edison and Bell combined their companies to produce phonographs with the best features of each, but they found it hard to compete with Berliner's longer records, cheaper duplicating costs, and wider entertainment catalogue.

In 1908, in what seemed a smart marketing move, the Victor company bought the rights to a cute painting of a dog listening to a recording. The painting by Francis Barraud was called "His Masters Voice". It became one of the most famous trademarks of the twentieth century. It was registered in 1900. The painting was originally offered to the Edison Bell Company, and the dog Nipper was painted listening to an Edison Phonograph, but that was easily changed.

Once again, Berliner ran into trouble with the commercial side of his invention. He had sold the rights to the Victor company, in which he was now only a minority shareholder. They realized that they had a good product but no marketing experience. They signed up Frank Seaman to advertise and promote the Gramophone. Seaman signed an agreement with the Columbia Phonograph company to produce the ZoneOPhone, a gramophone copy. Berliner was unhappy with this - he saw it as a sellout of his invention to a commercial rival. With Berliner threatening legal proceedings, Seaman got a

court injunction that prevented Berliner selling the Gramophone in the U.S. in competition with Seaman's exclusive agreement. Berliner, disgusted, moved himself and his equipment to Montreal in Canada and set up again. He sold only 2000 records in his first year of operation, but business did well and he sold over two million in the next year. The early records were one-sided, with the picture of Nipper on the reverse, but by 1908 the records were double-sided.

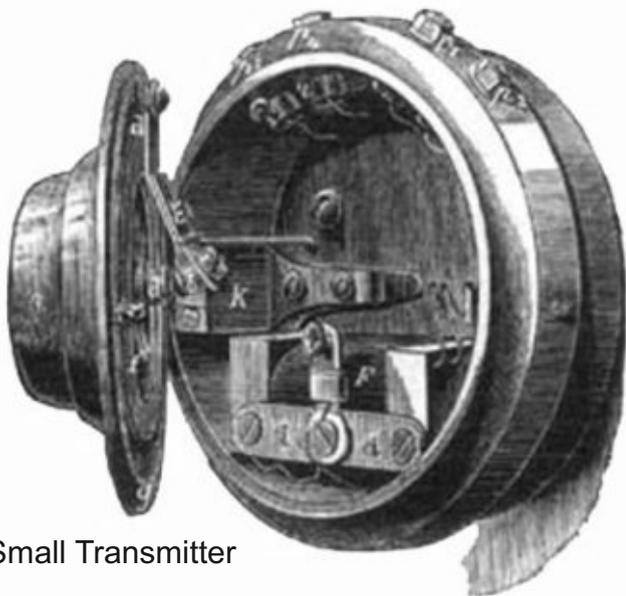
With financial stability, Berliner was able to continue experimenting in other areas. He was a music lover, but he was disappointed by the poor acoustic qualities of the halls in which many concerts were held. He developed an acoustic tile and acoustic flooring to correct the deficiencies. An interest in aircraft led him to develop and build a lightweight "radial" engine that powered a helicopter. It was said to have lifted two men off the ground in 1909. The dates are uncertain, but by 1922 he had a working helicopter that he showed to the U.S. Army.

On one of his trips to Europe Berliner became involved in telephones again. He returned to the single-contact transmitter and built a compact "capsule" version that could be used on a handset. It was demonstrated in Vienna in 1883.

contacts, and so was definitely in conflict with Edison's patent wherever it applied. This restricted the transmitter's use somewhat. His transmitters in Europe were built by a new company, Telephon-Fabrik J. Berliner, formed in 1881. The J was for his brothers, who ran the company for him - Joseph and Jacob. Jacob, who was recalled from America to run the company, had some business experience as the manager of a small tanning factory.

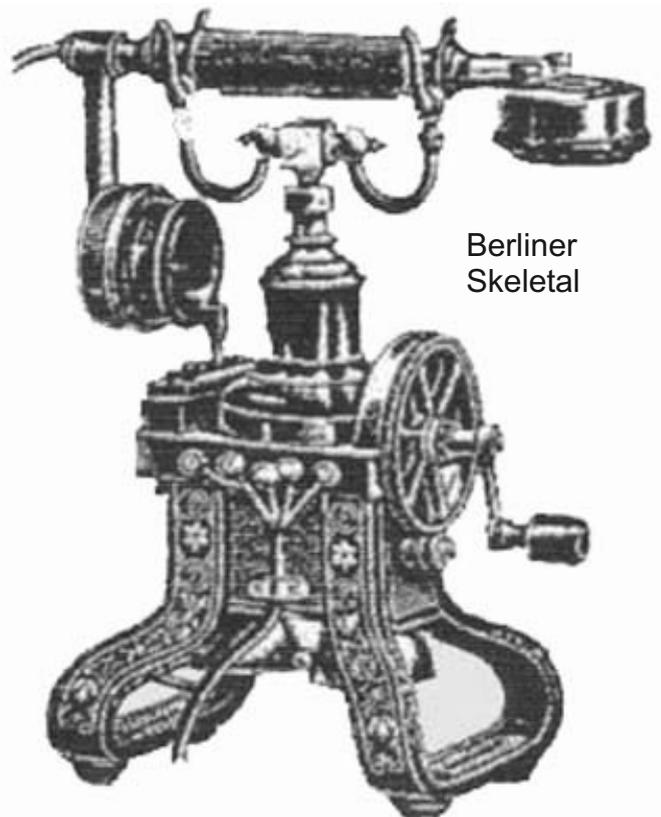
Once he had the Gramophone organised in Canada, Berliner returned to Germany in 1898 to set up production in Europe. He started a new company, Berliner Grammophon Gesellschaft, to manufacture it. This later became Deutsche Gramophone Gesellschaft, one of the world's greatest recording companies. The company was managed by his brother Joseph.

The legal situation with telephones in Europe was different to the United States, and many transmitters were being made that would have been in legal trouble in the U.S. The carbon granule transmitter was coming into wide use because of its superior performance, but it suffered from packing of the granules into the bottom of the transmitter.



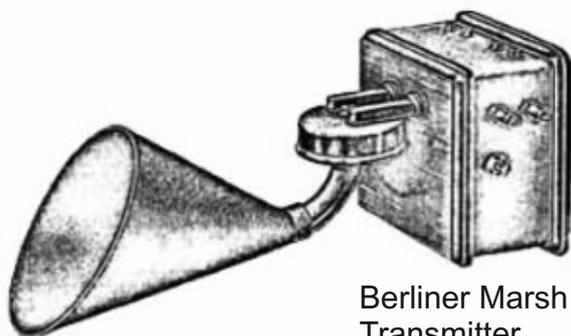
Small Transmitter

It was actually a version he had designed for the Bell company, which had been replaced by the Blake transmitter. It must have performed adequately, as it appears on phones used in France, Germany and Denmark. It should also be noted that this transmitter used two carbon



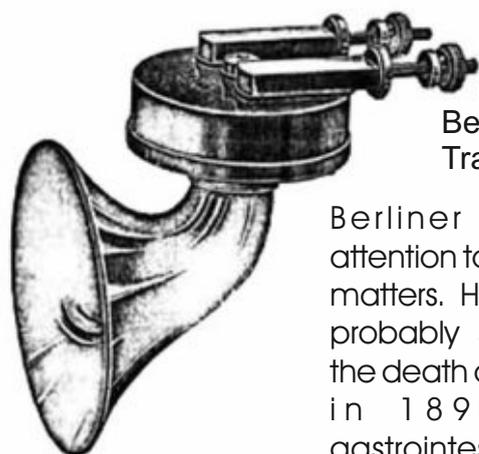
Berliner Skeletal

Berliner invented a version in 1893 that mounted the transmitter horizontally and fed the sound into a diaphragm at the base. This kept the granules shaken up and gave an efficient transmitter that was used by some manufacturers in Western Europe. It was called Berliner's Universal Transmitter in Europe. It is similar to an inverted version of Edison's original patent. Some are marked "Use Not Licensed Under Any U.S. Patents" so Berliner was aware of the legal complications. It is relatively unknown to collectors because it was not widely sold outside mainland Europe except by Marsh & Son in London. It proved a good substitute for the



Berliner Marsh Transmitter

Blake transmitters in Europe, and continued in production for around six to ten years. Berliner established the Berliner Telephone Company in Upper Thames Street, London to improve sales into British markets, but the general preference for Bell receivers or the new handsets was hard to beat. Just before World War 1 the company was sold and became Sterling Telephone and



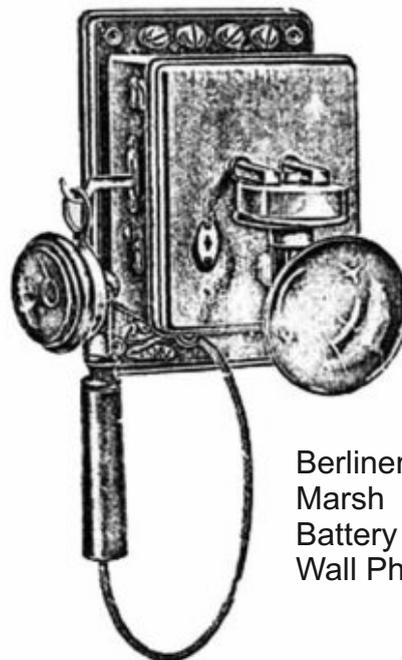
Berliner Marsh Transmitter

Berliner turned his attention to public health matters. His interest was probably stimulated by the death of his daughter in 1890 from a gastrointestinal attack.

The child mortality rate was approaching 30% and Berliner was convinced, probably correctly, that this was due to the consumption of unpasteurised milk. He formed the Society for the Prevention of Sickness in 1891, to encourage the scalding of milk to destroy

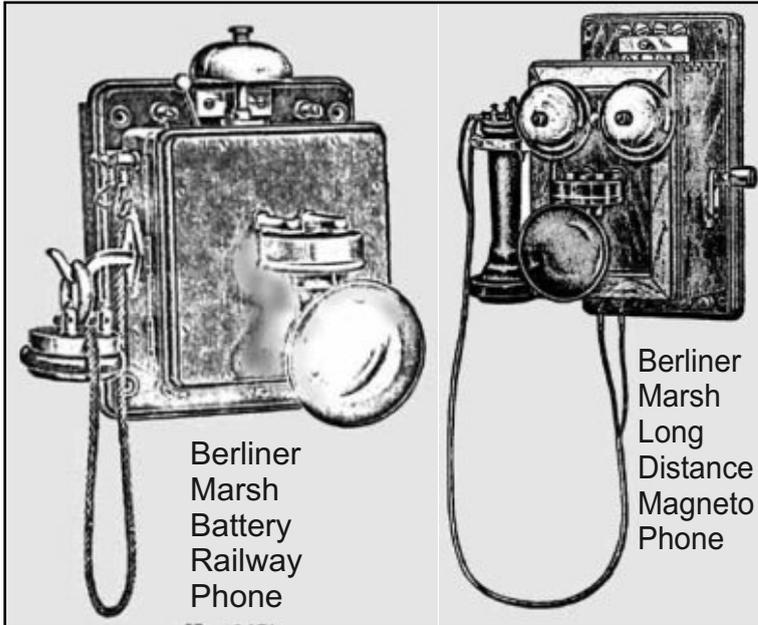
bacteria. He continued this work through the early 1900s, and it led to the adoption of milk health standards in the United States.

Berliner also believed in Womens' Rights. He endowed the Sarah Berliner Research Fellowship, named after his mother. This organisation gave Fellowship awards in many scientific fields to promising young women scientists.



Berliner Marsh Battery Wall Phone

He was not a man to promote himself. Although he was passionate about the things he cared for, like childrens' health, he lived a quiet life. There were cases where he would have been denied the credit he was due, and it was only his many friends who kept the record straight. The Blake-Berliner transmitter was one example. Another was when the U.S. Congress planned to mistakenly give Edison a medal for the invention of the Gramophone. His friends corrected that error, despite total silence from Berliner. Defying the Patent Office evidence, some early writers produced articles declaring that it was Edison who invented the loose-contact transmitter. The President of American Telephone and Telegraph, Theodore Vail, took it upon himself to correct that. There did not appear to be any animosity between Berliner and Edison. They were simply two inventors working in the same areas, and Edison was the better-known, so he inadvertently got some of the credit for Berliner's work. Even so, a scrapbook held in the Library of Congress Berliner Collection contains many



Berliner Marsh Battery Railway Phone

Berliner Marsh Long Distance Magneto Phone

Even in death he preferred to maintain a low profile. He asked for a quiet inexpensive funeral,



with his daughters to play some musical pieces that he loved, and some money to be given to poor mothers in his memory. He died on August 3rd, 1929, aged seventy nine.

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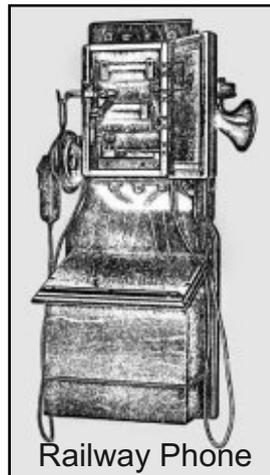
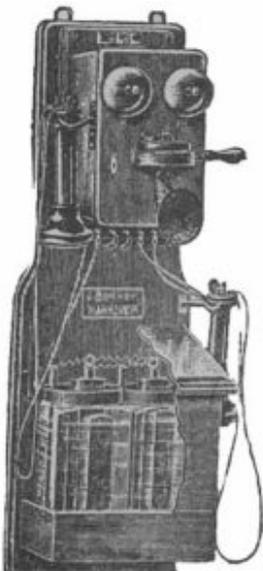
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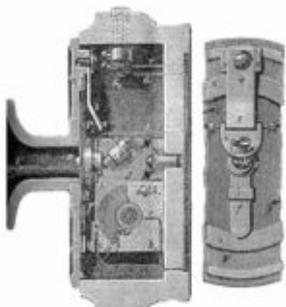
H Casson "*The History of the Telephone*" 1910

articles and legal details, and a note by Berliner that this information might be necessary in later years to protect his reputation. He obviously learned a lesson from Bell's legal troubles.

Berliner unnamed Phone Possibly Russell - 1886



Railway Phone



Berliner Patent Transmitter



Berliner Tel 15