THE AMAZING ÉCLAIRS RECEIVER

(PROMOTES EXPERIMENTATION AND EXPLORATION)

CHARLES WENZEL

FERRITE CORE ANTENNA

SHIELDED CABLE

BALUN

TUNED LOOP ANTENNAS

**FOLDED DIPOLE**

with balun & coaxial feeder

**DIRECTIONAL YAGI ANTENNA**

**2.4 GHz GROUND PLANE ANTENNA**

**CORKSCREW ANTENNA**

**VARIABLE CAPACITOR IN A BOX**

**RABBIT EARS**

**ADAPTERS**

1/4” TO RCA

1/4” TO 1/8”

F QUICK COUPLER

BNC TO F

**COMPONENT LAYOUT**

**BOTTOM VIEW**

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@2013 LENNIE ZINK
**THE AMAZING ÉCLAIRS RECEIVER**

(EMF/Charge/Light/Audio/Induction/RF/Sferics)

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**SUGGESTED CONSTRUCTION**

- **STORM DETECTOR**
  - (SPHERICS)
- **MATCHING TRANSFORMER**
  - 5R:2K
- **TWISTED PAIR**
- **GND**

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**FILTERS**
- **FILTER #1**
- **FILTER #2**

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**ALUMINUM ELEMENT**

- **1/4" WOOD DOWEL**
- **WIRE LOOP ANTENNA**

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**DIRECTIONAL YAGI ANTENNA**

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**FILTERS**

- **ALUMINUM ELEMENT**
- **WOOD SUPPORT**

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Lightning whistlers were first discovered by German scientist H. Barkhausen during World War I. To try to eavesdrop on Allied telephone conversations, he drove two metal stakes into the ground and connected them to the input of an audio amplifier. Instead of human voices, he heard lots of the atmospheric sounds. We don’t know how far apart the metal ground pipes were, but trying to recreate Barkhausen’s experience could be a great experiment in itself!

A “Rain Alert Microphone” consists of a speaker mounted midway inside a plastic bucket, mounted bottoms-up on the roof or just out in the yard. This project evolved from the Air Force’s need for rain alerts during manned rocket sled tests in New Mexico during the 1950’s! It works very well and also lets you hear all else going on in your neighborhood, whether you want to or not.
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PIEZO EXPERIMENTS

FORCE SENSOR / ACCELEROMETER

PIEZO TWEETER HORN

PIEZO VIBRATION SENSOR

PIEZO HYDROPHONE

MAGNETIC VIBRATION SENSOR
Open a can of tuna with an edge-cutting opener. After a good washing, glue a magnet to the top of the lid. Glue a piezo disc to the inside of the lid. Attach a 1/8 inch connector through the side of the can and solder the piezo wires to it. Test the piezo by connecting it to the input of an audio amplifier. Seal the lid to the can. The magnet will hold the sensor to metal objects.

GLUE
LID
OUTPUT
MAGNET
PIEZO DISC
GLUE
TUNA CAN
DOUBLE-FACED ADHESIVE TAPE

LIGHT EXPERIMENT
WILL A PIEZO UNDER PRESSURE LIGHT AN LED?

CYMATICS DISPLAY
A VARIABLE TONE GENERATOR LIKE A VCO SHOULD PRODUCE INTERESTING PATTERNS.
TUBE
BOWL
SALT OR POWDER
AUDIO FROM AMPLIFIER OUTPUT

INCREASED SURFACE AREA EXPERIMENT
Mounting the piezo with double-faced adhesive tape to a wall, structure-borne sound can be captured. Further experimenting with other objects will reveal lots of surprising sounds.

GLUE
LARGE CAN
GLUE
PIEZO SPEAKER
SOLDER COMPONENTS TO PIEZO
LOAD
GLUE TO COTTON BALL

SOUND EXPERIMENT
MASSAGE WITH FINGERS

VIBRATION EXPERIMENT
LEAD FISHING BALL
PLASTIC SPACERS
GLUE

SLINKY RECEIVER

If this piezo speaker is turned bottom down and the can filled with cleaning fluid, could it be used as an ultrasonic cleaner?

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Carefully cut away the center dome attached to the speaker coil. Glue a piece of plastic in its place.

Face the speaker upwards. It is ready to hold powders or crystals like salt.

Place a layer of plastic wrap over the speaker and it will hold water.

Connect the speaker to an audio amplifier with a sound producing source such as a tone generator. Slowly turn up the volume. Different tone frequencies will produce various patterns.

Glue a vinyl tube to the cone of a large speaker. While water is running through the tube, adjust frequency and volume of amplified signal. Observe the changes in the stream of water.

POSSIBLE SPEAKER “CABINETS”
- Glass canning jars
- PVC pipe fittings
- 2 liter plastic bottle
- Tin can
- Foam cup
- CD/DVR case
- Watering can
- Coffee mugs of all types

THE AMAZING ÉCLAIRS RECEIVER
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SPEAKER EXPERIMENTS

CYMATICS DISPLAY

LOW FREQUENCY MICROPHONE

THE STREAM OF WATER EXPERIMENT
THE AMAZING ÉCLAIRS RECEIVER
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INTERNAL RECEIVER CIRCUITS:
• 200 kHz and higher All-Band Radio Frequency Receiver
• Audio Amplifier

BASIC ACCESSORIES
• 2.4GHz Antennas
• Alligator Clips for experiments
• Directional Microphone
• EMF Generator
• Folded Dipole Antenna
• Hydro Phone
• Loopstick Antenna
• Rabbit Ears Antenna
• Sferics Detector
• Solar Ear
• Speaker Experiments
• Speaker Microphone
• Split Voltage Supply
• Stethoscope
• Telephone Line Interface
• Tuned Loop Antenna
• Variable Capacitor in a Box
• Vibration Sensor
• Yagi Antenna
600 B.C. Thales of Miletus writes about amber becoming charged by rubbing - he was describing what we now call static electricity.

1600 English scientist, William Gilbert first coined the term “electricity” from the Greek word for amber. Gilbert wrote about the electrification of many substances in his “De magnete, magneticisique corporibus”. He also first used the terms electric force, magnetic pole, & electric attraction.

1660 Otto von Guericke invented a machine that produced static electricity.

1675 Robert Boyle discovered that electric force could be transmitted through a vacuum & observed attraction & repulsion.

1729 Stephen Gray’s discovery of the conduction of electricity.

1733 Charles Francois du Fay discovered that electricity comes in two forms which he called resinous (-) & vitreous (+). Benjamin Franklin & Ebenezer Kinnersley later renamed the two forms as positive & negative.

1745 Georg Von Kleist discovered that electricity was controllable. Dutch physicist, Pieter van Musschenbroek invented the “Leyden Jar” the first electrical capacitor. Leyden jars store static electricity.

1747 Benjamin Franklin experiments with static charges in the air & theorized about the existence of an electrical fluid that could be composed of particles. William Watson discharged a Leyden jar through a circuit, that began the comprehension of current & circuit.

1752 Benjamin Franklin invented the lightening rod - he demonstrated lightning was electricity.

1756 Joseph Priestley discovered that electricity followed Newton’s inverse-square law of gravity.

1786 Italian physician, Luigi Galvani demonstrated what we now understand to be the electrical basis of nerve impulses when he made frog muscles twitch by jolting them with a spark from an electrostatic machine.

1800 First electric battery invented by Alessandro Volta. Volta proved that electricity could travel over wires.

1816 First energy utility in US founded.

1820 Relationship of electricity & magnetism confirmed by Hans Christian Oersted who observed that electrical currents effected the needle on a compass & Marie Ampere, who discovered that a coil of wires acted like a magnet when a current is passed thorough it.

1827 D. F. Arago invented the electromagnet.

1821 First electric motor invented by Michael Faraday.

1826 Ohm’s Law written by Georg Simon Ohm states that “conduction law that relates potential, current, & circuit resistance.”

1827 Joseph Henry’s electromagnetic experiments lead to the concept of electrical inductance. Joseph Henry built one of the first electrical motors.


1837 First industrial electric motors.

1839 First fuel cell invented by Sir William Robert Grove, a Welsh judge, inventor & physicist.

1841 J. P. Joule’s law of electrical heating published.

1873 James Clerk Maxwell wrote equations that described the electromagnetic field, & predicted the existence of electromagnetic waves traveling with the speed of light.

1878 Edison Electric Light Co. (US) & American Electric & Illuminating (Canada) founded.

1879 First commercial power station opens in San Francisco, uses Charles Brush generator & arc lights. First commercial arc lighting system installed, Cleveland, Ohio.

1880 First power system isolated from Edison.

In Grand Rapids Michigan: Charles Brush arc light dynamo driven by water turbine used to provide theater & storefront illumination.
1881 Niagara Falls, New York; Charles Brush dynamo, connected to turbine in Quigley's flour mill lights city street lamps.

1882 Edison Company opens Pearl Street power station. The first hydroelectric power station opens in Wisconsin.

1883 The electric transformer is invented. Thomas Edison introduces the "three-wire" transmission system.

1884 Steam turbine invented by Charles Parsons.

1886 William Stanley develops transformer & Alternating Current electric system. Frank Sprague builds first American transformer & demonstrates use of step up & step down transformers for long distance AC power transmission in Great Barrington, Massachusetts. The Westinghouse Electric Company is organized. 40 to 50 water powered electric plants reported on line or under construction in the U.S. & Canada.

1887 In San Bernadino, California, the High Grove Station, first hydroelectric plant in the West is opened.

1888 Rotating field AC alternator invented by Nikola Tesla.

1889 Oregon City Oregon, Willamette Falls station, first AC hydroelectric plant. Single phase power transmitted 13 miles to Portland at 4,000 volts, stepped down to 50 volts for distribution.

1891 60 cycle AC system introduced in U.S.

1892 General Electric Company formed by the merger of Thomson-Houston & Edison General Electric.

1893 Westinghouse demonstrates “universal system” of generation & distribution at Chicago exposition. In Austin, Texas, the first dam designed specifically for hydroelectric power built across Colorado River is completed.

1897 Electron discovered by J. J. Thomson.

1900 Highest voltage transmission line 60 Kilovolt.

1902 5-Megawatt turbine for Fisk St. Station (Chicago).

1903 First successful gas turbine (France). World’s first all turbine station (Chicago). Shawinigan Water & Power installs world’s largest generator (5,000 Watts) & world’s largest & highest voltage line—136 Km & 50 Kilovolts (to Montreal). Electric vacuum cleaner. Electric washing machine.

1904 John Ambrose Fleming invented the diode rectifier vacuum tube.

1905 In Sault Ste. Marie, Michigan the first low head hydro plant with direct connected vertical shaft turbines & generators is opened.

1906 In Ilchester, Maryland, a fully submerged hydroelectric plant is built inside Ambursen Dam.

1907 Lee De Forest invented the electric amplifier.

1909 The first pumped storage plant is opened in Switzerland.

1910 Ernest R. Rutherford measured the distribution of an electric charge within the atom.

1911 Willis Haviland Carrier disclosed his basic Rational Psychrometric Formulae to the American Society of Mechanical Engineers. The formula still stands today as the basis in all fundamental calculations for the air conditioning industry.

R. D. Johnson invents the differential surge tank & Johnson invents hydrostatic penstock valve.

1913 Electric refrigerator is invented.

Robert Millikan measured the electric charge on a single electron.

1917 Hydracone draft tube patented by W. M. White.

1920 First U.S. station to only burn pulverized coal is opened. Federal Power Commission (FPC) is established.

1922 Connecticut Valley Power Exchange (CONVEX) starts, pioneering interconnection between utilities.


1933 Tennessee Valley Authority (TVA) established.

1935 The Public Utility Holding Company Act is passed. The Federal Power Act is passed. The Securities & Exchange Commission is established. The Bonneville Power Administration is established. The first night baseball game in major leagues is played made possible by electric lighting.
1936 Highest steam temperature reaches 900 degrees Fahrenheit vs. 600 degrees Fahrenheit in early 1920s.
287 Kilovolt line runs 266 miles to Boulder (Hoover) Dam.
The Rural Electrification Act is passed.
1947 The transistor is invented.
1953 The first 345 Kilovolt transmission line is laid.
The first nuclear power station ordered.
1954 The first high voltage direct current (HVDC) line (20 megawatts/1900 Kilovolts, 96 Km).
The Atomic Energy Act of 1954 allows private ownership of nuclear reactors.
1963 The Clean Air Act is passed.
1965 The Northeast Blackout occurs.
1968 The North American Electric Reliability Council (NERC) is formed.
1970 The Environmental Protection Agency (EPA) is formed.
The Water & Environmental Quality Act is passed.
The Clean Air Act of 1970 is passed.
1972 The Clean Water Act of 1972 is passed.
1975 Brown’s Ferry nuclear accident occurs.
1977 The New York City blackout occurs.
The Department of Energy (DOE) is formed.
1978 The Public Utilities Regulatory Policies Act (PURPA) is passed, & ends utility monopoly over generation.
The Power Plant & Industrial Fuel Use Act limits the use of natural gas in electric generation (repealed 1987).
1979 The Three Mile Island nuclear accident occurs.
1980 The first U.S. windfarm is opened.
1981 PURPA ruled unconstitutional by Federal judge.
1984 Annapolis, N.S., tidal power plant—first of its kind in North America (Canada) opened.
1985 Citizens Power, first power marketer, goes into business.
1986 Chernobyl nuclear accident (USSR) occurs.
1990 Clean Air Act amendments mandate additional pollution controls.
1999 Electricity marketed on Internet.
FERC issues Order 2000, promoting regional transmission.