

## TESLA AGAINST MARCONI

### *The Dispute for the Radio Patent Paternity*

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**Abstract: The goal of this paper is to present the multilateral personality of the greatest inventor in history, Nikola Tesla and the claims against Guglielmo Marconi for the radio patent paternity.**

**Index Terms: Tesla (T.), Marconi (M.), coherer, magnifying transformer, LW (long wave), SW (short wave), MW (medium wave).**

#### I. INTRODUCTION:

*A genius is born - Nikola Tesla [1]*

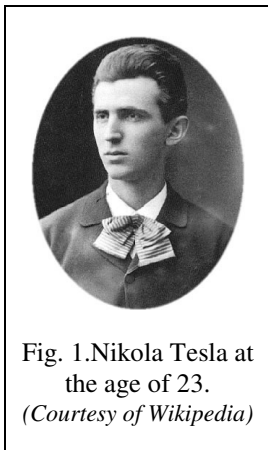


Fig. 1. Nikola Tesla at the age of 23.  
(Courtesy of Wikipedia)

Nikola Tesla (Fig.1) saw the daylight for the first time in his life in Smiljan, a small village in Croatia, in the Lika region, on July 10, 1856. His father, Rev. Milutin Tesla was a priest in the Serbian Orthodox Church Metropolitanate of Sremski Karlovci and his mother, Ana Kalinić, a very talented home craft tools producer, never learned to read, although

she was able to recall from memory entire epopees. After the school in Gospić, where he finished a 4 year term in only 3, T. started in 1875 to learn electrical engineering at the Austrian Polytechnic in Graz. Despite the affirmations of some sources, there are no precise indications if he received his Baccalaureate degrees from the university at Graz, since this university declared that he did not receive any title and did not continue his study after the first semester of the third year [1]. In December 1878 he left Graz, breaking also all relationships with his family. Some friends thought that he had drowned in Mura. What is known is that T. was employed for a year as assistant engineer in Maribor, Slovenia, where he suffered a nervous breakdown. Persuaded by his father to continue his studies, he attended the Charles-Ferdinand University in Prague in 1880, where he received the strong influence of Ernst Mach. However, he did not finish his study and left the university after the death of his father, completing a term of only 1 year. But he was genial, even without

an academic title. Tesla was an autodidact. He started to read many works, memorizing whole books. Specialists supposed that T. had a photographic memory. In his autobiography he tells that many times he experienced detailed moments of inspiration. Since his childhood, T. was stricken by halucinations accompanied frequently by blinding flashes of light. Much of the effects of this peculiar affliction were related to a word or an idea; the simple hearing of the name of an item was able to induce its detailed envisioning in Tesla's mind. Most of his inventions would have been *apriori visualized* in detail in his mind. (*picture thinking*). This perfect photographic memory was perhaps a hereditary inheritance from his mother, possessing, as said, a natural gift in remembering entire epic poems - who knows?

#### *Hungary and France*

After moving to Budapest in 1881 he started to work in Tivadar Puskás's Hungarian National Telephone Company. There, he worked with Nebojša Petrović, a young inventor from Austria, on a project using twin turbines to create continual power. On the opening of the telephone exchange in Budapest, 1881, Tesla became the chief electrician of the company, and later, the engineer for the country's first telephone system. He also devised a telephone repeater or amplifier, but according to others, the first loudspeaker. In 1882 he moved to Paris, attending the *Continental Edison Company*, where he was charged with the designing of improvements for electric equipments. In the same year, Tesla built the induction motor and improved a range of applications using rotating magnetic fields for which he received patents in 1888. After the death of his mother, in April 1882. he fell ill. Recuperation followed in Gospić and Tomingaj, his mother's birthplace.

#### *United States*

Tesla arrived in New York on 06.06.1884 with a recommendation letter from Charles Batchelor, his former manager, to Thomas Alva Edison, in which was stipulated textually: "*I know two great men: you are one of them; the other is this young man*". Tesla got the task to redesign Edison company's DC motors

and generators. He claimed later that he was offered US\$50,000 (~ US\$1.1 million in 2007, adjusted for inflation) for this task. Tesla gave the Edison company several efficient new patents, but as he asked in 1885 about the payment, Edison replied: "Tesla, you don't understand our American humor" and refused to pay. T. resigned after a new refuse of Edison to raise his weekly salary from 18 USD to 25. After a period of digging ditches for the Edison company, T. formed his own company, *Tesla Electric Light & Manufacturing*. The initial investors disagreed with T's plan for alternating current and he was forced again to work as a common worker a year to feed himself and to subventionate his next project. In 1887, he invented the brushless alternating current motor, presented to the AIEE (now IEEE) in 1888. In the same year, he started to develop his Tesla coil and began working with George Westinghouse at Westinghouse Electric & Manufacturing Company. In April of 1887, Tesla began investigating the X-rays, with his own single node vacuum tubes, a device without target electrode. Tesla was aware about the damages of these rays on the skin, but considered that the ozone and the nitrous acide are merely responsible and not the radiation itself. He made photos of his hand bones before Roentgen and sent them later to Roentgen, without commenting his discovery. T. was sure that these waves are longitudinal waves, produced in force-free magnetic fields, like in plasma, a fact confirmed also by others.

. This concept was demonstrated in 1891 (see fig.2). Unfortunately, much of these early researches of T. were lost in the 5<sup>th</sup> Avenue laboratory fire in March 1895. T. proposed later, in 1904, a "world system" in which energy could be transmitted wireless through various media, starting from a high-power ultraviolet beam forming a vertical ionized channel directly above the transmitter-receiver stations. The same concept was applied in further inventions of T., like the virtual lighting rods, the electrolaser electroshock weapon, being proposed for disabling war vehicles.

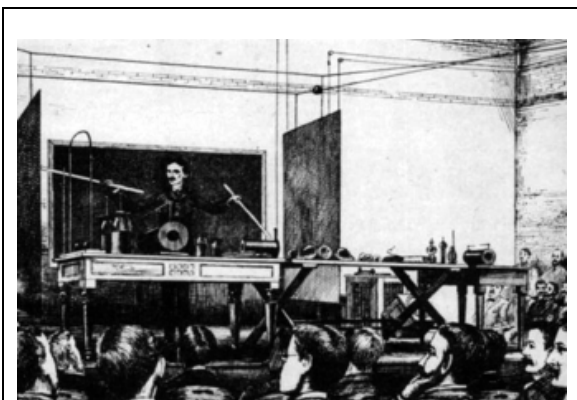


Fig.2. Tesla demonstrating his theory about the wireless transmission of energy waves in 1891 [Courtesy of Wikipedia]

## II. WIRELESS ENERGY TRANSMISSION – THE FIRST 100 YEARS' LANDMARKS [2]

1864 – James Clerk Maxwell – the mathematical model of electromagnetic radiation

1888 – Heinrich Hertz – the *apparatus for generating electromagnetic waves* – by many considered as the first radio transmitter.

1894 – Jagdish Chandra Bose ignited gunpower and rang a bell with electromagnetic waves.

1895 – Jagdish Chandra Bose succeeded to transmit electromagnetic signals at a distance of approx. one mile.

1897 – Nikola Tesla (the real inventor of the radio, inventor of microwaves and alternating current) patented his first inventions in the field of wireless energy transmission using for experiments his Colorado Springs tower.

1900 – Gulielmo Marconi failed to patent his radio invention . The patent office remarks: "*Marconi's pretended ignorance of the nature of a "Tesla oscillator" being little short of absurd...*"

1901 – Gulielmo Marconi sends and receives signals over the Atlantic. Replying to one of his collaborators, engineer Otis Pond, Tesla answers: "*Marconi is a good fellow. Let him continue. He is using seventeen of my patents.*"

1904 – at the St. Louis World Fair, a prize was offered for operating an aeromodel having a motor of 0.1 HP from a distance of 100 ft.

1926 – Shintaro Uda and Hidetsugu Yagi published their first article concerning the future Yagi antenna.

1964 – CBS News presented a reality program in which William C. Brown (former technical director of *JPL Raytheon*) and Walter Cronkite demonstrated the operation of a microwave-powered model helicopter, supplied from a microwave beam.

Starting with the 1975 Goldstone Deep Space Communications Experiments a large range of researches, using powerful microwave devices and lasers are now currently performed.

## III. TESLA IN COLORADO SPRINGS [1, 2, 4, 5]

About a year before his lecture on wireless energy transmission (1891) T. arrived to the conviction that rarefied air can be a suitable conductor and therefore

he went to Colorado Springs to build a transmission station in this part of the Rockies. Leonard E. Curtis, a friend, found land and provided power for the research from the El Paso Power Company of Colorado Springs and Colonel John Jacob Astor contributed with 30,000 US\$ to the construction. Nobody knew exactly what Tesla intended to perform in this laboratory (fig.2) erected on the highest mountain of the Southern Rockies– the Pikes Peak – he generally informed the press that he wants to transmit a signal from the Pikes Peak to Paris.



Fig.3. Tesla's Pikes Peak experimental station near Colorado Springs [Courtesy of PBS][

What was experimented in this experimental station is still not clear. In Colorado, with its strong storms, T. performed measurements and soon came to the idea that the earth is a relatively good conductor. He emitted the hypothesis that man could transmit strong impulses to any location on Earth practically without losses. To confirm his theory he constructed a new laboratory in Colorado Springs that would be able to produce the strong impulses that will be conducted to the earth. This new laboratory has a rolled back roof to prevent it from sparks and a wooden tower 80 ft high. On its top was placed a 142 ft metal mast that supported a large copper sphere. Inside the wooden tower was placed a huge Tesla coil. In an experiment of one second, the secondary coil produced wonderful electric sparks and a blue corolla. T. ordered to repeat the experiment without a time limit. Huge 100 ft long man-made lightning bolts were produced from the metal mast to the earth. The play came to an end with the burning of the power plant's generators. Since this event, T. received no more free electricity for his experiments from the El Paso Power Plant. The experiments in Colorado Spring lasted 9 months. Though T. wrote all the experiments in his diary, a question remains still not elucidated: did T. transmit powerful energy waves at Pikes Peak? Some reports conclude that several vacuum tubes planted in the soil in a certain distance from his laboratory were alighted, but this fact can be attributed to the specific high conductivity of this soil [1].

Another approach of T. was on the resonance frequency of the atmosphere between the earth's surface and the ionosphere. T. calculated that this may be about 8 Hz, a result which was verified in the 50's by other researchers that reached the same

result.

A third approach of T. was in the field of the ionosphere. T. anticipated correctly that this high stratus of the atmosphere may be highly ionized and therefore highly conductive. He started to think about a device able to transmit electrical energy from the Earth's surface to this high altitude. During this study, he received a repeating signal through his transmitter. He considered – and despite his ridiculization at his time for this announcement - today we may think too that Tesla was perhaps *the first person on Earth receiving a cosmic radio signal.*

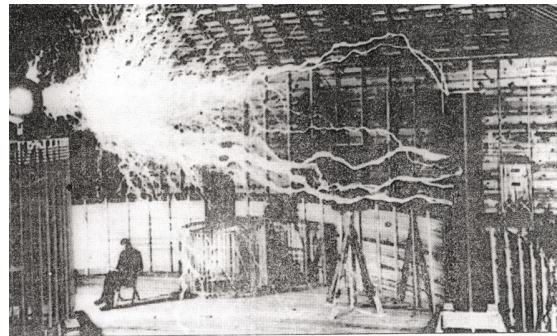


Fig. 4. The magnifying transformer at work in Colorado Springs [Courtesy of Wikipedia][1]

#### IV. THE LECTURES OF TESLA AND HIS PREDICTIONS [1, 2, 4, 5, 6]

Hertz had demonstrated the existence of electromagnetic waves in 1887 using as source of high frequency oscillations the sparks produced by discharges of condensers [6]. In his experiments, Tesla needed high frequency power on a vast scale and at very high voltages. In 1891 Tesla developed an AC generator with 384 poles and an output frequency of 10,000 Hz and soon he invented other generators even at higher frequencies, up to 25,000 Hz. In his study of increasing frequency and voltages, he started with the invention of such giant rotating machines, but finally he came to the conclusion that they are unable to produce the necessary effects and switched to other alternatives. Tesla was all the time convinced that undamped current generation is very important, a method which at his time was still inapplicable and will be introduced only after 1910. His early models utilizing the induction principle with stationary coils formed the equipment used for the large commercial machines built afterwards for radio communications. In his experiments Tesla used tuned circuits, reduction coils and oscillatory spark circuits, which, combined with an oscillation transformer create spectacular arc discharges. He exposed his theory in some famous lectures. The first of them was in 1892,

before the American Institute of Electrical Engineers in New York, the second, also in 1892, before the Institution for electrical Engineers and the Royal Institution in London, the Societe Internationale Francaise des Electriciens and the Societe Francaise de Physique in Paris and the third in 1893 before the Franklin Institute in Philadelphia and the National Electric Light Association in St. Louis. In these lectures, Tesla included also references on the structure of matter. In 1893 he also had an extensive exhibit at the Chicago World's Fair. A couple of years before, he explained how metals and dielectric materials could be heated using high frequency coils. He also described the effect of high frequency on the human body (diathermy). He produced vacuum tubes and introduced them in high frequency fields. In this way, he became the father of the neon tube and of the fluorescent lamp. He predicted the use of cheap synchronous electrical clocks. Such clocks were presented at the World's Fair in 1893. Tesla claimed that the future of aviation – than still inexistent, except the balloons - depended on the use of aluminum. Aluminum was a scarce and expensive material at this time and only the development of electricity contributed essentially to its price reduction. Tesla described in his early lectures and patents devices that became important many years later. For example, rotary sparks gaps and series spark gaps with small spacings predicted by T. in 1892-93 became a main issue in the wireless telegraphy from 1909 to 1920. In February 1892, Sir William Crookes published a prediction concerning the possibility of electromagnetic waves to be used for communications. Tesla has the idea to disturb the electrostatic field of the Earth using standing waves by excitation of its entire surface with high frequency power and than taking off power anywhere. Tesla described in his lecture in 1893 large antennas connected to the ground by wires for both purposes – transmission and reception and emphasizes the importance of applying the *electrical resonance principle to these schemes, using even variable tuning*. In 1896 Tesla succeeded to transmit electromagnetic signals to a boat on the Hudson River. About 1900, talking about the radio, he declared: *"I have no doubt that it will prove very efficient in enlightening the masses, particularly in still uncivilized countries and less accessible regions, and that it will add materially to general safety comfort and convenience, and maintenance of peaceful plants, all of which are capable of transmitting individualized signals to the uttermost confines of the earth. Each of them will be preferably located near some important center of civilization and the news that it receives through any channel will be flashed to all points of the globe. A cheap and simple device, which might be carried in one's pocket, may then be set up somewhere on sea or land, and will record the world's news or such special messages as may be intended for it."* Since 1893, Tesla put as basic

objective for himself a worldwide range of grandiose electrical effects, many of his priory invented patents were left for others to make from them less ambitious, but more practical applications. A few other researchers, inspired by his experiments and revelations, like Marconi, used his published patents for their own profit. [1].

## V. TESLA – FATHER OF THE AC SYSTEM[1,16]

We remember that as a young scientist Tesla had to compete with the then universally recognized "Father of the DC electricity", Edison. The AC system invented by Tesla was much more effective than the DC system proposed by Edison. The facility to transport electrical energy at long distances was the main reason which determined the abandon of DC networks in favor of Tesla's AC network. The Tesla system was adopted for the first time at the Niagara Falls power plant, which was put in service in 1895. The first recorded assets for economical use of the Niagara Falls waters are dated 1759 (the Daniel Joncairs sawmill's channel). The Niagara Hydraulic Power & Manufacturing Company was founded in 1853. In 1875, the water turbines in the new erected powerhouse began to turn, but electrical power was produced commercially here only starting from 1879, since Schoellkopf introduced electrical technology to his powerhouse turbines. This was the start of one of the first power stations in the world. Illuminating the spectacular falls was a desiderate of many sponsors. In 1860, this occurred using expensive calcium flares, but in 1881, Charles Brush installed electric carbon arc lights, supplied by a small DC generator. In 1904 a new power plant, featuring 34,000 HP was built. In 1918, Schoellkopf's Hydraulic Power Company merged with the Edward Dean Adams' Niagara Falls Power Company. In 1886, Thomas Evershed proposed a project of 200,000 HP electricity generation at Niagara Falls, but this plan was demised due to the impossibility to distribute DC power at long distances. The Niagara Falls Power Company offered a 100,000 US\$ award for anyone who could invent a system able to transmit electricity long distance. No one responded to this offer, because nobody was able to oppose to Edison, except Tesla. The greatest scientific minds of the world met in London to discuss the solutions. Against the advice of Thomas Edison and William Kelvin, Tesla's alternating current system was selected as the standard to be utilized. George Westinghouse started to develop Tesla's system. In 1883, Westinghouse replaced the illumination system of the Falls with AC technology. Ten years later, on May 6<sup>th</sup>, 1893, the Cataract Construction Company, a subsidiary founded in 1889 of the Niagara Falls Power Company, headed by the world's greatest financiers (J.P. Morgan, John Astor, William Vanderbilt and Edward Dean Adams), decided to use in its works in the Niagara Falls region alternating current (AC) for power generation and

transmission. A new era in the history of electricity began. The AC system – today extended in the entire world – is one of the major inventions in electroenergetics, and all this - thanks to Tesla.

## VI. FROM COLORADO SPRINGS BACK TO NEW YORK [1] .

Back to New York, Tesla wrote an enthusiastic paper for the "Century Magazine", where he describes in a futuristic view means to capture the Sun's radiation energy, to control the weather using electricity, predicts machines that would make wars impossible, and exposes his theory on the worldwide wireless energy transmission, as a global network that would link power stations, telecommunication, radio and even transmit images at remote locations. One of the most powerful magnats of this time, J.P. Morgan, offered to Tesla a capital of 150,000 US\$ to build a transmission tower and a power plant, but the sum was too small to cover all the expenses. An offer of 1,000,000 US\$ would be more reasonable for this goal. T. accepted this sum and started the construction works. Unfortunately, the history was cruel with this project. After tangled construction phases, due to lack of funds, in 1917 the Marines dynamited it by order of the USA Government, to avoid German spies' use.

## VII. TESLA – FATHER OF ROBOTICS [1].

Arrived in New York from Colorado Springs, Tesla tried to shock the assistance in his presentations. For example, a short time after his arrival, in 1898, he presented in the Madison Square Garden arena in New York, in an electrical exhibition, *the world's first radio controlled vessel model*. This is the first attempt to build *automatic robots*. Tesla Patent Nr. 613,809 describes the first device having a wireless remote control. The working model, the *teleautomaton* was controlled with radio signals and powered with an internal battery. On the device were mounted some small lamps by means of which – by switching them wireless on and off from the remote controller, Tesla responded to some easy mathematical questions of the assistance. Being questioned by a reporter about the possibility to use wireless controlled robotics in war missions, like explosive charges' bearing machines, T.replied: "*You do not see there a wireless torpedo, you see there the first of a race of robots, mechanical men which will do the laborious work of the human race.*"

## VIII. TESLA – FATHER OF WIRELESS [1,2,3,5,6]

In a paper entitled "*The True Wireless*"[3], published in the *Electrical Experimenter* in May 1919, Tesla explains his patent concerning wireless transmission of energy using earth's electric resonance in a more popular language: *The arrangement, as I described it*

*in detail, is shown in Fig. 8 [Fig.5 – P.B.][3]. In this case an alternator energizes the primary of a transformer, the high tension secondary of which is connected to the ground and an elevated capacity and tuned to the impress oscillations. The receiving circuit consists of an inductance connected to the ground and to an elevated terminal without break and is resonantly responsive to the transmitted oscillations.*

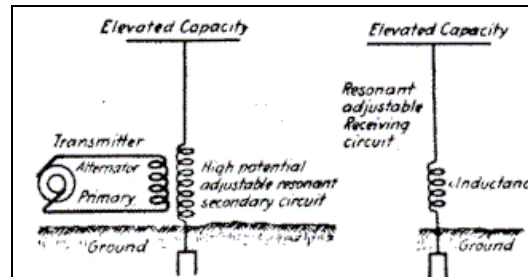


Fig. 5. Tesla's System of Wireless Transmission Thru the Earth as Actually Exposed In His Lectures Before the Franklin Institute and Electric Light Association in February and March, 1893 [3]

*I gave to the world a wireless system of potentialities far beyond anything before conceived. I made explicit and repeated statements that I contemplated transmission, absolutely unlimited as to terrestrial distance and amount of energy. But, altho I have overcome all obstacles which seemed in the beginning unsurmountable and found elegant solutions of all the problems which confronted me, yet, even at this very day, the majority of experts are still blind to the possibilities which are within easy attainment. My confidence that a signal could be easily flashed around the globe was strengthened thru the discovery of the "rotating brush," a wonderful phenomenon which I have fully described in my address before the Institution of Electrical Engineers, London, in 1892... This is undoubtedly the most delicate wireless detector known, but for a long time it was hard to produce and to maintain in the sensitive state. These difficulties do not exist now and I am looking to valuable applications of this device, particularly in connection with the high-speed photographic method, which I suggested, in wireless, as well as in wire, transmission"[3].*

## IX. NOBEL PRIZE CONTROVERSIES [1].

Thomas Edison and Tesla were proposed as potential laureates to share the Nobel Prize of 1915 in a press dispatch, but finally due to their reciprocal animosity, the prize was not given to them., despite their enormous scientific contributions. In the following events after the rumors, neither Tesla nor

Edison won the prize (although Edison did receive one of 38 possible bids in 1915, and Tesla did receive one bid out of 38 in 1937). Earlier, rumors circulated that Tesla was have been nominated for the Nobel Prize of 1912, for his experiments with tuned circuits using high-voltage high-frequency resonant transformers. In 1915, Tesla filed an unsuccessful lawsuit against Marconi.

## X. TESLA'S AWARDS [1].

For his multilateral groundwork in theoretical electrotechnics and for his prodigious inventor's and teacher's activity Tesla was awarded with some of the highest titles and prizes a scientist and an engineer can dream about during his life – except the Nobel Prize, that he virtually might have received instead of Marconi if in 1909 the Nobel Commission would had been correct. Tesla received the Elliott Cresson Gold Medal in 1893, the Edison Medal in 1916 and the John Scott Medal in 1934.

## XI. THE RIVAL APPEARS [10, 12, 13, 14, 15]

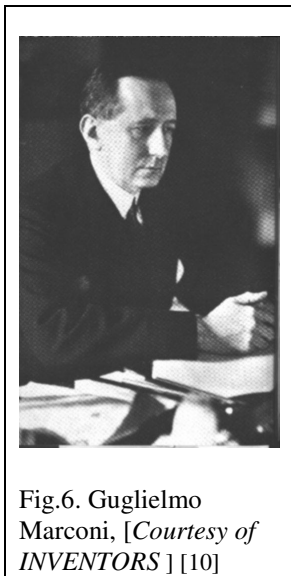


Fig.6. Guglielmo Marconi, [Courtesy of INVENTORS ] [10]

Guglielmo Marconi (fig.6) was born on April 25, 1874 in Bologna, Italy. His father was a rich Italian landowner and his mother, a granddaughter of the founder of the Jameson whiskey distillery. Marconi learned in Bologna in the lab of Augusto Righi, in Florence at the Istituto Cavallero, and, finally in Livorno. First experiments were performed at home, in December 1894

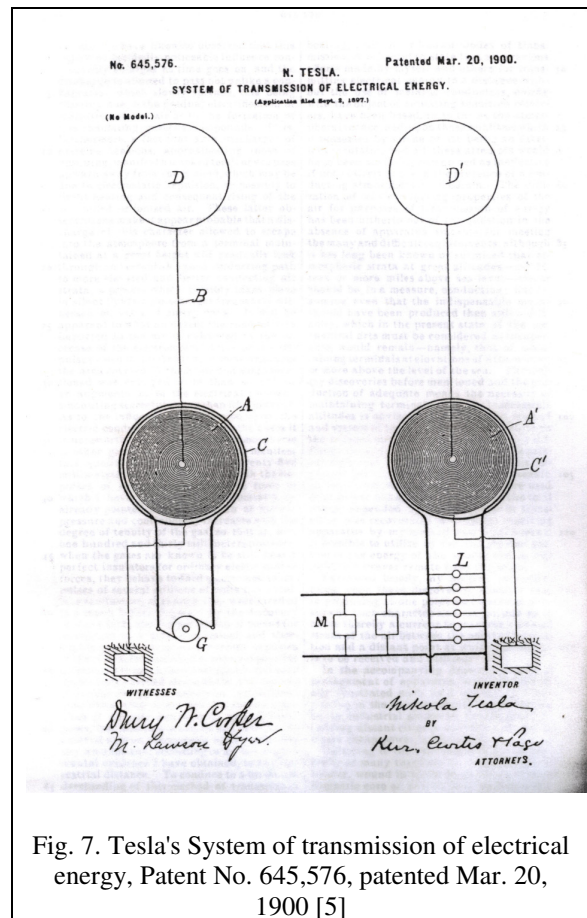
. After sending LW signals at a distance of 1 mile in 1895, he went to England and founded the Marconi Company at Chelmsford, Essex in 1897. His first patent in wireless telegraphy, Nr. 12039, was received on June 2, 1896, followed in July by experiments from the General Post Office building in London in a distance of 1.5 miles. On September 2, 1896 the span had increased to 8 miles with tests at Salisbury plain and then, on 11.05.1897, across the Bristol Channel (3.5 miles). Daily Express, in July 1898 was the first newspaper using radiotelegraph. Another device was installed at the board of Queen Victoria's Royal yacht. The extension of the new invention was really rapid. In December 1898 wireless telegraphy was installed between East Goodwin light ship and the

South Foreland lighthouse and on March 3, 1899, wireless communication was employed to save life. In summer 1899 the Marconi's wireless signals crossed the English Channel and on November 15, 1899 the first ocean wireless transmissions linked ships. On April 26, 1900, M. received his patent Nr. 7777 for "*Tuned Syntonic Telegraphy*", an invention that used tuned circuits, enabling a wireless set to be tuned to specific emitting station (like a radio receiver today). On January 23, 1901 the first long distance (196 miles) wireless transmission was performed from the Isle of Wight to The Lizard in Cornwall. The next task was to transmit over the Atlantic and this was realized on Thursday the 12th of December 1901. The letter "S" transmitted from Poldhu, Cornwall, was – according to Marconi and his assistant, Georges Piget - received at Signal Hill, St. Johns, Newfoundland. In a span of a few decades, radio transmissions changed the world and brought nations closer to each other. In 1909, Marconi shared the Nobel Prize with Karl Ferdinand Braun, from which he "borrowed" some parts of his work (like Braun's British patent on tuning), as he will recognize later. Guglielmo Marconi used also the patents of others, as we will see in the next chapter.. Marconi's 1901 tests were contested by scientists (Edison and others), motivating that M. receives only parasite signals from the atmosphere. Dr. Jack Belrose estimated that the Poldhu transmitter has a frequency of 850 Hz and what Marconi received were only SW, emitted by the ionosphere. Fearing to be challenged by concurrents, M. conducted new tests over the ocean, this time using a ship. These tests gave coherer-tape reception up to 2,496 km (1,551 mi), and audio reception up to 3,378 km (2,099 mi) during the night and half of these results during daytime, i.e. that Marconi's mid-day Atlantic wireless first crossing in 1901 with LW and MW was seemingly not real. An 1902 unsuccessful test from Glacier Bay confirmed this supposition. In 1903, President Theodore Roosevelt greeted wireless King Edward VII to HM birthday [ I still must look for the way - directly or by intermediary ship-stations (?)]. The two Marconi's company radio operators on the "Titanic" rescued survivors by their SOS signals.. In 1915 the Chelmsford Marconi factory, using a vacuum tube transmitter, organized the first entertainment radio broadcast and in 1922 such transmissions became regular (from the Marconi Research Centre at Writtle). Marconi. reached the Italian Senate in 1914 and was made a marchese in 1924 by King Victor Emmanuel III. In 1923 he had adhered to the fascist party of Benito Mussolini, which made him in 1930 President of the Accademia d'Italia. Later he was appointed a Member of the Fascist Grand Council. Marconi died in Rome in 1937 at the age of 63, after a series of heart attacks. All the radio stations in the world kept silence for two minutes. After state funerals his remains were deposited in his house, Villa Griffone, Sasso Marconi, Emilia-Romagna.

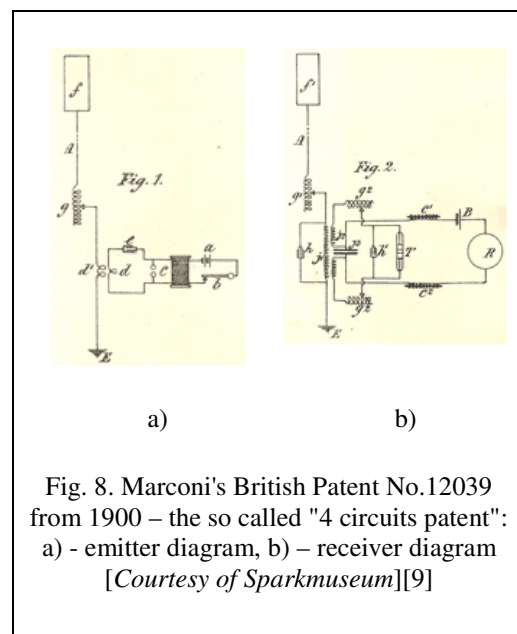
XI. A LATE RECOGNITION[2, 9, 12, 13, 17]

Marconi's work is based on copies of patents of many other inventors without their permission. His so-called original "two-circuit" device, a spark-gap transmitter plus a coherer-receiver, was similar to those used by Oliver Lodge in a series of worldwide reported tests in 1894. Tesla disputed that Marconi was able to signal for greater distances than anyone else when using the spark-gap and coherer combination. In 1900 Alexander Stepanovich Popov declared to the Congress of Russian Electrical Engineers: "[...] the emission and reception of signals by Marconi by means of electric oscillations [was] nothing new. In America, the famous engineer Nikola Tesla carried the same experiments in 1893." The Fascist regime in Italy credited Marconi as inventor of the radio. The doubt is if his own contribution was sufficient to constitute an independent patent, or if his component devices were too similar to the original ones (if not copies) developed years before by Hertz, Popov, Branly, Tesla, and Lodge – and in this case, they are copies. Marconi's "four-circuit" design, having two tuned-circuits at the transmitting and receiver antennas, **British Patent Nr.7777** from 26 April 1900 is a compound of the earlier work of Tesla and other inventors. 5 of 9 judges of the Supreme Court stated that Marconi's work had been anticipated by **John Stone Stone** (patent No.714,756) and **Oliver Lodge** (patent No. 609,154). The Supreme Court also studied **Tesla's patent No. 645,576** and noted that **Tesla had used four tuned circuits before Marconi**. In order to defend himself, in 1911 Marconi purchased through his company the Lodge-Muirhead Syndicate, whose main performance was Oliver Lodge's tuning patent, invented in 1897. Thus, the 7777 Patent was vividly discussed at this time from validation to complete rejection. In 1943, the US Supreme Court stated that: "*The Tesla patent No. 645,576, applied for September 2, 1897 and allowed March 20, 1900, disclosed a four-circuit system, having two circuits each at transmitter and receiver, and recommended that all four circuits be tuned to the same frequency. [...] He] recognized that his apparatus could, without change, be used for wireless communication, which is dependent upon the transmission of electrical energy.*" In its decision, the court noted: "*Marconi's reputation as the man who first achieved successful radio transmission rests on his original patent, which became reissue No. 11,913, and which is not here [320 U.S. 1, 38] in question. That reputation, however well-deserved, does not entitle him to a patent for every later improvement which he claims in the radio field. Patent cases, like others, must be decided not by weighing the reputations of the litigants, but by careful study of the merits of their respective contentions and proofs.*" The court also stated that: "*It is well established that as between two inventors priority of invention will be awarded to the one who by satisfying proof can show*

*that he first conceived of the invention.*" Following to this decision, most of Marconi's patents were

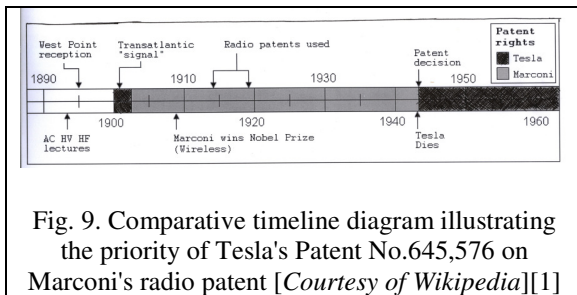


overturned by the US Supreme Court. A decision that



came unfortunately 9 months after Tesla's death.and

which was pronounced not mainly in order to do simply justice. At the time, the US Army and Marconi's company were involved in a trial on the radio patent rights, and in order to annulate Tesla's former claims for compensation, the Court nullified Marconi's other inventions. The priority of Tesla's US Patent No.645, 576 on the Marconi's US Patent No.763,772 is more evident if we use the following suggestive comparative timeline diagram, published in the Internet (Fig.9) [1]



Tesla was not alone in claiming against Marconi. Oliver Lodge claimed the usage of his unpatented ideas in Marconi's first radio patent. Don Kimberlin comments: "...What did happen by April 1900 was that Marconi uniquely had combined Professor Righi's transmitter, Branly's coherer, Tesla's elevated antenna and Lodge's tuned circuits to realize what ultimately became first wireless telegraphy..."[18]. In order to compare the patents, please see the figures (Fig.5, 7, 8a and b). From these drawings results that the use of resonant circuits was clearly primordially demonstrated (1893) and filed (1898) by Tesla, the Marconi patent was only afterwards "adjusted". Marconi's invention is only an application of Tesla's (and of others') prior researches and studies. The differences consist in the used media – in Tesla's patent it was the Earth, in Marconi's patent it is the air. In Tesla's patent, a high frequency polyphasic alternator provides the HF initial impulses, whereas in Marconi's feature, the impulses are produced by switching on-off manually the telegraph's switch. The differences are not in the principle, but in the application's purpose. Tesla – as discussed – wanted to create his planned worldwide wireless system, whereas Marconi – using the wireless transmission knowledge and technology previously set by Tesla and others – performed an apparatus for common use– the radiotelegraph - and fructified the results.

## XII. CONCLUSION

Tesla was the first to invent the radio. Marconi did not really invent the radio, he only combined, copied and adapted patents of Tesla and others and commercialized them as his own patent. He died in a plenty of glory and richness, whereas Tesla died as a poor man. No comments...

## XIII. REFERENCE

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