

TESLA  
VACUUM  
LAMP

1896 EDISON  
X-RAY TUBE

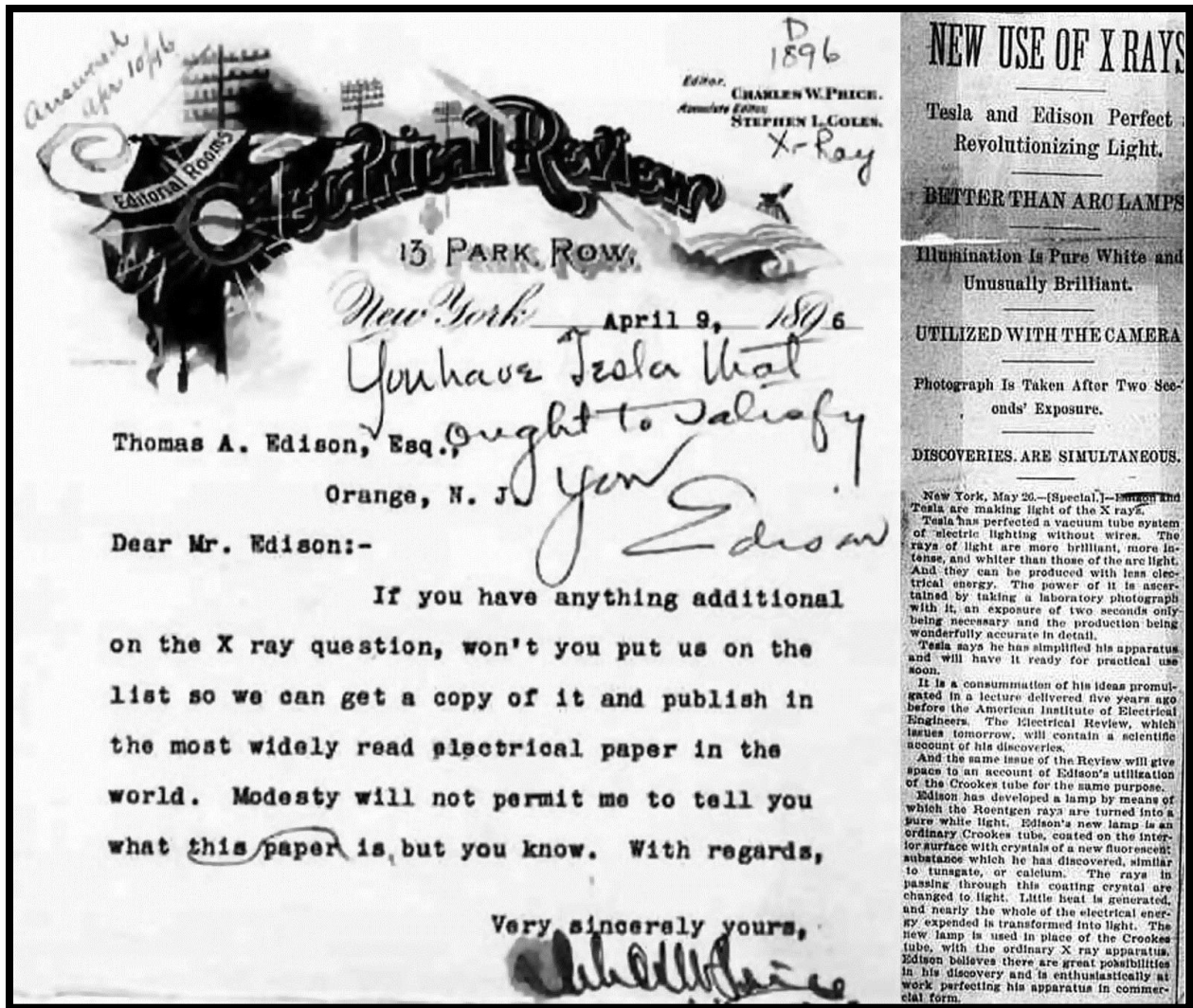
TESLA  
PHOSPHORESCENT  
BUTTON  
LAMP

TESLA  
WIRELESS  
LAMP

ELIHU THOMSON  
DOUBLE FOCUS  
HIGH FREQUENCY  
X-RAY TUBE

TESLA  
SINGLE  
WIRE  
LAMP

EDISON CALCIUM TUNGSTATE LAMP



“You have Tesla that ought to satisfy you. Edison”

It's not news to anyone in the Tesla community that Edison and Tesla were bitter rivals...but even after the famous “Battle of the Currents” to light the Columbia Exposition, the two continued to duel it out over new and novel forms of electric lights. It may be a surprise though to read the newspaper headline of 1896 “Tesla and Edison perfect revolutionizing light”... and it was not the only headline showcasing both inventors together. In reality they were both seeking to develop something more efficient than the incandescent bulb...and still outdo each other at the same time. In reality the work they were doing was not far off from one another.

In the history books, we often see that one or the other invented the fluorescent light. Nothing could be farther from the truth in reality. Artistic vacuum lamps, Geissler Tubes and Gassiot Tubes were sold since the mid-1800s...but the earliest discovery of mercury glowing in a vacuum was first noticed while moving barometers in the 1600s...but in 1705, Francis Haukesbee was a true pioneer. He developed a static electric machine that electrified an evacuated glass globe containing mercury. The mercury glowed bright enough to read by and he called this “the mercurial phosphor”. His genius did not stop there though. He noticed that an evacuated tube containing mercury could simply be shaken and the friction of the mercury against the glass would produce light. This is known now as tribo-luminescence. For those seeking free energy, in the late 1800s bulbs were constructed this way and tied to rocks in the ocean to warn ships...they were powered by nature – waves moving up and down – and the self-lit

buoy's light warned sailors of impending danger ahead. Of course today there might be environmental issues throwing glass tubes and mercury in the ocean...and the waves might argue that they aren't working for free! Haukesbee's work was elegant and thorough – and centuries before its time. Edison and Tesla did provide significant history in the topic however. Edison had invented the fluoroscope – a device which converted X-Rays to visible light - and could be used to see live X-Rays of the human body. The fluoroscope was a cardboard screen painted with a fluorescent paint – and it was a quest for the brightest fluorescing material that led him to develop a new light source. His new light was an X-Ray tube with calcium tungstate painted on the inside of the glass. The X-Rays would cause the fluorescent compound to glow brightly and the bulbs produced little heat and consumed little energy – there was a serious drawback though: They produced X-Rays. It wasn't immediately known that X-Rays were dangerous early on – and it was Edison's own assistant Clarence Dally that succumbed to the ill effects of repeated radiation exposure. With seven surgeries and eventually both arms amputated, he died in 1904 and is considered the first American X-Ray martyr. Meanwhile Tesla developed novel vacuum lamps, some were simply normal air evacuated to 1/100,000<sup>th</sup> of an atmosphere. When held near Tesla Coils, the lamps would glow without wires – the light was subtle, and pleasing, but scarcely bright enough for practical use. The next development, like Edison, was to use high vacuums. Instead of fluorescent materials, Tesla chose refractory materials which would incandesce under “molecular bombardment” - he chose both standard lamp filaments and carborundum buttons. What was unique about Tesla's lamps is that they could contain only a single filament and one connecting wire – or even two wires with a broken filament. The greatest engineering problem were to focus the electrons inside of the bulbs onto the material which gave off light – there were tedious mechanical challenges to perfect, and with high vacuums maintaining a hard vacuum was not an easy task due to outgassing of internal components. The same problems existed with early X-Ray tubes. (A little known part of history is that Elihu Thomson, a rival of Tesla and friend of Edison perfected an X-Ray tube specially made for Tesla Coils – and both Edison and GE marketed and promoted both Thomson's high frequency coils and X-Ray tubes. It was infact the first commercial “Tesla Coil” produced in the US...though they dared not call it by that name!). Like Edison's lamps, Tesla faced a similar drawback – they also emitted X-Rays while under normal operation. While both Tesla and Edison's ingenious lamps were a beautiful to witness, they also posed major health problems to those in their vicinity...and the lack of a real production of either was probably a good thing. Few original artifacts of either man still exist on this topic. But photographed are a few of the relics still existing. Endless thanks to Frank Jones for lending some of his priceless tubes for this article. Lutz Neumann of Cursdorf Germany makes replica Tesla bulbs – a spectacular uranium oxide bulb is seen to the right, and the other longer bulbs to the left were made by myself to demonstrate the principles. The taller single wire incandescent bulb was manufactured in Germany in the early 1900s...and both the Edison and Thomson X-Ray tubes are two of the scarcest X-Ray tubes in existence, and as seen still functional.

In the early 1900s Daniel McFarlan Moore and Peter Cooper Hewitt independently developed lamps that would later become what we think of more typically as the “fluorescent lamp”.

Jeff Behary May 2014