

NIKOLA TESLA AND MEDICINE

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TESLA & FRIENDS 2015

celebration of the 159th birthday of Nikola

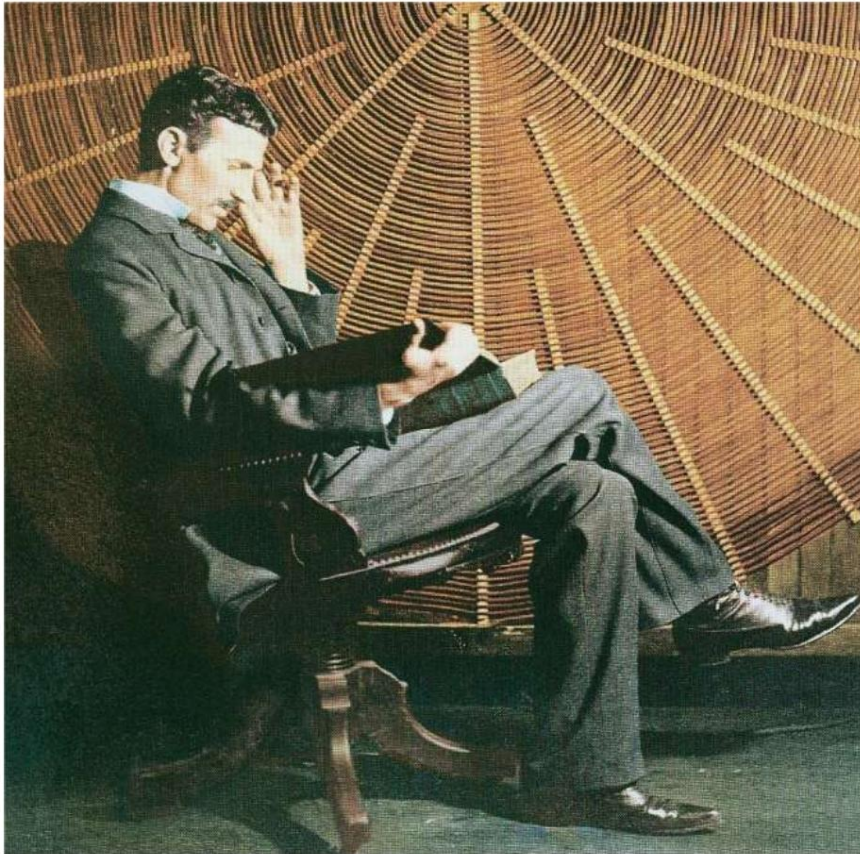
Tesla and the 2nd Nikola Tesla Day
in Croatia CONFERENCE "TESLA IN
ZAGREB" conference theme "Tesla in
medicine", HGK -

Zagreb Chamber July 10, 2015



Nikola Tesla

(Smiljan, 1856 - New York, 1943)



- scientist •
- inventor •
- physicist
- electrical
- engineer
- 157 patents
- 73 articles in scientific journals



Honorary doctorates

- University of Zagreb (1926) •
- Columbia University (1894) •
- Vienna University of Technology (1908) •
- University of Belgrade (1926), •
- University of Technology in Prague (1936) •
- University of Poitiers (1937), •
- Technical College in Graz (1937), •
- University of Paris (1937), •
- Polytechnic School in Bucharest (1937), •
- University of Grenoble (1938), •
- Sofia University (1939 – doctorate in physics), •
- University of Brno. (1934), •



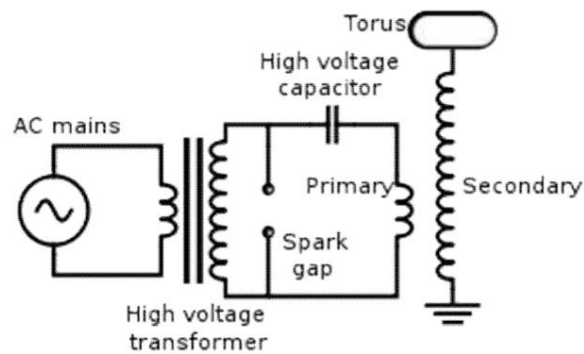
Prizes and awards

- honorary member of HAZU (then JAZU) in 1896
- regular member of the Serbian Academy of Sciences in Belgrade (1937),
- honorary member of the American Philosophical Society in Philadelphia (1896), •
- honorary member of the New York Academy of Sciences (1907), •
- winner of the Edison Gold Medal (1916), •
- winner of the John Scott Medal (1934), •
- honorary master's degree (M.Sc.) at Yale University (1894)

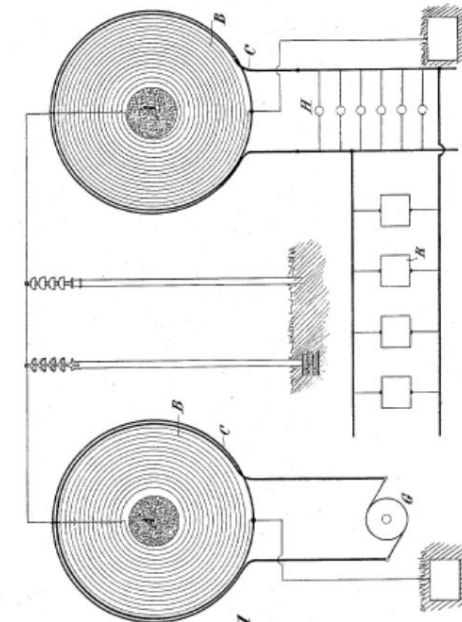


Tesla's transformer (1891)

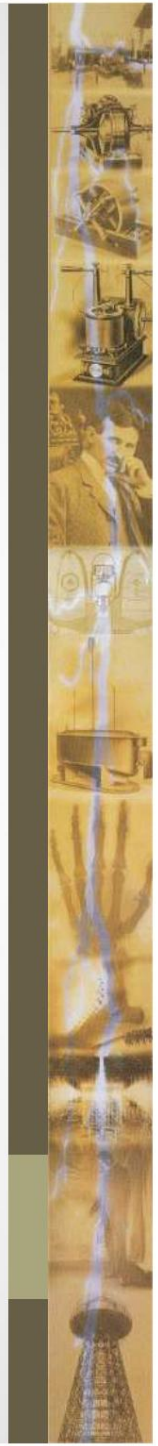
- used to obtain alternating currents of high frequency and high voltage – of Tesla currents
- it consists of two oscillating circuits of close oscillating frequencies
- when the resonant frequency is reached at the output of the Tesla transformer, energy is emitted



(No Model.)
N. TESLA.
ELECTRICAL TRANSFORMER.
No. 593,138. Patented Nov. 2, 1897.



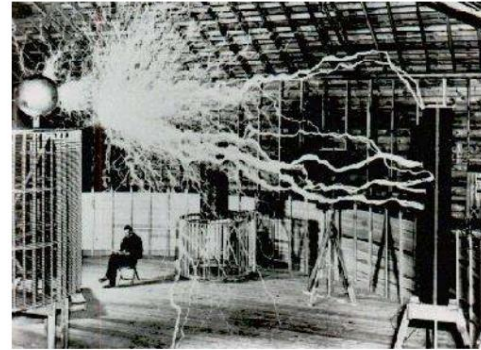
WITNESSES
Y. B. Linn.
Edward B. Hopkinson.
INVENTOR
Nikola Tesla
BY
Ken. Curtis & Age.
ATTORNEY



Tesla currents - alternating currents of high frequency and high voltage

In 1891, Tesla published in the *Electrical World* magazine:

- high frequency currents are not dangerous for humans
- using these currents it is possible to heat the tissues inside the human body (electrotherapy)



Tesla's HF currents in an experiment performed in Colorado in 1899.

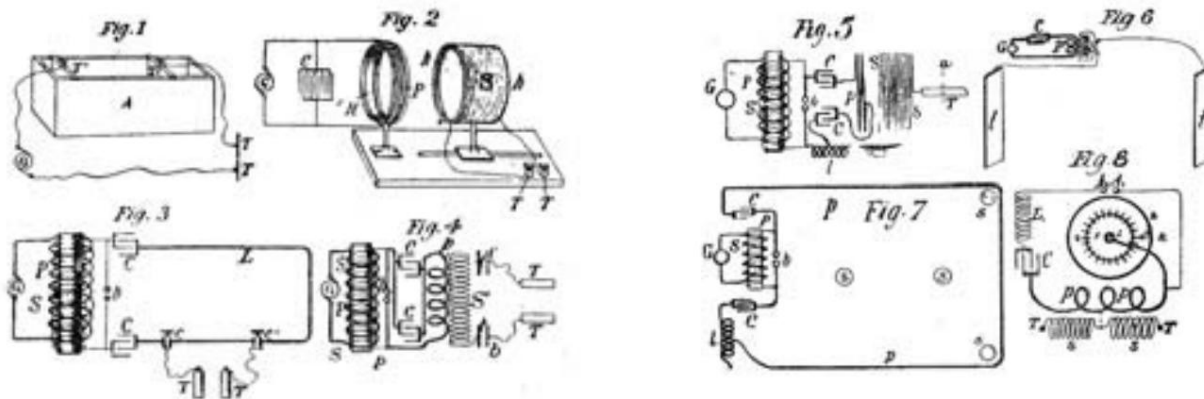


Tesla transformer in the Technical Museum in Zagreb



Tesla's contribution to electrotherapy

- a comprehensive presentation of his experiments with HF currents was given by Nikola Tesla himself in numerous public lectures
- 13.–15. September 1898 Buffalo lecture to the American Electrotherapeutic Association entitled: "High Frequency Oscillators for Electrotherapeutic and Other Applications"



Tesla's original spark oscillator designs for electrophysiological experiments; TT are electrodes for contact with the patient. The pictures are taken from the article by Z. Jakobovi} "Tesla's HF currents in electrotherapy"



Application of high-frequency currents in medicine

• diathermy

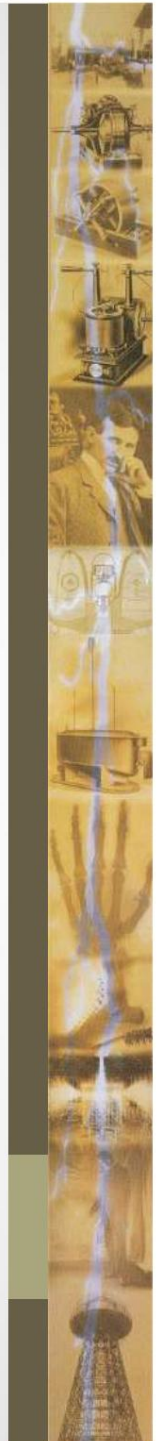
• teslinization



modern device for diathermy



Tesla's device for treatment with high-frequency currents



Tesla's transformer as a lesson



demonstration-educational Tesla transformer (without iron core)

- dates from 1908
- company for the production of lessons: Max Kohl, Chemnitz
- Department of Physics
Faculty of Medicine in
Words



Experiments with Tesla currents



Prof. Mile Cindriy (1869-1939) •
already in 1902. performed experiments with
Tesla currents at the gymnasium in Sušak
as the first in high school teaching in
Croatia (Cindriy M. Several experiments
with Tesla currents. Continued Spring 1902)



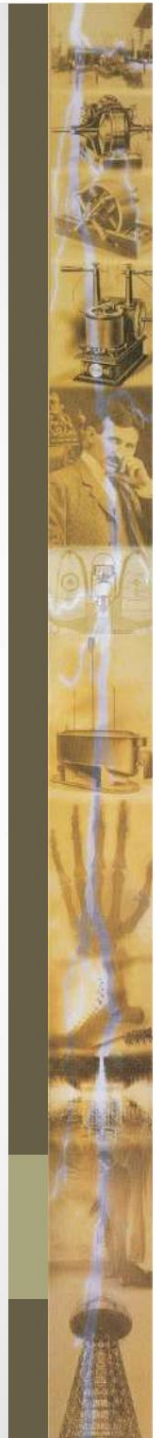
Ruhmkorff inductor



Sušak gymnasium building.



Part of the collection of old studies in the closets of the physics cabinet.



Tesla and the discovery of X-rays

• experiments with vacuum tubes and produces X-rays

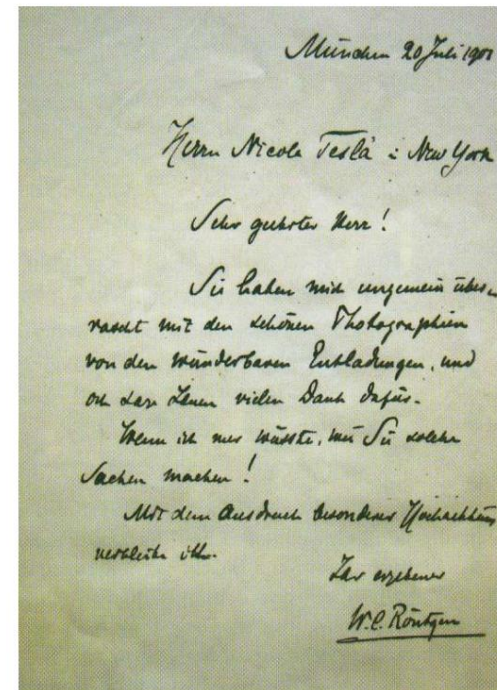
• 1896. publishes a series of articles in the Electrical Review magazine about "new" rays with images of the skull and chest

"Dear Sir!

You have surprised me tremendously with the beautiful photographs of wonderful discharges and I tell you thank you very much for that. If only I knew how you make such things!

With the expression of special respect
I remain yours devoted,

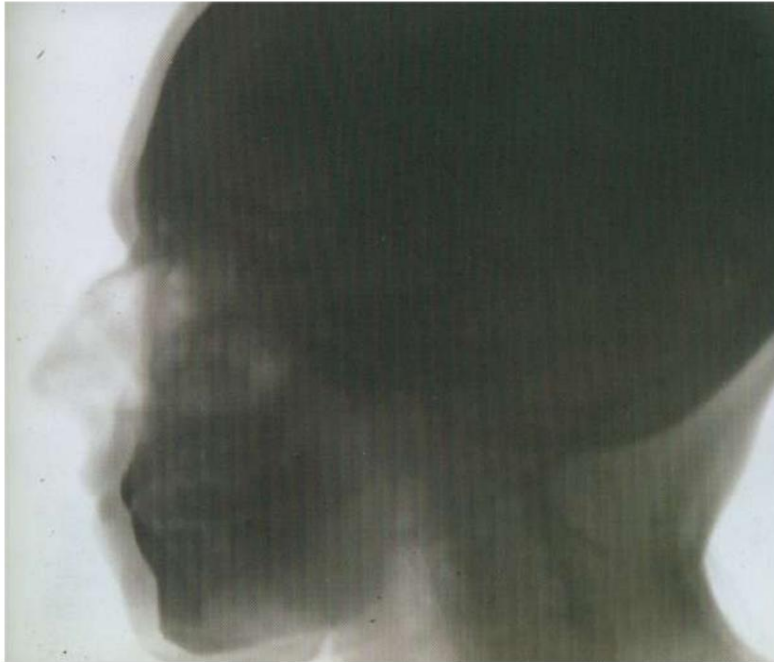
WC Roentgen."



Röntgen's letter to Tesla



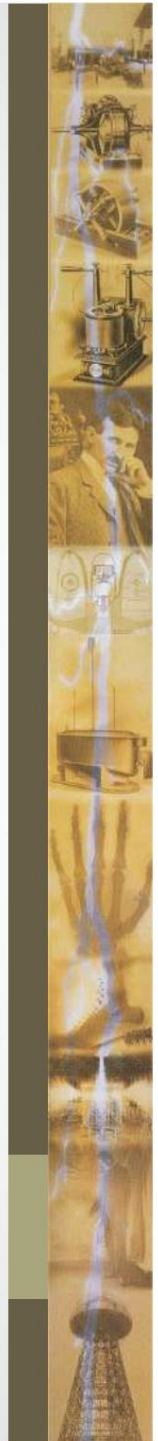
Images taken by Tesla using X-rays



photograph of the skull from 1896



An image of a human foot made by Tesla in 1896 with X-rays produced by his own vacuum tube (similar to Lenard's tube).



Tesla's papers on x-rays published in 1896 and 1897:

1. Tesla N. An interesting feature of X-ray radiations. *Electrical Review* , New York 1896;29(2):13–14.
2. Tesla N. Latest results. *Electrical Review* , New York 1896;28(12):147.
3. Tesla N. Latest Roentgen ray investigations. *Electrical Review* , New York 1896;28(17):206–207,211.
4. Tesla N. On reflected Roentgen rays. *Electrical Review* , New York 1896;28(14):171,174.
5. Tesla N. On the Roentgen streams. *Electrical Review*, New York 1896;29(23):277.
6. Tesla N. Roentgen rays or streams. *Electrical Review*, New York 1896;29(7):79,83.
7. Tesla N. On Roentgen radiations. *Electrical Review* , New York 1896;28(15):183,186.
8. Tesla N. On Roentgen rays. *Electrical Review*, New York 1896;28(11):131,134–135.
9. Tesla N. On the harmful actions of the Lenard and Roentgen tubes. *Electrical Review*, New York 1897;30(18):207,211.
10. Tesla N. On the source of Roentgen rays and the practical construction and safe operation of Lenard tubes. *Electrical Review*, New York 1897;31(4):67,71.



Tesla's X-ray research

- experimented with the Crooks tube and designed his own vacuum tube to produce X-rays
- investigated how different conditions (exposure length and distance) affect the quality of the X-ray image
- he is responsible for perfecting the technique of X-ray devices
- he devised a method of cooling X-ray tubes
- proposed the use of X-rays for the detection of lung diseases and for the detection of foreign body
- studied the reflection of X-rays on different materials
- warned about the danger when working with X-rays (reddening of the skin, hair loss,...)
- suggested some basic ways to protect against radiation: distance, time and shield

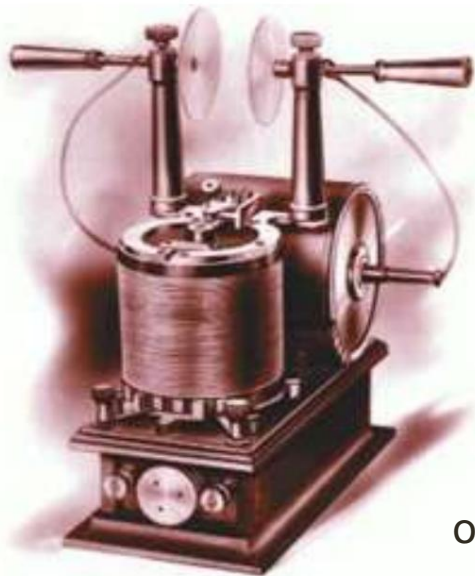


Other Tesla discoveries with medical applications

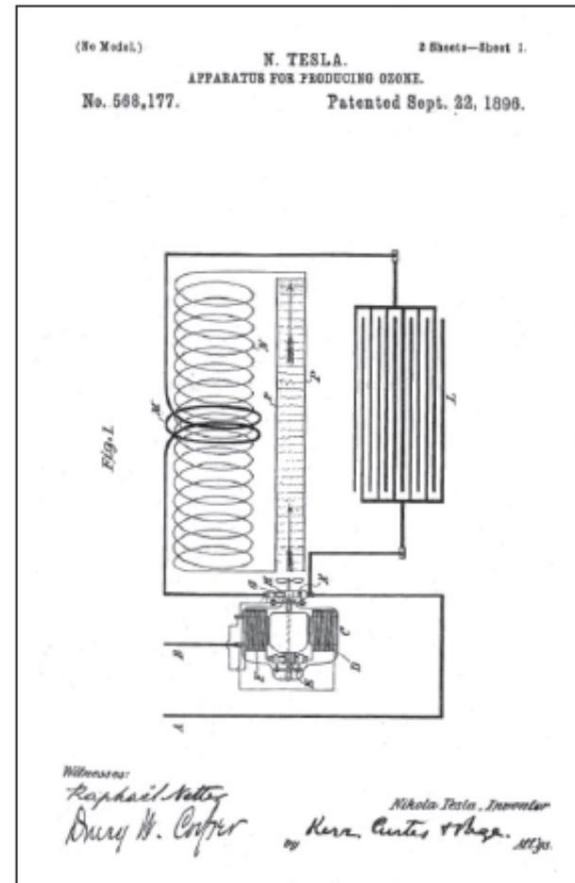
• notices that HF currents cause the formation of ozone in the air (refreshing and bactericidal effect)

• In 1896, he patented an ozone generator

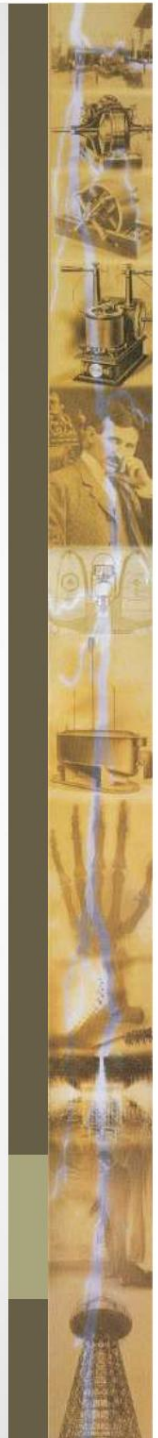
• Tesla Ozone Company



one of the first ozonizers



Patent application for ozone production device, 1896.



Other Tesla discoveries with medical applications

• electrography - "Kirlian effect"

• studied the physiological effects of mechanical vibrations

• constructed a "vibrator" to suppress the feeling of fatigue in the leg muscles

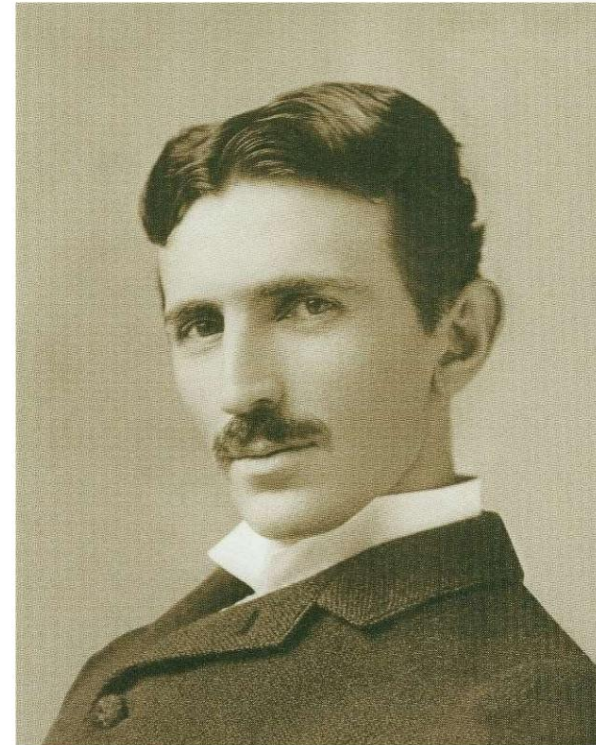
• published several articles on general biological topics, as well as proper nutrition and a healthy lifestyle



Human energy will be increased by taking special care of health, healthy diet, moderation, proper lifestyle, movement, respect for oneself and others.

Every man should regard his body as a gift of inestimable value, a magnificent work of art of indescribable beauty and skill beyond human comprehension, and so delicate and delicate that a single word, breath, look or thought can only hurt it"

Nikola Tesla



Sources:

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7. Pejnovič D. From the life and work of Nikola Tesla. *Nast Vjesnik* 1927;25:347.
8. Tesla N. High frequency oscillator for electro-therapeutic and other purposes (read at the eighth annual meeting of the American Electro-Therapeutic Association, Buffalo, NY Sept 13 to 15 1898) – Reprinted in: *Nikola Tesla-Lectures , Patents Articles*. Nikola Tesla Museum, Belgrade 1956.
9. Jakobovič Z. Tesla's high frequency currents in electrotherapy. *Ann Croat Acad Eng. Zagreb: Croatian Academy of Engineering*; 2007, 289-302.
10. Hrabak M, Stern Padovan R, Kralik M, Ozretić D, Potocki K, Scenes from the past: Nikola Tesla and the Discovery of X-rays. *RadioGraphics* 2008; 28(4):1189-1192.

