

Steps Of Product

- Idea of Product
 - Need
 - Concept Development
 - Prototype Development
 - Production
 - Legal & Support
 - Product Delivery

Piece of Undersea Fiber Optic Cable



X-ray Tube

PHILIPS ELECTRON OPTICS
Model No. 10125
SERIAL NO. 101250001
DATE OF MANUFACTURE 1980

10125



Attempts to improve incandescent light bulbs led to the development of the vacuum tube. Early light bulbs were filled with air, but the filament would burn out quickly because material from the hot filament condensed on the inside of the bulb. In 1883, Thomas Edison tried to stop this by adding a metal plate inside the bulb. He thought the material would stick to the plate instead of the bulb. He found that a small electrical current would flow through the vacuum without a wire.

Twenty years later, British scientist John Fleming created the diode vacuum tube, the combination of a plate and a hot filament. In the first years of the twentieth century, experimenters discovered that the diode could be used as a detector for radio signals.

In 1906, Lee de Forest added a third element, a wire grid between the filament and the plate. He discovered that this new tube could control a large current in the plate circuit with a much smaller current. This amplification enabled long distance telephone calls and made radio receivers more sensitive.

Vacuum Tubes





...not only used for communications and consumer electronics. They had industrial applications also. Electrometer tubes were used in labs for high sensitivity measurements of electric charge. Circuits in timing, sensing, and control systems used conventional tubes. Manufacturing and transportation systems and electrostatic dust collectors used high power rectifier tubes.

The early computer industry needed large quantities of vacuum tubes. A single computer contained thousands of tubes and was big enough to fill a room. The limited lifetime of conventional tubes meant that many needed to be replaced each hour.

Let's see a vacuum tube in action!

Try This
Place the green tubes in each socket in the multimeter circuit.

What to watch
The meter's needle will show the accuracy of the test.

What's going on?
The test circuit, which consists of a charged capacitor and the vacuum-tube tube. The capacitor is charged when the meter is turned on, causing measurement of the discharge.

So what?
This test shows the accuracy of the meter's needle.

12C1 Power Tube
Made by Sylvania
1932

6X4-26A Low-impedance
Amplifier Tube
Made by RCA
1935

1F21A Infra-red
Cathode
Tube
Made by Philips
1935

1420 Optical Beam
Amplifier Tube
Made by RCA
1935

6X4-26A Low-impedance
Amplifier Tube
Made by RCA
1935

600B Triode
Tube
Made by General Electric
1935

6X4-26A Low-impedance
Amplifier Tube
Made by RCA
1935

6075 "Pencil" Triode Tube
Made by RCA
1935



722A Magnetron Tube
Made by Sylvania
1945



WU47A Klystron
Oscillator Tube
Made by Sylvania
1945



12780Y-2 Miniature
Thyratron Switch Tube
Made by Sylvania
1945



60CS Series 600V Tube
Made by Sylvania
1945

Klystron K-12
Made by Sylvania
1945



6AR Octal Base Metal
Cathode Tube
Made by RCA
1945



60W "Nucleon" Triode
Tube
Made by RCA
1945



60CS Series 600V Tube
Made by Sylvania
1945



6075 "Pencil" Triode Tube
Made by RCA
1935



6127Y
Made by Sylvania
1945



6188 Phialer Triode
Tube
Made by Sylvania
1945



6075 "Pencil" Triode Tube
Made by RCA
1935

6075 "Pencil" Triode Tube
Made by RCA
1935

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Made by RCA
1935

Commercial Tubes

Commercial Tubes

In the 1950s, the demand for vacuum tubes in commercial applications increased. The development of ceramic tubes, such as silicon and glass, allowed for the production of smaller, more reliable tubes. These tubes were used in a wide range of applications, including military and aerospace electronics.

Tube manufacturers tried to compete with the new transistors by making smaller, more durable tubes. Silicon and glass tubes were used in military applications. They also used new construction techniques to lower production costs.

Although vacuum tubes continue to be used in limited applications, most digital electronics are now based on transistors, making tubes much smaller and faster.

Some early tubes, such as the 6X4, were used in power supplies. They were made of glass and had a large diameter. They were used in a variety of applications, including power supplies for vacuum tube radios and televisions.

Other early tubes, such as the 6AV6, were used in audio amplifiers. They were made of glass and had a small diameter. They were used in a variety of applications, including audio amplifiers for vacuum tube radios and televisions.



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Oscillograph 1943

over the Spectrum
... for sending
... another by listening for
... the waves at a specific

F and VHF
... into a frequency
... and
... characteristics to
... applications.

... designs a range
... with
... 20 MHz to 300 MHz.

... designs a range
... with
... 100 MHz and 3 GHz.

... transmission is to
... the use of an antenna
... of the radio waves. LDF
... and less complex
... based over short
... interface with other
... used in two-way
... systems.

... ground
... a range somewhat
... is still somewhat
... affected by atmospheric
... than electrical
... It is more easily blocked
... responses but it is less
... than LDF frequencies.
... include FID radio
... by business and military
... amateur radio.



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Weather Recording Station

10/29/2011

No Usage & Current

SYSTEM

From the simple interaction with static electricity to the complex power systems of the modern world, electricity has revolutionized the way we live and work.

1. Measure the current in a simple circuit.

2. Measure the voltage in a simple circuit.

3. Measure the power in a simple circuit.

4. Measure the resistance in a simple circuit.

5. Measure the inductance in a simple circuit.

6. Measure the capacitance in a simple circuit.

7. Measure the frequency in a simple circuit.

8. Measure the phase in a simple circuit.

9. Measure the impedance in a simple circuit.

10. Measure the admittance in a simple circuit.

Ohm's Experiments

Ohm's experiments were the first to show that the relationship between voltage, current, and resistance is a simple one. He discovered that the current flowing through a conductor is directly proportional to the voltage applied and inversely proportional to the resistance of the conductor.

What is Ohm's Law?
Ohm's Law states that the current flowing through a conductor is directly proportional to the voltage applied and inversely proportional to the resistance of the conductor.

What is getting out?
Ohm's Law is a fundamental principle of electricity that is used in a wide variety of applications, from simple circuits to complex power systems.



Faraday's Experiment

Faraday's experiment demonstrated that a changing magnetic field can induce an electric current in a nearby conductor. This is the principle of electromagnetic induction, which is the basis for the operation of generators and transformers.

What is getting out?
Faraday's experiment was the first to show that a changing magnetic field can induce an electric current in a nearby conductor.

THE WESTINGHOUSE SYSTEM

Westinghouse Electric System from Central Station, Erie, Pa., showing the first AC power system. The system was capable of generating power for industry.

What is getting out?
The Westinghouse system was the first AC power system, capable of generating power for industry.

THE WESTINGHOUSE SYSTEM

Westinghouse Electric System from Central Station, Erie, Pa., showing the first AC power system. The system was capable of generating power for industry.

What is getting out?
The Westinghouse system was the first AC power system, capable of generating power for industry.



Jumping Wires

Jumping wires is a simple experiment that demonstrates the effects of static electricity. It shows how a charged object can attract a neutral object, causing it to "jump" towards the charged object.

What is getting out?
Jumping wires is a simple experiment that demonstrates the effects of static electricity.





MAGNETIC
DETECTOR



To Operate The Detector

1. Listen on the Telephone Receiver.
2. Slowly turn the knob on the front. **CLOCKWISE PLEASE**
3. The radio station is detected only when the wire band is moving. It stops when the wire band stops.
4. See how slowly you can turn it and still hear the radio.

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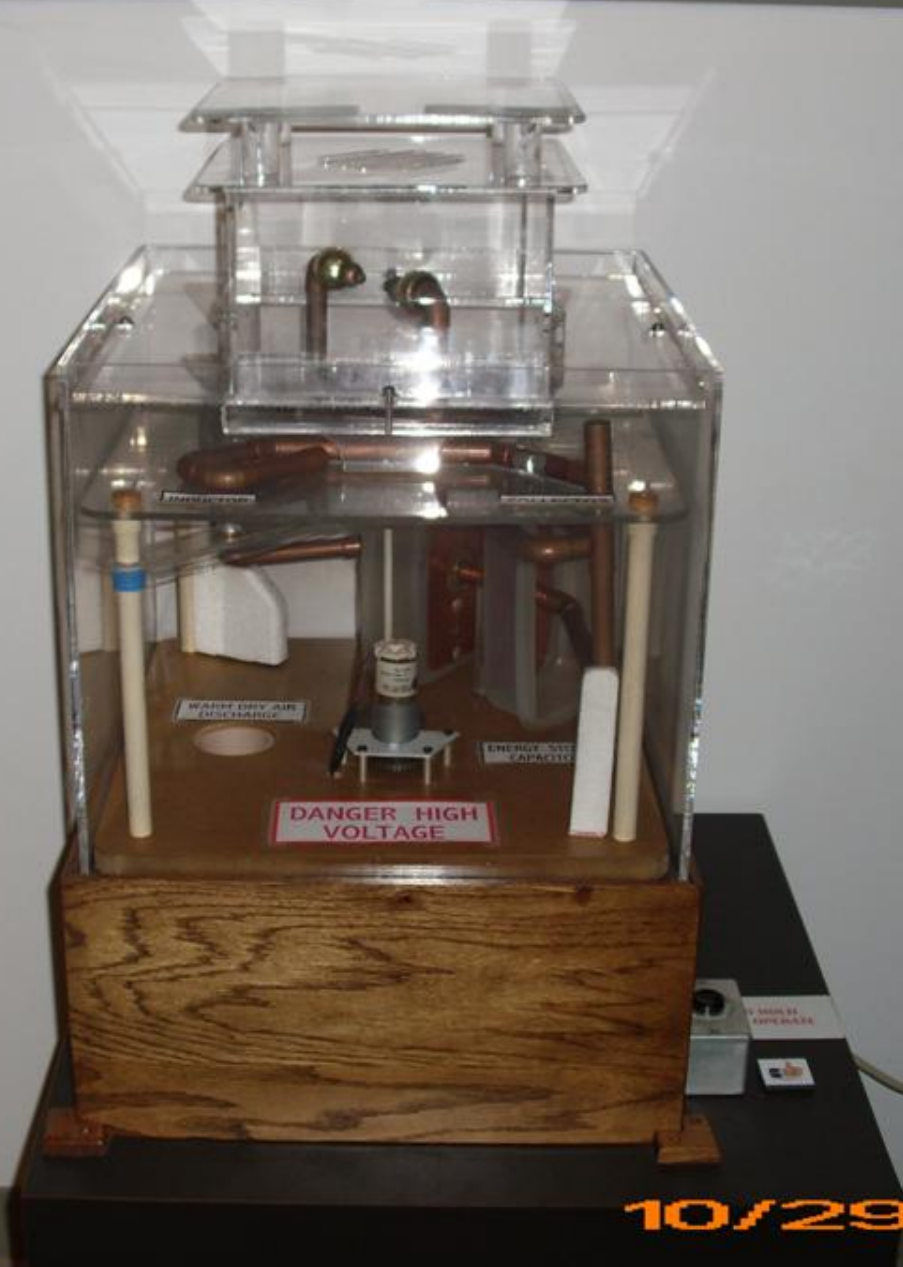
the drive motor which does all
the work. The motor is thus the

explanatory diagram
in the holder below



Kelvin's "Mouse Mill"
generator
This recorder was a primitive form of ink jet printer
using high potentials to accelerate ink flow

- Builds up a 70,000 volt charge
- Discharges through spark (gap)
- the recharge time interval of 9



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How It Works

These 3 Principles are at Work in the Following Sequence of Operation

- "Induction" of electrostatic charges on a conductor
- Separation of opposite charges to achieve high potentials
- Charge transport and placement on another Conductor

1. Drive Motor **A** spins insulating rotor disk **B** which carries charge transport rods **C**.
2. The rotation brings each rod under the influence of inductor electrode **D** which carries stray (assume negative) electrical charges from the environment.
3. When neutralizer brush **E** makes momentary contact with the rod, the negative charge on inductor **D** attracts positive charges to the rod - from grounded neutralizer bar **F**.
4. As the rod moves on from brush **E**, it carries an "excess" positive charge. This is an induced charge, and the process is called "induction".
5. As the rod moves away from inductor **D**, its packet of charge rises in potential during transport as mechanical work is done in separating charges of opposite polarity (**D** negative, **C** positive).
6. When the rod contacts the brush of collector electrode **G** its positive charge packet is transferred raising **G**'s potential - and that of connected inductor **H**. This process of charge emplacement also entails mechanical work.
7. Now that inductor **H** has a positive charge it can induce "excess" negative charges on the rods passing beneath, and these are transported at elevated potential to collector **I** - which in turn reinforces the negative charge on connected inductor **D**.
8. The entire sequence is self sustaining and self reinforcing, with each half of the machine storing positive and negative charge respectively in its associated energy storage capacitor **J** - via conductors **K**.
9. As the cycle continues the capacitor charge potentials rise until the spark gap **L** breaks down at a potential difference of the order of 70,000 volts. Almost all of the stored energy is dumped into the spark and the entire process repeats.
10. There is no electrical input to the machine except for the drive motor which does all the mechanical work of charge separation and emplacement. The motor is thus the fundamental source of the stored energy and spark.

For those who may be interested - a more detailed explanatory diagram and sequence of operation is available in the holder below

