Tesla Patents

**18921213\_US487796\_System of Electrical Transmission of Power**

1892 December 13 - Alternating current generator consisting of independent armature-circuits formed by conductors alternately disposed; Currents developed differ in phase and the field magnet poles in excess of the number of armature-circuits; Motor having independent energizing circuits connected to the armature-circuit of the alternating current generator; Rotating magneto-electric machine yielding a given number of current impulses or alterations for each turn or revolution; Poles which in number are less than the number of current impulses produced in each motor-circuit by one turn or revolution; Multipolar alternating-current machine.

**18931226\_US511559\_Electrical Transmission of Power**

1893 December 26 - Method of operating motors having independent energizing circuits; Passing alternating currents through circuits and retarding the phases of the current in one circuit to a greater extent; Directing alternating currents from a single source through both circuits of a motor and varying or modifying the relative resistance or self-induction of motor circuits, producing in currents differences in phases.

**18931226\_US511560\_System of Electrical Power Transmission**

1893 December 26 - Motor having independent energizing circuits connected with a source of alternating currents; Means of rendering the magnetic effects to said energizing circuit of difference phase; Armature within the influence of the energizing circuit; Energizing circuits connected in derivation or multiple arc and of different active or variable resistance (or self-inductance); Pairs of mains connected and a multiple circuit differential phase; Change of time-period of currents passing through an electro-motive phase-changing device interposed between the mains and the destination; Includes a correction.

**18940102\_US511915\_Electrical Transmission of Power**

1894 January 2 - Method of operating electro-magnetic motors; Passing alternating currents through one of the energizing circuits and inducing by such current in the other energizing circuit or circuits of the motor.

**18940102\_US511916\_Electric Generator**

1894 January 2 - Combination with the piston or equivalent element of an engine which is free to reciprocate under the action thereon of steam or a gas under pressure, of the moving conductor or element of an electric generator in direct mechanical connection; Engine and generator being adjusted by their relative adjustment with respect to period to produce currents of constant period; Electric generator having inducing or induced elements one of which is capable of oscillation in the field of force, the movable element being carried by the piston rod of the engine; Relation as to respect of period of electrical vibration will not disturb the period of the engine; Cylinder and piston reciprocating by steam or gas under pressure of a spring maintained in vibration by the movement of the piston, and the electric generator, the movable conductor or element of which is connected with the piston; Method of constructing and adapting elements; Imparting the oscillation of an engine to the moving element of an electric generator and regulating the period of mechanical oscillation by adjustment of the reaction of the electric generator.

**18940109\_US512340\_Coil for Electro-Magnets**

1894 January 9 - Effect of mutual relation self-induction exploited; Adjacent coil convolutions formed parts exists so that the potential difference is sufficient to neutralize negative effects; Object to avoid expensive, cumbersome, and difficult condensers; Bifilar coil winding technique.

**18940206\_US514167\_Electrical Conductor**

1894 February 6 - Prevent loss in line conductors; Insulate and encase conductors with a sheathing which is connected to the ground; Sheath or screen; Coaxial cabling.

**18940206\_US514168\_Means for Generating Electric Currents**

1894 February 6 - Generating and utilizing electrical energy discovered by Tesla; related to US454622 and US462418; Maintenance of intermittent or oscillatory discharges of a condenser of suitable circuit containing translating devices; Discharges take place in insulating liquids (such as oil); Varying spark gap distances; Keep circulating flow in liquid; Illustrates preferred manner.

**18940206\_US514169\_Reciprocating Engine**

1894 February 6 - Provide a means of engines, which under the applied forces such as elastic tension of steam or gas under pressure, that will yield constant oscillatory movements (in wide limits); Function is constant irrespective of the loads, frictional losses, or other factors (which degrade other engines); Convert pressure into mechanical power; Better at higher temperatures and pressures than previous engines; Same principles of this engine appear later in the modern gasoline motors of automobiles; often cited by enthusiasts as a version of the "earthquake machine."

**18940206\_US514170\_Incandescent Electric Light**

1894 February 6 - Related to US454622; Incandescent electric lamps; Particular forms of the lamp in which a light giving small body or button of refractory material is supported by a conductor entering a very highly exhausted globe or receiver; Conducting screen surrounds the supporting conductor; Single node vacuum tube.

**18940220\_US514972\_Electric Railway System**

1894 February 20 - Utilizes high potentials and high frequencies; Insulated and screened supply conductor along the line of travel; Induction bar or plate in inductive relation to the screened conductor and an electrical connection to the motor.

**18940220\_US514973\_Electrical Meter**

1894 February 20 - Method of measuring the amount of electrical energy expended in a given time in an electric circuit of alternating currents; High tension discharge through a rarefied gas between two conductors; Computing from the amount of the particles thrown off from the conductors or one of the same by action of the discharge of the energy expended; Primary coil in series with a translating device; High tension secondary; Two carbon conductors sealed in an exhausted receiver and coated with an insulating material on three sides, one terminal of each conductor being connected to a terminal of a secondary.

**18940410\_US517900\_Steam Engine**

1894 April 10 - Cylinder and reciprocating piston (with a spring) and controlling slide valve of an engine adapted to be operated by steam or a gas system under pressure of an independently controlled engine of constant period operating the said valve.

**18940814\_US524426\_Electromagnetic Motor**

1894 August 14 - Alternating current motor with energizing coils adapted to be connected with an external circuit of cores of different magnetic susceptibility so as to exhibit differences of magnetic phase under the influence of an energizing current; Rotary armature of magnetic poles and coils adapted to be connected with the external circuit surrounding the same; Cores constructed of different size, length, mass, or material whereby their magnetic phase will differ in time.

**18960225\_US555190\_Alternating Motor**

1896 February 25 - Related to US381968 and US382280; Mode and plan of operating electric dynamic motor generators by progressive shifting; Magneto-electric machine; Dynamo motor conversion with two independent alternating current circuits; Transmission of energy; Rotating magnetic field principles.

**18960915\_US567818\_Electrical Condenser**

1896 September 15 - Condenser constructed or provided with means for exclusion of air or gas; Armature composed of a conducting liquid; Armatures in two separate bodies of conducting liquid insulated electrically and contained in a receptacle; Insulating liquid seal on the surface of the conductive liquids.

**18960922\_US568176\_Apparatus for Producing Electrical Currents of High Frequency and Potential**

1896 September 22 - Conversion of direct current into currents of high frequency. Combination of high self-inductance circuit, choking coil circuit controllers adapted to make and break the circuit, a condenser into which the back-emf discharges when interrupted, and a transformer through the primary of which the condenser discharges; Motor for driving the controller; 'Current of high electromotive force (voltage) which is induced at each break of the main circuit (back-emf) furnishes the proper current for charging the condenser (capacitor).'

**18960922\_US568177\_Apparatus for Producing Ozone**

1896 September 22 - Primarily provides a simple, cheap, and effective apparatus for the production of ozone (or such gases); Obtained by the action of high-tension electrical discharges; Related to US462418 (November 3, 1891) and US454622 (June 23, 1891); In combination with a low self-induction and resistance circuit of direct currents, of a controller for making and breaking the same, a series-wound motor included in or connected with the charging-circuit and driving the controller; A condenser around the point of interruption in a circuit around the controller, and a transformer through the primary of which the condenser discharges (producing the potential necessary for such primary discharge and the coil raises the potential of such discharge) and which is in the discharge-circuit of the condenser; Device for maintaining a current of air between the discharge-surface; A fan-motor (maintaining a current of air between the discharge-surfaces) is connected with the charging-circuit.

**18960922\_US568178\_Method of Regulating Apparatus for Producing Electric Currents of High Frequency**

1896 September 22 - Cited by Tesla in "the True Wireless" (illustrated in that article as Fig. 10) in the wireless field for the concatenated tuned circuits; regulates the energy delivered by a system for the production of high-frequency currents. It consists of a supply-side circuit whose current is diverted into a charging circuit of high self-induction, a condenser (charged by the supply circuit), another circuit (with low self-induction) which the same discharges through (and raises the potential of the condenser), and means for controlling the charging and the discharging of same, the said method consisting in varying the relation of the varying frequencies of the impulses in the circuit comprise the system.

**18960922\_US568179\_Method of and Apparatus for Producing Currents of High Frequency**

1896 September 22 - used in the laboratory at New York, 35 South Fifth Avenue lab for employing currents of different phase; method for producing electric currents of high frequency, which consists in generating an alternating current, charging a condenser thereby during determinate intervals of each wave of said current, and discharging the condenser through a circuit of low self-induction; the combination with a source of alternating current, a condenser, a circuit-controller adapted to direct the current during determinate intervals of each wave into the condenser for charging the same, and a circuit of low self-induction into which the condenser discharges; the combination with a source of alternating current, a synchronous motor operated thereby, a charging-circuit in which the energy of said current is stored, a circuit-controller operated by the motor and adapted to interrupt the charging-circuit through the motor at determinate points in each wave, a condenser connected with the motor-circuit and adapted on the interruption of the same to receive the accumulated energy stored therein, and a circuit into which the condenser discharges.

**18960922\_US568180\_Apparatus for Producing Electrical Currents of High Frequency**

1896 September 22 - an isochronous mechanical break used in the laboratory at New York, 35 South Fifth Avenue lab for employing currents of different; patent covers possible variations within Tesla's wireless systems; a combination with a source of alternating current, of a condenser adapted to be charged thereby, a circuit into which the condenser discharges in a series of rapid impulses and in synchronism with the source, and a circuit-controller for effecting the charge and discharge of said condenser, composed of a set of sub-divided conductors (a pair of angularly adjustable terminal and two or more rotating conductors) moveable into and out of proximity with (e.g., passing by) each other, whereby a spark may be maintained between them and the circuit closed thereby during determined intervals.

**18970223\_US577670\_Apparatus for Producing Electric Currents of High Frequency**

1897 February 23. Two input circuits are each pulsed with a 25% duty cycle. Additionally, the brushes are phased so that the on states (discharges) never overlap. The output circuit has a toggled 50% output duty cycle, double the duration of the input pulse. Resultant back-emf is rectified to capacitors, and fed through a Tesla coil to a load.

**18970223\_US577671\_Manufacture of Electrical Condensers, Coils and Similar Devices**

1897 February 23 - Improvements of condensers, transformers, self-induction coils, rheostats, and other similar devices; Used in areas where currents of high potentials are brought into close proximity; Method of excluding gas or air from the dielectric environment of such devices; Insulated material rendered fluid by heat; Material permeated the interstices of device and held under pressure; Material cooled and solidified under pressure.

**18970608\_US583953\_Apparatus for Producing Currents of High Frequency**

1897 June 8 - Related to US568176; Conversion of electric current of ordinary character into high frequency and high potential; Can use either continuous (i.e., direct) or alternating currents.

**18971102\_US593138\_Electrical Transformer**

1897 November 2 - Novel form of transformer or induction-coil and a system for the transmission of electrical energy by means of the same; Improvement of electrical transformers; Develops electric currents of high potential; Corrects construction principles heretofore manufactured; Higher potential for transmission than has ever been practically employed heretofore; Free from the danger of injury from the destruction of insulation; Safe to handle; High-frequency power supply for lighting and other applications.

**18980816\_US609245\_Electrical Circuit Controller**

1898 August 16 - A circuit controller (see also 609245, 609246, 609247, 609250, 609251, 611719); Conductive fluid make and break circuit; Nozzle and conductor construction and their relative method of operation; Single source of power for operation; Nozzle and receptacle interaction; Combination of rotating receptacle and motor, a magnetic body in receptacle, and an exterior mounted magnetic body.

**18980816\_US609246\_Electric Circuit Controller**

1898 August 16 - A circuit controller (see also 609245, 609246, 609247, 609250, 609251, 611719); Conductive fluid make and break circuit; Conductive liquid forming terminals; Two orifices with relative movement that can direct jets or streams; Two insulated compartments; Jets or streams are brought into intermittent contact.

**18980816\_US609247\_Electric Circuit Controller**

1898 August 16 - A "circuit controller in which an independently-mounted terminal operated in a similar manner by a rotating body of conducting fluid may be enclosed within a gas-tight receptacle"; Conductive fluid make and break circuit; A combination of a closed receptacle containing a fluid, a method to rotate said receptacle, a mounted support, means for opposing or preventing the mount's movement in the same direction of the receptacle, and a terminal conductor in the support; Terminal capable of rotating about its axis or provided with rotating contacts; Fluid comprises the opposite terminal; Eccentric weight to a spindle; Rotating terminal connected with spindle; Receptacle mounted to rotate about an axis inclined to the vertical; Spindle inside receptacle; Weighted armature; Fluid is displace by centrifugal force.

**18980816\_US609248\_Electric Circuit Controller**

1898 August 16 - A circuit controller (see also 609245, 609246, 609247, 609250, 609251, 611719) in which one terminal body moves through jets or streams intermittently and intercepts jets or streams; Conductive fluid make and break circuit; Rotary conductor; One terminal body moves through jets or stream intermittently and intercepts jets or streams; One rigid terminal receives directed jets or streams; Combination in a receptacle of a conducting disk and an insulated disk; Stationary tube or duct to direct jets or streams toward the conductor across the path of intermittent projections.

**18980816\_US609249\_Electric Circuit Controller**

1898 August 16 - A circuit controller (see also 609245, 609246, 609247, 609250, 609251, 611719); Conductive fluid make and break circuit; Combination in a circuit controller with a closed rotary receptacle, of a rigid conductor mounted in the same and through which the circuit is intermittently established, and means for directing a jet of stream of a fluid which is contained in the receptacle, against the said body so as to affect its rotation independently of the receptacle; Rotary receptacle of a body or part mounted within the receptacle and concentrically mounted therewith, a conducting-terminal supported by said body and capable of rotation of the receptacle so as to oppose, by gyroscopic action, the rotation of the support, and means for directing a jet of conducting fluid against said terminal; A rotary receptacle of a support for a conductor mounted thereon concentrically with the receptacle and a gyrostatic disk carried by the support and adapted, when rotating, to oppose its movement in the direction of the rotation of the receptacle.

**18980816\_US609250\_Electrical Igniter for Gas Engines**

1898 August 16 - Ignition system principles used today in automobiles; Operation of a machine that requires a spark, flame, or any other similar effect; More certain and satisfactory for use of and control by the machine or apparatus; Charging and discharging a condenser through switch or commutator.

**18980816\_US609251\_Electric Circuit Controller**

1898 August 16 - A circuit controller (see also 609245, 609246, 609247, 609250, 609251, 611719). Circuit comprising, in combination, a receptacle containing fluid, means for rotating the receptacle, and a terminal supported independently of the receptacle and adapted to make and break electric connections; Receptacle contains a conductive and non-conductive fluid; Means of rotating the receptacle; Terminal adapted to make and break electrical connection with the conductive fluid within or under the non-conductive fluid.

**18981016\_US611719\_Electrical Circuit Controller**

1898 October 4 - A circuit controller (see also 609245, 609246, 609247, 609250, 609251, 611719). Conductive fluid make and break circuit; The combination of a closed receptacle, of a circuit controller contained therein, and surrounded by an inert medium under pressure; Method of maintaining an inert atmosphere under pressure; Vessel containing a liquefied inert gas and method of communicating with the interior of the receptacle; One terminal is of a conductive fluid (such as mercury); Combination of conductors of series of conductors constituting one terminal of a circuit controller, means of maintaining a stream or jet of conductive fluid as the other terminal with which the conductor makes intermittent contact; Close receptacle containing terminal; Method of excluding oxygen from terminals; Motive device for rotating conductors; Force-pump in direct connection with conductor for maintaining a circulation of conducting fluid contained in the receptacle through the nozzle or nozzles; Rotating screw with conductor and extending into a well in which the fluid collects; Duct or ducts leading from the well to points from which the fluid will be direct against the rotating conductor; Magnetic core mounted on spindle.

**18981108\_US613735\_Electric Circuit Controller**

1898 November 8 - A circuit controller (see also 609245, 609246, 609247, 609250, 609251, 611719). Conductive fluid make and break circuit; Combination with rigid and fluid conductors adapted to be brought intermittently into contact with each other; Means for imparting rotary motion to rigid and fluid conductors; Means to rotate by the movement of a fluid conductor.

**18981108\_US613809\_Method of and Apparatus for Controlling Mechanism of Moving Vehicle or Vehicles**

1898 November 8 - Tesla "Boat" patent; Art of controlling the movements and operation of a vessel or vehicle at a distance; Electromagnetic waves conveyed to vessel by the natural media and rendering by their means the controlling-circuit active or inactive; New and useful improvements in methods of and apparatus for controlling from a distance; Solution for controlling from a given point the operation of mechanisms; No intermediate wires, cables, or other form of electrical or mechanical connection with the object save the natural media in space; explanation of most practical and effectual method and apparatus; Remote control.

**19000320\_US645576\_System of Transmission of Electrical Energy**

1900 March 20 - Wireless transmission of electric power;Tesla applied for this patent in September 1897[4] This wireless power transmission scheme consisted of transmitting power between two tethered balloons maintained at 30,000 feet, an altitude where he thought a highly conductive layer of the atmosphere would exist. He based the idea on the same low pressure conductivity phenomenon noticed in a Crookes tube. Tesla also thought the system could be used to "transmit intelligible messages to great distances" and thought the layer he energized would "illuminate upper strata of the air" providing nighttime lighting for people below.

**19000515\_US649621\_Apparatus for Transmission of Electrical Energy**

1900 May 15 - Related to US645576; New and useful combinations employed; Transmitting coil or conductor arranged and excited to cause currents or oscillation to propagate through conduction through the natural medium from one point to another remote point therefrom and a receiver coil or conductor of the transmitted signals; Production of currents of very high potential; Transmitting station and receiving station.

**19000814\_US655838\_Method of Insulating Electric Conductors**

1900 October 23 - Method and practical application of insulation by freezing and solidification; Expounding on Faraday's hypothesis of freezing substances make them possess a higher dielectric level to insulate transmission conductors; Improvements in the method set out by Faraday; Method of insulating electrical conductors which consist in surrounding or supporting said conductors by a material which acquires insulating properties when frozen or solidified; Method of maintaining a conductor within a gaseous cooling agent by the continuous application of said agent; Trough or conduit with circulating cooling agents; Reissued as U.S. Patent RE11,865.

**19001023\_USRE11865\_Method of Insulating Electric Conductors**

**19011022\_US685012\_Means for Increasing the Intensity of Electrical Oscillations**

1901 October 22 - A method for producing a "great increase in the intensity and duration of the (electrical) oscillations excited in a freely-vibrating or resonating circuit by maintaining the same at a low temperature". Producing increase intensity and duration of electric oscillations; Combination of a circuit to possess freely vibrating excitations and of means for artificially cooling the circuit to a low temperature; Low temperature resonating circuit; Uses of electrical impulse oscillations; A circuit upon which oscillations are impressed, and which is adapted to vibrate freely, in combination with a receptacle containing an artificial refrigerant in which the circuit is immersed; Low resistance oscillators in a series of transmitting and receiving circuits in a system for the transmission of energy

**19011105\_US685953\_Apparatus for Utilizing Effects Transmitted from a Distance to a Receiving Device through Natural Media**

1901 November 5 - Heinriech Hertz methods cited; Induction method cited; Ground conduction method cited; Previous methods had limitations that result in great disadvantages for utilization; Wireless transmission developed by Tesla cited; Transmitting station coil arranged and excited to cause arbitrary or intermitted oscillation propagation to another remote point receiver station coil; Air is an excellent insulator; Air strata used for means of conduction for production of generating actions at a distance; Use of metallic conductor; Transmitting apparatus of signals or intelligence should produce effect as strong as possible; Charge a condenser or capacitor to utilize the potential energy.

**19011105\_US685954\_Method of Utilizing Effects Transmitted through Natural Media**

1901 November 5 -Utilizing effects or disturbances transmitted through the natural media, which consists on charging a storage device with energy from an independent source, controlling the charging of said device by the actions of the effects or disturbances (during succeeding intervals of time determined by means of such effects and disturbances corresponding in succession and duration of the effects and disturbances), and coincidentally using the stored energy for the operating a receiving device; Independent source may be at a distant transmitting electrical energy; Receiving device circuit discharges the accumulated stored energy (which may be potential energy) and causing variations in resistance in a circuit including an independent source of electricity and a storage device; Effecting the storage (such as, in a condenser) during any desired time interval and under control of such effects of disturbances; Accumulated energy may operate a transformer (by discharging through a primary circuit at predetermined times) which, from the secondary currents, operate the receiving device.

**19011105\_US685955\_Apparatus for Utilizing Effects Transmitted From A Distance To A Receiving Device Through Natural Media**

1901 November 5 - An apparatus for transmitting signals or intelligence through the natural media from a sending station to a distant point the combination of a generator or transmitter adapted to produce arbitrarily varied or intermitted electrical disturbances or effects in the natural media, and for utilizing electrical effects or disturbances transmitted through the natural media, the combination with a source of such effects of disturbances of a charging-circuit adapted to be energized by the action of such effects or disturbances, between which a difference of potential is created by such effects or disturbances, a storage device included in the charging-circuit and adapted to be charged thereby, a receiver, a means for commutating, directing, or selecting the current impulses in the charging circuit so as to render them suitable for charging the storage device, a device for closing the receiving-circuit, means for causing the receiver to be operated by the energy accumulated in the storage device at arbitrary intervals of time when connecting the receiving-circuit with the storage device for periods of time predetermined as to succession and duration, and means for discharging the storage device through the receiving-circuit at arbitrary intervals of time.

**19011105\_US685956\_Apparatus for Utilizing Effects Transmitted through Natural Media**

1901 November 5 - Related to his Magnifying Transmitter; Used as part of Tesla's Colorado Spring receivers that posed a distributed high-Q helical resonators, radio frequency feedback, crude heterodyne effects, and regeneration techniques; an apparatus for transmitting signals or intelligence through the natural media from a sending station to a distant point the combination of a generator or transmitter adapted to produce arbitrarily varied or intermitted electrical disturbances or effects in the natural media; combination of a source of electricity, a transformer, a device normally of high resistance but adapted to have its resistance reduced when acted upon by the effects or disturbances, with a receiving circuit connected with a condenser and a deceived adapted to open and close the receiving circuit at predetermined intervals of time.

**19011105\_US685957\_Apparatus for the Utilization of Radiant Energy**

1901 November 5 - 4 illustrations; Radiation charging and discharging conductors; Radiations considered vibrations of ether of small wavelengths and ionize the atmosphere; Radiant energy throws off with great velocity minute particles which are strongly electrified; Rays or radiation falling on insulated-conductor connected to a condenser (i.e., a capacitor), the condenser indefinitely charges electrically; Radiation (or radiant energy) include many different forms; Related to US577671; Transmitted or natural energy can be used; Photoelectric stepping alternating current motors.

**19011105\_US685958\_Method of Utilizing of Radiant Energy**

1901 November 5 - 2 illustrations; Ways of using radiation charging and discharging conductors; Rays or radiation falling on insulated-conductor connected to a condenser (i.e., a capacitor), the condenser indefinitely charges electrically; Radiation (or radiant energy) include many different forms; Related to US577671; Photoelectric stepping alternating current motors.

**19030317\_US723188\_Method of Signaling**

1903 March 17 - Elevated transmitter capacitance; Coil; Earth electrode; Signal generator.

**19030414\_US725605\_System of Signaling**

1903 April 14 - Elevated transmitter capacitance; Coil; Earth electrode; Signal generator; Apparatus of and method for electrical disturbance or impulses; Transmission of intelligent messages via wireless transmission; Govern the movement of distant automata.

**19050417\_B0008200\_Improvements relating to the Transmission of Electrical Energy**

April 17, 1905

**19050418\_US787412\_Art of Transmitting Electrical Energy through the Natural Mediums**

1905 April 18 - Elevated transmitter capacitance; Coil; Earth electrode; Signal generator; Apparatus for generating and receiving electrical signals; Tuned resonant circuits; Physics of propagation; Non-Hertzian notes; Globe as conductor; Low frequency oscillations.

**19091021\_US1061142\_Fluid Propulsion**

1909 October 21 - Transmission and transformation of mechanical power through the agency of fluid; Propelled fluid moves in a natural path; Avoids losses; Easy; Simple.

**19091021\_US1061206\_Turbine**

1909 October 21 - Improvements in rotary engines and turbines; Mechanical power based on the vehicle of fluid for power; Known as the Tesla turbine; Bladeless turbine design; Utilizes boundary layer effect; Fluid does not impact the blades as in a conventional turbine.

**19110822\_C135174\_Fluid Propulsion**

August 22, 1911

**19120813\_C142352\_Electrical Energy Transmission**

August 13, 1912

**Nikola Tesla’s Patent Applications for Which Patents Were Not Granted**