Famous People in Energy

Brief biographies of individuals who have made significant contributions to energy and science. The biographies vary in reading level, but we have tried to find pioneers that will be interesting for students of all ages.

Energy People (alphabetical)

Isaac Newton (1642)

back to top

Isaac Newton was born in 1642 in England. His father had died two months before his birth. When Isaac was three his mother remarried, and Isaac remained with his grandmother. He was not interested in the family farm, so he was sent to Cambridge University to study.

Isaac was born just a short time after the death of Galileo, one of the greatest scientists of all time. Galileo had proved that the planets revolve around the sun, not the earth as people thought at the time. Isaac Newton was very interested in the discoveries of Galileo and others. Isaac thought the universe worked like a machine and that a few simple laws governed it. Like Galileo, he realized that mathematics was the way to explain and prove those laws. Isaac Newton was one of the world's great scientists because he took his ideas, and the ideas of earlier scientists, and combined them into a unified picture of how the universe works.

Isaac explained the workings of the universe through mathematics. He formulated laws of motion and gravitation. These laws are math formulas that explain how objects move when a force acts on them. Isaac published his most famous book, Principia, in 1687 while he was a mathematics professor at Trinity College, Cambridge. In the Principia, Isaac explained three basic laws that govern the way objects move. He then described his idea, or theory, about gravity. Gravity is the force that causes things to fall down. If a pencil falls off a desk, it will land on the floor, not the ceiling. In his book Isaac also used his laws to show that the planets revolve around the suns in orbits that are oval, not round.

Isaac Newton used three laws to explain the way objects move. They are often call Newton's Laws. The First Law states that an object that is not being pushed or pulled by some force will stay still, or will keep moving in a straight line at a steady speed. It is easy to understand that a bike will not move unless something pushes or pulls it. It is harder to understand that an object will continue to move without help. Think of the bike again. If someone is riding a bike and jumps off before the bike is stopped what happens? The bike continues on until it falls over. The tendency of an object to remain still, or keep moving in a straight line at a steady speed is called inertia.

The Second Law {force = mass x acceleration; f = ma} explains how a force acts on an object. An object accelerates in the direction the force is moving it. If someone gets on a bike and pushes the pedals forward the bike will begin to move. If someone gives the bike a push from behind, the bike will speed up. If the rider pushes back on the pedals the bike will slow down. If the rider turns the handlebars, the bike will change direction.

The Third Law states that if an object is pushed or pulled, it will push or pull equally in the opposite direction. If someone lifts a heavy box, they use force to push it up. The box is heavy because it is producing an equal force downward on the lifter's arms. The weight is transferred through the lifter's legs to the floor. The floor presses upward with an equal force. If the floor pushed back with less force, the person lifting the box would fall through the floor. If it pushed back with more force the lifter would fly into the air.

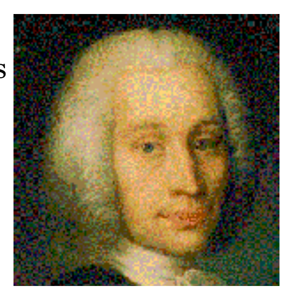
When most people think of Isaac Newton, they think of him sitting under an apple tree observing an apple fall to the ground. When he saw the apple fall, Newton began to think about a specific kind of motion—gravity. Newton understood that gravity was the force of attraction between two objects. He also understood that an object with more matter –mass- exerted the greater force, or pulled smaller object toward it. That meant that the large mass of the earth pulled objects toward it. That is why the apple fell down instead of up, and why people don't float in the air.

Isaac thought about gravity and the apple. He thought that maybe gravity was not just limited to the earth and the objects on it. What if gravity extended to the moon and beyond? Isaac calculated the force needed to keep the moon moving around the earth. Then he compared it with the force the made the apple fall downward. After allowing for the fact that the moon is much farther from the earth, and has a much greater mass, he discovered that the forces were the same. The moon is held in an orbit around earth by the pull of earth's gravity.

Isaac Newton's calculations changed the way people understood the universe. No one had been able to explain why the planets stayed in their orbits. What held them up? Less that 50 years before Isaac Newton was born it was thought that the planets were held in place by an invisible shield. Isaac proved that they were held in place by the sun's gravity. He also showed that the force of gravity was affected by distance and by mass. He was not the first to understand that the orbit of a planet was not circular, but more elongated, like an oval. What he did was to explain how it worked.

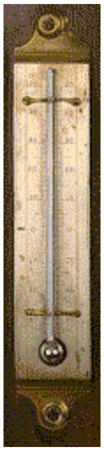
Anders Celsius (1701)

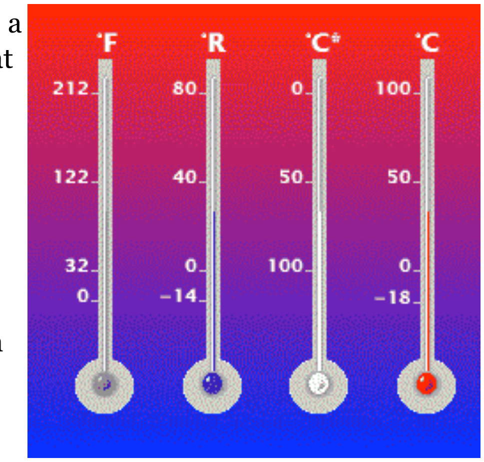
back to top



Anders Celsius was born in 1701 in Sweden. He succeeded his father as professor of astronomy at the University of Uppsala in 1730. It was there that he built Sweden's first observatory in 1741. One of the major questions of that time was the shape of the Earth. Isaac Newton had proposed that the Earth was not completely spherical, but rather flattened at the poles. Cartographic measuring in France suggested that it was the other way around - the Earth was elongated

at the poles. In 1735, one expedition sailed to Ecuador in South America, and another expedition traveled to Northern Sweden. Celsius was the only professional astronomer on that expedition. Their measurements seemed to indicate that the Earth actually was flattened at the poles.



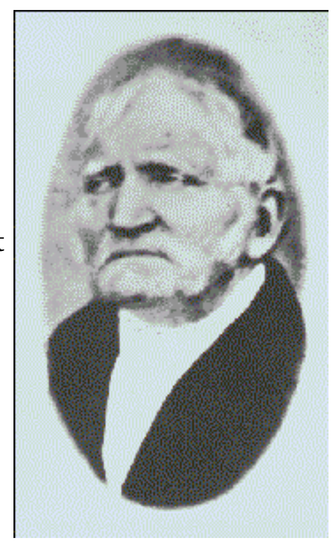


Celsius was not only an astronomer, but also a physicist. He and an assistant discovered that the aurora borealis had an influence on compass needles. However, the thing that made him famous is his temperature scale, which he based on the boiling and melting points of water. Celsius' fixed scale for measuring temperature defines zero degrees as the temperature at which water freezes, and 100 degrees as the temperature at which water boils. This scale, an inverted form of Celsius' original design, was adopted as the standard and is used in almost all scientific work.

Anders Celsius died in 1744, at the age of 42. He had started many other research projects, but finished few of them. Among his papers was a draft of a science fiction novel, situated partly on the star Sirius.

John Dalton (1766)

back to top



John Dalton was born in England in 1766, ten years before the U.S. Declaration of Independence was signed. His family lived in a small thatched cottage. As a small child, John worked in the fields with his older brother, and helped his father in the shop where they wove cloth. Although they had enough to eat, they were poor. Most poor boys at that time received no education, but John was lucky to attend a nearby school. In 1766, only about one out of every 200 people could read.

John was a good student and loved learning. His teachers encouraged him to study many things. When he was twelve, he opened his first school in a nearby town, but there was very little money. He had to close his school and work in his uncle's fields.

Three years later, he joined his older brother and a friend to run a school in Kendall, England. They taught English, Latin, Greek, French, and 21 math and science subjects. John studied the weather and the nature around him. He collected butterflies, snails, mites, and maggots. He measured his intake of food and compared it to his production of waste. He discovered he was color-blind and studied that, too.

In 1793, John moved to Manchester as a tutor at New College, and began observing the behavior of gases. He began to think about different elements and how they are made. He had a theory that each element is made up of identical atoms and that all elements are different because they are each made of different atoms. He thought that each element had a different weight, because it was made of different atoms.

In 1808, Dalton published a book, A New System of Chemical Philosophy, which listed the atomic weights of many known elements. His weights were not all accurate, but they formed the basis for the modern periodic table. Not everyone accepted Dalton's theory of atomic structure at the time, however. He had to defend his theory with more research.

When John Dalton died in 1844, he was buried with honors in England. More than 400,000 people viewed his body as it lay in state. As his final experiment, he asked that an autopsy be performed to find out the cause of his color-blindness. He proved that it was not caused by a problem with his eyes, but with his perception-the way his brain worked. Even in death, he helped expand scientific knowledge.

Today, scientists everywhere accept Dalton's theory of atomic structure. A simple country boy showed the world a new way of thinking about the universe and how it is made.

Georg Simon Ohm (1787)

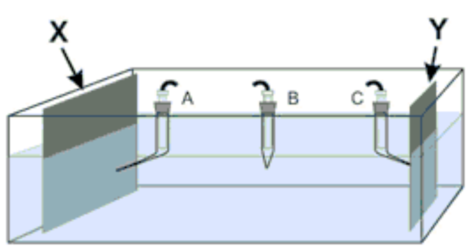
back to top

Georg Simon Ohm was born in 1787 in Germany. His father, Johann Wolfgang Ohm, was a locksmith and his mother, Maria Elizabeth Beck, was the daughter of a tailor. Although his parents had not been formally educated, Ohm's father was a remarkable man who had educated himself and was able to give his sons an excellent education through his own teachings.

In 1805, Ohm entered the University of Erlangen and received a doctorate. He wrote elementary geometry books while teaching mathematics at several schools. Ohm began experimental work in a school physics laboratory after he had learned of the discovery of electromagnetism in 1820.

In two important papers in 1826, Ohm gave a mathematical description of conduction in circuits modeled on Fourier's study of heat conduction. These papers continue Ohm's deduction of results from experimental evidence and, particularly in the second, he was able to propose laws which went a long way to explaining results of others working on galvanic electricity.

The basic components of an electrochemical cell are:



1) Electrodes (X and Y) that are made of electrically conductive materials: metals, carbon, composites ...
2) Reference electrodes (A, B, C) that are in electrolytic contact with an electrolyte
3) The cell itself or container that is made of an inert material: glass, Plexiglass, ... and
4) An electrolyte that is the solution containing ions.

Using the results of his experiments, Georg Simon Ohm was able to define the fundamental relationship between voltage, current, and resistance. What is now known as Ohm's law appeared in his most famous work, a book published in 1827 that gave his complete theory of electricity.

The equation I = V/R is known as "Ohm's Law". It states that the amount of steady current through a material is directly proportional to the voltage across the material divided by the electrical resistance of the material. The ohm (R), a unit of electrical resistance, is equal to that of a conductor in which a current (I) of one ampere is produced by a potential of one volt (V) across its terminals. These fundamental relationships represent the true beginning of electrical circuit analysis.

Michael Faraday (1791)

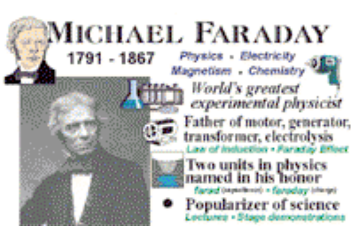
back to top

Born in 1791 to a poor family in England, Michael Faraday was extremely curious, questioning everything. He felt an urgent need to know more. At age 13, he became an errand boy for a bookbinding shop in London. He read every book that he bound, and decided that one day he would write a book of his own. He became interested in the concept of energy, specifically force. Because of his early reading and experiments with the idea of force, he was able to make important discoveries in electricity later in life. He eventually became a famous chemist and physicist.

Faraday built two devices to produce what he called electromagnetic rotation: that is a continuous circular motion from the circular magnetic force around a wire. Ten years later, in 1831, he began his great series of experiments in which he discovered electromagnetic induction. These experiments form the basis of modern electromagnetic technology.

In 1831, using his "induction ring", Faraday made one of his greatest discoveries - electromagnetic induction: the "induction" or generation of electricity in a wire by means of the electromagnetic effect of a current in another wire. The induction ring was the first electric transformer. In a second series of experiments in September he discovered magneto-electric induction: the production of a steady electric current. To do this, Faraday attached two wires through a sliding contact to a copper disc. By rotating the disc between the poles of a horseshoe magnet he obtained a continuous direct current. This was the first generator. From his experiments came devices that led to the modern electric motor, generator and transformer.

Faraday continued his electrical experiments. In 1832 he proved that the electricity induced from a magnet, voltaic electricity produced by a battery, and static electricity were all the same. He also did significant work in electrochemistry, stating the First and Second Laws of Electrolysis. This laid the basis for electrochemistry, another great modern industry.

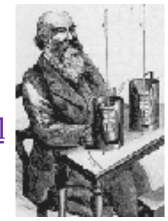


Michael Faraday, one of the world's greatest experimental physicist, is known as the father of the electric motor, electric generator, electric transformer, and electrolysis. He wrote the "Law of Induction" and is known for the "Faraday Effect". Two units in physics were named in his honor, the farad (for capacitance) and the faraday (as a unit of charge).

James Prescott Joule (1818)

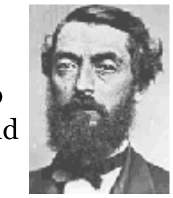
back to top

Joule was born in 1818 in England. A physicist, he shared in discovering the law of the conservation of energy. The law states that energy used in one form reappears in another and is never lost. In 1840, he stated a law, now called Joule's Law, that heat is produced in an electrical conductor. The international unit of energy, the joule, is named in his honor.



Edwin Laurentine Drake (1819)

back to top



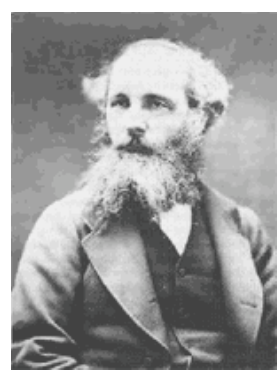
Edwin Laurentine Drake was born in 1819 in Greenville, New York. Drake is considered the petroleum entrepreneur of the oil industry. A former railroad conductor, his success was based on his belief that drilling was the best way to obtain petroleum from the earth. He organized Seneca Oil Co., leased land, and on August 27, 1859, struck oil at a depth of 69 feet near Titusville, Pennsylvania.

Most historians trace the start of the oil industry on a large scale to this first venture. Drake used an old steam engine to power the drill. After his well began to produce oil, other prospectors drilled wells nearby. Oil created riches for many people and for many countries, but not for Drake. His poor business sense eventually impoverished him. In 1876, he was granted an annuity by the State of Pennsylvania, where he remained until his death in Bethlehem, Pennsylvania.

An industry which brought great riches to so many, finally honored him by bringing his body back to Titusville and interring it in a fine tomb replete with symbolic bronze sculpture. The oil industry honors its birthplace with a museum and memorial park at the site where Drake struck oil in his pioneer well.

James Clerk Maxwell (1831)

back to top

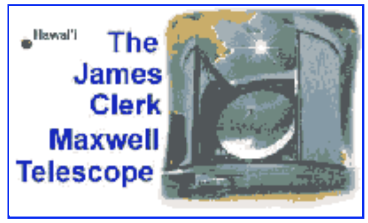


James Clerk Maxwell was born in Scotland in 1831. He is generally considered the greatest theoretical physicist of the 1800s, if not the century's most important scientist. He combined a rigorous mathematical ability with great insight into the nature of science. This ability enabled him to make brilliant advances in the two most important areas of physics at that time (electromagnetism and a kinetic theory of gases), in astronomy, and in biology as well.

$$\mathrm{div}\mathbf{D} = \rho$$
$$\mathrm{div}\mathbf{B} = 0$$
$$\mathrm{curl}\mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$
$$\mathrm{curl}\mathbf{H} = \mathbf{J} + \frac{\partial \mathbf{D}}{\partial t}$$

Maxwell was a physicist who is best known for his work on the connection between light, electricity, magnetism, and electromagnetic waves (traveling waves of energy). "Maxwell's Equations" are the group of four equations that show his greatness. This simple group of equations, together with the definitions of the quantities used in them and auxiliary relations defining material properties, fully describe classical electromagnetism. He discovered that light consists of electromagnetic waves. He not only explained how electricity and magnetism are really electromagnetism, but also paved the way for the discovery and application of the whole spectrum of electromagnetic radiation that has characterized modern physics. Physicists now know that this spectrum also includes radio, infrared, ultraviolet, and X-ray waves, to name a few.

Maxwell's second greatest contribution was his kinetic theory, especially the part dealing with the distribution of molecular speeds. In developing the kinetic theory of gases, Maxwell gave the final proof that the nature of heat resides in the motion of molecules. The kinetic theory of gases explains the relationship between the movement of molecules in a gas and the gas's temperature and other properties.



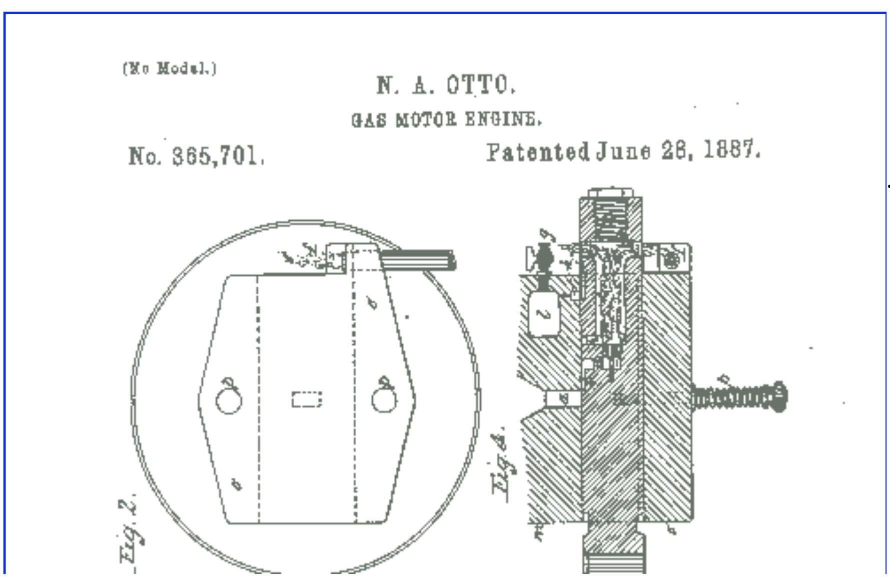
Maxwell also made important contributions in several other theoretical and experimental fields. Early in his career he figured out and then demonstrated the principles governing color, color vision, and how eyes work. He used a green, red and blue striped bow in making the world's first color photograph of an object. He hypothesized that the rings of the planet Saturn were made up of many small particles, and was proven right when satellites visited Saturn in the 1970's and later.

Nicolaus Otto (1832)

back to top

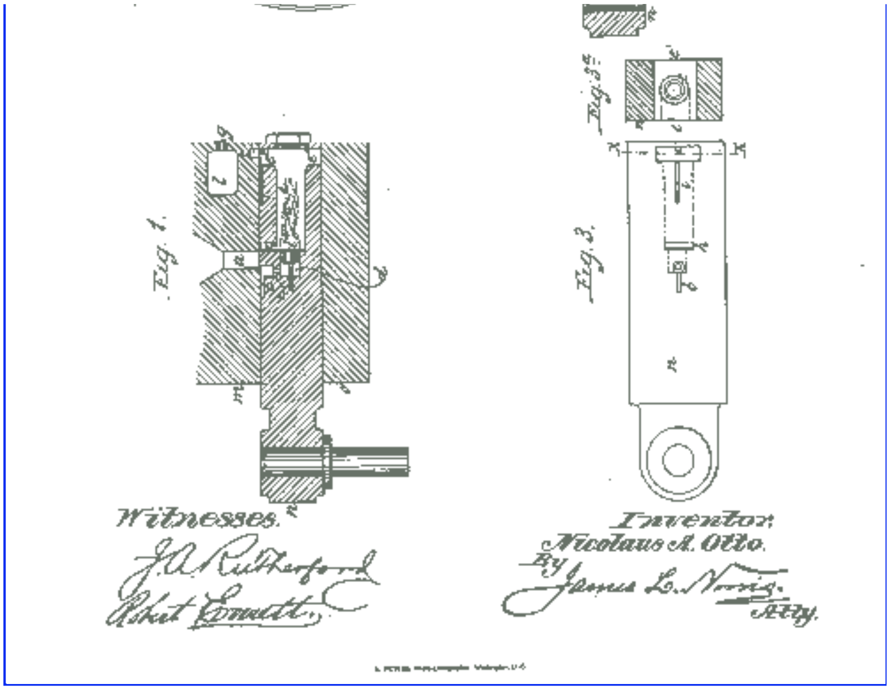
Born in 1832 in Germany, Nicolaus August Otto invented the first practical alternative to the steam engine - the first successful four-stroke cycle engine. Otto built his first four-stroke engine in 1861. Then, in partnership with German industrialist Eugen Langen, they improved the design and won a gold medal at the World Exposition in Paris of 1867.

In 1876, Otto, then a traveling salesman, chanced upon a newspaper account of the Lenoir internal combustion engine. Before year's end, Otto had built an internal combustion engine, utilizing a four-stroke piston cycle. Now called the 'Otto cycle' in his honor, the design called for four strokes of a piston to draw in and compress a gas-air mixture within a cylinder resulting in an internal explosion. He received patent #365,701 for his gas-motor engine. Because of its reliability, efficiency, and relative quietness, more than 30,000 Otto cycle engines were built in the next 10 years. He also developed low-voltage magneto ignition systems for his engines, allowing a much greater ease in starting.



Patent Number 365,701

Clicking on this image will take you from the EIA Kid's Page to the U.S. Patent and Trademark Office's Patent Full-Text and Image Database. When you get there, you will need to click on the box that says "Image" in order to



access the patent. When coming "back", you might need to double-click your "back" button.

Thomas Edison (1847)

back to top

Thomas Edison was born in 1847 in Milan, Ohio. Young Tom didn't do very well in school, so his mother decided to teach him at home. She gave him lots of books to read. Tom was a curious boy. He always wanted to know how things worked. He liked to see if he could make them work better. His mother let him set up a laboratory in the house where he could experiment with things.

As a young man, Tom set up a lab of his own, where he could try out his ideas. He invented lots of things in his laboratory. Guess what his favorite invention was? It was the phonograph. Before the phonograph, if you wanted to hear music, you had to play it yourself or go to a concert.

Edison's most famous invention was the light bulb.   At the time, people

used gas or oil lamps to light their homes. Edison knew it would be cheaper and easier to use electricity. The trouble was, nobody knew how to do it. Edison worked on his idea a long time . He tried lots of things that didn't work. But he didn't give up. He kept trying until one day it worked! Today, you can flip a switch and have light any time you want it.

Edison also built the first power plant. Edison's Pearl Street Power Station opened in 1882 in New York City. It sent electricity to 85 customers and made enough power to light 5,000 lamps.

Edison also invented the movie camera. When you go to the movies or watch TV, you can thank him for his ideas and hard work. Many of the electric machines you see at home or at school came from his ideas.

Inventing things was what Edison liked best. He thought about how things worked. Then he thought about how he could do it better. That is called inspiration. The hard part came next. Edison had to make his ideas work. He tried all kinds of things until he found exactly what would work. He called that perspiration. He said that invention was "one percent inspiration and ninety-nine percent perspiration."

Lewis Latimer (1848)

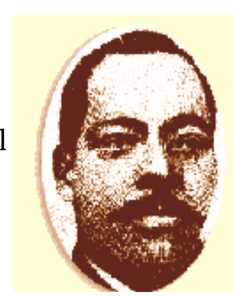
back to top

Lewis Howard Latimer was born in 1848 in Chelsea, Massachusetts. As a young man, Latimer learned mechanical drawing while working for a Boston patent office. In 1880, he was hired by Hiram Maxim of the U.S. Electric Lighting Company to help develop a commercially viable electric lamp. In 1882, Latimer invented a device for efficiently manufacturing the carbon filaments used in electric lamps and shared a patent for the "Maxim electric lamp". He also patented a threaded wooden socket for light bulbs and supervised the installation of electric streetlights in New York City, Philadelphia, Montreal, and London.

In 1884, Latimer became an engineer at the Edison Electric Light Company where he had the distinction of being the only African American member of "Edison's Pioneers" - Thomas Edison's team of inventors. While working for Edison, Latimer wrote Incandescent Electric Lighting, the first engineering handbook on lighting systems. Although today's incandescent light bulbs use filaments made of tungsten rather than carbon, Latimer's work helped to make possible the widespread use of electric lights.

Granville Woods (1856)

back to top



Born in Columbus, Ohio in 1856, Granville Woods literally learned his skills on the job. Attending school in Columbus until age 10, he served an apprenticeship in a machine shop and learned the trades of machinist and blacksmith. During his youth he also went to night school and took private lessons. Although he had to leave formal school at age ten, Granville Woods realized that learning and education were essential to developing critical skills that would allow him to express his creativity with machinery.

In 1872, he obtained a job as a fireman on the Danville and Southern railroad in Missouri, eventually becoming an engineer. He invested his spare time in studying electronics. In 1874, Woods moved to Springfield, Illinois, and worked in a rolling mill. In 1878, he took a job aboard the Ironsides, a British steamer, and, within two years, became Chief Engineer of the steamer. Finally, his travels and experiences led him to settle in Cincinnati, Ohio, where he became the person most responsible for modernizing the railroad.

In 1888, Woods developed a system for overhead electric conducting lines for railroads, which aided in the development of the overhead railroad system found in cities such as Chicago, St. Louis, and New York City. In his early thirties, he became interested in thermal power and steam-driven engines. And, in 1889, he filed his first patent for an improved steam-boiler furnace. In 1892, a complete Electric Railway System was operated at Coney Island, NY. In 1887, he patented the Synchronous Multiplex Railway Telegraph, which allowed communications between train stations from moving trains. Woods' invention made it possible for trains to communicate with the station and with other trains so they knew exactly where they were at all times. This invention made train movements quicker and prevented countless accidents and collisions.

Nikola Tesla (1856)

back to top

Nikola Tesla was born in 1856 in Austria-Hungary and emigrated to the U.S. in 1884 as a physicist. He pioneered the generation, transmission, and use of alternating current (AC) electricity, which can be transmitted over much greater distances than direct current.

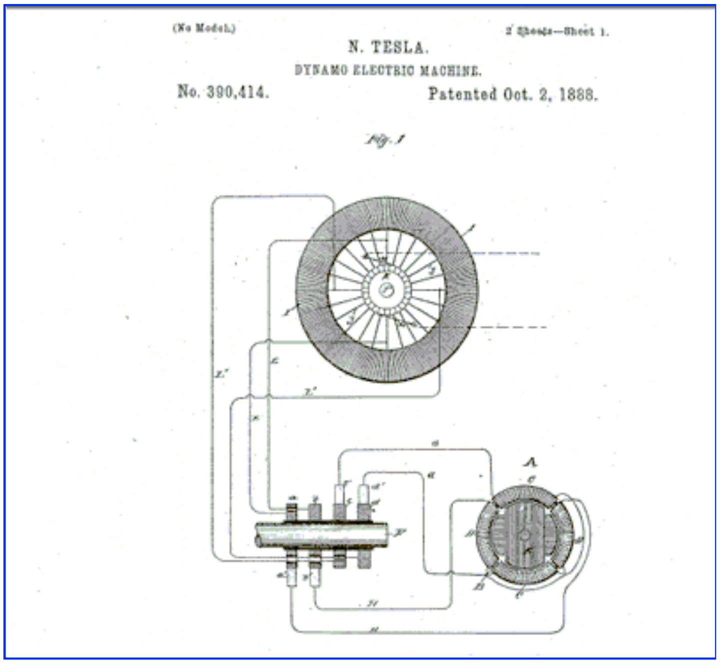
Tesla patented a device to induce electrical current in a piece of iron (a rotor) spinning between two electrified coils of wire. This rotating magnetic field device generates AC current when it is made to rotate by using some form mechanical energy, like steam or hydropower. When the generated current reaches its user and is fed into another rotating magnetic field device, this second device becomes an AC induction motor that produces mechanical energy. Induction motors run household appliances like clothes washers and dryers. Development of these devices led to widespread industrial and manufacturing uses for electricity.

The induction motor was only part of Tesla's overall conception. In a series of history-making patents, he demonstrated a polyphase alternating-current system, consisting of a generator, transformers, transmission layout, and motor and lights. From the power source to the power user, it provided the basic elements for electrical production and utilization. Our AC power system remains essentially unchanged today.

In 1888, George Westinghouse, head of the Westinghouse Electric Company, bought the patent rights to Tesla's system of dynamos, transformers and motors. Westinghouse used Tesla's alternating current system to light the World's Columbian Exposition of 1893 in Chicago. Then in 1896, Tesla's system was used at Niagara Falls in the world's first large hydroelectric plant. The Tesla coil, invented in 1891, is still used in radio and television sets, car starters, and a wide variety of electronic equipment.

Tesla's work with radio-frequency waves laid the foundation for today's radio. He experimented with wireless transmission of electrical power, and received 112 patents for devices ranging from speedometers to extremely efficient electrical generators to a bladeless turbine still in use today. He suggested that it was possible to use radio waves to detect ships (later developed as RADAR), and his work with special gas-filled lamps set the stage for the creation of fluorescent lighting.

Tesla was Thomas Edison's rival at the end of the 19th century - in fact, he was more famous than Edison throughout the 1890's. His invention of polyphase AC electric power earned him worldwide fame but not fortune. At his zenith his circle of friends included poets and scientists, industrialists and financiers. Yet Tesla died alone and almost penniless in a New York hotel room in 1943. During his life, Tesla created a legacy of genuine invention that still fascinates today. After his death, the world honored him by naming the unit of magnetic flux density the "tesla."



Patent Number 390,414

Clicking on this image will take you from the EIA Kid's Page to the U.S. Patent and Trademark Office's Patent Full-Text and Image Database. When you get there, you will need to click on the box that says "Image" in order to access the patent. When coming "back", you might need to double-click your "back" button.

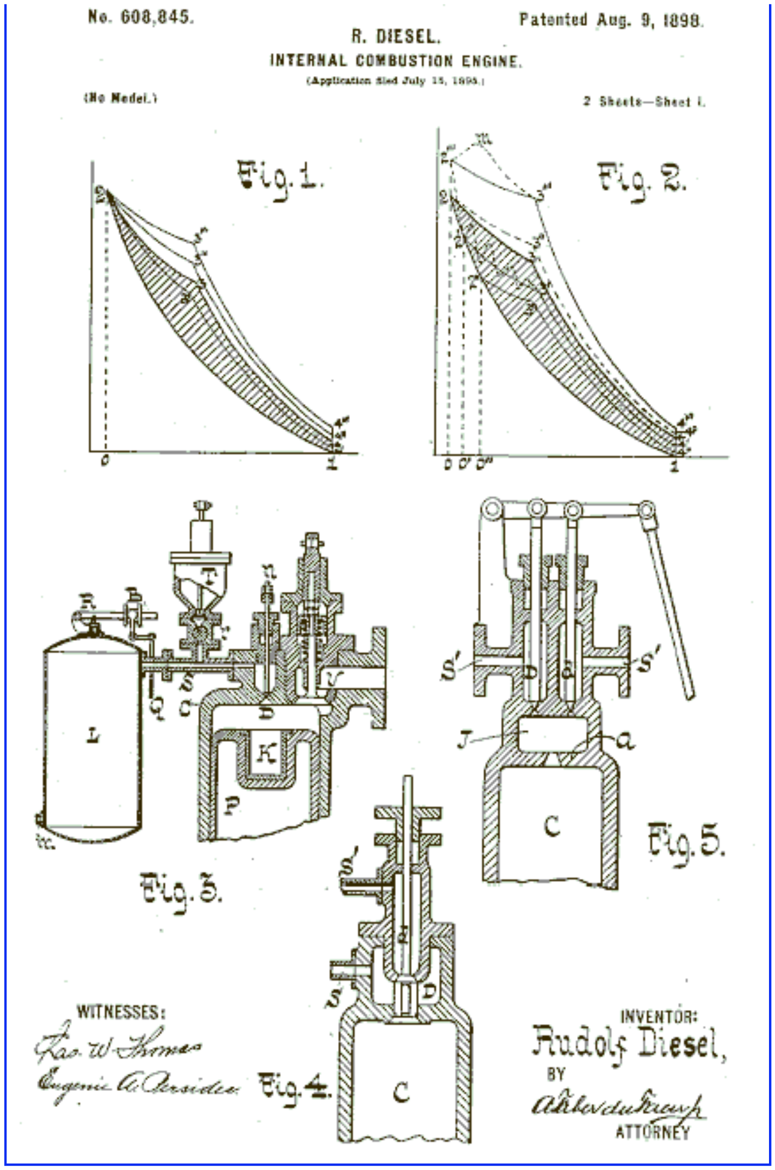
Rudolf Diesel (1858)

back to top

Rudolf Diesel was born in 1858 in France and began his career as a refrigerator engineer. For ten years he worked on various heat engines, including a solar-powered air engine. Diesel's ideas for an engine where the combustion would be carried out within the cylinder were published in 1893, one year after he applied for his first patent. Rudolf Diesel received patent #608845 for the diesel engine. The diesel engines of today are refined and improved versions of Rudolf Diesel's original concept. They are often used in submarines, ships, locomotives, and large trucks and in electric generating plants.

Though best known for his

invention of the pressure-ignited heat engine that bears his name, Diesel was also a well-respected thermal engineer and a social theorist. Diesel's inventions have three points in common: They relate to heat transference by natural physical processes or laws; they involve markedly creative mechanical design; and they were initially motivated by the inventor's concept of sociological needs. Diesel originally conceived the diesel engine to enable independent craftsmen and artisans to compete with large industry.

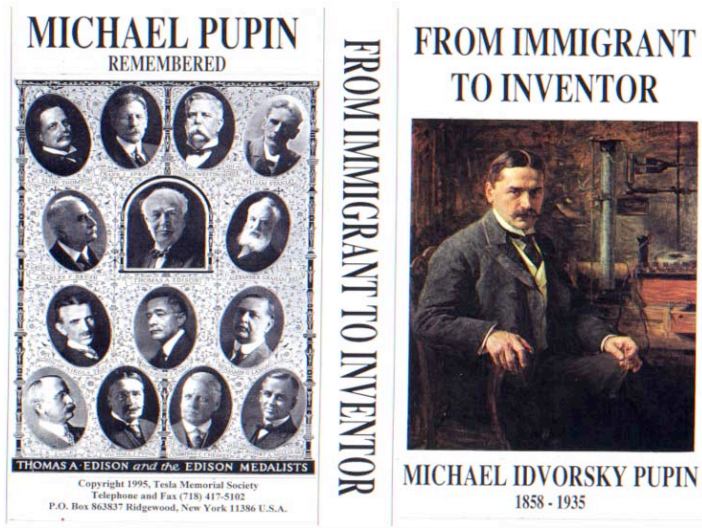


At Augsburg, on August 10, 1893, Diesel's prime model, a single 10-foot iron cylinder with a flywheel at its base, ran on its own power for the first time. Diesel spent two more years making improvements and in 1896 demonstrated another model with the theoretical efficiency of 75 percent, in contrast to the ten percent efficiency of the steam engine. By 1898, Diesel was a millionaire. His engines were used to power pipelines, electric and water plants, automobiles and trucks, and marine craft, and soon after were used in mines, oil fields, factories, and transoceanic shipping.

Patent Number 608,845
Clicking on this image will take you from the EIA Kid's Page to the U.S. Patent and Trademark Office's Patent Full-Text and Image Database. When you get there, you will need to click on the box that says "Image" in order to access the patent. When coming "back", you might need to double-click your "back" button.

Michael Pupin (1858)

back to top



Michael Pupin, American physicist and inventor, was born in Austria-Hungary in 1858. He immigrated to the United States in 1874, graduated from Columbia University in physics in 1883, and obtained his Ph.D. at the University of Berlin in 1889. Pupin taught at Columbia for more than 40 years, 30 of them as a professor of electromechanics.

Pupin improved the quality of long-distance telephone and telegraph transmission by inserting coils in the long lines at intervals; he discovered that matter struck by X-rays is stimulated to radiate other X-rays (secondary radiation) and invented an electrical resonator. He received 34 patents for his inventions, and he won the Pulitzer Prize in 1924 for his autobiography, *From Immigrant to Inventor*.

Marie Curie (1867)

back to top

Marie Curie was born in Poland in 1867. As a child, she amazed people with her great memory. She learned to read when she was only four years old.

Her father was a professor of science. The instruments that he kept in a glass case fascinated Marie. She dreamed of becoming a scientist, but that would not be easy. Her family became very poor, and at the age of 18, Marie became a governess. She helped pay for her sister to study in Paris. Later, her sister helped Marie with her education.

In those days, there were no universities for girls in Poland. So, in 1891, Marie went to the Sorbonne University in Paris. She was so poor, she ate only bread and butter, and drank tea. She wore old clothes she had brought with her from Warsaw.

Every day, she would study in the library until 10:00 p.m., then go to her cold little room, and read until 2 or 3 o'clock in the morning.

After four years at the Sorbonne, Marie married Pierre Curie, a well-known physicist. (A physicist is a scientist who studies the physical nature of the world -- what things are made of and why they do what they do.)

Together the Curies began looking for new elements. They took uranium ore, ground it up, and boiled it. They treated it with acids and other chemicals. Finally, after four years of hard work and tons of ore, they had one-tenth of a gram of pure radium. They had discovered the first radioactive element!

In 1903, Marie, Pierre, and another scientist, Henry Becquerel, were awarded the Nobel Prize in Physics for their discovery of radium and their study of radioactivity. Marie Curie was the first woman to win a Nobel Prize in Physics. Later, she won a second Nobel Prize in Chemistry.

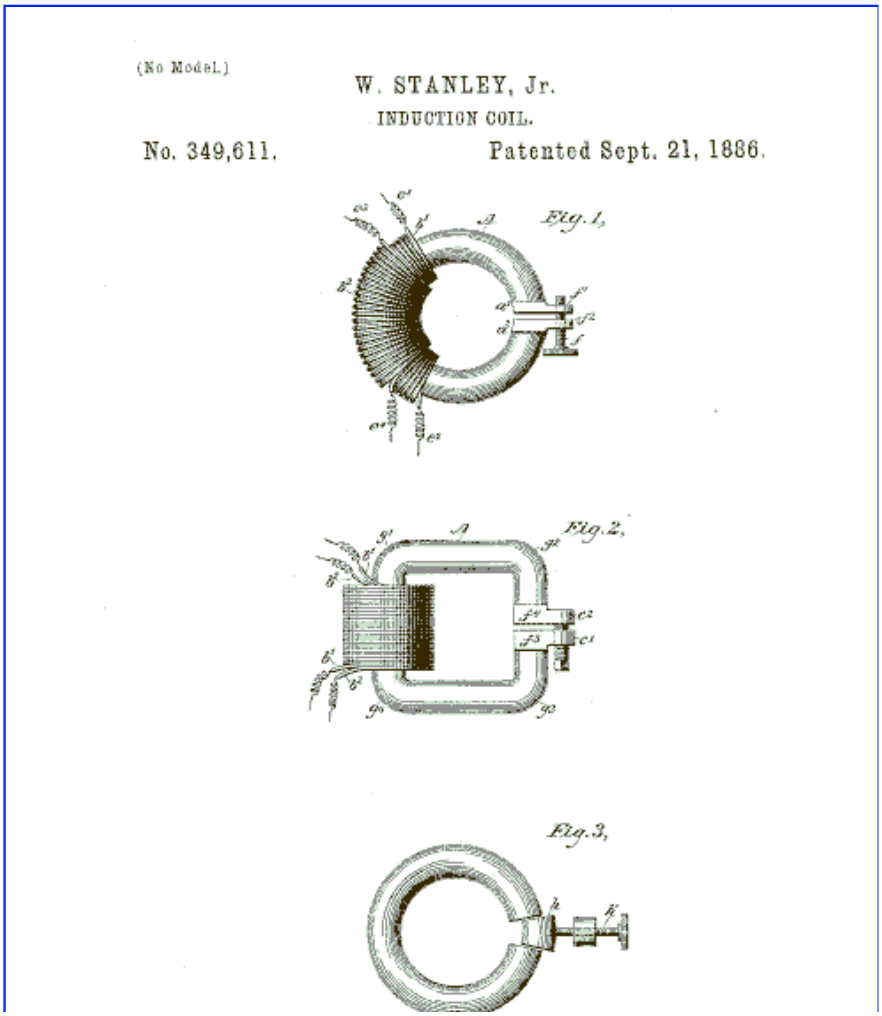
During World War I, Marie worked to develop x-rays. She believed they could help treat diseases like cancer. She never tried to make money from her discoveries, because she believed in helping others.

William Stanley (1858)

back to top

William Stanley was born in 1858. During his lifetime he was granted 129 patents covering a wide range of electric devices. The most notable of these is the induction coil, a transformer that creates alternating current electricity. In the 1880s every electricity distribution system used direct current (DC). The problem is that DC transmission over long distances is impractical, requires thick wires, is dangerous and could not be used for lighting. On the other hand, alternating current (AC) systems did not have these drawbacks. AC voltage systems could be varied by use of induction coils, but no practical coil system had been invented. Stanley's patent #349,611 changed all this and became the prototype for all future transformers.

Born in Brooklyn, New York, Stanley attended private schools before enrolling at Yale University. He began to study law at age 21 but less than a semester later left school to look for a job in the emerging field of electricity.



Stanley's first job was as an electrician with one of the early manufacturers of telegraph keys and fire alarms. He designed one of the country's first electrical installations for a store on New York's Fifth Avenue. After inventor and industrialist George Westinghouse learned of Stanley's accomplishments, he hired Stanley as his chief engineer at his Pittsburgh factory. It was during this time that Stanley began work on the transformer.

After Stanley left Pittsburgh, in 1886

he built the first AC system, providing lighting for offices and stores on the Main Street of Great Barrington, Massachusetts. He made transformers, auxiliary electrical equipment, and electrical appliances. The Stanley Electric Manufacturing Company was purchased by General Electric in 1903.

Patent Number 349,611
Clicking on this image will take you from the EIA Kid's Page to the U.S. Patent and Trademark Office's Patent Full-Text and Image Database. When you get there, you will need to click on the box that says "Image" in order to access the patent. When coming "back", you might need to double-click your "back" button.

Lise Meitner (1878)

back to top

Lise Meitner was born in Austria in 1878. As a young girl, she had a love for mathematics and physics, and adopted Madame Curie and Florence Nightingale as her heroines. After private schooling, she entered the University of Vienna and received her doctorate in physics in 1906. She had to get used to being the only woman in a room full of one hundred students.

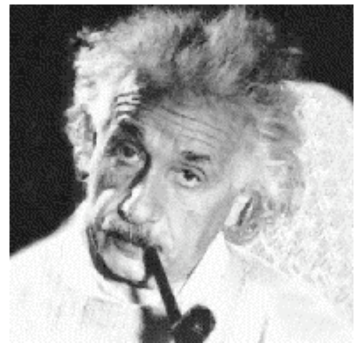
She worked at the Kaiser-Wilhelm Institute with radiochemist, Otto Hahn. They discovered the element protactinium and studied the effects of neutron bombardment on uranium. Meitner became joint director of the institute and was appointed head of the Physics Department in 1917. After leaving Nazi Germany in 1938, she found a post at the Nobel Physical Institute in Stockholm. She continued her research there, and, together with her nephew Otto Frisch, realized that they had split the uranium nucleus. They called the process "fission." During the war, she refused to work on the atomic bomb. In 1947, a laboratory was established for her by the Swedish Atomic Energy Commission, and she worked on an experimental nuclear reactor.

Albert Einstein (1879)

back to top

Albert Einstein was born in Germany in 1879. He enjoyed classical music and played the violin. One story Einstein liked to tell about his childhood was of a wonder he saw when he was four or five years old: a magnetic compass. The needle's invariable northward swing, guided by an invisible force, profoundly impressed the child. The compass convinced him that there had to be "something behind things, something deeply hidden."

Even as a small boy Einstein was self-sufficient and thoughtful. According to family legend he was a slow talker, pausing to consider what he would say. His sister remembered the concentration and perseverance with which he would build houses of cards.



In 1933, he joined the staff of the newly created Institute for Advanced Study in Princeton, New Jersey. He accepted this position for life, living there until his death. Einstein is probably familiar to most people for his mathematical equation about the nature of energy, $E = mc^2$.

Einstein wrote a paper with a new understanding of the structure of light. He argued that light can act as though it consists of discrete, independent particles of energy, in some ways like the particles of a gas. A few years before, Max Planck's work had contained the first suggestion of a discreteness in energy, but Einstein went far beyond this. His revolutionary proposal seemed to contradict the universally accepted theory that light consists of smoothly oscillating electromagnetic waves. But Einstein showed that light quanta, as he called the particles of energy, could help to explain phenomena being studied by experimental physicists. For example, he made clear how light ejects electrons from metals.

There was a well-known kinetic energy theory that explained heat as an effect of the ceaseless motion of atoms; Einstein proposed a way to put the theory to a new and crucial experimental test. If tiny but visible particles were suspended in a liquid, he said, the irregular bombardment by the liquid's invisible atoms should cause the suspended particles to carry out a random jittering dance. One should be able to observe this through a microscope, and if the predicted motion were not seen, the whole kinetic theory would be in grave danger. But just such a random dance of microscopic particles had long since been observed. Now the motion was explained in detail. Einstein had reinforced the kinetic theory, and he had created a powerful new tool for studying the movement of atoms.

Frederick M. Jones (1892)

back to top

Frederick M. Jones was born in Cincinnati, Ohio in 1892. After returning from France after serving in World War I, Mr. Jones worked as a garage mechanic. His mastery of electronic devices was largely self-taught, through work experience and the inventing process. With his experience as a mechanic he developed a self-starting gasoline motor. In the late 1920's Frederick Jones designed a series of devices for the developing movie industry, which adapted silent movie projectors to use talking movie stock. He also developed an apparatus for the movie box-office that delivers tickets and returns change to customers.

Frederick M. Jones was granted more than 40 patents in the field of refrigeration. In 1935 he invented the first automatic refrigeration system for long-haul trucks. The system was, in turn, adapted to a variety of other common carriers, including ships and railway cars. The invention eliminated the problem of food spoilage during long shipping times. The ability to provide fresh produce across the United States during the middle of summer or winter changed the American consumer's eating habits. Jones' inspiration for the refrigeration unit was a conversation with a truck driver who had lost a shipment of chickens because the trip took too long and the truck's storage compartment overheated. Frederick Jones also developed an air-conditioning unit for military field hospitals and a refrigerator for military field kitchens. Frederick Jones received over 60 patents in his career.

David Crosthwait (1898)

back to top

David Crosthwait was born in Nashville, Tennessee, in 1898. He received a B.S. from Purdue University (1913) and a Masters of Engineering in 1920. Mr. Crosthwait was considered an authority on heat transfer, ventilation and air conditioning. He was a Research Engineer, Director of Research Laboratories for C.A. Dunham Company in Marshalltown, Iowa, from 1925 to 1930. He was the Technical Advisor of Dunham-Bush, Inc. from 1930 to 1971. He served as the past president of the Michigan City Redevelopment.

Mr. Crosthwait was responsible for designing the heating system for Radio City Music Hall at Rockefeller Center in New York City. Mr. Crosthwait was the author of a manual on heating and cooling with water and guides, standards, and codes that dealt with heating, ventilation, refrigeration, and air conditioning systems. David Crosthwait received 39 patents relating to the design, installing, testing, and service of HVAC power plants, heating, and ventilating systems. After retiring from industry in 1969, Mr. Crosthwait taught a course on steam heating theory and control systems at Purdue University.

Louis Roberts (1913)

back to top

Louis W. Roberts was born in Jamestown, New York, in 1913. He was educated at Fisk University, where he received a Bachelor of Arts in 1935, and a Master of Science from the University of Michigan in 1937. Roberts served as a research assistant for Standard Oil of New Jersey from 1935 to 1936. He was a graduate assistant from 1936-37 while at the University of Michigan. He served as Instructor of Physics at St. Augustine's College from 1937-39. Roberts was appointed Professor of Mathematics and Physics at St. Augustine's College from 1941 to 1943 and Associate Professor of Physics at Howard University, 1943-44. Roberts holds eleven patents for electronic devices and is the author of papers on electromagnetism, optics, and microwaves.

Roberts served as Director of Research for Microwave Associates from 1950 to the present. He is also the Director of Energy and Environment at the Transportation System Center in Cambridge, Massachusetts, from 1977 to the present. The Transportation System Center, as part of the U.S. Department of Transportation, develops energy conservation practices for the transportation industries. Currently, transportation accounts for over half of the United States' consumption of petroleum. However, the Energy Conservation Policy Act requires the transportation sector to reduce fuel consumption in all types of vehicles.

During Roberts' career, he has served as chief of the Optics and Microwave Laboratory in the Electronics Research Center of the National Aeronautics and Space Administration. He founded and was president of a microwave company. His research interests focus on microwave and optical techniques and components, plasma research, solid state component and circuit development.

Roscoe L. Koontz (1922), photo courtesy of the Princeton site for African American Studies

back to top

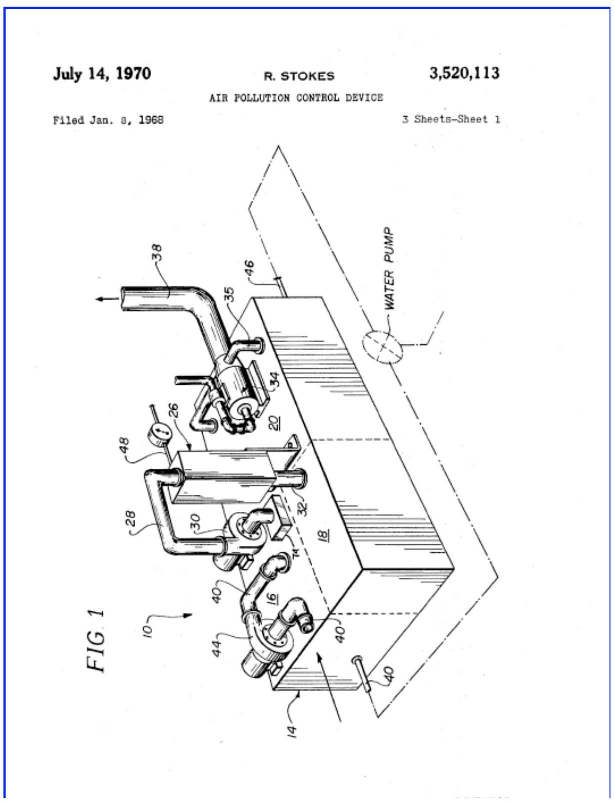
Roscoe L. Koontz was born in St. Louis, Missouri in 1922. He graduated from Vashon High School in St. Louis. His college education at Stowes Teachers College was interrupted by a three-year hitch in the U.S. Army during World War II. While in the army, he received technical training through a special pre-engineering army training program at West Virginia State College. Upon discharge from the army in 1946, he returned to Tennessee State University and graduated with a Bachelor of Science in Chemistry.

Roscoe Koontz was among the first formally trained health physicists through his participation in the first Atomic Energy Health Physics Fellowship Training Program, sponsored at the University of Rochester in 1948. He designed a pinhole gamma ray camera and collimator and helped to design and fabricate automatic air and water sampling equipment and radiation activity measuring devices.

Health physics became a recognized profession around 1942. When Koontz entered the field, there were few rules and guidelines and procedures for health physicists to follow. Together with their instructors, the early students, like Koontz, originated many of today's practices, instrumentation and techniques to protect people from the hazards of ionizing radiation.

Rufus Stokes (1924)

back to top



Rufus Stokes was born in Alabama in 1924. He later moved to Illinois, where he worked as a machinist for an incinerator company. In 1968, he was granted a patent on an air-purification device to reduce the gas and ash emissions of furnace and powerplant smokestack emissions. The filtered output from the stacks became almost transparent. Stokes tested and demonstrated several models of stack filters, termed the "clean air machine", in Chicago and elsewhere to show its versatility. The system benefited the respiratory health of people, but also eased the health risksto plants and animals. A side-effect of reduced industrial stack emissions was the improved appearance and durability of

buildings, cars, and objects exposed to outdoor pollution for lengthy periods.

Patent Number 3,520,113

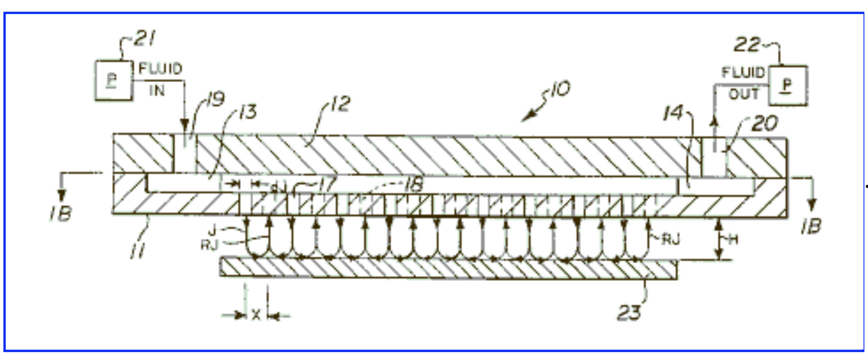
Clicking on this image will take you from the EIA Kid's Page to the U.S. Patent and Trademark Office's Patent Full-Text and Image Database. When you get there, you will need to click on the box that says "Image" in order to access the patent. When coming "back", you might need to double-click your "back" button.

Meredith C. Gourdine (1929)

back to top

Meredith C. Gourdine was born in Newark, New Jersey in 1929. He received a B.S. in Engineering Physics from Cornell University in 1953 and a Ph.D. in Engineering Physics from the California Institute of Technology in 1960. Dr. Gourdine pioneered the research of electrogasdynamics. He was responsible for the engineering technique termed Incineraid for aiding in the removal of smoke from buildings. His work on gas dispersion developed techniques for dispersing fog from airport runways.

Dr. Gourdine served on the technical staff of the Ramo-Woolridge Corporation from 1957-58. He then became a Senior Research Scientist at the Caltech Jet Propulsion Laboratory from 1958-60. He became a Lab Director of the Plasmodyne Corporation from 1960-62 and Chief Scientist of the Curtiss-Wright Corporation from 1962 to 1964. Dr. Gourdine established a research laboratory, Gourdine Laboratories, in Livingston, New Jersey, with a staff of over 150. Dr. Gourdine has been issued several patents on gasdynamic products as a result of his work. He received patent #5,548,907 for a method and apparatus for transferring heat, mass, and momentum between a fluid and a surface. Dr. Gourdine served as president of Energy Innovation, Inc. of Houston, Texas.



Patent Number 5,548,907

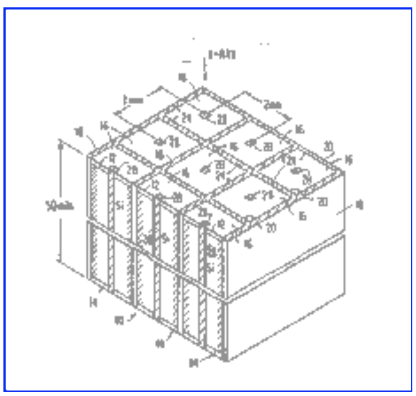
Clicking on this image will take you from the EIA Kid's Page to the U.S. Patent and Trademark Office's Patent Full-Text and Image Database. When you get there, you will need to click on the box that says "Image" in order to access the patent. When coming "back", you might need to double-click your "back" button.

George Edward Alcorn, Jr.

back to top

George Edward Alcorn, Jr. was born in 1940. He received a four-year academic scholarship to Occidental College in Los Angeles, where he graduated with a Bachelor of Science in Physics. He received his degree with honors while earning eight letters in basketball and football. George Alcorn earned a Master of Science in Nuclear Physics in 1963 from Howard University, after nine months of study. During the summers of 1962 and 1963, George Alcorn worked as a research engineer for the Space Division of North America Rockwell. He was involved with the computer analysis of launch trajectories and orbital mechanics for Rockwell missiles, including the Titan I and II, Saturn IV, and the Nova.

In 1967 George Alcorn earned a Ph.D. in Atomic and Molecular Physics from Howard University. Between 1965-67 Alcorn conducted research on negative ion formation under a NASA-sponsored grant. Dr. Alcorn holds eight patents in the United States and Europe on semiconductor technology, one of which is a method of fabricating an imaging X-ray spectrometer. His area of research includes: adaptation of chemical ionization mass spectrometers for the detection of amino acids and development of other experimental methods for planetary life detection; classified research involved with missile reentry and missile defense; design and building of space instrumentation, atmospheric contaminant sensors, magnetic mass spectrometers, mass analyzers; and development of new concepts of magnet design and the invention of a new type of x-ray spectrometer.



Patent Number 4,618,380

Clicking on this image will take you from the EIA Kid's Page to the U.S. Patent and Trademark Office's Patent Full-Text and Image Database. When you get there, you will need to click on the box that says "Image" in order to access the patent. When coming "back", you might need to double-click your "back" button.

Henry Ford (1863)

back to top

Henry Ford is often incorrectly thought of as the inventor of the automobile. (That distinction belongs to Karl Benz of Germany.) Henry Ford was an innovative man who revolutionized the automobile industry. Ford was born on July 30, 1863 in Dearborn, Michigan. As a child he worked on the family farm. In his spare time, he experimented in the farm's machine shop. At the age of 17, Ford left the family farm and moved to Detroit where he worked in continued his work in machine shops, specifically with steam engines. In 1882 Henry

Ford became a certified machinist and was hired by Westinghouse Company to set up and repair steam engines.

In 1891 Ford designed a small engine that burned gasoline. Thomas Edison then offered Henry Ford a job and Ford became the chief engineer for Edison Illuminating Company. Three years later, Ford built a gasoline-powered car known as the "horseless carriage". He quit his job with Edison to pursue interests with cars. Over the next few years, Henry Ford continued to develop his car designs, including the Model A and the Model T. He increased both speed and fuel efficiency. Efficiency was a trademark of Ford. He developed the assembly line to help produce cars quickly and economically. It was Ford's goal to make cars available to average Americans. During both World War I and World War II, the Ford plant was used in the war effort to build equipment. During the last portion of Henry Ford's life, he served as chairman of the Ford Foundation, a charitable organization. Henry Ford died on April 7,
1947.

Robert Goddard (1882)

back to top

Image of Robert Goddard. Photo source: National Air and Space Administration (NASA)

Robert Goddard is given credit as being one of the fathers of modern rocketry. Though not given credit during his lifetime, he is now recognized as a significant modern scientist. Robert Goddard was born on October 5, 1882 in Worcester, Massachusetts. As a young boy he displayed an interest and ability in science. He experimented with electricity. He became fascinated with fireworks, the beginning of his interest in rockets. Goddard attended public school in both Boston and Worcester. He attended Worcester Polytechnic Institute, a practical engineering school. He regularly journaled new ideas and inventions. After earning his degree, he taught at the institute and later at Clark University.

In 1920 Goddard wrote a paper describing sending an unmanned rocket to the moon. He was ridiculed by the press for this idea. Charles Lindberg became interested though and began to finance Goddard's work. Goddard moved his operation to New Mexico. During this time, he worked with parachute systems, stabilizing fins, and gyroscopes. Though his work was not widely known in the United States, Goddard's work was taken very seriously in Germany. During World War II, the Germans developed Goddard's theories further. Goddard was a faithful American and worked with the U.S. military to create and build the bazooka, an antitank weapon. He worked with the U.S. Navy to develop jet takeoff devices. Goddard died on August 10, 1945. After his death the U.S. Patent Office recognized Goddard for 214 patents regarding rocket designs. Today's rockets are based on Robert Goddard's designs and theories.

Benjamin Franklin (1706)

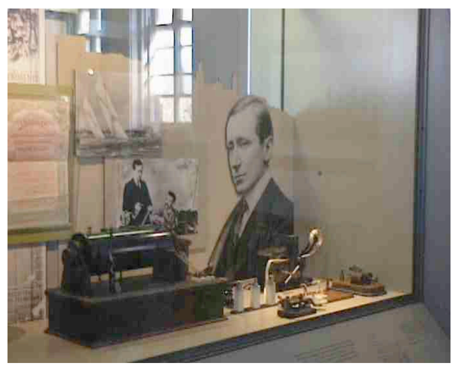
back to top

Benjamn Franklin was a diplomat, politician, printer, and scientist. He invented bifocals, the Franklin stove, and experimented with electricity. Franklin was born in

1706 in Boston, Massachusetts. He showed his intelligence and interest early on in reading and writing. At the age of ten though, he was taken out of school to learn his father's trade of candle making. Young Benjamin hated this work and two years later became an apprentice in his brother James' print shop. After five years Franklin left his brother's shop and went to New York. There was no work in New York so he moved to Philadelphia. Philadelphia was a much bigger city at the time. Franklin became very successful as a printer. Wealth brought him time to work on his inventions and interests. Franklin recognized that common fireplaces were inefficient. He designed the Franklin stove to use heat better. His stove drew in cool air, heated the air, and then circulated the heated air. These stoves became very popular in American and Europe. Electricity had recently been discovered in Europe. Franklin became extremely interested in it and spent six years trying to generate electricity. Franklin began to focus on lightning and the idea that it was caused by electric charges. Franklin suggested the use of lightning rods to redirect electricity away from buildings to keep them from burning down. By tying an iron key to a kite string during a storm, he was able to identify the electrical charge as being the same as in a Leyden Jar. This proved lightning was electricity. Benjamin Franklin spent the later part of his life pursuing his interests and working for the colonies and the creation for the United States. Franklin died in 1790 in the country he helped form and improve.

Guglielmo Marconi (1874)

back to top



Guglielmo Marconi was an Italian inventor and electrical engineer. He is recognized for his development of wireless telegraphy, also known as radio. Prior to Marconi's work, telegraph signals were sent through wires. Marconi was born on April 25, 1874 in Bologna, Italy. He showed an interest for science early in his life. Much of his studies were done privately. In 1894 Marconi began experimenting with wireless telegraphy. He based his work on Heinrich Hertz's work with electromagnets. Beginning with transmitting signals across a room, Marconi eventually was able to transmits signals across miles by grounding the transmitter and receiver. The Italian government was not interested in his work, so Marconi moved to England. During this time, he received his first patent regarding radio. Marconi's next goal was to send a message across the Atlantic. This was accomplished on December 12, 1901. He transmitted the letter "S" in Morse code. The success of this transmission opened scientific study in the atmosphere and the idea of an ionosphere. This technology became more well known as it was used in saving many lives aboard the troubled ships the Republic and the Titanic. This wireless technology became required on passenger ships. Marconi then began working on short-wave and microwave transmissions. Short-wave signals were cheaper and easier to operate.

In 1909 Marconi was awarded the Noble Prize in physics, which he shared with Karl F. Braun. In 1914 King George gave Marconi an honorary title of Knight Grand Cross of the Royal Victoria Order. Marconi also received John Fritz Medal, an American engineering award. He died on July 20, 1937.

J. Robert Oppenheimer (1908)

back to top

J. Robert Oppenheimer is considered the father of the atomic bomb. He was the director of the team who designed and built the first atomic bomb. Oppenheimer was born in 1908 in New York City. In 1925 he graduated from Harvard University. In 1927 Oppenheimer earned his doctorate degree from the University of Gottingen in Germany. Two years later he became a professor at the University of California at Berkley and worked on theoretical physics. From 1943-1945, Oppenheimer led a team of scientists who designed and built the first atomic bomb. Over several of the following years, Oppenheimer headed the advisory committee of the United States Atomic Energy Commission (AEC). He worked with the U.S. Department of Defense and worked internationally for control of atomic energy.

Oppenheimer's loyalty to the United States was questioned in 1953. He held opposition to the hydrogen bomb and had some connections with Communists. This led to an investigation by the AEC security panel. He was cleared of all charges but the allegations caused him to be denied further access to secret information. Oppenheimer was awarded the Enrico Fermi Award for contributions to theoretical physics. J. Robert Oppenheimer spent the last years of his life as the director of the Institute for Advanced Study in Princeton, New Jersey. He died in 1967.