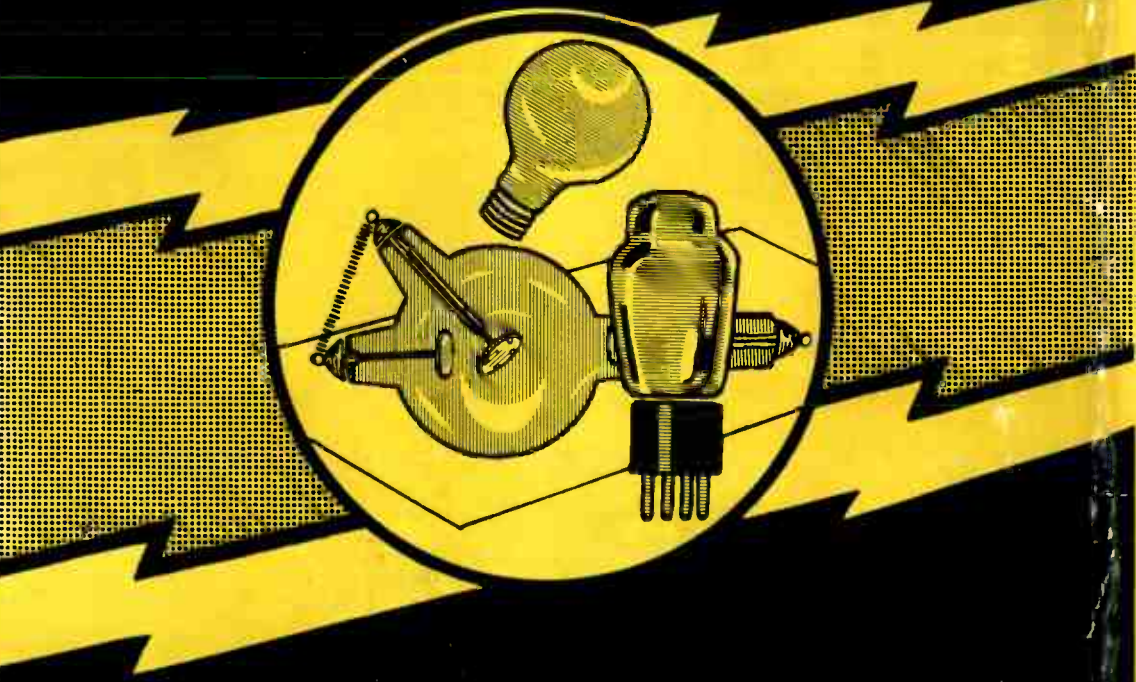
DRAKE'S ELECTRICAL and RADIO DICTIONARY



MANLY

Drake's

ELECTRICAL AND RADIO DICTIONARY

Electricity and Magnetism · Wiring, Distribution and Industrial Control Industrial Electronics · Radio Transmission and Reception · Photoelectricity and Phototubes · Television and Telephotography · Sound Pictures and Public Address

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Compiled by
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3,800 Words and Terms
550 Illustrations

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PREFACE

IN THIS Electrical and Radio Dictionary are explained the words and terms employed in the commercial and industrial applications of electronic devices and their associated apparatus. Since the associated apparatus includes the greater portion of electric wiring and distribution systems in general, the dictionary covers practically the whole electrical field, but does so with special reference to the electronic branch.

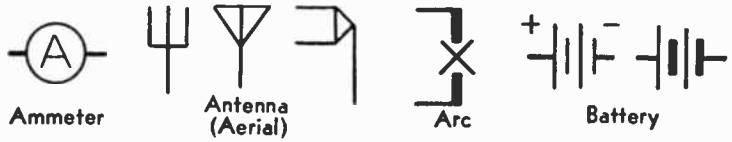
To make the definitions reasonably brief it has been necessary to use in them certain words and terms which themselves are technical. Such words in each definition are printed in *italics,* and will be found fully explained in their regular alphabetical positions on other pages. This method of cross-referencing makes it easy and convenient to commence with any given definition, and to follow the references until all electrical words and terms are resolved into the most elementary explanations. The result is equivalent to an encyclopedic treatment for any subject when all the references have been followed.

All words, terms and abbreviations are arranged in one continuous alphabetical order. Terms consisting of more than one word follow the first word. Hyphenated words are treated as single words, while abbreviations are handled as though their letters formed a word, all being inserted in their regular order according to this rule.

HAROLD P. MANLY

RADIO AND ELECTRONIC SYMBOLS

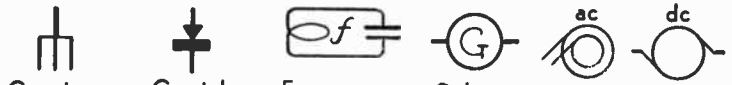
Definitions of the names of devices represented by the symbols are given in regular alphabetic order in the pages following.



Ammeter — Antenna (Aerial) — Arc — Battery

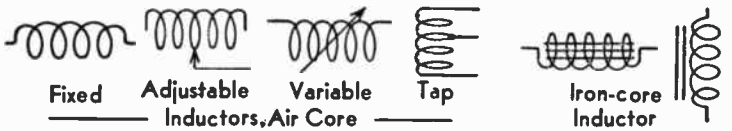
Fixed — Variable — Shield

Condensers



Counter-poise — Crystal Detector — Frequency Meter — Galvano-meter — Generator

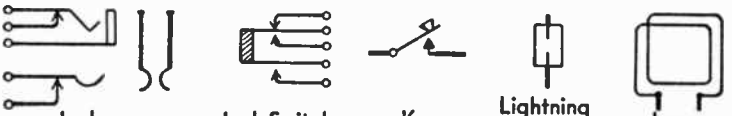
Glow Lamp — Grid Leak Condenser — Ground — Head Set (Telephone Receiver)



Fixed — Adjustable — Variable — Tap

Inductors, Air Core

Iron-core Inductor

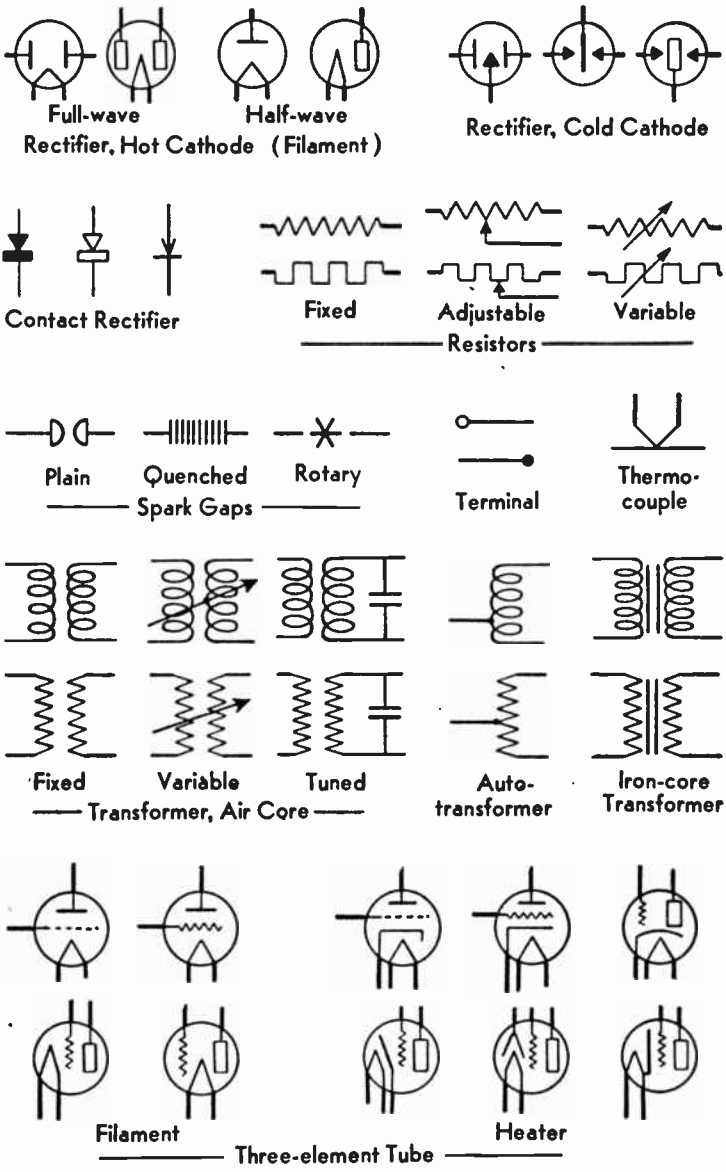


Jack — Jack Switch — Key — Lightning Arrester — Loop

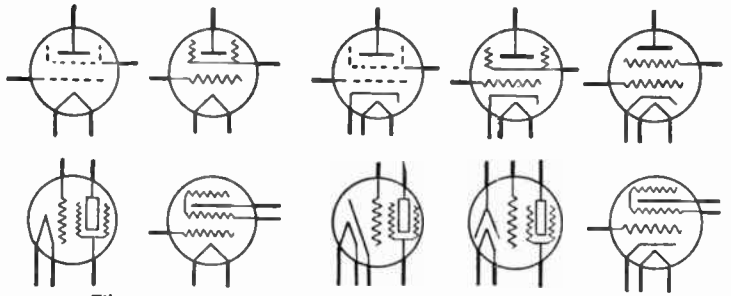
Loud Speaker — Microphone — Phonograph Pickup — Photocell — Piezo-electric Plate

RADIO AND ELECTRONIC SYMBOLS

Where several symbols are shown as representing the same device, the symbol placed at the left or the top is preferred for use.



RADIO AND ELECTRONIC SYMBOLS

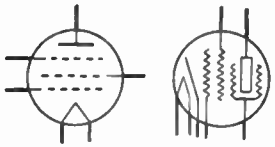


Filament

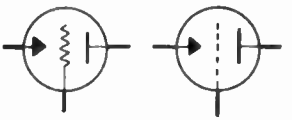
Heater

Screen Grid Tubes

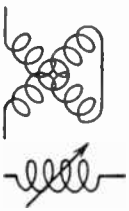
Power Pentode Tube



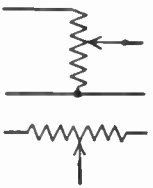
Screen Grid Pentode



Grid-glow Tube

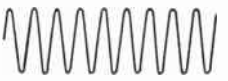


Variometer



Voltage Divider (Potentiometer)

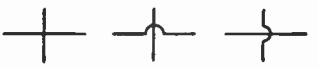
Voltmeter



Wave, Continuous

Wave, Damped

Wires, Joined



Wires. Crossed (not joined)

DRAKE'S ELECTRICAL AND RADIO DICTIONARY

A

A.—A symbol for area.

a.—A symbol for *ampere.*

ab-.—A prefix used in names of *electromagnetic units.*

A-battery.—A battery which furnishes current for the filaments of tubes.

aberration.—Failure to bring all light rays to a focus. *Chromatic aberration* or *spherical aberration.*

abscissa.—A distance measured horizontally across a graph to locate a point on a curve. See *coordinates.*

absolute efficiency.—The ratio of the output of an actual device to the output of a device similar but having no losses, both actuated by the same input.

absolute temperature.—Temperature measured from *absolute zero,* the units being centigrade degrees. The absolute temperature of a substance is equal to its centigrade temperature plus 273.1.

absolute unit.—A unit of measurement based on unchanging physical properties such as length, time, and mass. A unit in the *centimeter-gram-second* system.

absolute zero.—The temperature corresponding to the complete absence of heat; equal to 459.6 Fahrenheit degrees below zero or to 273.1 centigrade degrees below zero.

absorbed wave.—That portion of a wave or its energy which is dissipated in a medium against which it strikes.

absorbing condenser.—A condenser exhibiting *dielectric absorption.*

absorption.—Reduction of transmitted energy as a result of dissipation. *Atmospheric absorption* and *ground absorption* of radio waves. See *dielectric absorption.*

absorption circuit.—An *oscillatory circuit* tuned to a frequency at which it absorbs and dissipates energy taken from another circuit by coupling between the circuits. *See illustration, page following.*

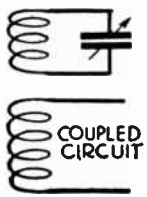
absorption coefficient.—The percentage of the total initial energy which is absorbed from a wave of any kind and dissipated (as heat) in a medium against which the wave strikes or through which it passes.

absorption current.—The current which flows into a condenser following its initial charge, this current being due to a gradual penetration of the electric strain into the dielectric. Also the current which flows out of a condenser following its initial discharge.

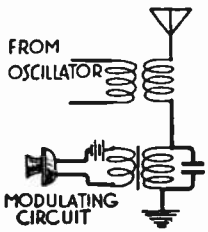
absorption modulation.—1—A name sometimes applied to *Heising modulation.* 2—Variation of antenna power by absorption in a coupled circuit containing a microphone or other means for modulation. *See illustration.*

absorption signalling.—*Continuous wave* signals produced by changes in transmitter circuit frequency, waves of one frequency being radiated and those of the other frequency being absorbed in an auxiliary circuit. See *compensation signalling.*

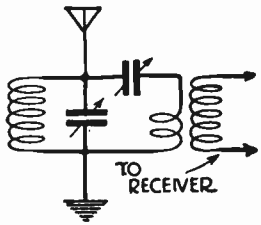
absorption unit for sound.—That dissipation for sound energy which is provided by a clear opening one foot square; energy passing through such a space being assumed as completely dissipated.



Absorption Circuit



Absorption Modulation



Acceptor-Rejector Circuit

absorption wave trap.—A *wave trap* consisting of a resonant circuit inductively coupled to an antenna circuit. Power at the undesired frequency is absorbed by the trap circuit.

A.C., a.c., or a-c.—Abbreviations for *alternating current.*

A. C. tube electric set.—A radio receiver using tubes in which the cathodes or filaments are heated by alternating current, and having a built-in *power unit* for plate and grid potentials.

accelerating grid.—A *screen grid* whose positive charge accelerates flow of electrons from cathode to plate.

acceptor circuit or acceptor resonance.—A *series resonance* circuit having minimum impedance at the resonance frequency.

acceptor-rejector circuit.—An antenna coupling system having a *rejector circuit* in series with the antenna circuit, an *acceptor circuit* in parallel with the rejector circuit, and inductive coupling between the winding in the acceptor circuit and the radio frequency amplifying portion of the receiver. *See illustration.*

accumulative amplification.—*Grid current detection.*

accumulator.—A *storage battery.*

achromatic.—Having the ability to refract light without separating it into colors, overcoming the effect of *chromatic aberration.*

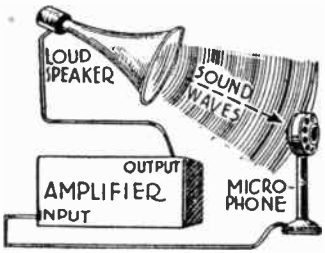
acoustic.—Pertaining to sound and hearing.

acoustic feedback.—A transfer of sound waves or energy from a loud speaker to a microphone in the same amplifying system. Any transfer of sound wave energy from a sound producing member to another member preceding it in the same system. *See illustration.*

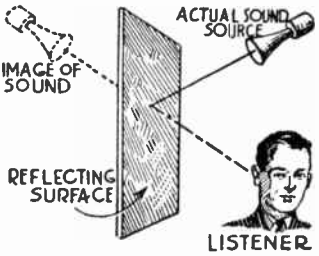
acoustic filter.—An arrangement of sound chambers and passages which allow comparatively free passage of sounds of certain frequencies while impeding or preventing passage of other sound frequencies.

acoustic frequency.—An *audio frequency.*

acoustic image.—An imaginary source of sound assumed to exist at the same distance behind a reflecting surface as the distance of an actual sound source from the front of that surface, the imaginary source having the same frequency and phase as the actual sound source. *See illustration.*



Acoustic Feedback



Acoustic Image

acoustic impedance.—The opposition of a sound conveying medium (such as air) to motion of a sound radiating surface. Equal to the pressure developed on a *unit surface* divided by the product of its velocity and area. One unit of acoustic impedance exists when a pressure of one *bar* produces a volume velocity of one cubic centimeter per second. A similar unit is used for *acoustic resistance* and *acoustic reactance.*

acoustic radiator.—The portion of a loud speaker at which sound waves originate.

acoustic reactance.—That portion of the *acoustic impedance* which is due to the effective mass of the sound radiating medium.

acoustic resistance.—That portion of the *acoustic impedance* which results in dissipation of energy. The real component of the acoustic impedance.

acoustic resonance.—An increase of sound intensity due to combination of *reflected waves* and *direct waves* which are in phase, or due to vibration of air columns or solid bodies at the sound frequency.

acoustic resonator.—An enclosure which increases the intensity of sounds at frequencies for which the enclosed air is set into natural vibration.

acoustic wave.—A sound wave in a gas, a liquid or a solid. A moving variation in the density, pressure or velocity of a medium.

acoustics.—1—The science of sound and its effects. 2—The properties of a room or an enclosure as they affect the behavior of sounds within the room.

actinic focus.—A focus at which come together the *actinic rays*, as distinguished from the *visible light* rays.

actinic ray.—A ray of radiant energy having the property of producing chemical changes; an *ultra-violet ray*.

actinism.—The property of certain light rays and other forms of radiant energy which enables them to produce chemical changes.

actino-dielectric.—*Photo-conductive.*

actinophonic.—Relating to the production of sound by action of *actinic rays*.

activation of filament.—*Reactivation of filament.*

active circuit.—The portion of a circuit which furnishes resistance, inductance or capacity essential to functioning.

active current or component.—The portion of the current which is *in phase* with the applied voltage, or the voltage which is in phase with the current it produces in an alternating current circuit. The part of the current or voltage which produces power in *watts*. Compare *reactive current or component.*

active lines.—In a television picture tube or camera tube, the periods during which the electron beam is scanning the lights and shades of the picture or is reproducing them.

active material.—In the plates or electrodes of a battery, the material which takes part in the chemical changes.

active spark.—A spark discharge across a gap in a circuit containing inductance and capacity.

active transducer.—A *transducer* supplying power from itself to a second system, this power being controlled from that in the first system. An amplifier using vacuum tubes is such a device.

activity coefficient.—The *space factor.*

acyclic.—Not following a cycle; *aperiodic.*

adapter.—Any device allowing the use of a part in a position or function for which that part is not originally intended.

Adcock antenna.—A receiving or transmitting antenna system consisting of one or more pairs of vertical conductors arranged end to end, with the other circuit elements connected between the pairs of conductors. Used in *direction finding. See illustration.*

additive process.—A method of producing colored motion pictures in which shades and tones of different colors are formed by superimposing two or more *primary colors.*

adjustable condenser.—A condenser of which the capacity may be

varied in steps or continuously by a manual control. *See illustration.*

adjustable resistor.—A resistor of which the resistance is adjusted manually.

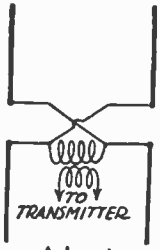
Admiralty unit.—A British unit of *capacity,* equal to 0.0011 microfarad.

admittance.—A measure of the ease with which an alternating current flows in a circuit. The reciprocal of the *impedance.* Measured in *mhos.* The usual symbol is *Y* or *y.*

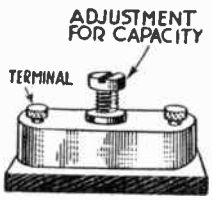
advance ball.—A part which, in a sound picture disc recording system, rests on the disc and determines the depth to which the *cutter* sinks.

Aeo light.—A light source of which the intensity may be changed by application of current varying at sound frequencies and in proportion to sound intensities in a *variable density system* of sound picture work. A lamp consisting of a cathode and an anode in helium gas, a luminous glow appearing between the elements.

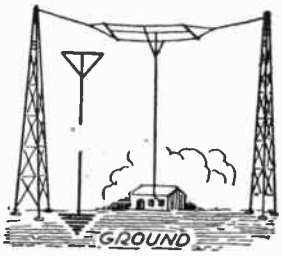
aerial.—1—The overhead conductors of a *capacity antenna* system. 2—Sometimes used to mean the entire antenna. See also *antenna. See illustration.*



Adcock Antenna



Adjustable Condenser



Aerial

aerotron.—A *three-element tube.*

aether.—The *ether.*

A.F., a.f., or a-f.—Abbreviations for *audio frequency.*

afterimage.—The impression of sight which remains in the eye after the image is no longer visible. The result of *persistence of vision.*

aging.—1—An increase of *hysteresis* and lessening of *permeability* in iron cores. 2—In *reactivation of filaments* that part of the process in which a thoriated filament is operated at a moderately high voltage to form a fresh layer of thorium. 3—In tube manufacture, a period of operation under conditions approximating normal service to bring the electrodes into normal condition or to determine operating characteristics.

A. I. E. E.—Abbreviation for *American Institute of Electrical Engineers.*

air cell.—A battery cell in which oxygen used as a *depolarizer* is taken from the air by a special form of carbon electrode. The cell

uses a liquid electrolyte, it is non-rechargeable, and delivers an average potential of about 1.2 volts.

air column.—The body of air contained within a horn or other sound chamber. *See illustration.*

air condenser.—A condenser having air at atmospheric pressure for its dielectric. *See illustration.*

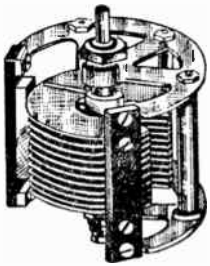
air-core.—Descriptive of an inductance coil or transformer having no iron in the magnetic circuit. A construction used in high frequency circuits. *See illustration.*

air gap.—A small space filled with non-magnetic material, forming a portion of a magnetic circuit otherwise completed through iron. The gap reduces tendency toward *saturation* and makes the magnetic flux more nearly proportional to the magnetizing force.

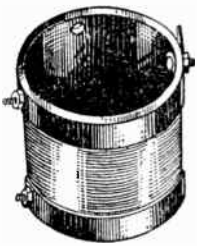
air line.—A British term for *land line.*

airplane effect.—An error introduced into aircraft beacon direction determination by inclination of the receiving aerial or of the ship.

Air Column



Air Condenser



Air Core

air thermometer ammeter.—A *calorimeter instrument.*

Alexanderson alternator.—An inductor alternator having the rotor formed with alternate segments of magnetic and non-magnetic material, operated at high speeds for the production of high frequency currents used in *continuous wave transmission* at high power.

Alexanderson altimeter.—A *reflection altimeter.*

Alexanderson modulation.—A *modulation* system in which variation of direct current at the modulating frequency alters the impedance of a transmitter circuit which includes a winding on the same iron core carrying the modulating current winding.

aligning condenser.—An adjustable condenser of small capacity connected in parallel with one unit of a *gang condenser* so that the total capacity of the section may be adjusted to allow simultaneous tuning with other sections. *See illustration.*

alkali earth.—One of a group of metals which includes *barium, calcium, magnesium and strontium.* They are *photo-emmisive* when acted upon by certain wavelengths of radiant energy.

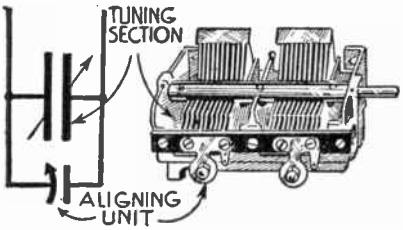
alkali metal.—A metal of the alkali group, capable of reacting with an acid to form a salt of the metal. *Potassium, sodium, lithium, rubidium, caesium.* These metals are *photo-emissive.*

alkali vapor detector tube.—A special form of tube in which the presence of alkali vapor or gas allows an amount of *ionization* which greatly increases the tube's sensitivity.

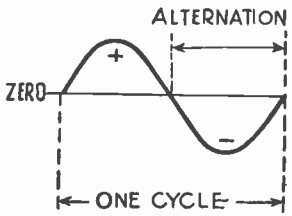
alkaline storage battery.—A storage battery using an electrolyte which is an alkali instead of an acid. An *Edison battery.* A *Hubbell battery.*

alpha rays.—*Radioactive rays* consisting of positively charged helium atoms; rays having comparatively little penetration through opaque objects but a decided ionizing effect on gases.

alternating component.—In a *pulsating current* or voltage or in a regularly varying *direct current* or voltage, the alternating quantity represented by rise and fall above and below the average value considered as zero for the alternations. The alternating



Aligning Condenser



Alternating Current

current or voltage which would remain with the *direct component* filtered out.

alternating current.—A current which reverses its direction at regular intervals, the waves of opposite polarity having the same shape and size. The average value of an alternating current is zero. One complete set of values in both directions constitutes one cycle, the time required for one cycle is the current's period and the number of cycles in one second is the frequency. The symbols are *A.C., a.c.,* or *a-c. See illustration.*

alternating current power supply.—A *power unit* taking its energy from an alternating current line.

alternating current resistance.—*Impedance* at a certain frequency.

alternating current tube.—A tube using alternating current in its filament or in a heater for the cathode.

alternating quantity.—An electric current or voltage, a magnetic force or flux, or other values which regularly and periodically reverse their direction.

alternation.—One-half of an alternating current *cycle,* during which

current or voltage changes from zero to maximum in one direction and then back to zero.

alternator.—1—A rotating dynamo-electric machine of the synchronous type which produces alternating current. 2—Sometimes used to designate any type of alternating current generator.

alternator transmitter.—A radio transmitter obtaining its radio frequency power from a *high frequency alternator.*

altimeter.—An instrument for observing altitude.

aluminum.—A soft, white metal of light weight. An excellent conductor which does not corrode.

aluminum cell lightning arrester.—A lightning arrester consisting of aluminum conductors inserted in an electrolyte which forms a resisting gas on the metal, the resistance breaking down and allowing flow of current with increase of voltage above a safe limit.

aluminum rectifier.—An *electrolytic rectifier* employing aluminum as one of its elements.

amalgam.—A combination of mercury with another metal.

amateur.—The operator of a short wave or high frequency transmitter which is privately owned and is not used for commercial work.

ambient temperature.—The temperature of the air or water coming in contact with the heated parts of an instrument.

American Morse code.—A system of telegraphic signals used chiefly in wire telegraphy and differing from the continental code in some of the letters and in the method of spacing.

American wire gage.—The gage or standard of measurement for the diameter of wire conductors of copper, brass, bronze, etc. Brown & Sharpe wire gage.

ammeter.—An instrument for measuring current flow in *amperes.*

ammeter shunt.—A resistance which remains nearly constant under all conditions, placed between the terminals of an ammeter to carry the bulk of current being measured. *See illustration.*

amperage.—The current in *amperes.*

ampere.—The practical unit of rate of flow of electric current. The current flowing through one ohm resistance with one volt pressure. A flow of one coulomb per second. The *International ampere.* The symbol is *a.*

ampere-hour.—The quantity of electricity passing with a flow of one ampere continued for one hour. Equal to 3600 *coulombs.* The symbol for quantity of electricity in ampere-hours or coulombs is *Q.*

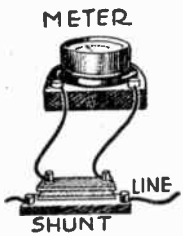
Ampere's right hand rule.—The *right hand rule* for lines of force around a conductor.

Ampere's stand.—Apparatus showing the effect on electric currents of magnets and other currents.

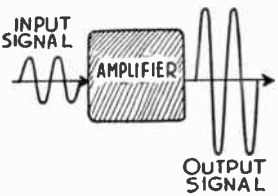
ampere-turn.—A unit of *magnetomotive force*. The force produced by one ampere of current flowing in one complete turn of a conductor. The number of ampere-turns is equal to the product of the number of turns in a winding and the number of amperes flowing in it. One ampere-turn is equal approximately to 1.257 *gilberts*.

amplification.—An increase in the voltage, current or power of a signal. Amplification occurs in vacuum tubes and transformers. *See illustration.*

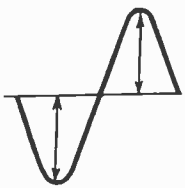
amplification coefficient, constant or factor.—A measure of the effect of grid voltage changes as compared with the effect of plate voltage changes in producing a given change of plate current in a vacuum tube. The ratio of a plate voltage change to a grid voltage change, both of which result in equal variation of plate current with all other factors remaining the same. The ratio of the alternating voltage appearing in the plate circuit to the alternating voltage applied to the grid circuit of a tube with which the plate circuit load is an infinite impedance. The symbol is the Greek letter *mu* (μ).



Ammeter Shunt



Amplification



Amplitude

amplifier.—The means by which signals are strengthened in power, voltage or current; the input power controlling a larger power supplied locally from the amplifier circuits.

amplify.—To increase the strength of received or transmitted signals.

amplifying transformer.—A transformer having a step-up voltage ratio, generally an *audio frequency transformer*.

amplifying tube.—A vacuum tube used for the purpose of increasing the voltage, current or power applied to its grid circuit.

amplitude.—The greatest value of an alternating quantity in one direction or in one polarity. A *peak value*. *See illustration.*

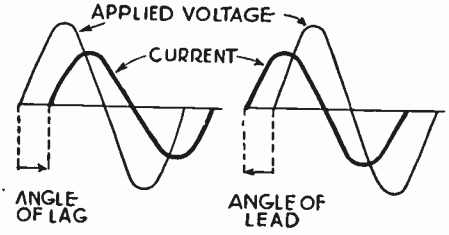
amplitude distortion.—A type of *distortion* occurring when high voltages in the applied signals are multiplied by a different factor

than the low voltages, the ratio of gain or of loss changing with changes in signal *amplitude.*

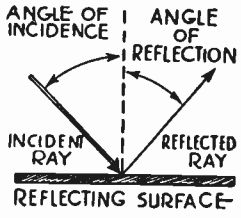
analyzer.—A *set analyzer.*

anchor gap.—A small air gap in the antenna circuit of a combined transmitter and receiver, allowing flow of the transmission antenna current across the gap but forcing received waves to pass around the gap through a receiver circuit.

angle.—1—of lag and of lead: The number of *electrical degrees* by which the current in an alternating current circuit reaches its peak and zero values after (angle of lag) or before (angle of lead) the applied voltage reaches the corresponding peak and zero values in the same circuit. See *inductive load* and *capacitive load. See illustration.* 2—of incidence: The angle between a line perpendicular to a reflecting surface and a light ray striking that surface. 3—of reflection: The angle between a line perpendicular to a reflecting surface and a light ray reflected from that surface. *See illustration.*



Angle of Lag and Lead



Angle of Light

Angstrom unit.—A unit of *wavelength,* equal to the one hundred-millionth part of a *centimeter* or to one ten-thousandth of a *micron.*

angular velocity.—In an alternating current circuit, the frequency multiplied by 2π, or by approximately 6.2832. Measured in *radians* per second. The symbol is the Greek letter omega (ω).

anion.—A *negative ion;* an ion which moves toward an anode.

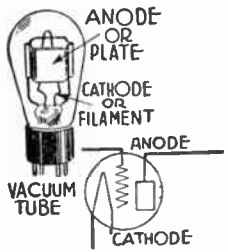
annunciator wire.—Copper wire of number 18 or 16 gage, covered with double cotton, impregnated.

anode.—1—The electrode through which current enters a vacuum, an electrolyte or other medium. The plate of a vacuum tube. *See illustration.* 2—The electrode through which current enters a source (as the negative terminal of a battery) or the terminal at which current enters a power consuming device. 3—The electrode toward which travel the negative ions while the positive ions move toward the cathode. 4—In vacuum tube work, a word having the same meaning as *plate.* See also *cathode.*

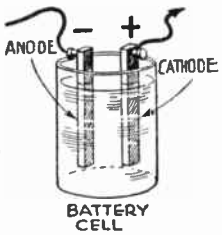
anode battery.—A British term for *plate battery.*

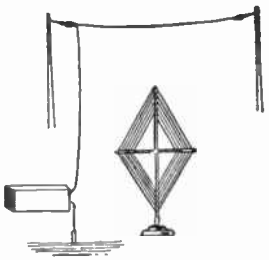
anode bend rectification.—A British term for *plate current detection.*

antenna.—Conductors arranged to absorb energy from a radio wave or to radiate energy in the form of radio waves. A *capacity antenna* or a *loop antenna. See illustration.*



Anode and Cathode



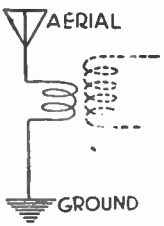


Antenna

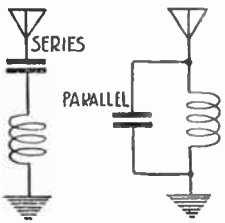
antenna capacity.—The *electrostatic capacity* of the antenna circuit.

antenna circuit.—The entire path traversed by currents produced in an aerial, its ground and any capacities, inductances and resistances in circuit with these two. *See illustration.*

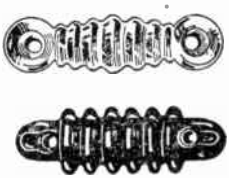
antenna condenser.—1—A condenser placed in series with an antenna circuit for the purpose of reducing the circuit capacity and increasing the *resonance frequency.* 2—A condenser in parallel



Antenna Circuit



Antenna Condenser



Antenna Insulators

with the capacity of an antenna system for the purpose of increasing the total capacity and lowering the *resonance frequency* of the antenna circuit. *See illustration.*

antenna coupling.—The coupling through which there is transfer of energy from an antenna circuit to a receiver, or from a transmitter to its antenna circuit.

antenna current.—The current flowing in an *antenna circuit.*

antenna effect.—The ability of any conductor insulated from the earth to act as one plate of a *capacity antenna*. Especially, such an effect as observed in a *loop antenna*.

antenna feed system.—A *current feed* or a *voltage feed* to a transmitting antenna.

antenna form factor.—The ratio of an antenna's effective height to its real physical height.

antenna height.—The *effective height of the antenna*.

antenna inductance.—The *self-inductance* existing in the conductors of the antenna system, in the aerial and down-lead wires.

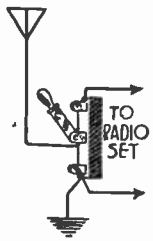
antenna insulator.—An insulator which attaches an aerial wire or its down-lead to supports. *See illustration, page preceding.*

antenna lead-in.—The conductor connecting an aerial wire to a receiver. Compare *down lead. See illustration.*

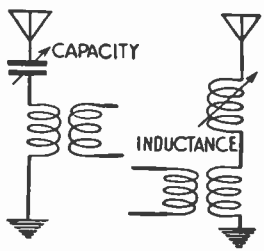
antenna reflector.—That part of a *beam antenna* which reflects or reverses the direction of the radiation.

antenna resistance.—The total *effective resistance* of an antenna

Antenna Lead-in



Antenna Switch



Antenna Tuning

circuit. The resistance found by dividing the average power in an antenna circuit by the square of the maximum effective current in the antenna. Antenna resistance includes the radiation resistance, the ground resistance, the losses due to corona, eddy currents, dielectric effects and insulation leakage, and also the ohmic resistances of conductors.

antenna switch.—A switch for disconnecting the aerial wire from a receiver. The same switch may ground the antenna. *See illustration.*

antenna tower.—The supports for the electrical portions of an aerial.

antenna tuning condenser or tuning inductance.—A variable condenser or variable inductance used in an antenna circuit to produce *resonance* at certain desired frequencies. *See illustration.*

antenna wavelength.—The wavelength corresponding to the *natural frequency* of the antenna circuit.

anti-capacity switch.—Any form of switch in which the metallic current carrying parts are well separated to reduce the *electro-*

static capacity between them. Usually a cam switch. *See illustration.*

anti-coherer.—A device of which the resistance is increased by electric waves acting upon it; used in early forms of receiving apparatus. Compare *coherer.*

antimony detector.—A *crystal detector* formed by contact between silicon and antimony.

antinode.—The points in a series of waves where the greatest amplitude or field strength exists. Points midway between the nodes. See *node.*

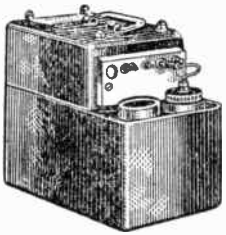
antiphase.—*Opposite phase.*

anti-regeneration.—The process of applying energy from a tube's plate circuit to its grid circuit with the voltages in such phase relation that the grid voltage changes are reduced in strength.

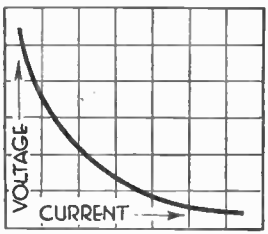
anti-resonance.—*Parallel resonance.*

aperiodic.—Having no period, no natural frequency. Not *resonant* at any one frequency.

Anti-capacity Switch



A-power Supply



Arc Characteristic

aperiodic circuit.—A circuit which is not tuned or *resonant.* A circuit in which oscillations are not maintained, the resistance serving to damp out oscillatory effects. A circuit is aperiodic when the resistance squared is greater than four times the inductance in henries divided by the capacity in farads.

aperiodic instrument.—A *deadbeat instrument.*

aperture plate.—In a film system of sound recording, a plate containing an oblong opening which fixes the size of a light beam passing through it and reaching the film.

A-power supply.—A device which furnishes filament or cathode heating current for vacuum tubes. *See illustration.*

apparent inductance.—The combined effect of a coil's *true inductance* and its *distributed capacity* in determining the resonance frequency of a circuit containing the coil. That value of inductance which would have the same effect on tuning as is actually had by a coil's real inductance and its distributed capacity together. Compare *true inductance.*

apparent power.—The *volt-amperes* in an alternating circuit.

apparent resistance.—The *impedance* of an alternating current circuit.

applied voltage.—The *impressed voltage.*

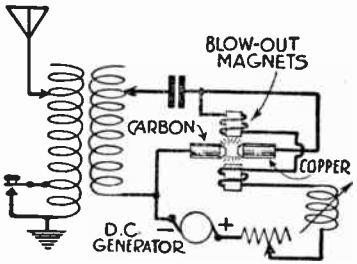
arc.—A luminous discharge or continuous flow of current across a space between electrodes, the conduction being due chiefly to ionization of gases in the space. A very intense or concentrated *glow discharge.*

arc characteristic.—A curve showing the relation between the voltage across an electric arc and the current flowing through the arc. *See illustration, page preceding.*

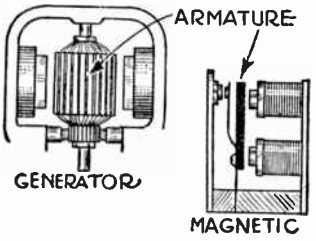
arc converter.—An *arc generator.*

arc generator.—An electric arc employed in continuous wave transmission for the production of high frequency currents, using power from a direct current circuit. A *Poulsen arc.*

arc transmission.—*Continuous wave transmission* in which the high



Arc Transmission



Armature

frequency currents are produced in a circuit containing an electric arc shunted with a capacity and an inductance in series. The arc is operated from a direct current source and its change of resistance during flow of the condenser charging current results in an *oscillatory current* through the capacity and inductance. *See illustration.*

argon.—One of the inert gases existing naturally in the atmosphere.

argon rectifier.—A hot cathode type of *gaseous conduction rectifier* using argon gas in the bulb.

arithmetic mean.—One-half the sum of two values; the average.

armature.—1—The part of a generator or motor carrying the conductors in which induction results in electromotive force or in power. 2—A piece of iron or steel forming part of a magnetic circuit, being either fixed in position or moved under the influence of changing magnetic strength. *See illustration.*

armored cable.—An insulated conductor protected with a twisted or braided covering of metal.

Armstrong oscillator.—A *tuned-grid, tuned-plate oscillator.*

Armstrong receiver.—A form of receiver using a *regenerative detector* having both the grid circuit and plate circuit tuned to resonance.

articulation.—The percentage of detached speech syllables which may be correctly understood by a listener when the only source of distortion between the original sound source and the listener is the device of which the articulation is being measured.

artificial antenna.—A circuit having values of resistance, inductance and capacity equivalent to those of a transmitting or a receiving antenna, but from which energy is dissipated in the form of heat rather than in radio waves. Used for testing purposes. See *standard antenna.*

artificial cable or line.—A network containing resistance, inductance and capacity so arranged as to simulate the effect of a real transmission line in electrical effect.

aspect ratio.—The ratio of television picture width to picture height. Width divided by height.

astatic.—Having little or no magnetic property.

astatic coil.—An *inductance coil* having a very limited external field due to its construction with two cylinderical windings, one within the other, so connected that the two polarities oppose. The outer winding acts as an effective shield for the inner one. *See illustration, page following.*

astatic galvanometer.—A galvanometer with two sets of magnets which make it independent of outside magnetic influences.

astigmatic lens.—A lens which does not sharply focus certain of the lines in an image.

asymmetric.—Not *symmetrical. Unilateral.*

asymmetric conductor.—A conductor allowing more current to flow in one direction than in the other.

asymmetrical antenna.—An antenna which radiates or receives more effectively in some directions than in others due to its form of construction.

asynchronous.—Not *synchronous.* A machine in which the speed of rotation does not correspond with the frequency of its current.

atmospheric absorption.—Dissipation of energy from a radio wave moving through space, the absorption being due to atmospheric conductivity and to the consequent *reflection* and *refraction* of the waves.

atmospherics.—Radio waves produced by electrical effects in the atmosphere; a form of *static* interference.

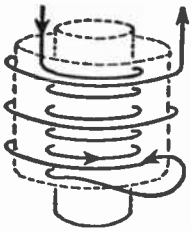
atom.—The smallest particle of an elementary substance, a particle which is not further divisible by chemical means. Compare *molecule.* An atom consists of a positive nucleus around which rotate one or more negative electrons.

atomic weight.—The weight of an atom of a substance in comparison with the weight of an atom of hydrogen.

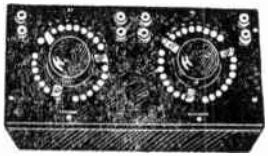
attenuation.—1—A lessening of intensity or power. Any reduction in voltage, current or power between different circuits or between different parts of one circuit. 2—Radio attenuation is the decrease in *amplitude* of the electric and magnetic forces in a radio wave with increase of distance from the transmitter.

attenuation box.—An *attenuation network* provided with switching means for altering the power loss. *See illustration.*

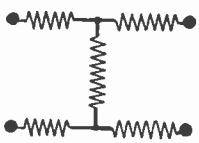
attenuation coefficient, constant or factor.—1—The rate at which a wave diminishes in energy with distance from the transmitter or source. 2—The relation between the current at a source and the current received from a uniform transmission line. The attenuation occurring in one section of a line of recurrent structures. 3—The number which, multiplied by the distance of transmission, gives the natural logarithm of the ratio of the amplitude of the forces at that distance to their amplitude at the transmitter



Astatic Coil



Attenuation Box



Attenuation Network

attenuation equalizer.—A device which increases the *transmission loss* at certain frequencies so that the loss for all transmitted frequencies within a certain range is made substantially the same. Frequencies originally over-emphasized are reduced in amplitude to equal all other frequencies. A system of inductances, capacities and resistances which attenuates certain frequencies.

attenuation network.—An arrangement of resistors used to introduce a known amount of power loss in a circuit while maintaining desired impedance relations. *See illustration.*

attenuation unit.—A *transmission unit.* See also *natural attenuation unit.*

attenuator.—A device for lessening the *amplitude* of a signal current while introducing minimum distortion.

attraction.—*Electric attraction.*

audibility.—The strength of a signal or sound as measured in units based on the response of the ear. The ratio of the actual signal strength to the strength required for a signal which can barely be heard.

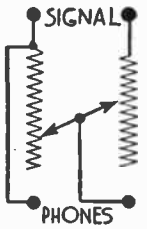
audibility factor.—The ratio between the resistances employed in a test with an *audibility meter*. A measure of audibility which is made by varying a resistance connected in parallel with a telephone receiver.

audibility meter.—A variable resistance connected across a telephone receiver and adjusted so that signals from a measured source are just audible. The resistance required allows comparison of strength between a measured source and a reference source as a standard. *See illustration.*

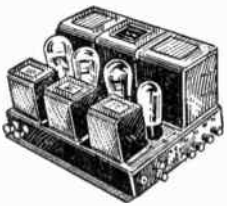
audible.—Capable of being heard; perceptible to the ear.

audible spectrum.—Sound waves within the limits of human hearing; the *audio frequencies*.

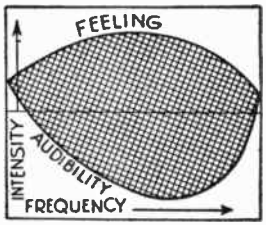
audio frequency.—A current, voltage, sound or other wave motion having a frequency which affects the ear as sound, approximately



Audibility Meter



Audio Frequency Amplifier



Auditory Sensation Area

between 20 and 20,000 cycles per second. Abbreviations are *A.F.*, *a.f.*, and *a-f*.

audio frequency amplification.—An increase in voltage, current or power of a signal at *audio frequency*.

audio frequency amplifier.—Apparatus containing vacuum tubes and used for increasing the voltage and power of an *audio frequency* signal. *See illustration.*

audio frequency choke.—An inductance coil used to impede the flow of *audio frequency* currents through a circuit.

audio frequency oscillator.—Apparatus for the production of currents at audio frequencies. A *beat frequency oscillator*, a *magnetostriction oscillator*, a *tuning fork oscillator* or a *vacuum tube oscillator* working at *audio frequency*.

audio frequency transformer.—A transformer designed to provide coupling between two circuits operating at *audio frequencies*.

audio howler.—An *audio frequency oscillator*.

audiometer.—An instrument for measuring the intensity or audibility of sounds.

audion.—A *vacuum tube.*

audiotron.—A *three-element tube.*

audition.—The act of hearing or of listening to sounds.

auditory.—Pertaining to the ear and the sense of hearing.

auditory masking.—The *masking effect.*

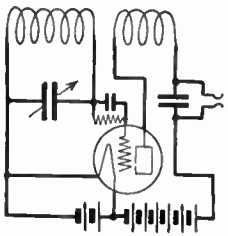
auditory sensation area.—The sound intensities included between the *threshold sound intensities,* between the threshold of audibility and the threshold of feeling. *See illustration, page preceding.*

aural.—Pertaining to the sense of hearing.

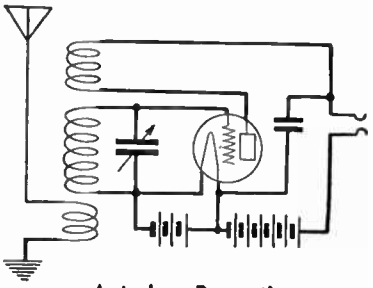
aural radio range.—A *radio range* sending signals modulated with an audio frequency for reception with telephone receivers.

aurora.—The aurora borealis or aurora australis; a luminous effect of electrical origin appearing in the earth's polar regions.

Austin-Cohen formula.—A formula for calculation of the current produced in a receiving antenna when the known factors include distance to transmitter, carrier frequency, transmitter power and antenna heights.



Autodyne
Frequency Meter



Autodyne Reception

auto-coherer.—A *coherer* detector with associated parts for automatically releasing the contact material between signals.

autodyne frequency meter.—A *frequency meter* producing within itself currents at radio frequency which beat with received currents, *resonance* being indicated when the two frequencies are alike and produce a *zero beat. See illustration.*

autodyne reception.—Radio reception by combining a received frequency with another frequency produced in the detector circuit of the receiver to produce a beat frequency. *Heterodyne reception* in which a single vacuum tube operates both as an oscillator and as a *first detector.* Self-heterodyne reception. The principle employed in some superheterodyne receivers. *See illustration.*

autoformer.—An *auto-transformer.*

auto-heterodyne reception.—*Autodyne reception.*

automatic circuit breaker.—A *circuit breaker* which opens when current in the controlled circuit exceeds a predetermined value,

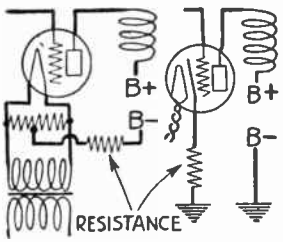
operation being effected by a magnet connected in the controlled circuit.

automatic grid bias.—A direct current voltage difference or *grid bias* applied between control grid and cathode of a vacuum tube; the bias being the voltage drop across a resistance connected between the tube's plate circuit and its cathode or filament. The voltage drop results from flow of plate circuit current from the cathode through this resistance, varying with changes of plate current and thus providing the automatic feature. *See illustration.*

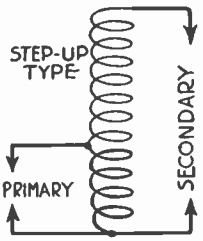
automatic regulation.—Control of voltage or current by electrical devices connected to the circuits to be controlled. Control which operates as a result of conditions, without manual operation.

automatic transmitter.—A telegraph transmitter in which the key is operated automatically.

automatic tuning.—*Tuning* accomplished by some mechanical or electrical means other than the manual operation of a dial or knob.



Automatic Grid Bias



Auto-transformer

Ayrton-Perry Winding

Certain stations or frequencies are tuned in by press buttons, keys or similar devices.

automatic volume control.—A method of automatically maintaining a nearly constant power output or loud speaker volume from a receiver in which the antenna input is varied by fading and similar effects. With one commonly used system a part of the signal is rectified and used to alter the control *grid bias* on radio frequency or intermediate frequency amplifying tubes. Increase of signal strength then makes the bias more negative which reduces the amplification, while a smaller antenna input produces a contrary effect, amplification being made inversely proportional to antenna input.

autoplex receiver.—A *super-regenerative receiver.*

auto-transformer.—A transformer in which part of the primary winding is also a part of the secondary, or vice versa, the two windings being conductively connected together so that a part of the energy in the secondary comes directly from the primary. *See illustration.*

average selectivity.—The selectivity of several cascaded amplifying stages; equal to the *n*-th root of the product of the *n* separate stage selectivities.

average shading.—In a television image, the result of separately evaluating the light or shade of each *elementary area* and then averaging all of these values in terms of similar units. The shading which would result from running all lights and shades together to form an even shading over the entire picture area.

average value.—The algebraic sum of two opposite effects, such as currents or voltages of opposite polarity. The difference, if any, between the values of one polarity and those of the opposite polarity. The average value of a sine wave alternation is equal to 0.637 times the maximum or peak value.

Ayrton-Perry winding.—A *non-inductive winding* using two conductors connected in parallel, one of them carrying current clockwise and the other carrying it anti-clockwise around the winding. *See illustration, page preceding.*

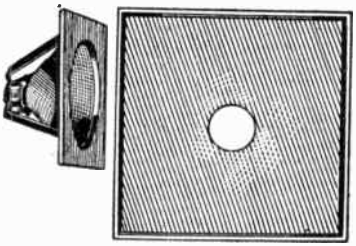
B

B.—A symbol for *magnetic flux density.*

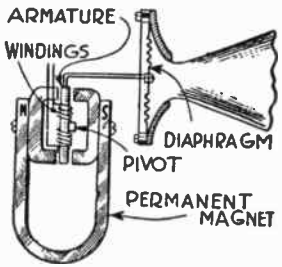
b.—A symbol for *susceptance* in mhos.

back coupling.—A coupling by means of which energy from an output circuit is applied to the input circuit of the same system. *feedback.*

back current.—Current which flows through a rectifying element in a direction opposite to that in which the rectified current is passed. The current which results from those portions of alternations which are not completely suppressed by the valve action of a *rectifier.*



Baffle



Balanced Armature Loud Speaker

back e.m.f.—*Counter-electromotive force.*

back focal length.—The distance from the center of a lens to its *principal focus* on the side of the lens away from the object.

background noise.—Noises which result from irregular and slight changes taking place in the circuit elements of a transmitter. Also *tube noise, needle scratch* and similar effects.

back oscillation.—High frequency current which flows back through the secondary of the transformer supplying power to the oscillatory circuit in *spark transmission.*

back-shunt signalling.—*Absorption signalling.*

back voltage.—*Counter-electromotive force.*

back wave.—The *compensation wave.*

baffle.—A partition used to prevent free movement of air between front and back surfaces of a *free radiator.* The baffle surrounds and extends outward from that part of a loud speaker which originates the sound waves so that air compressions on one side of

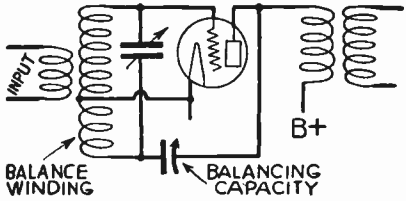
the radiator cannot be neutralized by the rarefactions simultaneously produced on the other side. *See illustration.*

bakelite.—An insulating material composed chiefly of *phenolic compound.*

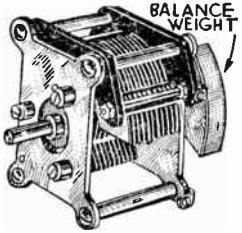
balanced amplifier.—An amplifier using *push-pull amplification.*

balanced antenna.—Two receiving antennas coupled to one receiver, one antenna being tuned to the frequency to be received and amplified, the other being tuned to the frequency of a nearby interfering station.

balanced armature loud speaker.—A loud speaker unit in which the motion resulting in sound is produced by a small iron armature which is pivoted and balanced between two sets of permanent magnet poles and is surrounded by the windings carrying the signal currents. Changes in magnetism produced by signal currents cause the armature to rock back and forth. A *moving iron* loud speaker. *See illustration, page preceding.*



Balanced Circuit



Balanced Condenser

balanced circuit.—A circuit containing a vacuum tube in which the internal *plate-grid capacitance* is balanced or compensated for by an external capacity. Feedback through the tube is neutralized by the external feedback in *opposite phase. See illustration.*

balanced condenser.—A variable condenser in which the weight of the rotor on one side of the shaft is balanced by an equal weight or by another rotor on the opposite side. *See illustration.*

balanced detectors.—Two detectors so connected as to let *static* effects partially neutralize each other while signals are effectively received.

balanced H-section attenuator.—An *attenuation network* maintaining constant impedance relations in both directions and allowing balance of both sides of the line to ground. *See illustration.*

balanced modulator.—A modulation system used with *side band transmission.* Two tubes are connected as in a push-pull circuit,

the carrier being eliminated in their output transformer. *See illustration.*

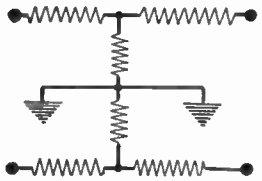
balancer.—Devices used with a *direction finder* to allow more accurate determination of direction.

balancing.—The process of adjusting an external capacity so that it allows a *feedback* of voltage which is opposite in phase and equal in effect to the feedback through the plate-grid capacitance of an amplifying tube.

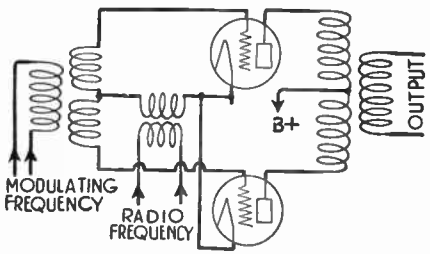
balancing condenser.—1—The condenser used in a *balanced circuit;* a neutralizing condenser. 2—A condenser which equalizes the capacities to ground of the two sides of a *direction finder* loop antenna set for minimum signal.

ballast coil.—A resistor for limiting the current in a circuit.

ballast resistance.—1—A resistance in series with a transmitting arc to partially overcome the arc's negative resistance. 2—A unit



Balanced H-section Attenuator



Balanced Modulator

connected in the primary circuit of a power transformer to partially compensate for changes in line voltage.

ballast tube.—A tube containing a resistance element which maintains a fairly constant current in its circuit when changes occur in the applied voltage.

ballata.—A natural vegetable gum similar to *gutta-percha.*

ballistic galvanometer.—An instrument for measuring quantity of electricity in *coulombs.* The movement is undamped, and a single swing of the pointer is proportional in extent to the amount of electricity discharged from a condenser through the movement.

balsa wood speaker.—A loud speaker using a free radiator of balsa wood which is very light in weight.

band exclusion filter.—An electric filter which greatly attenuates currents between two limiting or *cutoff frequencies* flowing in the circuit of which the filter is a part. *See illustration.*

band filter.—1—A *band exclusion filter*. 2—A *band selector circuit*.

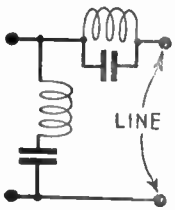
band microphone.—A *ribbon microphone*.

band pass filter.—An electric filter which allows comparatively free passage of currents at frequencies within certain upper and lower limits while greatly attenuating currents at all frequencies outside these limiting or *cut-off frequencies*. *See illustration.*

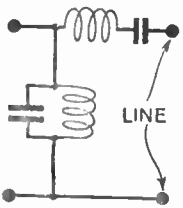
band selector circuit.—A filter system preceding or incorporated with a *radio frequency amplifier* for the purpose of allowing only a limited band or number of frequencies to pass through it to the amplifier. *See illustration.*

banked winding.—A coil winding in which successive turns are laid up into two or more layers, the whole winding proceeding in this manner from one end to the other of the form without returning at any point. Employed to reduce the *distributed capacity* of a winding requiring many turns. *See illustration.*

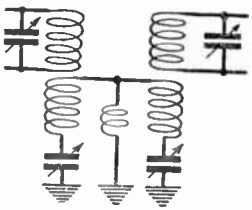
bar.—A pressure of one dyne per square centimeter.



Band Exclusion Filter



Band Pass Filter



Band Selector Circuit

barium.—An alkaline earth of which compounds are used in cathodes of photocells having maximum response to yellow-green light.

Barkhausen effect.—Slight fluctuations in the rate at which a material becomes magnetized, the magnetization not proceeding at a perfectly uniform rate.

bar magnet.—A *permanent magnet* formed of a straight piece of steel. *See illustration.*

barrage receiver.—A receiving system using two antennas, the currents produced in them by an undesired station neutralizing each other by reversal of phase in one circuit.

barretter.—An instrument for detecting the presence of electric waves by their heating of a conductor and its consequent change of resistance.

barrier.—A partition of insulating material.

Bartlane picture transmission.—A system of *facsimile transmission* transferring the picture to a perforated tape from which transmission takes place in a manner similar to that used for telegraphy.

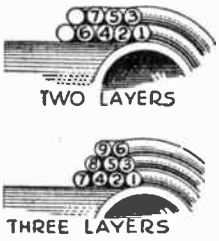
basket winding.—A type of coil winding in which each turn is made to assume an irregular contour so that adjacent turns are separated by considerable spacing except at the points of crossing. The purpose is to reduce *distributed capacity. See illustration.*

battery.—One or more electrically connected *primary cells* or *storage cells* in which chemical energy is changed into electromotive force.

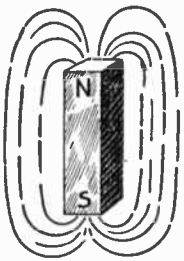
battery acid.—Sulphuric acid used in the electrolyte of a *lead-acid* type of storage battery.

battery capacity.—The current, measured in *ampere-hours* or *coulombs,* which a battery will deliver between full charge and complete discharge.

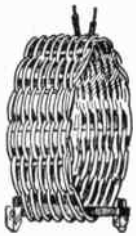
battery charge.—Passage of direct current through a battery in a direction opposite to that of the current on discharge, for the purpose of restoring the active materials.



Banked Winding



Bar Magnet



Basket Winding

battery discharge.—Current flow resulting from change of chemical energy into electrical energy in a battery.

battery electrolyte.—A solution of sulphuric acid in water used as *electrolyte* in lead-acid storage batteries. The liquid used in any type of primary cell or storage cell.

battery eliminator.—A device which furnishes plate current and sometimes filament current for tubes. Built as a separate unit and used to replace batteries.

battery liquid.—*Battery electrolyte.*

battery operated set.—A receiver operated entirely from primary or storage batteries for all tube currents and voltages.

battery paste.—Lead compounds which are pasted into the grids to make plates for *lead-acid* storage batteries.

battery tube.—A filament type or heater type of tube designed for operation with batteries as the source of filament or heater current.

B-battery.—A battery which furnishes current for the *plate circuits* of vacuum tubes.

beacon.—A *radio beacon.*

beacon course.—An *equisignal zone.*

beam antenna.—An antenna from which radiation is confined to a small angle in one direction only.

beam transmission.—Radiation of radio waves in a direction limited to a small angle instead of almost equally in all directions. The result of wave *reflection* from a system of conductors back of the radiating antenna.

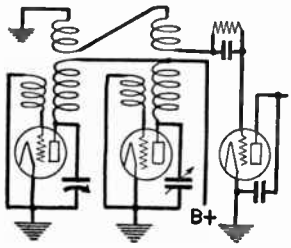
beat.—One cycle of a wave produced by *beating.*

beat frequency.—A frequency equal to the difference between two other frequencies *beating* together.

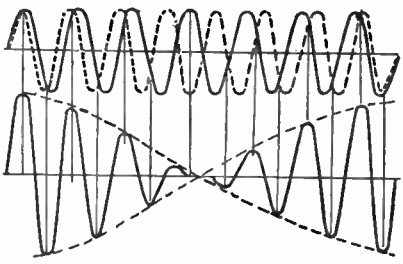
beat frequency oscillator.—An *audio frequency oscillator* in which audio frequency currents are produced by the *beating* together of higher frequencies generated in two separate circuits. *See illustration.*

beat frequency receiver.—A *superheterodyne receiver.*

beat interference.—*Beating* together of two modulated carrier



Beat Frequency Oscillator



Beating

waves to produce a new frequency in the radio frequency amplifier of a receiver, this beat frequency carrying one or both the original modulations and being detected in the usual manner. See also *cross modulation.*

beat note.—An audible frequency produced by the *beating* of two higher frequencies.

beat reception.—1—*Heterodyne reception.* 2—*Zero beat reception.*

beating.—The action by which two or more waves of different frequencies acting together produce an additional frequency equal to the difference between two of the original frequencies. The instant at which peak values of like polarity occur simultaneously in the original frequencies is the instant at which there is a peak amplitude in the beat frequency. *See illustration.*

Becquerel effect.—The *photo-voltaic* action.

beeswax.—An insulating wax having fairly low dielectric loss. Dielectric constant about 3.0.

bel.—A transmission unit in the decimal system. The commonly used unit is a *decibel,* equal to one-tenth of a bel.

B-eliminator.—Apparatus utilizing alternating current from a power line for production of plate potentials and currents, and sometimes for grid biasing potentials. *See illustration.*

bell ringing transformer.—A small transformer connected to the power and light circuit and furnishing current for operating door bells, signals, etc.

bell wire.—*Annunciator wire.*

Bellini-Tosi direction finder.—A *direction finder* employing two loops or triangular antennas crossed at right angles and connected to a *goniometer. See illustration.*

beta rays.—*Radioactive rays* consisting of negatively charged particles, or of electrons. *Cathode rays.*

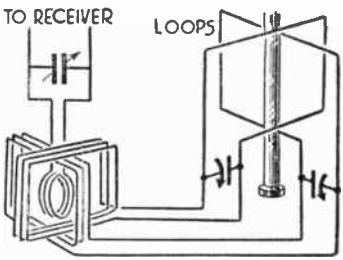
Bethenod alternator.—A *Latour alternator.*

Beverage antenna.—A *wave antenna.*

bezel.—A screen or window placed in a panel to allow observation of tubes or pilot lamps.

B-H curve.—A *magnetization curve.*

B-eliminator



Bellini-Tosi Direction Finder

bias.—A difference in potential between electrodes of a vacuum tube. See *grid bias.*

bias detector.—A vacuum tube detector employing the principle of *plate current detection.*

biasing resistor.—A resistance element providing a voltage drop for grid bias, usually in the system known as *automatic grid bias. See illustration, page following.*

biconcave lens.—A *double concave lens.*

biconvex lens.—A *double convex lens.*

bifilar winding.—A form of *non-inductive winding* in which the current is carried through two conductors, flowing first one direction and then returning in the opposite direction around the winding. *See illustration, page following.*

bilateral antenna.—An antenna which radiates or receives more effectively in two diametrically opposite directions than in any other directions.

Billi condenser.—A *variable condenser* having as plates two metal

tubes, one sliding within the other, with the dielectric between them.

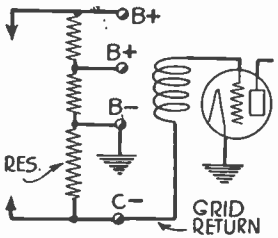
binaural effect.—The effect of sounds on both ears, by which it is possible to determine the direction from which the sounds are coming.

binder.—Liquid insulating material which, upon drying, acts as a protective coating or as a fastening for the windings of coils.

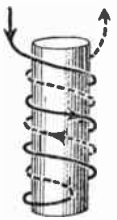
binocular coil.—An inductor consisting of two separate and parallel coils so arranged that the field of each one passes chiefly through the other, there being comparatively small external field. *See illustration.*

binocular parallax.—The difference in apparent position of an object when viewed first with one eye and then with the other while the head remains stationary.

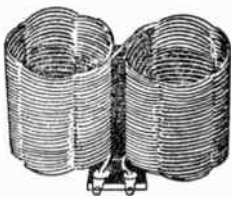
binocular vision.—The appearance of objects as seen by both eyes of an observer, allowing the effect of solidity or of the third dimension.



Biasing Resistor



Bifilar Winding



Binocular Coil

biotron.—Two vacuum tubes connected together to produce a steeper *mutual characteristic* curve than found with either tube alone.

bipass.—A British spelling of *bypass.*

bipolar.—Having two magnetic poles.

Birmingham wire gage.—A gage used for telegraph and telephone wires, also other soft wires.

black body.—An ideal material which is assumed to completely absorb, with no reflection, all frequencies reaching it and is also assumed to give forth all the frequencies of any radiation.

black body photocell.—A form of *photocell* in which light is assumed to be completely absorbed.

black level.—The value of television carrier current when not modulated by any signal voltage, a value which is increased by synchronizing and equalizing voltages.

black light.—A name sometimes applied to *ultra-violet rays.*

blanketing.—The effect of a powerful radio signal which makes reception of weaker signals difficult or impossible.

blanking signal.—A television signal which extinguishes the electron beam in a receiver picture tube while the beam is blanked in the transmitter camera tube.

blasting.—The result of tube *overloading* on the sounds emitted by a loud speaker.

bleeder current.—The steady current which flows through all sections of a power unit *voltage divider* and assists in improving the voltage regulation of the system.

bleeder resistance.—That portion of the resistance in a power unit *voltage divider* which determines the value of *bleeder current*.

blind spot.—A space within which signals from a transmitter are received with little strength or not at all.

blocked impedance.—The *terminal impedance* of an acoustic device when the mechanical portion has an infinite impedance.

blocking.—Reduction of a tube's plate current to zero because of an excessive negative charge on the control grid, the circuit conditions being such that the negative charge is neutralized very slowly.

blocking condenser.—A condenser used to keep direct currents out of a circuit. A *stopping condenser*.

blooper.—A receiver which radiates signals because of *oscillation* taking place in circuits coupled to the antenna.

blow-out magnet.—A *magnetic blow-out*.

blue glow.—The appearance of the space within a vacuum tube in which gas is undergoing ionization, due to the use of excessive voltages or to an imperfect vacuum and residual gas in the tube.

Board of Trade unit.—A British unit of electrical energy; equal to one *kilowatt-hour*.

bobbin.—A winding of small size.

body capacity.—The *electrostatic capacity* which exists between parts of a person's body and radio circuit parts.

body leakage.—*Volume leakage*.

bolometer.—An instrument for measurement of heat by the change of resistance resulting from change of temperature in a conductor.

bolometer bridge.—An instrument for measuring small high frequency currents according to the change in resistance produced in a conductor which is heated while carrying these currents. The resistance element is placed in one arm of a *Wheatstone bridge*. *See illustration, page following*.

bombardment.—*Electron bombardment*.

bonding.—Connecting metallic parts together so that they form a continuous electrical conductor.

book condenser.—A *variable condenser* having two plates hinged together on one edge like the leaves of a book and having a dielectric attached to one plate or supported between the plates.

booster.—1—A generator of which the output is used to maintain the voltage on a circuit and overcome line drop, etc. 2—One or more *stages of amplification* added to a receiver.

booster charge.—A high rate, short time charge given to a storage battery.

booster transformer.—A transformer with its secondary in series with a line in which the voltage is to be raised to make up for line drop, etc.

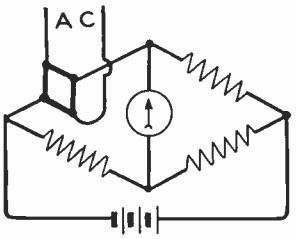
bornite.—A *crystal detector* unit of sulphide of iron and copper, used in contact with another crystal of zincite.

bottle.—A name for a *vacuum tube*, usually a transmitting tube.

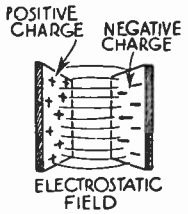
bougie decimale.—A standard of *luminous intensity* having a value slightly less than the *international candle.*

bound charge.—An *electrostatic charge* so affected by another nearby charge that it does not escape to earth nor have an effect on an electroscope. A charge of one polarity remaining on an insulated conductor. *See illustration.*

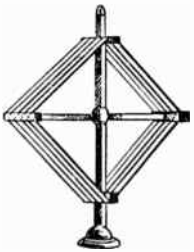
bound electron.—An electron associated with the *positive nucleus* of an atom, not detached during electrical actions.



Bolometer Bridge



Bound Charge



Box Loop

box bridge.—A *Wheatstone bridge.* A *postoffice bridge.*

box loop.—A *loop antenna* with the turns of the conductor wound side by side to form a flat band. *See illustration.*

box negative plate.—A lead-acid storage battery negative plate formed by riveting two sides of the grid together with active material between them.

B-power supply.—A device furnishing *plate current* for tubes.

Branly coherer.—A *coherer* form of detector.

Braun tube.—A *cathode ray tube* having a partition or diaphragm through which a beam of cathode rays passes on its way to a fluorescent screen in the end of the tube.

breakdown voltage.—1—The applied voltage at which an insulator or dielectric is punctured. 2—In a *grid-glow tube*, the value of grid-cathode voltage at which a glow discharge commences.

breaker.—An *interrupter.*

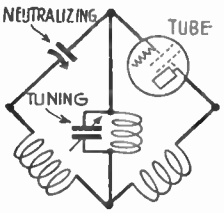
break-in key.—A switch for disconnecting a receiver and connecting a transmitter.

break-in operation.—Operation of a receiving station in such man-

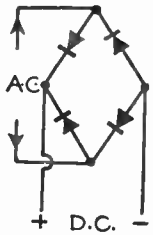
ner that its operator can interrupt the received transmission for the purpose of sending signals to the transmitting station.

breathing of microphone.—A slow periodic change in the resistance and response of a *carbon microphone* .

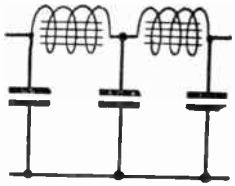
bridge circuit.—A circuit employed in neutralizing the *feedback* effect of interelectrode capacities in amplifying tubes; also for preventing voltage changes in one portion of any device from affecting other portions. A parallel circuit with each of its sides divided into two parts at junction points, and with a bridging element connected from one junction across to the other. When the impedances of the two resistors, inductors or capacities forming one side of the parallel circuit bear to each other the same ratio that is borne by the two elements forming the other side, there is no potential difference across the bridging element. Consequently, no change can result in current flowing in the bridging element from variations in a voltage applied to the ends of the parallel circuit. *See illustration.*



Bridge Circuit



Bridge Rectifier



Brute Force Filter

bridge rectifier.—A circuit allowing the use of four *half-wave rectifier* elements operating as a *full-wave rectifier*. There are four arms, each containing one rectifying element, and connected in the form of a rectangle. Alternating current applied across opposite corners of the rectangle results in rectified current between the remaining two corners. *See illustration.*

bridging amplifier.—An *audio frequency amplifier* taking its signal input from a transmission line or voltage amplifier and furnishing power for operation of a loud speaker, a sound record cutting stylus, a television lamp or other power consuming device.

bridging condenser.—A fixed condenser connected across a circuit element to bypass high frequency currents around that element. A *bypass condenser*. A *telephone condenser*.

bright emitter.—A British term for a vacuum tube with a tungsten or thoriated filament which glows brightly while in normal operation.

brightness.—The appearance of an object which is emitting or

reflecting light. See *intrinsic brightness.* Measured in *lamberts,* or in apparent *candlepower* per unit of area, or in *lumens* per unit of area.

brightness control.—A television receiver control for varying the average illumination of the picture. Also a circuit which automatically maintains a constant average illumination of the picture.

brilliance.—A quality of reproduced sound in which high frequencies and overtones have their correct emphasis in relation to the lower frequencies.

britannia joint.—A wire joint made by laying two heavy wires side by side with ends pointing opposite directions, then wrapping a smaller wire around them.

British thermal unit.—A unit for measurement of heat. The heat required to raise the temperature of one pound of water, at its point of maximum density, one degree Fahrenheit. Equal to 252 *calories.*

broadcasting.—*Radiation* of radio signals which may be picked up by any receiver within range of the transmitter. Broadcasting includes the transmission of entertainment and other features of public interest.

broadside directional antenna.—A directional antenna radiating chiefly in a direction at right angles to the line along which the antenna elements are disposed. Compare *end-on directional antenna.*

broad tuning.—The condition existing when a tuned circuit or circuits respond not only to frequencies within one band or channel but also to a considerable range of frequencies on each side. Having little *selectivity.*

bronze.—An alloy metal containing copper and tin, also zinc and other metals.

Brown & Sharpe wire gage.—The *American wire gage.*

brush.—A stationary member of metal or carbon resting on a revolving part to allow flow of current between moving and stationary parts of a machine.

brush discharge.—A visible glow due to *ionization* of the air at edges and corners of a conductor operating at high voltage, such as the plate of a condenser. The *corona.*

brush loss.—The power dissipated in forming a *brush discharge.*

brute force filter.—A *low pass filter* depending on large values of inductance and capacity rather than on any resonance effects to oppose passage of alternating current through it. *See illustration, page preceding.*

B.T.U.—Abbreviation for *British thermal unit.*

bucking coil.—An induction coil or winding so connected that its field opposes the field of another winding, their polarities being opposite. *See illustration.*

buckling.—Bending of *lead-acid* storage battery plates caused by

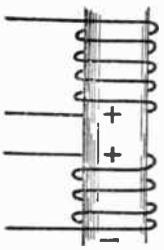
excessive chemical action on one part of the plate, producing an excess of lead sulphate.

buffer condenser.—A condenser connected between the anode and cathode of a *cold cathode rectifier* for the purpose of lessening voltage surges and improving the wave form of the rectified current. *See illustration.*

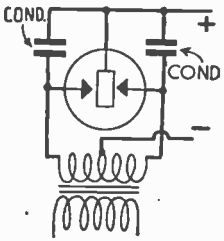
buffer stage.—A stage of amplification employed to prevent feedback of energy from a power circuit into a preceding input circuit.

bug.—A telegraphic transmitting key with which movement of the lever to one side results in a series of dots and movement to the other side results in single dashes to form *code* signals. *See illustration.*

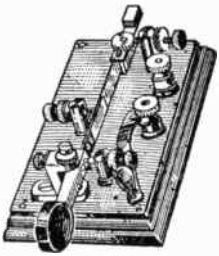
Bunsen cell.—A primary cell using a carbon rod in nitric acid electrolyte contained in a porous cup outside of which is a zinc plate in a sulphuric acid electrolyte. A *closed circuit cell.*



Bucking Coil



Buffer Condenser



Bug

burning of microphone.—A variation of the resistance in a *carbon microphone* which results in a hissing or sputtering sound from its signals.

burning voltage.—The voltage used in the aging process for vacuum tubes undergoing *reactivation* of thoriated filaments.

burnout.—An open circuit caused by such overheating of a conductor as to cause its melting and breaking apart.

bus bar.—A rod of copper, bronze or brass used to carry large currents or to form common connection between several circuits.

bus wire.—An uninsulated tinned copper wire, square or round in section and usually of number 14 gage.

bushing.—An insulating tube or washer which carries a conductor through an opening.

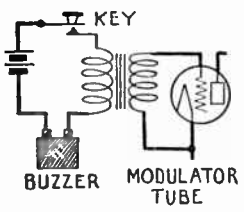
buzzer.—A device for rapidly opening and closing a circuit by the action of an electromagnet.

buzzer exciter.—A *buzzer oscillator.*

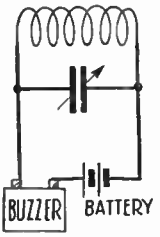
buzzer field phone.—A portable telephone and telegraph from which it is impossible to intercept messages other than by direct connection to its circuits.

buzzer modulation.—*Modulation* at the audio frequency of buzzer operation; a buzzer being connected in or to either the grid circuit or the output circuit of an oscillator tube. *See illustration.*

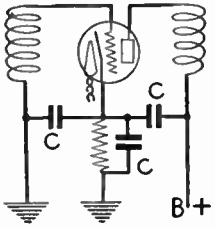
buzzer oscillator.—A form of *radio frequency oscillator* in which oscillatory currents are produced by a buzzer's opening and closing a direct current path in which is a tuned circuit. The signal is modulated by the current interruptions. *See illustration.*



Buzzer Modulation



Buzzer Oscillator



Bypass Condenser

bypass.—A path through which alternating currents at audio or radio frequency may flow around some part. Generally a fixed condenser or resistance.

bypass condenser.—A condenser providing a low impedance alternating current path around a resistor or other part in a circuit. *See illustration.*

C

C.—The symbol for *capacitance* or *capacity* in farads.

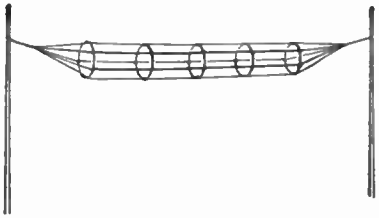
c.—Abbreviation for the prefix *centi-*.

cabinet resonance.—The condition in which the confined air or the walls of an enclosure vibrate naturally at a certain frequency, thus producing an apparent strengthening of sounds at the resonance frequency.

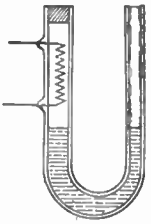
cabinet speaker.—A loud speaker enclosed within a cabinet separate from the housing of the receiver or amplifier.

cable.—A number of separate conductors insulated from one another and carried within one outside covering.

Cabling



Cage Antenna



Calorimeter Resistance Meter

cable sheath.—A lead alloy covering over a telephone or telegraph cable.

cabling.—Binding together of separately insulated conductors into one cable. *See illustration.*

cadmium.—A metallic element. Employed in photocell cathodes showing maximum response to ultra-violet rays.

cadmium cell.—A *Weston cell.*

cadmium test.—Measurement of the voltage difference between a test electrode of cadmium inserted in the electrolyte of a *lead-acid battery* and either the positive or negative plates.

caesium.—An alkali metal, somewhat similar to potassium, used in photocell cathodes showing maximum response to yellow light.

cage antenna.—An aerial formed by a number of parallel conductors evenly spaced around the points of a circle and connected together at their ends. *See illustration.*

calcium.—An alkaline earth of which compounds are used in photocell cathodes.

calibrate.—1—To ascertain by measurement or comparison with a

standard, variations between true values and actual readings of a measuring instrument. 2—To determine and record the settings of a control with reference to frequency or some other characteristic.

calido.—A resistance metal consisting of nickel, chromium and iron.

call letters.—A series of letters, or of letters and numbers, which identifies a transmitting station.

calorie.—The heat energy required to raise the temperature of one gram of water one degree centigrade. Approximately equal to 4.18 *joules*, or to 0.00397 *British thermal units*.

calorific.—Capable of producing heat.

calorimeter instrument.—A resistance or current measuring device in which expansion of air around a conductor heated by a measured current causes a column of liquid to move upward in a U-shaped tube connected to the chamber containing the conductor and the heated gas. *See illustration, page preceding.*

cam switch.—An electric switch in which the contacts are closed by pressure exerted by a cam-shaped member. *See illustration.*

cambric tubing.—A hollow insulating tube made from oil impregnated cotton and linen cloth. *Spaghetti tubing.*

can.—1—A *shield*. 2—Slang expression for a *headphone*.

canal rays.—Beams of positively charged particles which pass away from an anode and through openings in a cathode of a vacuum tube.

candle.—An *international candle*.

candlepower.—The luminous intensity measured in *international candles* or *standard candles*.

caoutchouc.—A name for rubber.

capacitance.—1—*Electrostatic capacity*. 2—Sometimes used as meaning *capacitive reactance*.

capacitive circuit.—A circuit in which *electrostatic capacity* is the principal electrical factor present, the inductance being very low or negligible in comparison.

capacitive coupling.—A form of coupling in which a single *electrostatic field* is common to two circuits. Coupling by means of a capacity contained in each of the two coupled circuits. *See illustration.*

capacitive feedback.—A feedback through a *capacitive coupling* between output and input circuits.

capacitive load.—A load circuit in which the *capacitive reactance* exceeds the *inductive reactance*. A load in which the current leads the voltage. Compare *inductive load*.

capacitive reactance.—The part of the *reactance* which is due to capacity in an alternating current circuit. Measured in ohms. Equal to the number of ohms resistance which would have the same effect in opposing current flow as actually results from a condenser or capacity in the circuit. The symbol is X_c.

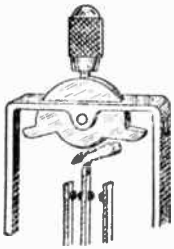
capacitive susceptance.—The reciprocal of the *capacitive reactance*

in a circuit containing negligible resistance. Measured in *mhos*.

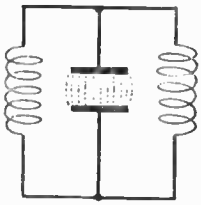
capacitor.—A condenser used to add *electrostatic capacity* to a circuit.

capacity.—1—*Electrostatic capacity*. The symbol is *C*. 2—The number of *ampere-hours* delivered by a battery upon discharge.

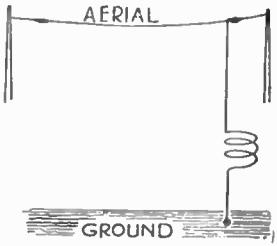
capacity altimeter.—A device for determining an aircraft's height



Cam Switch



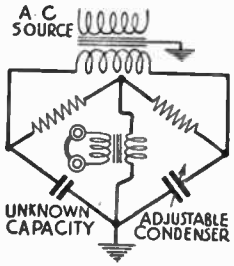
Capacitive Coupling



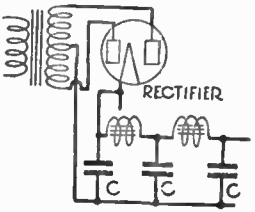
Capacity Antenna

above the ground from changes in *electrostatic capacity* between two conductors when the ground, acting as a third conductor, is approached.

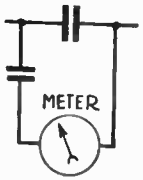
capacity antenna.—An antenna of which the chief electrical characteristic is the *electrostatic capacity* between the aerial and the ground. An open antenna having an overhead aerial. *See illustration.*



Capacity Bridge



Capacity Input Filter



Capacity Shunt Ammeter

capacity bridge.—A *Wheatstone bridge* for measurement of capacity; sometimes arranged to balance out the resistance and inductance of a circuit to be measured. *See illustration.*

capacity coupling.—*Capacitive coupling.*

capacity-frequency factor.—The relation between operating frequency and the apparent capacity of a condenser.

capacity ground.—A *counterpoise.*

capacity input filter.—A *power unit* filter of low pass type in which a condenser is connected directly across or in parallel with the rectifier output. Compare *choke input filter. See illustration, page preceding.*

capacity meter.—1—An instrument utilizing a *Wheatstone bridge* circuit arranged for direct measurement of *electrostatic capacities.* 2—An instrument indicating values of *electrostatic capacity* by comparison of known and unknown capacitive reactances.

capacity plate antenna.—An automobile antenna of the capacity type having a large metal plate fixed underneath the car as one of its parts.

capacity reactance.—*Capacitive reactance.*

capacity shunt ammeter.—A *high frequency instrument* in series with a small (high reactance) capacity, the two being in shunt or parallel with a large (low reactance) capacity placed in series with the circuit carrying the measured current. *See illustration, page preceding.*

carbon.—A conducting material occuring as graphite, lamp black, plumbago, etc. It is one of the elements. Carbon in various forms has a resistance from fifty to several hundred times that of copper.

carbon back microphone.—A *solid back microphone.*

carbon contact pickup.—A *phonograph pickup* producing audio frequency current changes by variation of the pressure and resistance in one or more contacts between pieces of carbon.

carbon microphone.—A microphone in which electrical resistance is varied by pressure from a sound diaphragm exerted upon a mass of loosely held carbon particles which are compressed or released by movement of the diaphragm. A *double button microphone* or a *solid back microphone.*

carbon rheostat.—A rheostat composed of many carbon blocks which may be pressed together to reduce the contact resistance, or released to increase the resistance.

carborundum detector.—A *crystal detector* having the mineral substance carborundum, under rather heavy pressure, as one of its contact elements.

carcel.—A French standard of *luminous intensity* equal approximately to 9.615 *international candles.*

carrier current.—High frequency currents modulated by a signal and carried by wire conductors. The current which exists in connection with a *carrier wave.*

carrier current telephony.—*Wired radio.*

carrier frequency.—The frequency of the original unmodulated wave of a transmitter.

carrier frequency amplification.—A system of producing and amplifying a high frequency output from a *photocell,* the varia-

tions in light which correspond to an impressed signal resulting in modulation of the high frequency output. The high frequency may be produced by suitable interruption of light, by variation of cell voltage, or it may be applied to an additional electrode in the photocell. Amplification at high frequency avoids some of the difficulties present with low frequency amplification.

carrier frequency telephony.—*Wired radio.*

carrier suppression.—A system of transmission in which the carrier wave or current is not radiated or transmitted. *Side band transmission.*

carrier wave.—A transmitter's high frequency *radiation* which may be modulated with the signal frequencies. That part of a *modulated wave* which is of the same frequency as the original continuous wave or the unmodulated wave.

cartridge fuse.—A *fuse* carried inside a glass or composition tube with metal end caps for connection.

cascade amplification.—An amplifying system consisting of two or more *stages of amplification,* the output of one stage forming the input for the following stage. *See illustration.*

cascade connection.—A series connection of electrical devices or circuits. A connection of several devices such that the output from one of them forms the input for the following device .

cascade converter.—A *motor converter.*

cathion.—A *cation.*

cathode.—1—The electrode at which electric current leaves an electrolyte, a vacuum or other medium. The filament or other electron emitting surface of a vacuum tube is the cathode. 2—The positive terminal of a battery is the cathode. 3—The electrode toward which positive ions travel while negative ions move toward the anode. See also *anode.*

cathode capacitance.—The sum of the *electrostatic capacities* between a vacuum tube cathode and all other electrodes in the tube. The symbol is C_f.

cathode current.—Current flowing either to or from the *cathode* of a vacuum tube through the space within the tube.

cathode dark space.—*Faraday's dark space.*

cathode grid.—The characteristic electrode of a *power pentode* tube.

cathode heating time.—The number of seconds elapsing between application of heater voltage and a plate current equal to ninety per cent of the final value.

cathode particles.—Electrons emitted from a *cathode.*

cathode ray.—A stream of electrons emitted from a *cathode.*

cathode ray oscillograph.—An instrument using a *cathode ray tube* to make visible the wave form of a changing current or volt-

age through deflection of the ray by electromagnetic or electrostatic fields produced by the current or voltage.

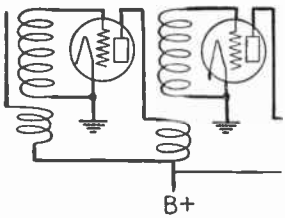
cathode ray tube.—A vacuum tube in which beams of electrons emitted from a cathode and given velocity by a charged anode are deflected by a magnetic or electric field and made visible by striking against a *fluorescent* screen in the end of the tube. Electric forces controlling the deflecting fields are indicated by movement of the beam. *See illustration.*

cation.—A *positive ion;* an ion which moves toward the cathode during electrolysis. See *anion.*

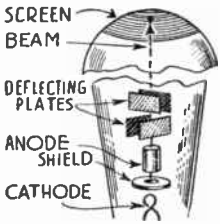
cat whisker.—A small wire or metallic point making contact with the mineral element in a *crystal detector.*

C-battery.—A battery which provides *negative bias* voltage for the grid of a vacuum tube.

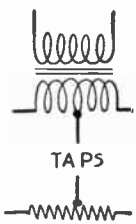
C-battery detector.—A vacuum tube detector employing the principle of *plate current detection.*



Cascade Amplification



Cathode Ray Tube



Center Tap

cell.—A *galvanic cell,* an *electrolytic cell* or a *photoelectric cell.*

cellular coil.—A *honeycomb coil.*

celluloid.—An insulating material. Dielectric constant 4.0 to 6.0.

center tap.—A connection to the electrical center of a winding, or to a point midway between the electrical ends of a resistor or other portion of a circuit. *See illustration.*

centering control.—A television receiver control for shifting the picture on the screen. The horizontal control moves the picture sideways; the vertical control moves it up or down.

centi-.—A prefix meaning one one-hundredth of the unit.

centigrade temperature scale.—One of the scales used for measurement of temperature. Zero is taken as the temperature of melting ice and the "100" point is at the temperature of boiling water.

centimeter.—1—A unit of length in the metric system of measurements; equal approximately to 0.3937 inch. 2—A C.G.S. unit of *electrostatic capacity,* approximately equal to 1.11 micro-micro-

farad or 1/900000 microfarad. 3—A C.G.S. unit of *self-inductance* equal to the one-thousandth part of a microhenry. Abbreviated *cm.*

centimeter-gram-second units.—Units based on the centimeter for length, the gram for mass and the second for time, these being the fundamentals in an internationally accepted system of measurement. Abbreviated *C.G.S.*

central anode photocell.—A *photocell* in which the anode is more or less completely surrounded by the cathode. The type of cell in most general use.

central cathode photocell.—A *photocell* in which the cathode is centrally located and partially surrounded by the anode.

ceresin wax.—A prepared mineral wax of high dielectric strength and resistivity. Dielectric constant 2.5.

cerusite.—A carbonate of lead used for *crystal detectors.*

C_f.—Symbol for cathode capacitance.

C_g.—Symbol for grid capacitance.

C_{gf}.—Symbol for grid-filament capacitance.

C_{gk}.—Symbol for grid-cathode capacitance.

C_{gp}.—Symbol for grid-plate capacitance.

C.G.S.—Abbreviation for centimeter-gram-second units.

C.G.S. line of force.—*A magnetic line of force.*

chain broadcasting.—Broadcasting from several transmitters at once of a program received over land lines from a central *key station.*

chalcopyrite.—One of the minerals used in a *Perikon detector.* Iron copper sulphide.

channel.—1—A *radio channel.* 2—A complete audio frequency amplifying and transmission line system, from microphone or other source to a transmitter or reproducer.

characteristic.—A graph or curve showing the manner in which one value is caused to change as a result of changes in some other value or factor. *See illustration, page following.*

characteristic conductivity of photocell.—The increase of *photocell current* in relation to the applied voltage; numerically equal to the per cent increase of current for one volt increase of potential, divided by 100.

characteristic impedance.—The *iterative impedance.*

charge—1—The electricity held in a condenser or other capacity. *Electrostatic charge.* 2—Ability of a storage battery to produce an electric current.

charged body.—A body which has positive or negative *electrification,* which is carrying a *positive charge* or a *negative change.*

charger.—A device for charging storage battery cells. Usually a *rectifier* of some form.

charging current.—1—The current which flows into a condenser during charge. It is equal in quantity to the *displacement current.* 2—The current used for a *battery charge.*

charging of lightning arresters.—Re-forming the insulating gas in *aluminum cell lightning arresters* by passing current through them.

chassis.—The framework, conductors and electrical units of a radio receiver or other instrument. *See illustration.*

check receiver.—A British term for *monitor.*

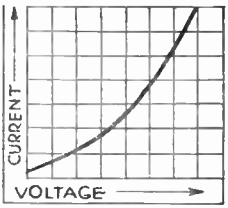
chemical condenser.—An *electrolytic condenser.*

chemical depolarizer.—Chemicals placed in a battery electrolyte to either prevent the formation of the gas of *polarization* or absorb the gas as it is formed.

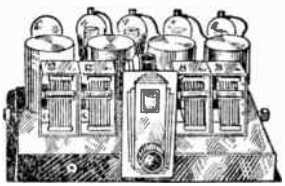
chemical rectifier.—An *electrolytic rectifier.*

choke - capacity coupled amplifier. — An *impedance - capacity coupled amplifier.*

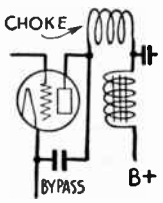
choke coil.—1—A coil having sufficient *self-inductance* to greatly diminish flow of alternating currents through it while allowing comparatively free passage for direct current. A coil which develops sufficient *reactance* to undesired frequencies to practically prevent their flow in parts of a circuit containing the coil. *See*



Characteristic Curve



Chassis



Choke Coil

illustration. 2—Such a coil used to keep high frequency current out of power supply circuits connected to a transmitter's antenna circuit.

choke control.—A British term for *Heising modulation.*

choke coupling.—*Impedance coupling* obtained by the use of choke coils.

choke input filter.—A power unit type of *low pass filter* in which a choke coil is in series with the rectifier output before this output reaches the first condenser in parallel across the filter. Compare *capacity input filter.*

chopper.—A device for interrupting *continuous wave* signals at audio frequency either in the transmitter or receiver. A rotating wheel with alternate conducting and insulating segments traveling under a contact brush. A rotating variable condenser in a tuned circuit.

chopper modulation.—Modulation of *continuous waves* with an audio frequency interruption produced by a *chopper.*

Christie bridge.—A form of *slide wire bridge.*

chromatic.—Pertaining to color.

chromatic aberration.—An effect which causes refracted white light to form an image showing colored fringes, due to the different angles at which the various colors are bent.

chromic acid cell.—A primary cell using one zinc electrode between two carbon electrodes in an electrolyte of sulphuric acid and bichromate of potassium or sodium or else chromic acid. This cell, in the two-fluid type, places the zinc in a sulphuric acid solution carried in a porous cup.

circuit.—A path through which may pass electric, magnetic or electrostatic effects. The entire path traversed by an electric current, including the source, the energy consuming devices and all conductors between them.

circuit breaker.—A form of switch that will open a circuit carrying a large current without harm to the switch contacts.

circular loom.—A circular tubing composed of fabric and insulating composition which is used to insulate and protect wires.

circular mil.—A unit of cross sectional area of wires and other conductors. The area of a circle having a diameter of one mil or the one-thousandth of an inch; equal to 0.0000007854 square inch.

clarifier.—1—A *wave trap.* 2—A device for reducing the effects of *static* interference.

Clark cell.—A *standard cell* using one electrode of mercury, another of zinc amalgam and an electrolyte containing zinc sulphate and mercurous sulphate. Its voltage is 1.434.

class A operation.—Operation of an amplifier or modulator tube with *grid bias* such that plate current variations occur only on the straight portion of the *grid-plate characteristic*, without plate current cut-off and without positive grid potential on signal peaks. The distortion limit is within five per cent.

class B operation.—Operation of an amplifier or modulator tube with grid bias such that plate current is near zero with no signal and such that the grid becomes positive on signal peaks. Distortion is reduced by filtering or by using *push-pull* or balanced circuits.

class C operation.—Operation of an amplifier or oscillator tube with grid bias such that the plate current is zero with no signal and such that *saturation* plate current occurs with positive grid potential on signal peaks. *Harmonic distortion* is reduced in connected circuits.

click method.—A method of determining *resonance frequency.* A click is heard in headphones connected to an *oscillatory circuit* when the resonance frequency of this circuit is made the same as that of another circuit coupled to the first one. The click results from starting or stopping of oscillations in the first circuit because of power absorbed into the second circuit.

climax.—A resistance metal consisting of nickel and steel.

close coupling.—A coupling through which a comparatively large

amount of energy is transferred. Usually a coupling of which the *coupling coefficient* is 0.5 or greater. A coupling in which the *mutual inductance* of two circuits is large in comparison with their *self-inductances*.

closed antenna.—A *loop antenna*.

closed circuit.—A circuit which is complete and through which may pass electric currents or magnetic lines of force.

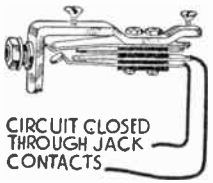
closed circuit cell.—A *galvanic cell* adapted for continuous use and which is usually harmed by standing with its circuit open.

closed circuit jack.—A jack through which a circuit is normally closed. *See illustration.*

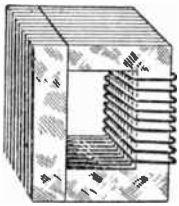
closed circuit voltage.—The voltage across the terminals of a source when current is flowing from it.

closed core.—An iron or steel core extending all the way around a magnetic path with the possible exception of one or more small gaps used to control the amount of flux. *See illustration.*

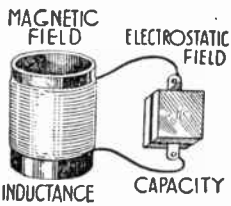
closed field coil.—An inductance coil having a small external field.



Closed Circuit Jack



Closed Core



Closed Oscillator

An *astatic coil, binocular coil,* etc.

closed oscillator.—An *oscillatory circuit* having lumped inductance and lumped capacity, the fields of opposite polarity set up on opposite sides of the circuit tending to counteract each other at all points distant from the circuit, thus preventing effective *radiation* beyond a very limited area. *See illustration.*

cm.—Abbreviation for *centimeter*.

coarse tuning.—*Broad tuning*.

coated filament.—An *oxide coated filament*.

code.—A system of signals used in telegraphy. The continental code is used in radio telegraphy. It consists of combinations of dots and dashes representing letters, numerals, punctuation and complete phrases.

code rules.—The rules of the *National Electric Code*.

coefficient.—A number indicating the rate of change or the amount of change caused in some quantity or value by variation of conditions or by variation of another quantity.

coefficient of absorption.—The *absorption coefficient*.

coefficient of amplification.—*The amplification coefficient.*

coefficient of attenuation.—The *attenuation coefficient.*

coefficient of coupling.—The *coupling coefficient.*

coefficient of detection.—The *mutual detection coefficient,* or the *grid detection coefficient.*

coefficient of hysteresis.—The *hysteresis coefficient.*

coefficient of induction.—*Inductance.*

coefficient of leakage.—*Leakage coefficient.*

coefficient of mutual induction.—*Mutual inductance.*

coefficient of photo-current.—*Photo-current coefficient.*

coefficient of photo-voltage.—*Photo-voltage coefficient.*

coefficient of radiation.—*Radiation resistance.*

coefficient of reflection.—The *reflection coefficient.*

coefficient of self-induction.—*Self-inductance.*

coefficient of temperature.—The *temperature coefficient of resistance.*

coercive force.—The *magnetizing force* which must be applied in a direction opposite to the original magnetizing force in order to completely remove *residual magnetism.*

coffer.—A deeply recessed panel; useful in acoustical treatment of auditoriums.

coherer.—A *detector* consisting of particles of carbon or of nickel and silver carried in an insulating tube between the ends of two metal rods. Flow of signal currents through the mixture causes the particles to cling together and become conductive for current, thus allowing indication of the signal. Before the following signal pulse the particles have to be separated by tapping or jarring the coherer.

coil.—An *inductance coil.*

coil antenna.—A *loop antenna.*

coil form.—The insulating support upon which an *inductance coil* is wound. *See illustration.*

coil loading.—Changing the original inductance of a transmission line by placing inductance coils at various points in the line.

coil loss.—The loss of energy due to *high frequency resistance* of an inductance coil.

cold cathode grid-glow tube.—A *grid-glow tube* capable of handling only small currents in the controlled circuit, there being no primary source of electrons in the tube.

cold cathode rectifier.—A *gaseous conduction rectifier* in which ionization and conduction of current take place through a very small space between the electrodes, under the influence of applied alternating voltages and without the assistance of *primary emission* from a heated cathode. *See illustration, page following.*

collecting lens.—A lens used near a source of light for the purpose of collecting a quantity of light rays.

collector ring.—A metal ring through which current enters or leaves the rotor windings of alternating current machines.

collodion.—A solution of pyroxylin or guncotton in ether and alcohol, used for insulation or as a binder. Dielectric constant 3.5 to 4.0.

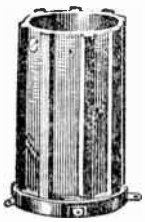
colloidal.—Minutely divided. A material in such form as may be held in solution, or a form such as deposited from a solution.

color.—A quality of visible things evidenced by the effects on the eye of different frequencies or wavelengths of reflected or transmitted light.

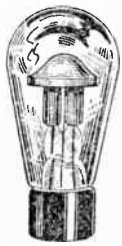
color coding.—Selection of colors and color combinations in conductor insulation so that the color indicates the circuit of which the conductor is a part.

color sensitivity.—The change which occurs in *photocell sensitivity* or in *photocell current* with change in wavelength of radiant energy or in color of light, other factors remaining constant. See *selective emission.*

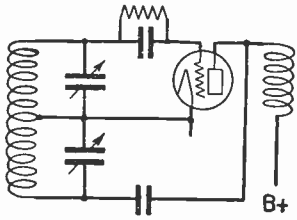
color television.—A system of television using at the transmitter



Coil Form



Cold Cathode Rectifier



Colpitts Oscillator

three types of *photocells*, each responsive to one of the colors, red, green and blue. Three transmitting channels are used and at the receiver the channels operate red, green and blue light sources from which the beams are combined to form shades and tones of color.

Colpitts oscillator.—A vacuum tube *oscillator* circuit in which a single winding shunted with two condensers in series is connected between the tube's grid and plate, with the tube's cathode or filament connected to the junction between the two condensers. The feedback is through *capacitive coupling* in the condensers. *See illustration.*

combination crystal detector.—A *crystal detector* formed by the contact between pieces of two different crystalline minerals. A *Perikon detector.*

combination current.—Two or more different kinds of current in one circuit; as alternating current and direct current.

commercial frequency.—An alternating current frequency used in

lighting and power circuits. Usually 25 cycles, 40 cycles and 60 cycles in the United States and 50 cycles in England.

common connection.—A single connection to two or more circuits.

common logarithm.—See *logarithm.*

communication band.—An entire range of frequencies which result from modulation of the carrier and which are used during a radio transmission.

commutating machine.—A direct current machine using a commutator; such as a generator, motor, booster, motor-generator, etc.

commutation.—In a rotating dynamo-electric machine, change of direction of current flow in the armature conductors as the commutator bars connected to coil ends pass under the brushes.

commutator.—A device for changing alternating current into direct current. The ends of alternating current circuits are connected to a ring of metal segments which revolve in contact with stationary brushes, these brushes being in such positions that currents flow only in one direction through the direct current circuits connected to them.

commutator rectifier.—A rectifier employing a rotating *commutator* which changes alternating current into pulsating direct current.

commutator ripple.—A *ripple voltage* from a direct current generator.

comparison method.—Measurement of an unknown value by the adjustment of a similar characteristic of known value so that the two bear a definite ratio to each other. Resistance measurement with a *Wheatstone bridge* is an example.

compass.—A device for indicating geographical direction by means of a magnetic needle which aligns itself with the earth's magnetic lines. A mariner's compass.

compass deviation.—An error in compass reading caused by local magnetism or magnetic bodies near the compass.

compass variation.—Deflection of a compass needle from the true north when caused by movement of the earth's magnetic pole and by magnetic disturbances in general.

compensating network.—An *attenuation equalizer.*

compensation signalling.—*Continuous wave* signals produced by changing the radiated frequency during the spaces in code messages. See *absorption signalling.*

compensation wave.—The frequency radiated in *compensation signalling* while the transmitter key is open, this wave differing by a few per cent frequency from the working wave.

compensator.—1—Parts of a *direction finder* which apply correction factors for deviation from the true direction. 2—A name sometimes applied to an *aligning condenser.* 3—A speed regulating device for an electric motor.

complementary color.—A color which, combined with another color, produces white.

complete glow.—The condition existing in a *grid-glow* tube after

the discharge has been transferred from the cathode-grid path to the cathode-anode path. The final condition reached in normal operation of such a tube.

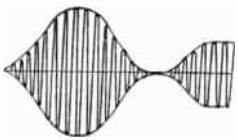
complete modulation.—*Modulation* in which the amplitude of the carrier is caused to drop to zero. One hundred per cent modulation. *See illustration.*

complex coupling.—A combination of *inductive* and *capacitive couplings.*

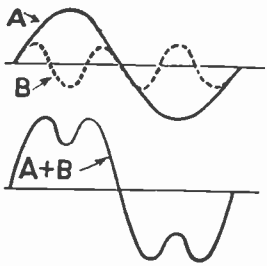
complex wave.—A *periodic wave* made up of a combination of several frequencies or several sine waves superimposed on one another. *See illustration.*

compliance.—A measure of the flexibility of a mechanical part when acted upon by a force. The reciprocal of stiffness. Expressed in centimeters of movement per dyne of force.

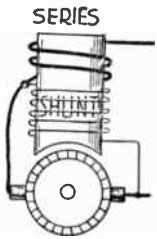
component.—One of the several parts in a total value; a part which may be subject to independent variation in value. Any one of



Complete Modulation



Complex Wave



Compound Winding

several different forces which, acting together, are the equivalent in effect of the single force of which they are said to be components.

composite cable.—A cable containing wires of more than one gage size.

composite line.—A telephone or telegraph line in which successive sections are not of similar construction.

composite print.—A sound picture film which carries both pictures and *sound track* ready for reproduction.

composited circuit.—A two-wire telephone circuit with two superposed signal circuits, each upon one wire of the first circuit, and both having ground returns.

compound lens.—A lens system made up of several *simple lenses* through which a light beam passes.

compound winding.—1—In a generator, two field windings, one connected in series and the other in parallel with the armature for maintaining a fairly constant voltage with variable load. 2—Any

combination of a series winding and a shunt winding on a common magnetic circuit. *See illustration.*

compressed air condenser.—A condenser in which the dielectric air is compressed for the purpose of raising the voltage at which breakdown occurs.

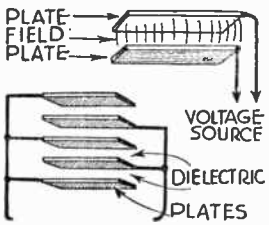
compression condenser.—A condenser in which the electrostatic capacity is varied by pressing the plates closer together or allowing them to spring farther apart.

compression lightning arrester.—A *lightning arrester* consisting of a resistance in series with air gaps enclosed by a tube. The arc expands and compresses the enclosed air.

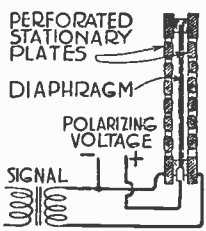
compressional vibration.—*Longitudinal vibration.*

concatenation.—*Cascade connection.*

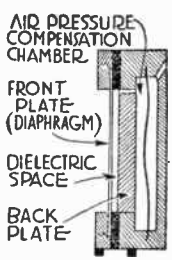
concave lens.—A lens which is thinner through the center than around the edges.



Condenser



Condenser
Loud Speaker



Condenser
Microphone

concavo-convex lens.—A lens which is concave on one side and convex on the other side. A *meniscus lens.*

condensance.—*Capacitive reactance.*

condenser.—A device which provides *electrostatic capacity* in compact form. A condenser consists of two conductors, or sets of conductors, called the plates, separated by a non-conducting medium called the *dielectric.* A difference of potential applied to the plates charges the condenser, placing the dielectric under strain, in which condition it stores electric energy which is reconverted into electromotive force upon discharge of the condenser. *See illustration.*

condenser antenna.—A *capacity antenna.*

condenser capacity.—The *electrostatic capacity* of a condenser. Measured in *farads.*

condenser charge.—The *electrostatic charge* of a condenser. Measured in *coulombs.*

condenser coupling.—*Capacitive coupling.*

condenser dielectric.—The material between the plates of a condenser.

condenser input filter.—A *capacity input filter.*

condenser leakage.—A slow penetration of current through a condenser's *dielectric*, allowing gradual discharge or allowing a steady flow of current through the condenser, the dielectric acting as an imperfect insulator.

condenser loud speaker.—A loud speaker in which sound is radiated from a moving member forming one plate of a *condenser* in an electric circuit carrying signal voltages. The movement results from *electric attraction* which varies with the signal voltages. *See illustration, page preceding.*

condenser microphone.—A *microphone* in which sound waves cause relative motion between the plates of a condenser, thereby varying the electrostatic capacity and *impedance* of a connected circuit in which are set up current variations corresponding to the sound wave. *See illustration, page preceding.*

condenser pickup.—A *phonograph pickup* in which the electric output is generated by mechanically controlled changes in *electrostatic capacity.*

condenser reactance.—*Capacitive reactance.*

condenser resistance.—The *ohmic resistance* of the conductors in a condenser.

condenser transmitter.—A *condenser microphone.*

condenser tuning.—Bringing an oscillatory circuit into *resonance* by variation of a condenser's capacity.

condensing lens.—A lens which concentrates light on a small area.

condensite.—A moulded *phenolic compound.*

condensive.—Same as *capacitive.*

conductance.—1—The ability to carry or conduct electricity. The reciprocal of the *resistance* in a direct current circuit and the active component of the *admittance* in an alternating current circuit. Measured in *mhos.* The symbol is *G* or *g.* 2—*Photocell conductance.*

conduction.—Transmission of electricity, sound or heat through a medium without physical motion of the medium itself, as in the flow of electric current through a wire. See *convection.*

conduction current.—Current flowing in a conductor because of differences of potential between parts of the conductor. Current flow which is not accompanied by any physical movement between parts of the carrying medium or conductor. Compare *convection current.*

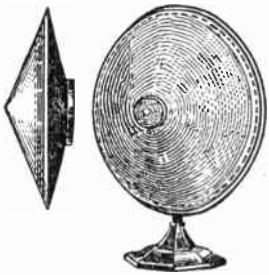
conductive coupling.—*Direct coupling.*

conductivity.—The *conductance* of a material expressed in numerical units. The number of mhos conductance between opposite faces of a centimeter cube. The reciprocal of *resistivity*. Also called specific conductance. The symbol is the Greek letter gamma (γ).

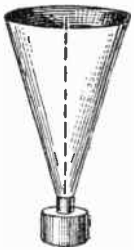
conductor.—Any material which allows electric current to flow through it continuously when voltage is applied. Metals are the most common conductors. Specifically; one or more wires, not insulated from one another, and capable of carrying a single electric current.

conduit.—*Rigid iron conduit* or tubing within which are carried wires to be protected and supported. Also *flexible metal conduit* or tubing.

conduit wire.—A *twin cable.*



Cone Speaker



Conical Horn

Constrained Radiator

cone speaker.—A loud speaker in which the sound radiating member or projector is of conical shape. Usually a *magnetic loud speaker. See illustration.*

conical horn.—A horn in which the equivalent sectional radius increases at a constant rate. *See illustration.*

conjugate foci.—Two points on opposite sides of a lens, at either one of which may be placed a point source of light with its image appearing at the other point. The source and the image are interchangeable in position between the two conjugate foci.

connected load.—The sum of all the *continuous ratings* or loads connected to a system.

conservation of energy.—The principle that energy cannot be created nor destroyed, but only can be changed from one form into another. Some of the total energy may change into a form no longer useful or available.

console.—An ornamental cabinet for a receiver, the cabinet standing from the floor on legs.

consonance.—*Resonance*, either electrical or acoustical; especially as occurring in bodies or circuits which are coupled but not directly connected.

constant.—A quantity which expresses a fixed value, condition or property of a material.

constant-current generator.—A generator which maintains a constant value of current with change of load. This may be done by series winding on the fields or by separate regulators.

constant-current modulation.—*Heising modulation.*

constant-current transformer.—A transformer in which the secondary current remains the same at all loads as long as the primary voltage does not change.

constant-impedance unit.—A control unit, such as a volume control or mixer, which in its normal operation does not alter either its input or output *terminal impedance.*

constant-potential transformer.—A transformer in which the ratio of the primary voltage to the secondary voltage is nearly the same at all loads.

constant-speed motor.—A motor operating at practically the same speed with change of load.

constrained radiator.—The sound radiating portion of a loud speaker in which the original mechanical motion acts first upon a part of the air confined in a horn or similar enclosure. *See illustration.*

contact breaker.—A *circuit breaker.* A *buzzer.*

contact detector.—A *crystal detector.*

contact point.—One of the metallic parts of a switch on which rests a brush or arm to complete a circuit.

contact potential.—A voltage difference which exists between metals of different kinds in a vacuum, also a voltage difference between two different metals brought together and then separated in open air.

contact rectifier.—A *crystal detector*, a *copper oxide rectifier*, a *sulphide rectifier* or any contact between two materials which allows flow of current more easily one way than the other between the materials. *See illustration.*

contact resistance.—The resistance across two conductors at their point of contact.

contactor.—A device which opens and closes a circuit during regular operation of a device.

continental code.—A system of telegraphic signals used generally in European countries and for radio telegraphy in America.

continuity test.—A test for determining whether a circuit is complete, or is open and incapable of carrying the kind of current it should handle.

continuous current.—A steady direct current, one which does not

vary in strength and which contains no appreciable alternating component.

continuous loading.—The addition of inductance uniformly distributed along the length of a transmission line.

continuous oscillations.—*Continuous waves.*

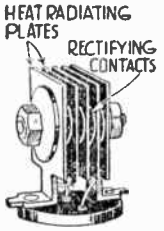
continuous rating.—An output which may be maintained continuously without exceeding specified limits of temperature, etc.

continuous spectrum.—A *spectrum* in which there are no gaps between frequencies or wavelengths.

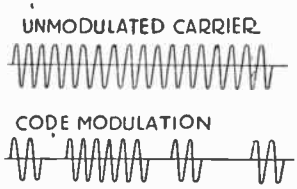
continuous transmitter.—In *facsimile transmission,* a machine which does not require stopping for reloading after each transmission.

continuous waves.—Radio waves which maintain a constant amplitude and constant frequency. Abbreviated *C.W.* or *cw.* Undamped waves.

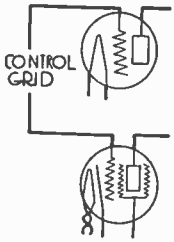
continuous wave transmission.—Radio telegraph transmission by



Contact Rectifier



Continuous Wave Transmission



Control Electrode

continuous waves which are broken up into the dots and dashes of the code. *See illustration.*

contrast control.—A television receiver control for varying the range of illumination or the brightness difference between parts of the picture.

control grid or electrode.—A vacuum tube electrode whose potential with reference to the cathode determines the amount of current flowing from an anode or plate to the cathode. Any electrode with which change of voltage between it and another electrode controls the action of a vacuum tube. *See illustration.*

control grid glow tube.—A *grid-glow tube.*

controller.—A device which controls the operation of electrical apparatus to which it is connected.

convection.—Transmission of effects through gases or liquids by motion of parts of the conveying medium itself.

convection current.—1—The electric current resulting from movement of ions through a gas or an electrolyte; the current flowing

through an ionized gas in a gaseous tube or an electric arc. 2—A flow of air or other gas resulting from repulsion or attraction of electric charges imparted to the particles.

convective refraction.—Sound wave *refraction* due to movement of the air, such as in a wind.

converging or convergent lens.—A lens which causes rays of light to come together at or toward a point. A *convex lens*.

converse piezo-electric effect.—The production of mechanical stress in a *piezo-electric crystal* by application of an electric field.

conversion factor.—A number by which a quantity expressed in one unit is multiplied to find an equivalent value in a different unit.

converter.—1—A superheterodyne oscillator and a first detector, connected to the input of a tuned radio frequency amplifier which then works as an intermediate amplifier, the combination operating as a *superheterodyne receiver*. 2—An *arc generator*. 3—A name applied to rotary converters, motor-generators, rectifiers, or any device for changing alternating to direct current power or vice versa, or for changing the voltage of direct current.

convex lens.—A lens thicker through the center than at the edges. A *plano-convex* or a *double convex lens*.

Coolidge tube.—A *hot cathode X-ray tube*.

Cooper-Hewitt lamp.—A *mercury arc lamp*.

coordinates.—*Abscissas* and *ordinates*. *See illustration*.

co-phasal.—Having the same *phase*.

copper.—A soft, malleable metal of reddish color, the most important and generally used of all electrical conductors. The resistivity of annealed copper at a temperature of 20° centigrade is 10.371 ohms per mil-foot and its temperature coefficient of resistance for the same temperature is 0.00393.

copper clad steel.—Wire having a steel center covered with copper.

copper loss.—The energy dissipated as heat in conductors. The loss resulting from resistance. The I^2R *loss*. Measured in *watts*.

copper oxide rectifier.—A *rectifier* employing a copper oxide coating on a piece of metallic copper, these two materials showing unilateral conductivity.

copper pyrites.—One of the minerals used in a *Perikon detector*. Copper sulphide.

copper rectifier.—A *copper oxide rectifier* or a *sulphide rectifier*.

copper sulphide rectifier.—A *sulphide rectifier*.

cord.—A small, well insulated and very flexible cable.

cording diagram.—A diagram showing how external apparatus is to be connected to a receiver or transmitter by the operator.

core.—1—The iron which forms a path for the *magnetic circuit* in a transformer, a choke coil, etc. See *transformer core*. 2—The conductor of a cable.

core loss.—The *iron loss*.

core transformer.—A transformer in which the *core* forms a single

continuous ring or rectangular piece carrying the windings. Compare *shell transformer. See illustration.*

corkscrew rule.—In turning a right-handed cork screw the screw travels ahead in the direction of current in a conductor and turns around in the direction of the magnetic lines of force around the conductor. Compare *right-hand rule* for movement of lines of force. *See illustration.*

corona.—A pale purple light caused by ionization of the air near a body carrying high voltage or highly charged. A *brush discharge.*

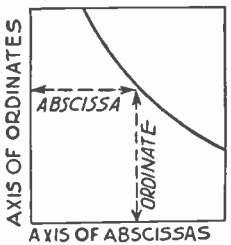
corona loss.—The power dissipated in the electric discharge forming a corona.

corpuscle.—An *electron.*

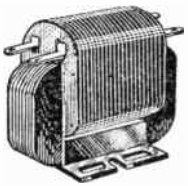
corrected radio bearing.—A radio bearing which has been modified by a *direction finder calibration.*

corrective network.—An *attenuation equalizer.*

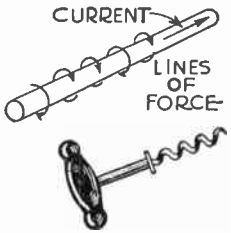
corrector circuit.—An *attenuation equalizer.*



Coordinates



Core Transformer



Corkscrew Rule

cosmic.—Pertaining to the entire universe rather than only to the earth.

cosmic rays.—Rays of exceedingly high frequency coming from origins as yet unknown in outer space. Wavelengths less than 0.01 *Angstrom units.*

coulomb.—The practical unit of electrical quantity. The quantity of electricity passing during one second in a circuit carrying one ampere. The quantity of electricity contained in a condenser of one farad capacity when there is a potential difference of one volt between the plates. The symbol for quantity of electricity in coulombs is Q.

Coulomb's law.—A law which states that the attractive or repulsive force of two electric or magnetic charges upon each other is directly proportional to their quantities and inversely proportional to the square of the distance between them.

counter-electromotive force.—A voltage developed in an *inductive circuit* by an alternating or pulsating current, the polarity of this voltage being at every instant opposite to that of the applied

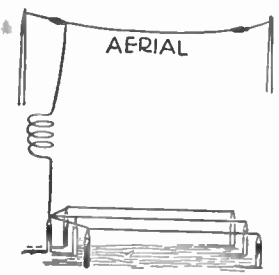
voltage. The counter-electromotive force results from cutting of the circuit's conductors by the moving lines of force produced by the varying current. Abbreviated *counter-e.m.f.*

counter-e.m.f. cell.—A battery cell with plain lead plates connected so they oppose the voltage of a storage battery upon the beginning of a discharge, reducing it to normal value. The energy absorbed during charge is spent in electrolyzing the water in the cell.

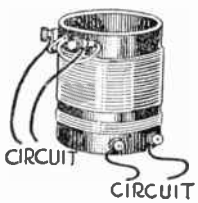
counterpoise.—Metallic conductors placed either on or a few feet above or below the ground, directly under aerial wires, and used in place of or in conjunction with the earth or ground as part of a *capacity antenna* circuit. The counterpoise is insulated from the ground. *See illustration.*

couple.—Two parts between which there is electrical action.

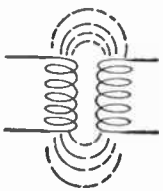
coupled circuit.—A circuit containing a capacity, inductance or



Counterpoise



Coupler



Coupling Transformer

resistance which is also contained in another circuit so that energy may be transferred from one circuit to the other through the common element. A circuit affected by another either conductively, inductively or electrostatically. See *coupling*.

coupler.—Coils, condensers, resistances or combinations of these parts so connected that they provide coupling between two circuits. *See illustration.*

coupling.—The means by which electrical energy is transferred from one circuit to another. Coupling may be *direct, inductive, capacitive* or *resistive.*

coupling capacitor.—A capacity through which two circuits have *capacitive coupling.*

coupling coefficient or factor.—A numerical measure of the amount of coupling between two circuits. The ratio of the mutual inductive reactance, capacitive reactance or resistance of two circuits to the square root of the product of the separate similar

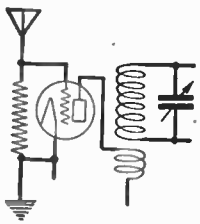
reactances or resistances in the two circuits. The usual symbol is *k*.

coupling inductor.—An inductance coil or coils providing *inductive coupling* between two circuits.

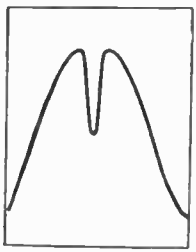
coupling transformer.—A transformer used to provide *inductive coupling* between audio frequency or radio frequency circuits. *See illustration.*

coupling tube.—A vacuum tube employed to carry the effect of changes in voltage, current or power from one circuit into another, while eliminating the effect on the second circuit of factors such as capacity and resistance in the first circuit. Specifically; such a tube used between the antenna and the first tuned circuit of a receiver. *See illustration.*

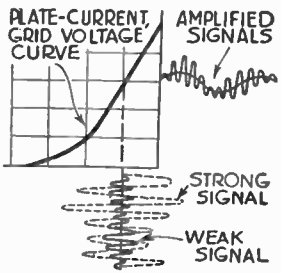
course bearing.—A path which may be followed by aircraft to



Coupling Tube



Crevass



Cross Modulation

reach any location, determined by two or more *direction finding stations* and communicated to the ship.

c.p.—Abbreviation for *candlepower.*

C_p.—Symbol for *plate capacitance.*

C_{pf}.—Symbol for *plate-filament capacitance.*

C_{pk}.—Symbol for *plate-cathode capacitance.*

C-power supply.—A device which provides grid bias voltage for vacuum tubes.

c. p. s.—An abbreviation for *cycles per second.*

crest factor.—The ratio of the maximum value to the *root-mean-square value* in an alternating wave.

crest voltmeter.—A *peak voltmeter.*

crevass.—A pronounced dip in a *resonance characteristic. See illustration.*

critical angle.—The *angle of incidence* of a light ray which, if

exceeded, results in a total *reflection* of the ray back into the medium in which it first exists and in no penetration of the ray into the medium beyond the reflecting boundary.

critical damping.—The damping present with *critical resistance.*

critical resistance.—In an *oscillatory circuit,* a resistance just great enough to prevent *sustained oscillation* at the circuit's natural frequency. A resistance in number of ohms greater than twice the square root of the inductance in henrys divided by the capacity in farads.

Crookes' dark space.—A non-luminous region of slight depth around the surface of the cathode in a tube carrying current through an ionized gas.

Crookes' tube.—A tube containing gas under low pressure in which ionization and a luminous glow result from passage of an electric current.

cross.—A *short circuit* or accidental ground caused by two conductors coming in contact where they cross each other.

crossed coil direction finder.—A *goniometer.*

cross joint.—A wire joint between two lines crossing each other, usually made by cutting the crossing wire and winding the two ends in opposite directions around the through wire.

cross modulation.—In a radio frequency amplifying tube having a high negative bias and simultaneously affected by a strong signal and a weaker one, a rectification effect which causes changes of average plate current at the *modulation frequencies* of the strong signal. The weaker signal is amplified in the usual manner, but the variations in average plate current carry the effect of the strong signal along with that of the weaker one through the amplifier and detector where both signals are made audible. *See illustration, page preceding.*

cross talk.—Speech or sounds in one telephone circuit carried into another circuit by *electromagnetic* and *electrostatic induction* between the conductors.

crystal.—A mineral body having a definite internal structure which results in the external surfaces being plane and arranged symmetrically.

crystal control.—See *piezo-electric.*

crystal detector.—A form of *detector* using certain minerals, as galena or carborundum, which allow comparatively free flow of current in one direction but oppose flow in the opposite direction between the crystal and a pointed metallic contact or another crystal of different material. The rectifying effect on a high frequency current allows detection to be had.

crystal receiver.—A radio receiver using a *crystal detector,* generally without any amplifying tubes. *See illustration.*

cumulative grid rectification.—*Grid current detection.*

cumulative winding.—A two-section winding in which separate currents in the sections produce magnetic fields in the same direction.

cuprous oxide cell.—A device exhibiting photovoltaic action. A cuprous oxide cathode and an inert anode are immersed in an electrolyte sealed within a glass container. See *photo-voltaic*.

Curie cut.—An *X-cut* for a quartz crystal.

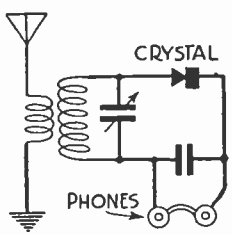
current.—The *electric current*.

current amplification.—The ratio of the signal current in the output circuit of an amplifier to the signal current in its input circuit.

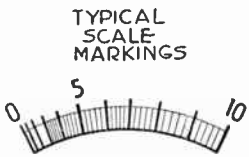
current density.—The amount of electric current passing through a given cross section or area of a conductor, such as so many amperes per square inch. The ratio of the current in amperes to the cross sectional area of the conductor.

current feed.—A connection from the closed circuits of a transmitter to its antenna at a point where the antenna carries a large current at low voltage.

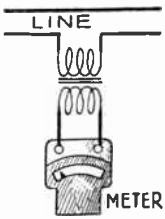
current limiter.—Any device through which no current greater than a certain value can flow, regardless of applied voltage.



Crystal Receiver



Current Square Meter



Current Transformer

Usually a *diode* in which the maximum emission is limited by a limited heating of the cathode, thus preventing any current greater than of *saturation* from flowing.

current limiting reactance.—A coil of which the *reactance* reduces the current through an alternating current circuit in which there exists a short circuit or other overload.

current ratio.—The ratio of the effective primary current to the effective secondary current of a transformer.

current regulator.—A coil in which the reactance or inductance is automatically changed to maintain a constant current in a circuit with varying loads.

current relay.—A relay which operates upon a change in current value.

current resonance.—The condition of *parallel resonance*.

current square meter.—A current measuring device utilizing the effects of heat, such as a *hot-wire* or a *thermocouple instrument*,

in which movement of the pointer is proportional to the square of the current flowing. *See illustration.*

current supply loss curve.—The curve showing the relation between changes in the direct current supply and the response of an *electro-acoustic transducer.*

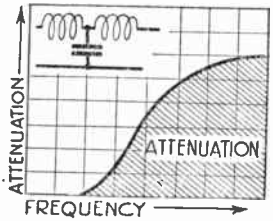
current transformer.—1—A transformer having its primary in series with a current carrying conductor and its secondary connected to a meter calibrated to measure the current in that conductor. 2—A transformer used to prevent mutual effects between inductances and capacities in a meter and those in a circuit carrying a current measured by the meter. *See illustration.*

current winding.—A winding connected in *series* with a circuit.

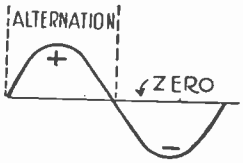
curve of sines.—A *sine curve.*

cushion socket.—A vacuum tube socket which allows the tube to move rather freely within narrow limits so that vibrations at high frequency are quickly damped and do not greatly affect the tube's internal elements. *See illustration.*

Cushion Socket



Cut-off Frequency



Cycle

cut-in signalling.—*Continuous wave* signals produced by complete stoppage of radiation during space periods in code.

cutoff frequency.—1—The frequency at which a *filter* system or *attenuation network* changes its characteristic more or less sharply, either facilitating or opposing the passage of frequencies higher or lower than that termed the cutoff frequency. *See illustration.* 2—The frequency above or below which a tube, a line, an amplifier, a loud speaker, a microphone or any transducer ceases to function efficiently.

cutoff relay.—A *relay* which disconnects apparatus from a circuit.

cut-out.—1—A *fuse block.* 2—A switch operated manually or by an electromagnet for opening a circuit.

cutter.—That portion of a sound picture disc-recording apparatus which cuts the sound grooves in the original disc, or *wax master.*

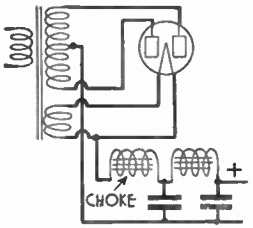
C.W. or cw.—An abbreviation for *continuous waves.*

cycle.—1—One complete positive *alternation* and one complete negative alternation of an alternating current. The current starts

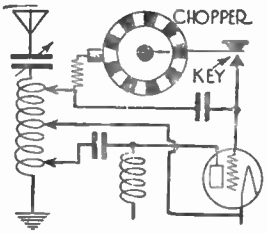
in one polarity, rises to maximum value, falls to zero, reverses, rises to maximum value in the opposite polarity and returns to zero value. *See illustration.* 2—A complete set of any recurrent values.

cymometer.—A frequency meter. *Fleming's cymometer.*

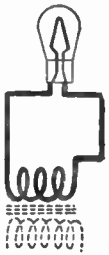
cymoscope.—Any device which indicates the presence of electric waves.



Choke Input Filter



Chopper Modulation



Circuit

D

D.—Symbol for *electrostatic flux density.*

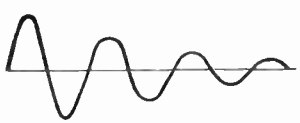
d.—Abbreviation for the prefix *deci-.*

damped alternating current.—A current of which successive amplitudes progressively decrease. *See illustration.*

damped impedance.—The impedance at the terminals of the electrical or the mechanical system of an *electro-acoustic transducer* when the impedance of the other system is infinite.

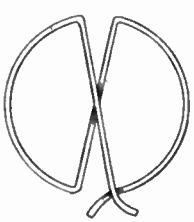
damped oscillation or wave.—One of a series of waves in which the *amplitude* of successive cycles is progressively smaller.

damped wave transmission.—Transmission of damped waves; *spark transmission. See illustration.*

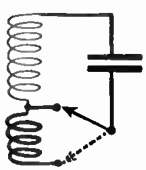


Damped Alternating Current

Damped Wave Transmission



D-coil



Dead-end Turns

damping.—1—Reduction of amplitude or strength of a radio wave or of a sound wave due to absorption and dissipation of power with time, distance traveled, and character of mediums in the path of the wave. 2—of a circuit: The progressive dropping off in value of voltage and current measured at one point in a line after the energy source has been removed. 3—of an instrument: Bringing the pointer to rest more quickly than with a free swing by the introduction of electrical or mechanical losses which absorb power.

damping coefficient, constant or factor.—1—The Naperian logarithm of the ratio between two successive similar values of an exponentially decreasing quantity. The product of the *logarithmic decrement* and the *frequency* in a circuit. Depends on the relative values of effective resistance and reactance entering into the total impedance of a circuit or electrical device. 2—The ratio between the angular movements of an instrument pointer in two successive swings, one in each direction.

damping coil.—An inductance coil connected in a circuit to increase *damping* of the circuit.

Daniell cell.—A primary cell consisting of a zinc electrode in an electrolyte of zinc sulphate and sulphuric acid within a porous cup, and with a copper electrode in an electrolyte of copper sulphate around the outside of the cup. It is a *closed circuit cell.*

daraf.—A unit of *elastance;* equal to the elastance of a centimeter cube of air.

dark current.—A small current which flows in a *photocell* because of applied voltage alone, and when there is a complete absence of light.

dark light.—*Infra-red rays.*

dark space.—*Crookes' dark space* or *Faraday's dark space.*

d'Arsonval meter.—A *moving coil instrument.*

db.—Abbreviation for *decibel.*

D.C., d.c. or d-c.—Abbreviations for *direct current.*

D.C.C.—Abbreviation for *double cotton covered wire.*

D. C. tube electric set.—A receiver using tubes in which the filaments are heated by direct current from a light and power line, and with a built-in *power unit* for plate and grid potentials.

D-coil.—A *closed field coil* made by winding wire in figure "8" fashion back and forth around two D-shaped forms lying parallel with each other. *See illustration.*

dead.—1—Having a *reverberation period* too short for realistic effect of sounds. 2—Not connected to a source of electromotive force; at *ground potential.*

deadbeat instrument.—A meter in which the pointer comes to rest quickly, or without back and forth movement.

dead belt.—The area included within the limits of *skip distance.*

dead end switch.—A switch which disconnects the *dead end turns* of a coil from the active turns.

dead end turns.—Turns at one end of a coil which are not included in the active circuit but which are still conductively connected to the main portion of the winding. *See illustration.*

dead spot.—A region within which signals from certain transmitters are received with difficulty or not at all.

decade unit.—An adjustable resistance, capacitance, etc., consisting of several sections, each divided into ten parts, with each tenth part of a following section equal in value to the whole preceding section. *See illustration.*

decadent wave.—A *damped oscillation.*

decay.—Gradual reduction of *amplitude* in successive cycles of a periodic wave of current, voltage, etc.

deci-.—A prefix meaning one-tenth of the unit. Abbreviated *d.*

decibel.—A unit for measurement of *gain* or of *attenuation* in power, voltage or current between different circuits or different parts of a circuit. The unit for power measurements is ten times the common logarithm of the ratio between the two powers compared.

For voltage and current measurements it is twenty times the common logarithm of the voltage or current ratio when the terminal impedances are equal. Abbreviated *db*.

decineper.—A unit of *attenuation* or of *gain* equal to one-tenth *neper*.

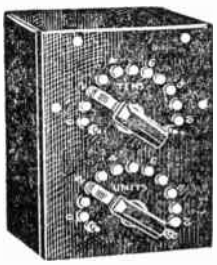
decoherer.—A device for separating the particles in a *coherer* between signal impulses.

decoupling.—Prevention or reduction of *feedback* effects.

decrement.—*Logarithmic decrement.*

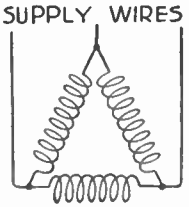
decrement method.—The *reactance variation method.*

decremeter.—An instrument for measuring *logarithmic decrement.* Measurement is made according to the change required in the capacity of an *oscillatory circuit* to produce a certain change in current. *See illustration.*



Decade Unit

Decremeter



Delta Connection

definition.—Ability to produce clear, sharp images or pictures in *television* and *telephotography.*

DeForest coil.—A *honeycomb coil.*

degeneration.—The opposite of *regeneration; feedback* in opposite phase.

deionization.—Prevention of continued *ionization,* as by the reduction of the density of gas in the path of an arc or of a glow discharge.

deka-.—A prefix meaning ten times the unit.

delta (δ).—Greek letter symbol for *logarithmic decrement.*

delta connection.—A three-phase circuit connection in which the three wires of the supply are connected to three corners of a triangle of which the sides represent the load. *See illustration.*

demand factor.—The ratio of the greatest power requirement to the connected load of a system.

demand limiter.—A *current limiter.*

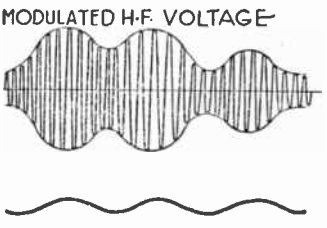
demodulation.—A process which obtains from a modulated wave the signal impressed upon the wave during modulation. The process of *detection.*

demodulator.—1—Any *detector.* 2—The *second detector* in a superheterodyne receiver.

density.—The ratio of a total quantity to the number of units of area, volume, etc., in which it is uniformly distributed; as the ratio of weight to volume.

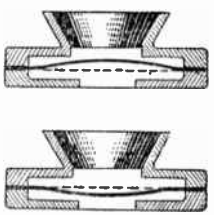
depolarizer.—Anything which removes the gases of *polarization* from the electrodes in a battery cell. This may be done by chemical action, physical shape or mechanical movement.

detection.—The process in which a high frequency carrier current or carrier wave, modulated with a low frequency signal, is used to produce a new current having a direct component which varies in



Detection

Diamond Weave Coil



Diaphragm

accordance with the signal. A rectification process applied to high frequency carrier currents. See *detector. See illustration.*

detection coefficient.—The *grid detection coefficient* or the *mutual detection coefficient.*

detector.—A device furnishing a low frequency or *audio frequency* output which represents the *modulation* of a high frequency or radio frequency current used as the input. A part of a receiver which changes radio frequency power into a form of power suitable for operating a telephone receiver, an audio amplifier, a relay, a telegraphic tape recorder or other form of audible or visible indicator of signals which have been impressed on the radio frequency power. See *plate current detection, grid current detection* and *crystal detector.*

detector tube.—1—A tube of which the characteristics are especially well adapted for *detection;* having good rectifying qualities. 2—Any tube used as a *detector.*

detune.—To change either the capacity, the inductance or both in a *tuned circuit* so that it no longer is resonant at the applied frequency.

detuning spade.—A metal disc which is moved into the field of a *tuning coil*, whereupon eddy currents set up in the metal produce their own fields. Reaction between the eddy current fields and the coil's field reduces the effective inductance and increases the *resonance frequency*.

deviometer.—A type of *visual reed indicator* allowing an aircraft to follow a course lying on one side or the other of the *equisignal zone* from a radio range.

dial.—A numbered or otherwise graduated disc, segment or drum attached to the shaft of an adjustable device to allow setting of the adjustable quantity to a calibrated value.

diamagnetic.—Tending to lie at right angles with the direction of the lines of force in a magnetic field. Bismuth is the chief diamagnetic material. See *paramagnetic*.

diamond weave coil.—A flat, round inductance coil of the *spider-web* type in which the turns forming the outer edge take on a diamond shape. *See illustration, page preceding.*

diaphragm.—The moving member which is acted upon by sound waves in a *microphone*, or which sets up sound waves in a *loud speaker*. *See illustration.*

die-away curve.—A curve passing through the maximum values of a train of *damped oscillations or waves.*

dielectric.—Any non-conducting medium. Generally such a medium when between the plates of a condenser. A material which transmits electric forces by *strain* developed in its mass.

dielectric absorption.—The effect which allows a small current to flow for a short time into a condenser after the first rush of *charging current*, and which causes the instantaneous discharge of the condenser to be followed by a continuously decreasing current.

dielectric conductance.—With a condenser, the conductance of a shunted *equivalent resistance* in which the energy loss is equal to the loss actually due to *dielectric hysteresis*.

dielectric constant.—A characteristic of a substance expressed as the ratio of a condenser's capacity when using the substance as *dielectric* to the capacity of the same condenser when using air as dielectric. The number of times the electrostatic capacity of an air condenser would be increased by using the substance as dielectric between the plates. Also called specific inductive capacity. The usual symbol is K, or the Greek letter epsilon (ϵ).

dielectric current.—*Displacement current.*

dielectric flux.—The electricity which moves in the *dielectric* of a condenser when voltage is applied to the plates. The quantity is equal to that of the charging current. The symbol is the Greek letter psi (ψ).

dielectric flux density.—*Electrostatic flux density.*

dielectric hysteresis.—An effect which retards the rate of charge and of discharge in a condenser, being a sort of electrical friction. The result is that more energy is required to charge the condenser than is secured from it upon discharge, the effect being due entirely to properties of the *dielectric* and not to leakage of current.

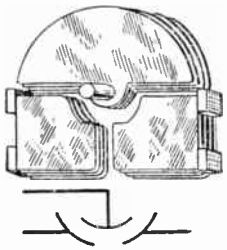
dielectric loss.—Dissipation of power in *dielectric conductance* or *dielectric hysteresis*.

dielectric power factor.—The *power factor* of a condenser.

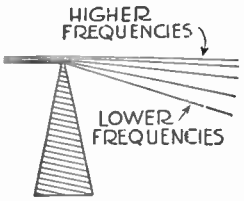
dielectric strain.—The condition of a dielectric substance in which there exists an *electrostatic field* due to charges on the conductors enclosing the dielectric.

dielectric strength.—The greatest voltage per unit of thickness which a *dielectric* will withstand before it breaks down and permits the passage of current. Usually measured in volts per centimeter or per mil (1/1000th inch) of insulator thickness.

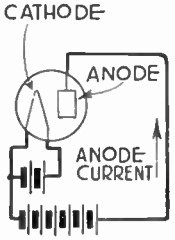
dielectric stress.—The number of volts applied per unit of thickness of the *dielectric* in a condenser as the condenser is charged.



Differential Condenser



Diffraction



Diode

dielectric test.—A test of *dielectric strength* of insulation made by applying a voltage in excess of that encountered in normal service.

dielectric viscosity.—*Dielectric absorption.*

difference frequency.—The *beat frequency*, which is equal to the difference between the two frequencies producing it.

differential condenser.—A variable air condenser having two similar sets of *stator plates* and one set of *rotor plates* arranged to mesh first with one and then with the other set of stators. *See illustration.*

differential galvanometer.—A moving coil instrument with two coils, used for comparing two currents or for measuring their difference.

differential relay.—A relay which operates because of a difference between two electrical values; current, voltage, etc.

differential resistance of tube.—The *plate resistance.*

differential winding.—A winding consisting of two coils so connected that a single current passing through both causes them to

have fields of opposite polarity, these fields partially or completely neutralizing each other in effect.

diffraction.—A bending and spreading apart of radio, sound and light waves as they pass around the edges of obstacles in their path. Diffraction increases as the frequency becomes lower. Compare *refraction* and *reflection. See illustration, page preceding.*

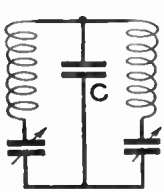
diffusion.—*Reflection* or *refraction* of waves at various irregular angles rather than in the form of beams.

diode.—A tube with only two elements, a cathode or filament and an anode or plate. A *rectifier* or *detector* tube passing current only in one direction, from the anode to the cathode. *See illustration.*

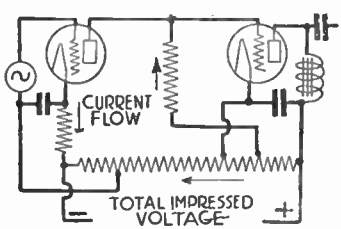
diphase.—*Two-phase.*

diplex circuit.—A telegraph circuit handling two messages in the same direction at one time.

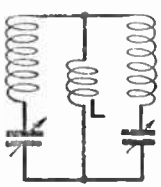
diplex transmission.—Transmission of two distinct signals with apparatus allowing use of certain parts for both signals at the same time.



Direct Capacitive Coupling



Direct Coupled Amplifier



Direct Inductive Coupling

dipole.—Having two *poles.*

direct capacitance.—The ratio of the *electrostatic charge* on one conductor to the voltage difference between it and another conductor. Neighboring conductors are assumed to be at the voltage of the first conductor being considered.

direct capacitive coupling.—Coupling which results from the reactance of an *electrostatic capacity* which forms a part of each of two coupled circuits. *See illustration.*

direct component.—The average value of a *pulsating current* (or voltage) or of a regularly varying *direct current,* this average value being considered as a steady direct current to which has been added an alternating component to produce the actual pulsating or varying current. Compare *alternating component.*

direct coupled amplifier.—An audio frequency amplifier having a single resistor or capacitor or inductor in the plate circuit of one tube and grid circuit of following tube; bias and plate voltages being secured from a tapped voltage divider. *See illustration.*

direct coupling.—Coupling which is the result of a single inductance, capacity or resistance forming a part of each of the two coupled circuits.

direct current.—An electric current which flows in only one direction through its circuit. A current which is always of the same polarity, although the strength may vary. See *continuous current*. Abbreviated *D.C.*, *d.c.*, or *d-c*.

direct current amplifier.—An amplifier using *direct coupling* with a resistor included both in the plate circuit of one tube and in the grid circuit of the following tube, suitable grid bias being secured from separate batteries for each stage or by taking the grid connections and plate connections from suitable points on a voltage divider. A change of direct current on the first grid circuit results in a corresponding change of plate current in the last stage.

direct current characteristic.—A graph showing the relation between a direct current and the voltage which causes it to flow.

direct current converter.—A rotary machine which changes direct current of one voltage to direct current at another voltage. A *motor-generator* or a *dynamotor*.

direct current power supply.—Parts which take power from commercial direct current lines and furnish direct currents at suitable voltages and of suitable freedom from ripple for tube circuits.

direct current resistance.—*Ohmic resistance*.

direct excitation transmission.—A *spark transmission* system having the spark gap in the antenna circuit and storing energy in the antenna's capacity rather than in a separate oscillatory circuit condenser.

direct inductive coupling.—Coupling which is the result of the *self-inductance* in a single part which is included in each of the two coupled circuits. *See illustration*.

direct lighting.—Illumination secured by passage of light through an object to the light sensitive device in a *television* receiver.

direct piezo-electric effect.—The production of electric polarity in a *piezo-electric crystal* by application of mechanical strain.

direct selector.—A receiver tuning control in which there is a one-to-one ratio between motion of the operating knob and the shaft of the variable unit.

direct wave.—1—Any wave which has not been reflected, which comes directly from a source. 2—The *ground wave*.

direction finder.—A radio receiver which allows the direction of travel of radio waves to be determined. A *goniometer* or a *radio compass*.

direction finder calibration.—Determination of the direction and strength of local radio waves in order to allow for their effect on a *direction finder*.

direction finder deviation.—The difference between a *radio bearing* as observed and the *corrected radio bearing*.

direction finding station.—A ground receiving station which determines the direction of an aircraft and advises the ship of its position.

directional antenna.—An *antenna* which radiates or receives more effectively in some directions than in others.

directional loud speaker.—A *loud speaker* having a projector or radiating surface which delivers sound chiefly over an area included within a narrow angle in front of the loud speaker.

directional relay.—A *relay* operating with change of polarity, phase, etc.

directional selectivity.—The ratio of the force received by an *antenna* from waves coming from a certain direction to the force received from waves of equal intensity coming from all directions.

directive antenna.—An antenna which radiates more energy in some directions than in other directions.

directive coefficient.—With a transmitting antenna, the ratio of the *radio field intensity* within an angle of a certain number of degrees to the average field intensity in all directions.

directive radio beacon.—A *radio range.*

directly heated cathode.—A cathode carrying its own heating current and at the same time acting as an electron emitter. A *filament.*

disc discharger.—A *rotary spark gap.*

disc scanning.—A television *scanning* system employing a *Nipkow disc.*

discharge tube.—A light source consisting of a tube containing gas in which ionization allows formation of a luminous *glow discharge* between electrodes.

discharger.—A *spark gap.*

disconnecting switch.—A switch used to open circuits which are carrying very little current or no current.

discontinuous spectrum.—A *spectrum* containing only a single wavelength or only a certain few wavelengths.

discontinuous waves.—*Damped oscillations* or *waves.*

dispersion.—A separation of waves of sound, light or radio energy into beams or rays arranged according to frequency or wavelength, the effect being due to unequal *refraction* of different frequencies. See *spectrum.*

displacement current.—The momentary flow of current in a dielectric while the *electrostatic field intensity* changes during charge or discharge of a capacity.

disruptive discharge.—Breakdown of a dielectric between bodies having a high potential difference, the breakdown being accompanied by a spark.

dissonance.—1—The relation between circuits not in *resonance* at the same frequency. 2—The relation between wave motions which are not *in phase.*

distortion.—Any change in the form of a wave which occurs during its transmission or amplification. A reproduction of wave form

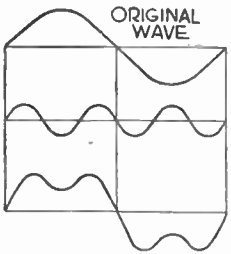
which is not the same in frequency, phase or contour as the original wave. Note that a change in amplitude does not constitute a change in wave form. Compare *frequency distortion*, *phase distortion* and *amplitude distortion*. *See illustration.*

distortion transformer.—A *peaked transformer.*

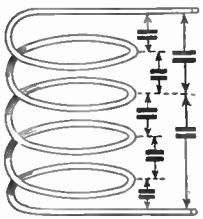
distress signal.—See *S O S.*

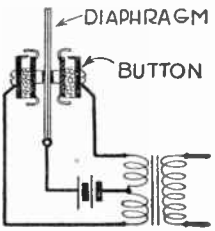
distributed capacity.—1—*Electrostatic capacity* existing between extended portions of conductors as distinguished from capacity which is concentrated in condensers. The capacity existing between turns of a winding. *See illustration.* 2—The value of capacity which, connected across an ideal inductance having no distributed capacity, would tune that ideal inductance to the same frequency as that to which an actual coil tunes because of its distributed capacity.

distributed inductance.—1—The inductance which exists along the entire length of a conductor as distinguished from self-induc-



Distortion


Distributed Capacity



Double-Button Microphone

tance concentrated in coils. 2—Inductance added uniformly along a transmission line, to balance the line's capacitive reactance.

distribution center.—The point at which several minor circuits connect to the main supply circuit or to a feeder.

distribution panel.—A switchboard carrying switches and jacks for controlling and interconnecting many circuits.

distribution system.—A system of conductors leading to power consuming devices and carrying current of the form used in such devices.

divergence loss.—The loss in strength of radiated waves due to their spreading out as they travel away from the source. The strength varies inversely as the square of the distance from the source.

diverging or divergent lens.—A lens which causes rays of light passing through it to spread apart or separate. A *concave lens.*

diversity antenna.—A means for overcoming the effects of *fading.* Two or more receiving antennas are provided with local amplifiers, the outputs from which are combined.

divided circuit.—A *shunt* or *parallel circuit.*

dope.—A cement used for supporting and insulating the conductors in coils.

double button microphone.—A *microphone* having two carbon resistance elements or buttons, one on each side of a central diaphragm, and connected in parallel on the current source. *See illustration, page preceding.*

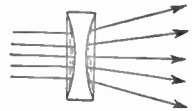
double circuit receiver.—A receiver in which the antenna circuit is coupled to the first tuned circuit inductively.

double coil direction finder.—A *goniometer.*

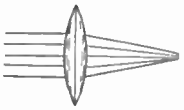
double concave lens.—A lens of which both sides are concave or recessed. *See illustration.*

double convex lens.—A lens of which both sides are convex or outwardly bulging. *See illustration.*

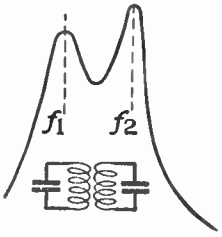
double cotton covered wire.—Copper wire insulated with two layers of cotton threads. Abbreviated *D.C.C.*



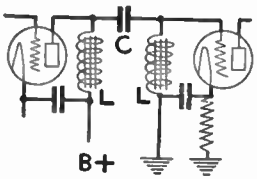
Double Concave Lens



Double Convex Lens



Double Hump Resonance



Double Impedance Coupling

double current generator.—A machine which generates both alternating current and direct current at the same time from the same armature structure, or one which generates two different voltages of direct current at one time from one armature.

double detection reception.—*Superheterodyne reception.*

double diode.—A rectifying tube having a single cathode and two anodes or plates to form a *full-wave rectifier.*

double grid tube.—A vacuum tube with two separate grids, one plate and one cathode. A *screen grid tube.*

double hump resonance.—The condition with two closely coupled *tuned circuits* wherein *resonance* occurs at two different frequencies, the frequencies being further apart as the coupling is made closer. *See illustration.*

double impedance coupling.—A coupling between two amplifying

tubes which is formed by one inductance coil in the first plate circuit, another inductance coil in the second grid circuit, and a coupling condenser between the first plate and the second grid. Voltages developed across the plate coil are impressed through the condenser on the grid circuit. *See illustration.*

double modulation.—The modulation process in which a signal modulates one high frequency current or carrier wave and this first carrier is then used to modulate a second carrier having a different frequency.

double modulation beacon.—A *radio range* capable of providing two directive beams at 180 degree separation, or four beams at arbitrary angles.

double-pole switch.—A switch which opens or closes two separate circuits or both sides of one circuit.

double refraction.—An effect produced by various crystals which refract or bend a light beam at two different angles, a single entering beam emerging as two beams of which one has a greater angle than the other with the direction of the original beam.

double regeneration.—*Regeneration* applied simultaneously to a detector and to preceding radio frequency amplifying stages.

double silk covered wire.—Copper wire insulated with two layers of silk threads. Abbreviated *D.S.C.*

double throw switch.—A switch which connects one conductor to either one of two other conductors. *See illustration.*

doublet.—Equal forces of opposite polarity placed close together.

doublet antenna.—An aerial system including two similar parts placed end to end and having power applied at the center.

doughnut coil.—A *toroidal coil.*

dovetail condenser.—A *variable condenser* having two sets of spaced plates so mounted that the plates in one set slide longitudinally between those of the other set.

down lead.—The conductor connecting the *aerial* wires of a transmitter to the current generating circuits of the apparatus. A name sometimes applied to a *lead-in.*

drainage coil.—A grounded coil connected across lines to reduce any electrostatic voltage generated.

draping.—Sound absorbing materials used to prevent excessive *echo* and *reverberation.*

drive circuit.—A *master oscillator* circuit.

driver.—A source of radio frequency or audio frequency currents or fields. An *oscillator.*

driver element.—The portion of a *telephone receiver* which converts electric power into mechanical power or motion.

drop.—A fall of potential due to resistance. Also, the wires which extend a pole circuit to a building, as a telephone drop.

dropout.—The current or voltage at which a contactor opens.

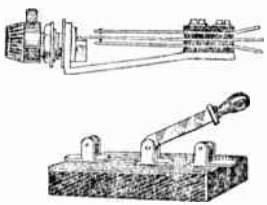
drum dial.—A *dial* of which the portion carrying the graduations has the form of a cylinder or drum. *See illustration.*

drum scanning.—A television scanning system employing a *scanning drum.*

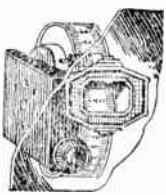
dry cell.—A *galvanic cell* having a cylinder or box of zinc as the electrode carrying the negative terminal, a carbon rod or block as the electrode carrying the positive terminal and an electrolyte of sal-ammoniac solution with which is mixed zinc chloride. The liquid is held in a mass of manganese dioxide and powdered graphite acting as a *depolarizer.* The voltage is 1.5. *See illustration.*

dry cell battery.—Several *dry cells* connected together in series or parallel to provide more voltage or current than can be taken from a single cell.

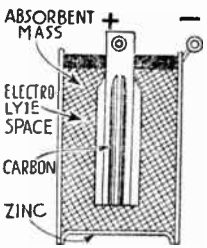
dry cell tube.—A tube for which filament current is secured from dry cells.



Double Throw Switch



Drum Dial



Dry Cell

dry condenser.—An *electrolytic condenser* which is sealed moisture tight.

D.S.C.—Abbreviation for *double silk covered wire.*

dual amplification.—Amplification in a *reflex circuit.*

Duddell arc.—The *singing arc.*

Duddell oscillograph.—An *oscillograph* employing a mirror carried by wires through which flows the measured current, the wires being located in a strong magnetic field with which the field around the wires reacts to produce motion of the mirror. *See illustration, second page following.*

Dufour oscillograph.—A *cathode ray oscillograph* which records the movement of the ray on a photographic plate within the vacuum chamber.

dull emitter.—A vacuum tube with *oxide coated filament* which gives normal electron emission at low temperature and while glowing at a dull red color.

dumb antenna.—A non-radiating circuit with electrical constants like those of the regular antenna, used to take the output of a

transmitter during intervals when no signal is to be radiated, as between dots and dashes of code.

dummy antenna.—An *artificial antenna.*

duolateral coil.—A *honeycomb coil.*

duplex cable.—Two insulated conductors twisted together.

duplex circuit or transmission.—Any communication channel which may be used in both directions at the same time.

duplex operation.—Transmission and reception in associated channels at one time.

duralumin.—A trade name for a hard alloy of aluminum; used for parts such as microphone diaphragms.

dust core.—A magnetic *core* consisting of fine iron particles held by cement. Used where a solid or laminated iron core would introduce too great *eddy current* losses and *hysteresis* losses at high frequencies.

duty-cycle rating.—A continuous or short-time load equivalent to the load imposed during a regular cycle of operation.

DX.—Distant. Reception from stations located at a distance from the receiver.

dynamic.—Relating to motion, and to the forces associated with motion.

dynamic characteristic.—A curve showing the changes produced in one quantity by changes of another quantity under operating conditions. A curve showing the effects of alternating currents. A curve showing the mutual effects of two quantities, both of which vary at the same time. Compare *static characteristic.*

dynamic electricity.—The *electric current*, electricity in motion.

dynamic loud speaker.—An electrodynamic loud speaker or *moving coil loud speaker.*

dynamic resistance.—The effective opposition to flow of current across a *parallel resonance* circuit at resonance.

dynamic sensitivity.—See *photocell sensitivity.*

dynamo-electric machine.—An electric generator or an electric motor. A machine which converts mechanical into electrical energy or vice versa.

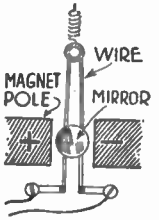
dynamometer.—A device for measuring the torque from a source of power either by absorbing the power completely or by measuring the power carried through the dynamometer.

dynamometer instrument.—1—An instrument in which one or more coils move in a field produced by fixed or moving coils. The same current flows through two sets of coils, the two resulting fields reacting upon each other to produce motion of a pointer. The movement used in a *wattmeter. See illustration.* 2—An instrument in which a metal disc in the field of a coil is moved by reaction between the coil's field and the field due to eddy currents produced in the disc. The pointer is attached to the disc.

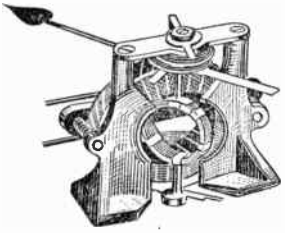
dynamotor.—A machine having a single set of fields and either one or two armature cores with two armature windings, one winding

acting as a motor and the other as a generator. It is generally used to change direct current values or alternating current values, but not to change one kind of current to the other.

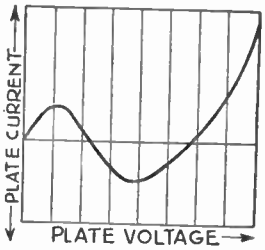
dynatron.—A vacuum tube in which *secondary emission* from the plate results in an electron flow to a grid which is at higher potential than the plate. As the plate voltage is increased through a certain limited range, the plate current decreases, exhibiting the



Duddell Oscillograph



Dynamometer Instrument



Dynatron

effect of *negative resistance*. Generally usd as an oscillator. The actual plate current depends on the difference between the quantity of electrons initially striking the plate and the quantity sent off from the plate by *secondary emission. See illustration.*

dyne.—The C.G.S. unit of *force.* The force which would produce a velocity of one centimeter per second when acting on a mass of one gram. Approximately the force exerted by a weight of one milligram acted upon by gravity.

E

E.—Symbol for *effective* voltage, potential difference or electromotive force.

e.—Symbol for *instantaneous* voltage, potential difference or electromotive force.

E_a.—Symbol for *filament* or *heater voltage* at the source.

ear muffs.—Soft rubber rings placed around *headphones* to close the space through which outside sounds might enter the ears.

earphone.—A *headphone.*

earth.—The *ground* or a ground connection.

earth capacity.—A *counterpoise.*

E_b.—Symbol for *plate voltage* at the source.

ebonite.—A name for *hard rubber.*

E_c.—Symbol for *grid bias* voltage at the source. The symbol for supply voltage for the grid nearest the cathode in a multigrid tube is E_{c1}, and for the second grid from the cathode it is E_{c2}.

E. C.—Abbreviation for enamel covered wire.

echo.—A more or less exact repetition of a sound due to the waves being reflected from a surface back toward the source.

echo altimeter.—A *reflection altimeter.*

echo effect.—In sound radio or television reception, the arrival and reproduction at the receiver of two similar signals with a short time interval between them, this effect being due to one of the signals traveling a longer path as it is reflected from the *Heaviside layer* in passing from transmitter to receiver.

echo room.—A room used in broadcasting studios to produce echo effects in order to make a more natural reproduction of certain kinds of sound.

E_d.—Symbol for *screen-grid voltage* at the source.

eddy current.—An electric current which circulates or eddies within the body of a conductor, being produced by varying magnetic fields which pass into the conductor. The fields usually arise from other outside conductors, but may arise from currents flowing in a circuit of which the affected conductor is a part. *See illustration, page following.*

eddy current loss.—The power used in production of *eddy currents.* The heating effect of such currents.

edge effect.—Change in a condenser's apparent capacity due to displacement of the *electrostatic field* at the outer edges of the plates.

Edison battery.—An *alkaline storage battery* using powdered iron and mercury in the negative plates, peroxide of nickel and flake nickel for the positive plates, and a water solution of potassium

hydrate and lithium hydrate as the electrolyte. The average voltage on discharge is 1.2 volts per cell.

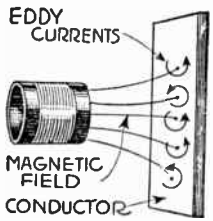
Edison effect.—Flow of current through a vacuum between a positively charged electrode and a second heated electrode. *See illustration.*

Edison-Lalande cell.—A primary cell using electrodes of copper oxide and zinc in an electrolyte of caustic soda and water.

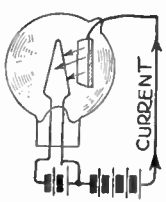
E_f.—Symbol for voltage drop across a filament or across a cathode heater.

effective current.—An alternating current value equal to the value of a direct current having the same heating effect. The *root-mean-square* current. For a *sine wave* alternating current the effective value is 0.7071 times the peak value or maximum value. The symbol is *I*. *See illustration.*

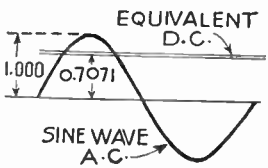
effective emission of photocell.—In a *gas photocell* the current due to the combined effect of *primary emission* and of *ionization.*



Eddy Current



Edison Effect



Effective Current

effective height of antenna.—The height which would be required in an antenna of similar design, but having no losses, to produce the same radiated field sent out from an actual antenna or to receive from a radio wave the same energy as actually received by the real antenna. An antenna height which is less than the physical height and which may be used in calculations involving *radiation* or absorption of signals. The height of an equivalent antenna consisting of a vertical conductor carrying a uniform current which is the same as the maximum current in the actual antenna.

effective inductance.—*Apparent inductance.*

effective power.—The *true power.*

effective resistance.—1—A measure of the total energy loss in a circuit. Equal to the watts of power divided by the square of the current in amperes in the circuit. 2—In an antenna circuit, the sum of the *radiation resistance,* the *ohmic resistance* and the *dielectric loss.*

effective voltage.—In an alternating current system, the alternating

voltage equivalent to a direct voltage which would result in the same heating effect. For a sine wave voltage it is equal to 0.7071 times the maximum or peak voltage. The *root-mean-square* voltage. The symbol is *E*.

efficiency.—The ratio of the useful energy output to the energy input of a device. Usually expressed as a per cent. The symbol is the Greek letter eta (η).

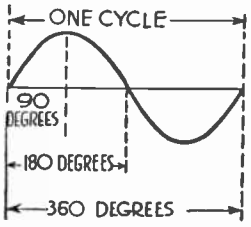
E_g or e_g.—Symbol for *bias* voltage between grid and cathode. For bias voltage of the grid nearest the cathode in a multigrid tube the symbol is E_{g1}, and for the grid second from the cathode it is E_{g2}, etc.

E_h.—Symbol for voltage drop across a heater of a tube.

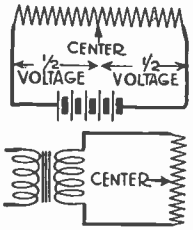
Einthoven galvanometer.—A *vibration galvanometer.*

E_j or e_j.—Symbol for voltage on a tube electrode.

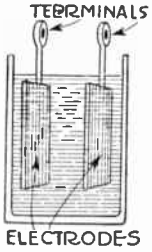
elastance.—Opposition to production of electrostatic lines of force in an *electrostatic field.* The reciprocal of the *electrostatic capacity.* The ratio of the electromotive force to the electrostatic force. Measured in *darafs.* The symbol is *S*.



Electric Angle



Electric Center



Electrode

elastivity.—The *elastance* between opposite faces of a centimeter cube of a substance or the specific elastance of a substance. The reciprocal of the *dielectric constant.*

electric.—1—*Electrostatic.* 2—Pertaining to *electricity* and its effects. Electrical.

electrical.—See under *electric.*

electric angle.—A portion of an alternating current *cycle.* The entire cycle is considered as being divided into 360 equal electric degrees, an electric angle being a part of a cycle measured in degrees and fractions. *See illustration.*

electric attraction.—The force which tends to draw together two bodies carrying *electrostatic charges* of unlike polarity.

electric axis.—An *X-axis* of a quartz crystal.

electric balance.—A *Wheatstone bridge* or an *electrometer.*

electric center.—A point in a circuit or in part of a circuit at which the voltage is midway between the voltages at the ends. A point

of zero voltage between other points of positive and negative voltage. A *neutral* point. In a winding carrying alternating current, the point at which there is neither rise nor fall of voltage during a cycle. *See illustration.*

electric charge.—An *electrostatic charge.*

electric circuit.—A conductive path through which may flow *electric current* or between parts of which may exist a *potential difference.*

electric coupling.—*Capacitive coupling.*

electric current.—The flow of electricity in conductors. The rate at which electricity passes a point in a conductor. Measured in *amperes.* The symbol for effective or *root-mean-square* current value is *I,* and for instantaneous value it is *i.*

electric degree.—One of the 360 equal parts of a *cycle.* See *electric angle.*

electric density.—The amount of electricity existing as a *charge* per unit of area on a conductor's surface.

electric displacement.—Movement of electrons with reference to the molecules to which they are bound in a *dielectric. Displacement current.*

electric field.—An *electrostatic field.*

electric fluid.—An obsolete term for electricity.

electric pole.—A point or a surface at which is exhibited an *electrostatic force;* a surface at which an *electrostatic field* enters or leaves a medium.

electric repulsion.—The force which repels from each other two bodies carrying *electrostatic charges* of like polarity.

electric set.—A receiver operated wholly from the light and power lines without batteries.

electric valve.—A *rectifier.*

electricity.—The agency which acts in the production of all *electrodynamic* and *electrostatic* effects. A form of energy or a means for transferring energy.

electrification.—The condition of a body as determined by the quantity of *electrons* it carries. A body is positively electrified when it carries less than a normal number of negative electrons (resulting in a positive charge) and is negatively electrified when carrying more than the normal number of negative electrons (resulting in a negative charge).

electrify.—To produce an *electrostatic charge* on an insulated conductor.

electro-acoustic.—Relating to the effects of electric currents and sound recording or reproducing devices on each other.

electro-acoustic transducer.—Apparatus transferring power in

either direction between an electric circuit and an *acoustic* device.

electrochemical.—Relating to *electrochemistry*. Electrolytic.

electrochemistry.—The science of the production of chemical effects from electricity and of the production of electric energy from chemical energy.

electrode.—A terminal or surface at which electricity passes from one material or medium into another. An *anode* or a *cathode*. A conductor by which current enters or leaves any electrical device. *see illustration, second page preceding.*

electrode conductance.—The ratio of current change in the circuit of a tube electrode to the change in voltage on the same electrode, other potentials remaining constant.

electrodynamic.—Relating to the effects between electric currents and the forces they produce through their *magnetic fields*. The science of electrodynamics deals with the action of electric currents on themselves and on other currents, and with actions between currents and magnets.

electrodynamic induction.—*Self-induction* or *mutual induction.*

electrodynamic loud speaker.—A *moving coil loud speaker.*

electrodynamometer.—A *dynamometer.*

electrokinetic energy.—Energy contained in electricity in motion; that of the *electric current* and its *magnetic field.*

electrokinetics.—The science of electricity in motion. Compare *electrostatics.*

electrolysis.—Chemical change or decomposition caused by flow of electric current. Separation of a liquid compound into its elements by an electric current flowing through it, the elements being deposited upon an electrode in the process or liberated as gases.

electrolyte.—A liquid chemical compound in which flow of electric current causes separation of the elements of the liquid, or a chemical change in the liquid. The liquid used in *primary cells, storage cells,* or *electrolytic cells.*

electrolytic.—Making use of *electrolysis.*

electrolytic cell.—A combination of *electrodes* and *electrolyte* in which chemical changes are produced by passage of electric current from an outside source.

electrolytic condenser.—A condenser using an electrode as one plate, the electrolyte as the other plate and the layer of gas formed on the electrode surface as the dielectric. The capacity is high for the space occupied. *See illustration, page following.*

electrolytic conduction.—Flow of current through an electrolyte by means of positive and negative ions passing through the liquid. *Convection.*

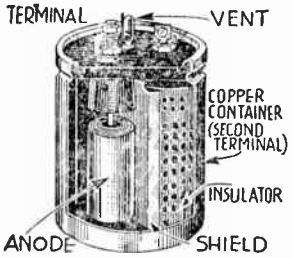
electrolytic copper.—A very pure copper refined by *electrolysis.*

electrolytic detector.—A *detector* utilizing the characteristic of one-way conductivity between a small platinum electrode and a sulphuric acid electrolyte through the layer of gas formed on the electrode surface. Alternating signal currents are thus rectified into direct currents having average changes at audio frequency.

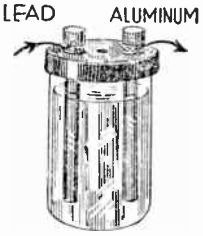
electrolytic interrupter.—An *interrupter* operating by the rapid formation and disappearance of insulating gas on the surface of an anode in an electrolyte. A *Wehnelt interrupter.*

electrolytic oscillator.—A *Wehnelt oscillator.*

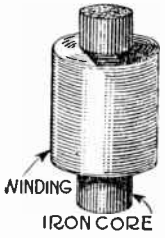
electrolytic rectifier.—One or more plates of lead, iron, carbon, or other inert material, and one or more plates of aluminum or tantalum immersed in an electrolyte solution. Electric current will pass from the electrolyte into the aluminum or tantalum, but not in the reverse direction, thus allowing *rectification* of alternating current. Current tending to flow from the aluminum or tantalum into the electrolyte causes the immediate formation of a very thin film of



Electrolytic Condenser



Electrolytic Rectifier



Electromagnet

insulating gas on the metal's surface, thus stopping the current flow. Reversal of voltage causes instant decomposition of the gas film and current is allowed to flow. *See illustration.*

electrolyze.—To separate by *electrolysis.*

electromagnet.—1—A soft iron *core* wholly or partially surrounded by a coiled conductor, flow of current through the conductor making the iron a magnet as long as the current continues to flow. *See illustration.* 2—An *air-core* winding which exhibits all the attributes of a magnet while current flows in the winding.

electromagnetic.—Pertaining to or depending upon *electromagnetism.*

electromagnetic blowout.—A *magnetic blowout.*

electromagnetic component.—That portion of *radiation* which is due to electromagnetic fields producing detached magnetic loops and consequent disturbances propagated through space.

electromagnetic coupling.—*Inductive coupling.*

electromagnetic cylinder.—A *solenoid.*

electromagnetic field.—The lines of force and the space they occupy around an electromagnet. A *magnetic field.*

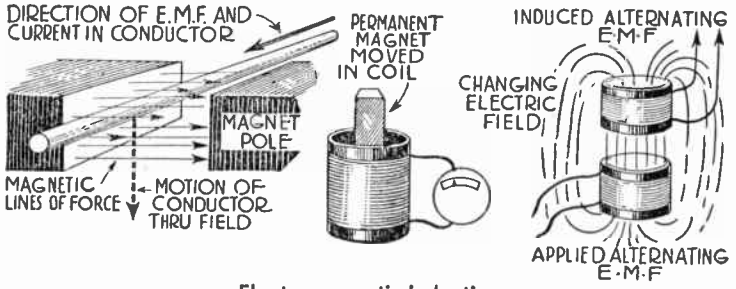
electromagnetic flux.—The flow of magnetism through an electromagnet and its field; the *lines of force* passing through the magnet and its field. *Magnetic flux.*

electromagnetic induction.—The production of *electromotive force* in a conductor which is cutting through magnetic lines of force or which is being cut through by moving lines of force. The principle employed in the electric generator and in inductive coupling. *Self-induction* and *mutual induction. See illustration.*

electromagnetic interrupter.—A *magnetic interrupter.*

electromagnetic lines of force.—*Magnetic lines of force.*

electromagnetic loud speaker.—A loud speaker employing an *electromagnet* excited by the audio frequency currents and working in connection with a movable iron armature which is connected to the sound radiating surface.



Electromagnetic Induction

electromagnetic microphone.—A *microphone* in which sound waves cause vibration of a coil in a strong magnetic field, currents at audio frequency being produced by voltages generated in the coil.

electromagnetic pickup.—A *magnetic pickup.*

electromagnetic radiation.—Sending into space the lines composing an electromagnetic field; one portion of the total *radiation* from a transmitter.

electromagnetic rectifier.—A *vibrating rectifier.*

electromagnetic stress.—*Magnetic stress.*

electromagnetic unit.—Any *absolute unit* in the C.G.S. system; a unit based on the force exerted between two magnetic poles.

electromagnetic wave.—A periodic disturbance arising from electromagnetic action and producing a varying magnetic field and a varying electric field traveling through space. A radio wave.

electromagnetism.—1—*Magnetism* resulting from flow of current.

2—The relations between *magnetism* and *electricity*.

electrometallurgy.—The use of electricity in producing metals.

electrometer.—1—An instrument for measuring *potential differences*. In one type the potential produces electrostatic charges on two stationary plates, one of which is connected to a movable vane of which the deflection is proportional to the square of the effective applied voltage. 2—An *electroscope*.

electromotive force.—The *force* which acts to move electricity in the form of the electric current. Measured in *volts*. (*e.m.f.*)

electron.—The smallest quantity of negative electricity which is capable of moving between atoms of matter. A unit negative charge. One of the particles of negative electricity which is emitted by the *cathode* in a vacuum tube and is attracted toward a positively charged *anode* in the tube.

electron bombardment.—Striking of *electrons*, moving at a high velocity, against the surface of a conductor. This bombardment may result in liberation of other electrons from the surface, in *secondary emission*.

electron coupling.—*Modulation* of plate current by an element whose potential varies according to the waveform in the second circuit. See *pentagrid converter*.

electron current.—The *thermionic current*.

electron drift.—A slow motion of *free electrons* which some theories assume as existing along a conductor which is carrying current.

electron emission.—1—A passage of *electrons* from the surface of a material into the surrounding space due to the action of heat, light, cathode rays, chemical action or impact excitation. 2—The rate of electron emission from a cathode, measured as the current resulting when all emitted electrons are drawn from the cathode.

electron flow.—Movement of *electrons* in a vacuum from a heated cathode to a positively charged anode, the direction of electron flow being opposite to that of current flow. *See illustration.*

electron gun.—The elements of a cathode-ray tube which produce and direct the electron beam; the cathode, control grid, first and second anodes.

electron relay.—A *three-element tube*.

electron theory.—An explanation of all electrical, magnetic and radiant energy actions by the assumption that all matter consists of atoms composed of positive nuclei around which negative *electrons* move in regular paths from which they may be detached under certain conditions.

electron theory of magnetism.—The theory which holds that the rotation of *electrons* in the atoms of a magnetized body may be changed so that most of them act to form magnetic fields acting in one direction. It is assumed that rotation of an electron produces a magnetic effect just as rotation of electric current in a coil produces such an effect.

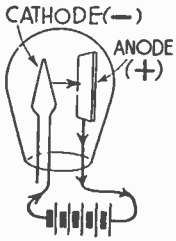
electron theory of matter.—The theory that the *electron* is a common part of all substances, that the *atoms* of all elements are composed of positively charged central parts about which rotate the negatively charged electrons in definite orbits or paths. In the space between atoms it is assumed that there are *free electrons* which are moved by application of *electromotive force* when the material considered is a conductor. *See illustration.*

electron tube.—A *vacuum tube* utilizing the effect of emission of electrons from a heated body within the tube. The type of tube commonly used in radio applications.

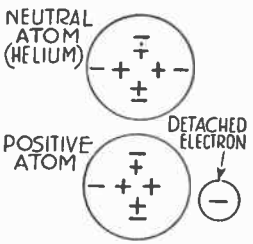
electronegative.—Carrying a negative charge. Passing toward the anode in the process of *electrolysis.*

electronic.—Relating to electron action. *Thermionic.*

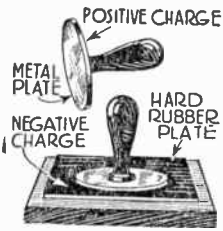
electronics.—The science dealing with the action and effects of electron flow in vacuums and gases, and with the use of vacuum tubes and gaseous tubes in all branches of art and industry.



Electron Flow



Electron Theory of Matter



Electrophorous

electro-optics.—The science dealing with the relations between *light* and *electricity.*

electrophorous.—A device with which may be produced a *bound charge* of positive polarity. *See illustration.*

electropolar.—Having positive and negative *electric poles.*

electropositive.—Carrying a positive charge. Passing toward the cathode in the process of *electrolysis.*

electroscope.—An instrument for detecting electricity or electric charges by means of attraction and repulsion between electrified bodies. *See illustration.*

electrostatic.—Relating to *electrostatic charges* or to electricity at rest. The effects observed in capacities, in condensers and in the fields or lines of force between charged bodies are electrostatic in their nature. The science of electricity at rest, and of electric charges, is called electrostatics. Compare *electrokinetics.*

electrostatic adhesion.—The attractive force existing between two materials in contact when there is a difference of potential between them and when there exists a high *contact resistance.*

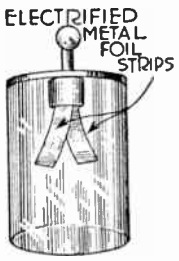
electrostatic altimeter.—A *capacity altimeter.*

electrostatic capacity.—The ability to hold an *electrostatic charge.* The ratio of the number of *coulombs* of electricity stored in a condenser to the voltage difference between the plates. Also called capacitance and permittance. Measured in *farads,* microfarads, etc. The symbol is *C.*

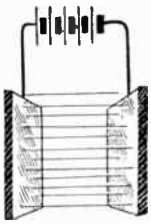
electrostatic charge.—The amount of electricity, measured in *coulombs,* which is contained in a condenser and which will flow through a circuit connected to the condenser terminals. The amount of electricity caused to flow from a condenser by release of the dielectric strain. A similar amount of electricity contained in or delivered from any capacity.

electrostatic circuit.—The path in which exist *electrostatic lines of force* in dielectric materials.

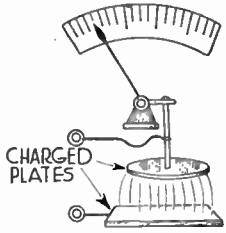
electrostatic component.—The portion of *radiation* which is due to electrostatic fields. See *electromagnetic component.*



Electroscope



Electrostatic Field



Electrostatic Voltmeter

electrostatic coupling.—*Capacitive coupling.*

electrostatic energy.—Energy contained in electricity at rest, such as in the charge of a condenser. Electrical *potential energy.*

electrostatic field.—The space traversed or occupied by *electrostatic lines of force.* A space within which forces exist because of electrostatic charges on conductors on either side of the space. *See illustration.*

electrostatic field intensity.—1—The force exerted on a *unit pole* of positive polarity at a point in an electrostatic field. 2—*Radio field intensity.* 3—The ratio of the voltage across a capacity to the distance between the plates, usually measured in millivolts or microvolts per meter or per centimeter.

electrostatic flux.—The *electrostatic lines of force* existing between bodies at different potentials.

electrostatic flux density.—The number of electrostatic lines of force per square centimeter cross section of an *electrostatic field.* The symbol is *D.*

electrostatic force.—Force exerted by attraction and repulsion between *charged bodies*, or bodies between which there is a difference of potential. Electric attraction and electric repulsion.

electrostatic induction.—The production of *electrostatic charges* on a conductor which is brought into an *electrostatic field.* Any insulated conductor brought near another conductor which is charged will receive charges by means of electrostatic induction.

electrostatic leakage.—*Condenser leakage.*

electrostatic lines of force.—Lines indicating the paths in which are acting the forces of attraction or repulsion between electrically *charged bodies.* Lines drawn through points of equal intensity in an *electrostatic field.*

electrostatic loud speaker.—A *condenser loud speaker.*

electrostatic machine.—Apparatus for production of electric charges by means of friction between unlike materials or by movement of bodies in an electric field.

electrostatic meter.—See *electrostatic voltmeter.*

electrostatic microphone.—A *condenser microphone.*

electrostatic pickup.—A *condenser pickup.*

electrostatic potential.—The work required in bringing from an infinite distance a positive *unit charge* to the point at which the potential exists.

electrostatic strain.—The change in the atomic or electronic condition of a *dielectric* due to the effect of charged conductors on either side. Analogous to a mechanical strain which accompanies a change in shape, form or size of a body subjected to a force.

electrostatic stress.—The force exerted by charged bodies upon a *dielectric* between them. Measured in volts per unit thickness of the dielectric. The symbol is *G.*

electrostatic unit.—An *absolute unit* in the C.G.S. system, a unit based on the force between two quantities of electricity or on the properties of a *unit charge* of electricity.

electrostatic voltmeter.—An instrument measuring potential differences by the repulsion or attraction between conductors which are charged by the voltage being measured. These meters may be used with either D.C. or A.C. voltages, and they take negligible current from the circuit. *See illustration.*

electrostatics.—The science of electricity at rest, and of electric charges. Compare *electrokinetics.*

electrostriction.—A change in the physical form or size of a body which is being acted upon by *electrostatic stress* or by an electric field.

electro-therapeutic.—Pertaining to the use of electricity in medicine and surgery.

electrothermic.—*Thermoelectric.*

element.—1—One of the *electrodes* in a tube, a cell, or other electrical device. 2—A substance which cannot be separated by ordinary physical or chemical means into other substances.

elementary area.—One of the small sections into which a picture or image is divided during the process of *scanning* in television.

eliminator.—A *battery eliminator.*

elongation factor.—A factor used in calculations of *self-inductance* to correct for varying ratios of diameter to length of a winding.

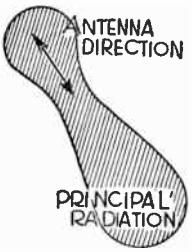
E_m.—Symbol for *maximum* voltage, potential difference or electromotive force.

e.m.f.—An abbreviation for *electromotive force.*

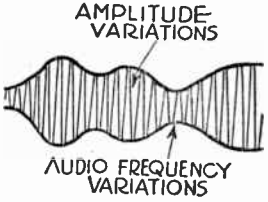
emission.—*Electron emission.*

emission characteristic.—A graph showing the relation between the *total emission* from a cathode and the effect controlling the emission; a voltage, current, temperature, etc.

emission current.—The current resulting from electron emission from a heated cathode in a vacuum tube. The total current coming



End-on Directional Antenna



Envelope

Equisignal Zone

to the cathode from all other electrodes. The symbol is I_s. See *saturation current.*

empire cloth.—An insulating fabric made from cambric impregnated with oils.

empirical.—Based on experience and observation but not always on recognized physical laws.

emulsion.—Gelatine solution carrying minute particles of silver halides which compose the image on a photographic film. Exposure to light begins the process of converting silver bromide to metallic silver, which process is continued by developing.

enclosed fuse.—A *cartridge fuse.*

end fixture splice.—A wire joint between one large and one small wire made by wrapping a few turns of the small wire around the large one, then bending over the end of the large wire and winding the remainder of the smaller wire over the bend.

endodyne reception.—*Autodyne reception.*

end-on directional antenna.—A directional antenna radiating chiefly in the direction of the line on which the antenna elements are disposed. Compare *broadside directional antenna. See illustration.*

energy.—The ability to do *work*. An ability due to motion, position, electromotive force, chemical action, temperature, etc. Electrical energy is measured in *joules* and in *watt-hours*. The symbol is *W*. See *potential energy* and *kinetic energy*.

energy component.—The *active current* in an alternating current circuit.

envelope.—A line indicating the variations in amplitude undergone by an alternating quantity; as the audio frequency variations in the amplitude of a high frequency current or field. *See illustration.*

E_p or e_p.—Symbol for *plate voltage* between plate and cathode.

epsilon (ϵ).—Greek letter symbol for *dielectric constant*.

equal heterodyne.—The condition of zero beat. *Heterodyne reception* in which the received oscillations and the local oscillations are of the same frequency.

equalizer.—An *attenuation equalizer*.

equalizing charge.—A long, low-rate battery charge to fully restore the active materials in the plates.

equalizing condenser.—A *balancing condenser*.

equalizing signal.—A television signal which causes the two fields of one frame produced on the receiver picture tube to start from the correct positions.

equisignal radio range or beacon.—A *radio beacon* sending out two characteristic signals which are received with equal strength only while a moving receiving station follows a definite course.

equisignal zone.—The path within which an aircraft must travel in order that two different signals from a radio range may be received with equal intensity, indicating that a course toward the range is being followed. The region within which the two signals from an *equisignal radio range* are received with equal intensity. *See illustration.*

equivalent circuit.—An arrangement of series and shunt connected impedances which is the equivalent in action of a complicated circuit at a given frequency.

equivalent focus and focal length.—The *focus* or the *focal length* which actually results from the use of several lenses in one system, or such a value as translated into terms of a single lens producing the same effect.

equivalent periodic line.—A *periodic line* having the same electrical behavior as a *smooth line* at some assumed frequency.

equivalent resistance.—The amount of *resistance* which would cause the total amount of energy loss which actually takes place in an electrical part. It is the resistance which would have to be added to a loss-less circuit of the same type in order that an equal loss might take place. Equivalent series resistance is the resistance which would be added in series, and equivalent shunt resistance is the resistance which would be added in shunt with the ideal circuit or device. In a condenser it is the equivalent

series resistance representing the loss due to *dielectric absorption*. *See illustration.*

equivalent sectional radius.—The square root of the cross section normal to the axis, divided by pi (π).

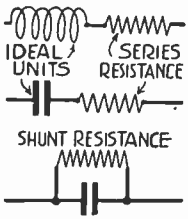
equivalent sine wave.—A *sine wave* which has the same effective value and the same frequency as an actual wave of alternating current.

equivalent smooth line.—A *smooth line* having the same electrical behavior as a *periodic line* at one frequency.

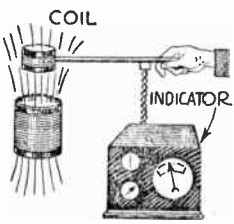
erg.—The C.G.S. unit of *work* or *energy*. The work done by one dyne of force acting through one centimeter distance. The energy used in moving a body one centimeter against a force of one dyne. 10,000,000 ergs equal one *joule*.

E_s.—Symbol for *screen voltage* between screen and cathode in a vacuum tube.

eta (η).—Greek letter symbol for *efficiency*.



Equivalent Resistance



Exploring Coil

Exponential Horn

ether.—A medium which has been assumed to pervade all space regardless of what objects or substances are occupying that space. Radio waves, light, heat, X-rays, etc., are assumed to cause movements of the ether and to be propagated through it.

ether waves.—Radio waves, light waves, radiant heat waves, etc., which are transmitted through and by the ether.

evacuation.—The process of withdrawing air and other gases from within the bulb of a tube, leaving a more or less perfect vacuum.

excitation.—Production of electrical effects.

exciter.—A source of electrical energy or current. A small generator for exciting the fields of a larger one. An *oscillator*.

exciter lamp.—The source of light for operating a *photoelectric cell*.

exciter tube.—A *vacuum tube oscillator* from which is supplied energy at proper frequency to compensate for circuit losses in one or more larger oscillator tubes and to insure that those tubes continue in an oscillating condition.

exciting current.—The *magnetizing current*.

expansion type meter.—A *hot wire meter* in which lengthening of the current carrying conductor allows movement of a pointer.

exploring coil.—A small *inductance coil* connected to some indicator of current flow, such as a detector and headphone. When the coil is moved into a changing field, currents are produced in its circuit and are detected or indicated to allow determination of the field's extent and intensity. *See illustration.*

exploring disc.—A *Nipkow disc.*

explosion-proof.—Descriptive of apparatus in a case constructed to withstand an explosion of specified gas or dust within it, and prevent ignition of the gas or dust around the case by sparks or flashes.

exponential damping.—*Damping* which proceeds according to an exponential law.

exponential horn.—A sound projector or horn of which the cross sectional area increases with its length according to a logarithmic law, successive areas at equal distances from each other increasing at a constant ratio from one to the next. *See illustration.*

exponential notation.—See *standard notation.*

exponential tube.—A form of *variable-mu tube.*

extensional vibration.—*Longitudinal vibration.*

external field influence.—The percentage change caused in an instrument's reading by an external field having an intensity of five *gausses* in the most unfavorable phase and position, the field being produced by a current of the same frequency as that at which the instrument operates.

externally operable.—Capable of being operated without exposing the operator to parts which are electrically alive.

extinction voltage.—The voltage corresponding to the minimum current with which an *arc* is maintained between electrodes.

F

F.—Symbol for *magnetomotive force.*

F. or f.—Symbol for *luminous flux.*

f.—Symbol for *frequency* in cycles.

face-parallel cut.—A *Y-cut* for a quartz crystal.

face-perpendicular cut.—An *X-cut* for a quartz crystal.

facsimile transmission.—Electrical transmission of any representation which may be made in black and white or with very limited changes in shade, such as writing, diagrams, etc. *Telephotography.*

fader.—A *mixer.* A volume control for an audio frequency amplifier.

fading.—A periodic rise and fall of strength of radio wave signals arriving at a receiver; assumed as being due to interference between waves reflected at various angles from the *Heaviside layer.* Variation of signal strength due to changes occurring in the transmission path.

Fahnestock clip.—A form of binding post having a spring catch which holds and makes contact with a wire.

Fahrenheit temperature scale.—One of the scales used for measurement of temperature. The temperature of melting ice is at 32 degrees above zero and the temperature of boiling water is 212 degrees above the zero point. Compare *centigrade temperature scale.*

fairlead.—The opening or guide through which a *trailing wire antenna* passes out of the airplane body. The aerial connection of the radio set is made to the fairlead.

falling characteristic.—The result of *negative resistance,* especially in an arc where increase of current causes greater ionization and allows a still greater current, the equivalent of a decreasing resistance with an increase of current. *See illustration.*

fan antenna.—An *antenna* consisting of a number of wires in a single vertical plane, the upper ends being farther apart than the lower ends. A harp antenna. *See illustration.*

fan-driven generator.—An aircraft generator driven by a fan or propellor exposed to the air stream. *See illustration.*

farad.—The practical unit of *electrostatic capacity.* A capacity with which a potential difference of one volt between plates results in a charge of one coulomb of electricity, or in a charging current of one ampere flowing into the capacity for one second.

Faraday effect.—Rotation of a beam of polarized light passing through a magnetic field.

Faraday's dark space.—A non-luminous region near the cathode, and between the visible glows around the cathode and anode, in a tube containing gas undergoing ionization.

Faraday's law.—The law which states that the induced *electromotive force* in a circuit is proportional to the rate of change of magnetic lines of force linked with the circuit.

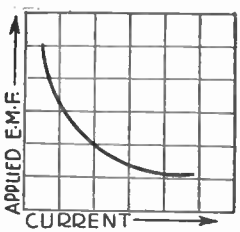
fatigue.—1—A reduction in the emission of a *photocell* with age. 2—*Aging* of iron.

feedback.—A transfer of energy from the output to the input of the same system. In usual applications the feedback energy is applied *in phase* with that already existing in the input and there results an increase in total input, with effects such as *regeneration.* Feedback energy applied in *opposite phase* reduces the total input and may be used for effects such as *balancing.*

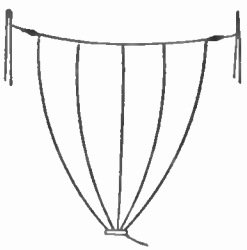
feedback coil.—A *tickler coil.*

feeder.—A conductor carrying current from a supply source to a center of distribution for circuits.

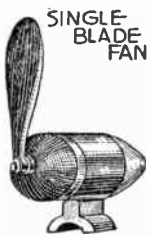
feed ratio.—In a *multiple tuned antenna* the ratio of the sum of the currents at all the *antinodes* to the current put into the antenna.



Falling Characteristic



Fan Antenna



Fan-driven Generator

feed resistance.—In a *multiple tuned antenna,* the result of dividing the power fed into the antenna by the square of the current in the feed line.

feed voltage modulation.—A *modulation* system in which the total radio frequency power output is varied by introducing into the oscillator circuit additional power which is varied at the signal frequency.

ferro-magnetic modulator.—A *magnetic modulator.*

ferron detector.—An iron pyrites *crystal detector.*

fibre.—An insulating and supporting material made chiefly from treated paper, cloth and cellulose. Dielectric constant 5.0 to 8.0.

fidelity.—The degree in which an amplifying system or other circuit delivers from its output an accurate reproduction of the input signal. The opposite of *distortion.*

field.—1—The space within which force is exerted by lines from a current carrying conductor, a magnet pole or an electrostatic

charge. A *magnetic field* or an *electrostatic field*. 2—That part of an electric generator or motor in which are produced the magnetic lines of force used in *induction*.

field form.—A curve showing the distribution of the *magnetic flux* passing into an armature from the field poles.

field frequency.—With interlaced scanning, the number of times per second that half the lines are scanned.

field intensity.—*Magnetic field intensity, electrostatic field intensity* or *radio field intensity*.

field localizer.—A signalling system which allows an aircraft pilot to closely approach a landing field.

field magnet.—An electromagnet or a permanent magnet furnishing a strong magnetic field in a loud speaker, a microphone, a phonograph pickup or other electrical device.

field strength.—*Field intensity*.

figure "8" coil.—A *closed field coil* made by winding a single con-

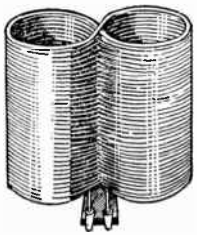
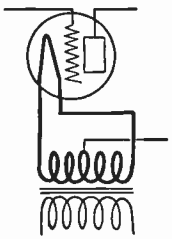


Figure "8" Coil



Filament Circuit

Filament Rheostat

ductor around two cylindrical forms lying parallel with each other, the winding progressing along the length of both forms at one time. *See illustration*.

filament.—A tube cathode which is heated by current flowing through it and from which electron emission takes place.

filament battery.—A battery which provides current for heating a tube filament.

filament capacitance.—The sum of the separate *direct capacitances* between a tube filament and all the other elements in the tube. In a three-element tube, the sum of the *grid-filament capacitance* and the *plate-filament capacitance*.

filament circuit.—All of the parts through which flows current for heating a tube filament. *See illustration*.

filament current.—The electric current used for heating the filament in a tube; the current flowing through the filament. The symbol is I_f.

filament emission.—The current which results from the emission of *electrons* from a heated filament in a tube. *See emission current*.

filament resistance.—The *ohmic resistance* of a tube filament. The symbol is R_f.

filament resistor.—A resistor, usually of the fixed type, which limits the flow of current through a tube filament.

filament rheostat.—A *variable resistance* which is used to limit the flow of current through a tube filament. *See illustration.*

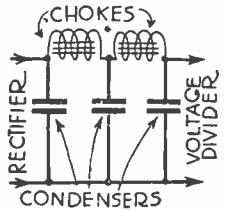
filament switch.—A switch for opening and closing a filament circuit.

filament voltage.—The *potential drop* across the filament of a tube. The voltage applied across the ends of a filament. The symbol for voltage of the source is E_a, and for voltage across the filament is E_f.

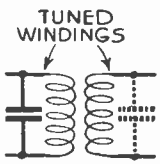
filament voltmeter.—A voltmeter connected across a *filament circuit* and indicating the voltage drop in the tube filaments.

film gate.—In the film system of sound pictures, the part of the mechanism holding the film against the *aperture plate.*

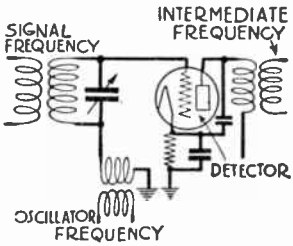
filter.—1—An electric filter is a combination of resistances, induc-



Filter Choke
Filter Condenser



Filter Transformer



First Detector

tances and capacities, or any one or two of these; used to attenuate currents and power at certain frequencies while allowing comparatively free flow of other frequencies or of direct current. These filters are classed as *high pass, low pass, band pass* and *band exclution* filters. 2—Light filters and sound filters are devices which attenuate or completely prevent the passage of light or sound of certain frequencies or wavelengths.

filter choke.—An inductance used in a *filter* system to retard the flow of currents at higher frequencies and permit passage of low frequencies or direct current. *See illustration.*

filter condenser.—A capacity used in a *filter* system to prevent the flow of direct current or retard flow of currents at low frequencies and permit passage of higher frequencies. *See illustration.*

filter transformer.—A coupling transformer in which the primary, the secondary, or both primary and secondary are *tuned* to the operating frequency for the purpose of increasing the secondary output at this frequency. *See illustration.*

fine tuning.—*Sharp tuning.*

first detector.—In *superheterodyne reception,* the tube in whose grid circuit the signal frequency and the oscillator frequency combine to produce the *intermediate frequency* or the beat frequency which appears in the plate circuit. *See illustration, page preceding.*

fish.—A name given to the small weight on the end of a *trailing wire antenna.*

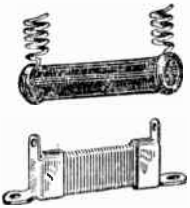
fish line conductor.—A form of conductor used for *resistors,* formed by winding a fine metal wire closely around a thread of insulating material such as silk.

fish paper.—A thin, rather flexible fibre used for *insulation.*

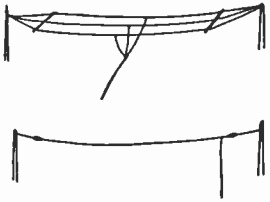
five-element tube.—A pentode. See *power pentode,* also *screen grid pentode.*

fix.—The point at which lines for two or more *radio bearings* cross one another.

Fixed Condenser



Fixed Resistance



Flat Top Antenna

fixed condenser.—A condenser of which the capacity is not adjustable or variable. *See illustration.*

fixed coupler.—An *inductive coupling* in which the amount of coupling between circuits is not variable.

fixed crystal.—A *crystal detector* in which the contact position is not adjustable.

fixed resistance.—An electrical resistance the value of which cannot be varied. *See illustration.*

flashing of filament.—Operation of a thoriated filament for a few seconds at a high temperature and with a current above the normal amount for the purpose of improving the emission. Part of the process of *reactivation of filaments.*

flat top antenna.—An antenna having its elevated wires suspended horizontally. *See illustration.*

flat tuning.—*Broad tuning*

Fleming valve.—A two-element tube with only a filament and a plate; used as a detector. A *diode.*

Fleming's cymometer.—A form of *frequency meter* allowing direct reading of *oscillation constants* by simultaneous variation of inductance and capacity in an oscillatory circuit.

Fleming's rules.—A method of using the thumb and two fingers of one hand to show the relations between directions of lines of force, flow of current and direction of motion. See *left-hand rule* and *right-hand rule.*

flexible armored cable.—A *cable* covered with two layers of spirally wound metal strip.

flexible cord.—A *stranded conductor* within a flexible insulating covering.

flexible metal conduit.—A metal tubing composed of spirally wound strips allowing easy bending. Used for enclosing and supporting all classes of wiring.

flexible tubing.—*Circular loom. Spaghetti tubing.*

floating battery.—A battery which is receiving a charge during a period of discharge.

floating grid.—A *free grid.*

flood lighting.—Illumination of an entire object at one time in *television* transmission.

fluorescence.—The property of certain materials by which they emit light when struck by high frequency waves, such as cathode rays.

fluorescent screen.—A surface coated with a salt, such as calcium sulfide, which emits light when bombarded by electrons, as cathode rays, X-rays, etc. The large end of a cathode-ray tube.

fluoroscope.—A device making use of X-rays to produce *fluorescence* shadows of objects surrounded by a material through which visible light does not pass.

flutter echo.—An *echo* consisting of numerous distinct repetitions of the original sound.

flux.—The passage of light, sound, heat, magnetism, radio waves or other forms of *radiant energy* through a space. The rate at which such a flow takes place in a given cross section of the space. The lines of force which constitute a *magnetic,* an *electrostatic* or a *radiation field.*

flux density.—The number of lines of force passing through a given cross sectional area in a field. See *magnetic flux density* and *electrostatic flux density.*

flux linkage.—The product of the number of turns in a coil and the number of *magnetic lines of force* passing through the coil.

flux meter.—An instrument for measuring and indicating *magnetic flux* in a field.

flyback period.—The time during which a television scanning beam is extinguished while voltages which move it return to values at which the following trace will start to cover the picture area.

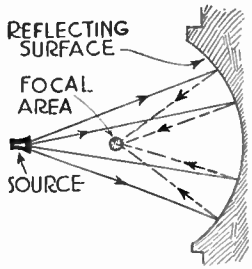
focal area for sound.—The concentration of sound waves reflected from a curved surface. *See illustration.*

focal length.—The distance between the *optical center* and the *principal focus* of a lens. *See illustration.*

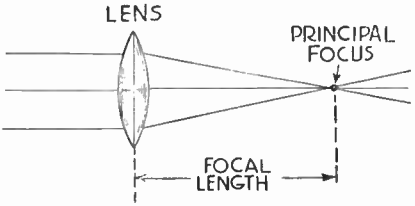
focal plane.—A plane lying parallel to the face of a lens, at right angles to the principal axis, and at such a distance from the lens that it is the location of the principal focus formed by the lens.

focus.—A point at which reflected or refracted waves or rays come together. In optics, a *real focus*, a *principal focus*, a *virtual focus*.

focusing control.—A cathode-ray tube control for adjusting the size of the luminous spot on the screen.



Focal Area for Sound



Focal Length

phots. Illumination in foot-candles is equal to the candlepower of the source divided by the square of the distance in feet to the source.

foot-lambert.—A unit of *brightness*. The brightness of a surface which is emitting or reflecting one *lumen* per square foot.

force.—Any effect which changes or tends to change the condition of objects; any agency which tends to change the position of an object or to change its ability to do work. Measured in *dynes*.

force factor.—A measure of the coupling between the electrical and mechanical systems of an *electro-acoustic transducer*.

forced oscillations.—Oscillations which occur in a circuit as the result of an impressed voltage having the frequency of the oscillations, often different from the circuit's *natural frequency*.

form factor.—The ratio of the effective value to the mean value in one *alternation* of a wave. The form factor of a sine wave is 1.111.

formica.—The trade name of an insulating *phenolic compound.*

form winding.—Winding and shaping a coil upon a fixed form before mounting in its working position.

Foster bridge.—A *slide wire bridge* for comparing two resistances.

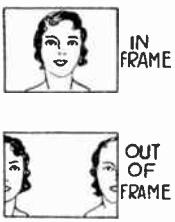
Foucault current.—An *eddy current.*

four-circuit receiver.—A receiver in which coupling between the antenna and the first grid circuit is provided by means of a separately tuned *link circuit.*

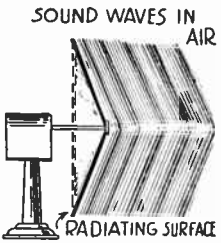
four-element tube.—A tube containing four electrodes, usually one cathode, one plate and two grids. A *screen grid tube.* Also a tube handling audio and radio frequencies at the same time, one frequency being applied to each of the grids.

frame.—1—The total area scanned in television; the space occupied by the picture or image which is transmitted. *See illustration.* 2—

Frame



Framing



Free Radiator

An iron or steel structure acting as a support, also as a part of the *magnetic field* in some devices.

frame antenna.—A *loop antenna.*

frame frequency.—The number of times per second that a television picture area is scanned.

framing.—The process of bringing a received picture in *television* or *telephotography* within the boundaries of the illuminated area so that all portions of the picture are in correct relative position without any transposition between top and bottom or between right-hand and left-hand sides. *See illustration.*

framing control.—Any television receiver control for changing the position or size of the picture.

free alternations.—Alternations having a frequency determined by the *natural frequency* of the circuit in which they occur.

free charge.—1—Instantaneous current upon discharge of a condenser. 2—A charge not bound. See *bound charge.*

free electron.—An *electron* which does not move in a regular orbit

around the positive nucleus of an atom but follows an irregular path, leaving the atom entirely upon formation of the electric current.

free grid.—The condition under which the *control grid* of a tube is not connected to the tube's cathode by any direct current path, the *grid voltage* then being free from any definite relation to the cathode potential.

free impedance.—*Iterative impedance.*

free oscillations.—The *damped oscillations* occurring in a circuit after an impressed voltage has ceased to act. *Oscillatory currents* at a frequency determined by the circuit's inductance and capacity. Compare *forced oscillations.*

free path.—The *mean free path.*

free radiator.—A portion of a loud speaker which radiates sound waves into air not confined in a horn, sounding box or other enclosure. *See illustration, page preceding.*

frequency.—The number of complete *cycles* per second existing in any form of wave motion; as the number of cycles per second of an alternating current, a sound wave or a light beam. Measured in *cycles.* The symbol is *f.*

frequency band.—All the frequencies between two definite limiting frequencies.

frequency changer or converter.—Any device which furnishes in its output a frequency higher or lower than the frequency of the input. A *frequency multiplier.* A *static frequency transformer,* a *Latour alternator,* the *first detector* of a superheterodyne receiver, etc.

frequency correction.—Compensation for unequal transmission of various frequencies in a line by use of *attenuation equalizers.*

frequency discrimination.—*Frequency distortion.*

frequency distortion.—A type of distortion in which certain *frequencies* are amplified or attenuated more or less than are other frequencies.

frequency doubler.—Apparatus for doubling an alternating current frequency; generally by selection and amplification of the second *harmonic* of the original frequency.

frequency influence.—The percentage change in an instrument's reading caused by a deviation of ten per cent from the rated frequency.

frequency meter.—A device which allows measurement of the *frequency* of an alternating current or voltage, or the frequency of a radio carrier wave. The usual form consists of a tuned circuit calibrated in frequencies and provided with means for showing maximum current or other indication of resonance when the tuned frequency of the circuit is made the same as the frequency of the voltage, current or field to be measured. Compare *autodyne frequency meter. See illustration.*

frequency multiplier.—A *frequency changer* which increases an

applied frequency, multiplying it by some whole number. A *harmonic amplifier.*

frequency relay.—A relay which operates upon a change of frequency.

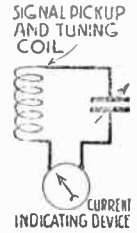
frequency response.—The changes which take place in the degree of amplification or attenuation furnished by a device as the frequency of the input power is varied throughout the working range. Usually shown by a graph. Compare *frequency distortion. See illustration.*

frequency run.—A test of characteristics and *attenuation* of a transmission line at various audio frequencies.

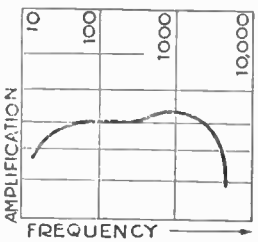
frequency tolerance.—The greatest frequency by which a transmitter's *carrier wave* is allowed to vary from the assigned value.

frictional electricity.—*Electrostatic charges* produced by friction or relative movement between two different substances.

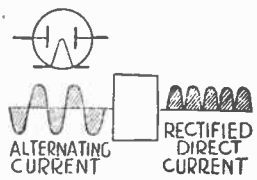
frictional machine.—Apparatus for producing *electrostatic charges*



Frequency Meter



Frequency Response



Full-wave Rectifier

through rubbing two unlike substances, such as leather and glass, together. The charge may be removed from the rubbing elements and stored on condenser plates.

fringe effect.—Extension of the *electrostatic field* outside the space between plates of a condenser.

fringe howl.—A high pitched sound heard when a receiver's circuits are on the verge of oscillation.

Fuller cell.—A *chromic acid cell* of the two-fluid type.

full-wave rectifier.—A *rectifier* which utilizes both the positive and the negative *alternations* of the supply current in the production of rectified current of a single polarity. Contains two similar electrodes, or sets of electrodes, one functioning during one alternation and the other during the opposite alternation in the supply current. *See illustration.*

fundamental frequency.—1—The frequency of which all other frequencies in a wave are multiples. Compare *harmonic.* 2—In an antenna circuit, the lowest frequency at which the circuit is *resonant* when there is no added capacity or inductance.

fundamental tone.—The *fundamental frequency* in a sound wave.

fundamental wavelength.—The wavelength corresponding to the *fundamental frequency*.

fuse.—A short length of conductor which will carry a certain current continuously but which will melt and open the circuit with an overload applied for a few minutes.

fuse block.—An insulating support provided with terminal connections and used for placing fuses in one or more circuits.

G

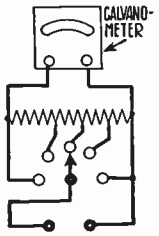
G.—Symbol for *electrostatic stress.*

G. or g.—Symbol for conductance in mhos.

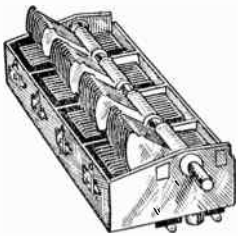
gain.—1—The ratio of the output power, voltage or current to the input power, voltage or current in an amplifying system. Generally measured in *decibels.* 2—Gain of *resonant circuit:* The ratio of the voltage developed by the *oscillatory current* flowing through the *capactitive reactance* to the exciting voltage applied to the circuit.

gain amplifier.—An *audio frequency amplifier* whose input is the small power from a microphone, photocell, phonograph pickup or similar source and whose output is fed into a transmission line or a power amplifier.

Galvanometer



Galvanometer Shunt



Gang Condenser

gain control.—A device which controls the intensity of signal voltage applied to the input of an *amplifier.*

galena detector.—A *crystal detector* utilizing as one of its contacts a piece of galena or sulphide of lead, a crystalline blue-gray substance with a metallic lustre.

galvanic cell.—A combination of electrodes and electrolyte in which an *electromotive force* is produced.

galvanometer.—1—An instrument for detecting the presence, the relative intensity, and sometimes the polarity of small currents. 2—Any current measuring instrument not calibrated in amperes or fractions of an ampere, but calibrated in an arbitrary scale. 3—See *astatic-, ballistic-, deadbeat-, differential-, marine-, reflecting-, sine-, vibration,* and *tangent-galvanometer. See illustration.*

galvanometer shunt.—A resistance connected across the terminals of a galvanometer and so arranged that a current to be measured

may be passed through various definite fractional parts of the total resistance, thus allowing the measurement range of the meter to be extended. *See illustration.*

gamma (γ).—Greek letter symbol for *conductivity.*

gamma rays.—Secondary *radioactive rays* produced by change in rate of motion of *alpha* or *beta rays.* Rays emitted by radioactive substances and having penetrating properties even greater than those of X-rays. Frequencies lying in and above the highest X-ray frequencies.

gang condenser.—Two or more variable *tuning condensers* operated together from one control. *See illustration, page preceding.*

gang socket.—Two or more tube sockets in one mechanical unit.

gas amplification.—The increase of current in a *gas photocell* over that in an otherwise similar vacuum cell, the illumination being the same for both cells. An increase of total emission because of ionization taking place in the gas.

gas content tube.—A *gaseous tube.*

gas photocell.—A photocell containing a gas which increases the *photocell sensitivity,* the gas generally being argon or a mixture of helium and neon. The sensitivity increase is due to *ionization.*

gaseous conduction.—Flow of current through an ionized gas.

gaseous conduction rectifier.—A rectifier tube in which a comparatively large current flow results from *ionization* of a gas inside the bulb.

gaseous tube.—A tube having a certain volume of some inert gas such as argon or helium in its bulb, the purpose of the gas being to allow *ionization.* Such tubes are used as *rectifiers* and as *detectors.*

gassing.—Production of the gases hydrogen and oxygen during battery charge or other electrolytic action.

gassy tube.—A tube of the vacuum type in which there is an imperfect vacuum, the remaining gas allowing *ionization,* irregular variations of plate current and a flow of excessive *grid current* even with a negative bias.

gauss.—The C. G. S. unit of *magnetic flux density,* equal to one line of magnetic force per square centimeter or equal to 6.45 lines per square inch of cross section.

Geissler tube.—A glass tube containing any of a variety of gases in which a *glow discharge* is accompanied by a color characteristic of the gas.

generator.—1—Any source of electric current or voltage, especially a machine for changing mechanical power into electric power. 2—A device for the production of alternating or oscillating currents

from direct current power or from non-oscillating current power. An *oscillator.*

geometric capacity of condenser.—The ratio of a condenser's *free charge* to the voltage across its terminals.

geometric mean.—The square root of the product of two quantities.

geometric value.—A quantity which depends on the shape and size of parts without reference to their material or to associated parts.

geophysical.—Relating to the earth.

German silver.—A resistance metal consisting of copper, nickel and zinc in various proportions. Nickel silver.

getter.—An alkali metal introduced into the vacuum space of a tube and vaporized for the purpose of absorbing any gases which may have been released in the bulb after sealing off.

ghost image.—An additional picture slightly displaced from a regular television picture and appearing at the same time because of a signal being received on the same antenna but slightly displaced in time because of wave *reflection.*

gilbert.—The C. G. S. unit of *magnetomotive force.* Equal approximately to 0.796 ampere-turn.

glidometer.—An instrument indicating to an aircraft pilot the position of his ship relative to the gliding path furnished by a *landing beam.*

glow discharge.—1—A luminous glow which accompanies *ionization* in a gas through which current is passing between electrodes. 2—This condition in a photocell; indicating excessive ionization and current and becoming independent of the amount of illumination on the cell once the glow commences. 3—The *corona.*

glow lamp.—1—A light source of which the intensity may be varied at a sound frequency in sound picture recording. 2—A *television lamp.*

glow microphone.—A microphone in which current variations are produced by the direct action of air waves on a *glow discharge* between two electrodes, the resulting movement of the glow changing the resistance of the circuit.

glow potential.—In a photocell, the anode potential at which a *glow discharge* commences. See also *stopping potential.*

glow tube.—A name sometimes applied to a *voltage regulator tube,* a *television lamp,* a *grid-glow tube* or a *discharge tube.*

G_m.—The symbol for *mutual conductance.*

Goldschmidt alternator.—A high frequency, high power alternator in which the original generated frequency is multiplied in tuned circuits forming portions of the rotor and stator so that the output may be at a frequency four or more times that initially produced.

goniometer.—An antenna system consisting of two *loop antennas* at right angles to each other, connected to two coils also at right angles, these coils being associated with a third coil which may be rotated. Used as a receiving system in a *radio compass,* the

changes of energy produced in the rotated coil allow determination of the direction of radio waves. Used as a radiating system of a *radio range,* movement of the rotated coil allows changes in the pattern of the radiated field. See *Bellini-Tosi direction finder.*

gram.—A unit of weight in the metric or C.G.S. system. Equal to 0.03527 avoirdupois ounce, 15.43 grains.

gram-calorie.—A *calorie.*

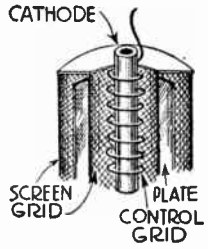
gramophone.—A phonograph.

graph.—A *characteristic;* a curve showing relations between varying quantities.

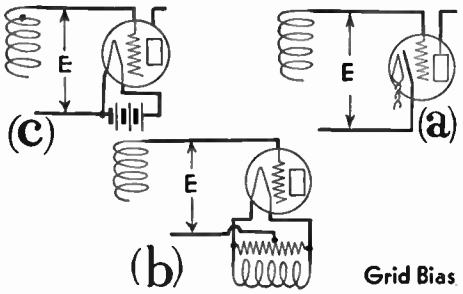
graphite.—A soft form of carbon, often used as resistance material.

gravity battery.—A primary cell using a zinc electrode in a zinc sulphate and sulphuric acid electrolyte and a copper electrode in a copper sulphate solution, the copper sulphate electrolyte remaining in the bottom of the jar and the zinc sulphate floating on it due to the difference in weight between the solutions.

Greek letter symbols.—The meanings of Greek letter symbols are given under the English spellings of the names of these letters in



Grid



Grid Bias

the regular alphabetic order. The following letters are those in general use:

gamma (γ)	theta (θ)	rho (ρ)
delta (δ)	lambda (λ)	tau (τ)
epsilon (ϵ)	mu (μ)	phi (ϕ)
eta (η)	pi (π)	psi (ψ)
		omega (ω)

Grenet battery.—A *plunge battery.*

grid.—A tube electrode having openings through which the electron stream may pass. A *control grid,* a *screen grid,* a *cathode grid,* etc. *See illustration.*

grid battery.—A battery which furnishes a *grid bias* voltage. A C-battery.

grid bias.—The direct component of the *grid voltage.* The direct current potential difference between a grid of a tube and *(a)* the tube's cathode, *(b)* the center of the filament in an A.C. filament tube or *(c)* the negative end of the filament in a battery operated

filament tube. The symbol for the bias voltage at its source is E_o Compare *grid voltage*. *See illustration.*

grid-bias battery.—A *C-battery.*

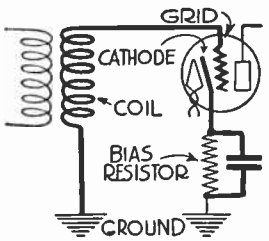
grid-bias detector.—A detector tube utilizing the principle of *plate current detection.*

grid capacitance.—The sum of the separate *direct capacitances* between the grid of a tube and all the other elements in the tube. In a three-element tube, the sum of the *grid-filament capacitance* and the *grid-plate capacitance.* The symbol is C_g.

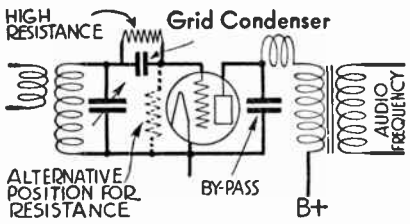
grid-cathode capacitance.—The *electrostatic capacity* between the grid and the cathode of a tube. The symbol is C_{gf}.

grid characteristic.—A graph showing the effect of *grid voltage* changes on *grid current,* the other electrode voltages remaining unchanged.

grid circuit.—That part of a tube circuit included between the cathode and grid, both inside and outside the tube. *See illustration.*



Grid Circuit



Grid Current Detection

grid coil.—Any inductance coil forming part of the *grid circuit* of a tube.

grid condenser.—1—The condenser used with *grid current detection,* connected in series with the grid circuit, usually between the tube's grid and the circuit's inductance. *See illustration for Grid Current Detection.* 2—Any condenser in series with a grid circuit, as a blocking condenser to allow a certain bias voltage being applied to a grid.

grid conductance.—The ratio of a small change in *grid current* to the change of *grid voltage* which produces it, the plate voltage remaining unchanged.

grid control.—A British term for *grid modulation.*

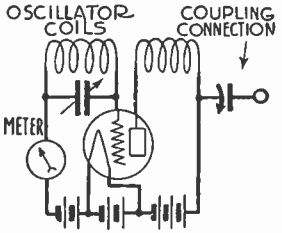
grid current.—Current flowing in a *grid circuit.* This current flows from grid to cathode or to any other element at a potential below that of the grid. In general, there is a flow of appreciable grid current only when the grid is positive with reference to the cathode or when the tube is oscillating. The symbol is I_g or i_g.

grid current detection.—Detection in which the control grid of a

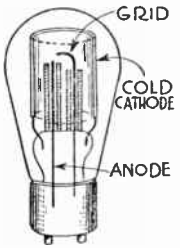
tube is connected to the cathode through a high resistance and is connected to the grid circuit inductance coil through a small capacity condenser. *Grid current* in the resistance produces grid potentials which result in plate current changes at audio frequency. *See illustration.*

grid detection coefficient.—The ratio of a change in direct grid current in a tube to the square of the effective alternating grid voltage which produces the current change; there being no external resistance in the grid circuit or the plate circuit.

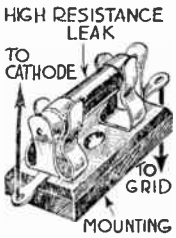
grid dip oscillator.—A device for indicating *resonance* or the resonance frequency of an oscillatory circuit coupled to the device. An oscillating vacuum tube, the grid current of which flows through a meter on which the reading drops when oscillation is lessened or stopped by absorption of energy from the oscillator circuit into the coupled circuit. Maximum dip of the meter's pointer indicates that the two circuits are in resonance. *See illustration.*



Grid Dip Oscillator



Grid-glow Tube



Grid Leak

grid emission.—*Electron emission* which takes place from a grid electrode which has become overheated.

grid-filament capacitance.—The *direct capacitance* between the grid and the filament of a vacuum tube. In a three-element tube, one-half of the quantity found by adding the *grid capacitance* and *filament capacitance,* and subtracting the *plate capacitance.*

grid-glow tube.—A gas filled tube which contains a cold cathode, an anode, and a grid electrode which electrostatically shields the anode. Ionization allows formation of a *glow discharge* carrying a small current between grid and cathode and, if the negative charge of the grid is reduced to a critical value, the discharge transfers to the anode-cathode path, at the same time becoming sufficiently intense to carry a current many times greater than the original current in the grid circuit. Control of the grid's negative charge through an external leakage impedance, such as the effective resistance through a photocell, allows operation of the grid-glow tube as a relay for the photocell or other external variable impe-

dance. See also *hot cathode grid-glow tube. See illustration.*

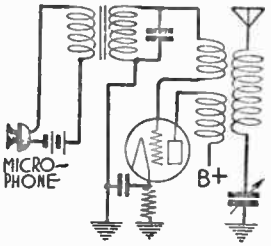
grid leak.—A resistor connected directly or indirectly between the grid and the cathode of a tube for the purpose of determining or affecting the *grid bias,* and for allowing escape of excess negative charges from the grid. Used with *grid current detection, resistance-capacity coupling,* etc. *See illustration.*

grid leak detector.—A detector tube employing the principle of *grid current detection.*

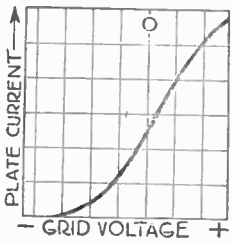
grid modulation.—*Modulation* effected by audio frequency voltages applied to the grid of an oscillator tube in the transmitter circuit. *See illustration.*

grid-plate capacitance.—The *direct capacitance* between the grid and the plate in a tube. In a three-element tube, one-half the quantity found by adding the *grid capacitance* and *plate capacitance,* and subtracting the *filament capacitance.* The symbol is C_{gp}.

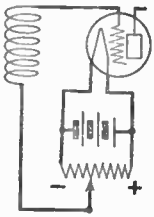
grid-plate characteristic.—A graph showing the relation between



Grid Modulation



Grid-plate Characteristic



Grid Potentiometer

grid voltage and *plate current* in a vacuum tube. The mutual characteristic. *See illustration.*

grid-plate transconductance.—*Mutual conductance;* the ratio of plate current changes to grid voltage changes.

grid potentiometer.—A voltage divider which varies the grid bias of an amplifying tube in control of sensitivity and volume. *See illustration.*

grid rectification detector.—A detector tube employing *grid current detection.*

grid resistance.—The effective resistance through the space between the grid and the cathode or filament of a tube. The resistance depends on the *grid bias.* The symbol is R_g.

grid return.—The connection to the cathode or filament of a tube through which it would be possible for grid current to flow. The polarity and potential of the grid return affect the *grid bias. See illustration, page following.*

grid suppressor.—A resistance of about 1,000 ohms value con-

nected between a radio frequency amplifying tube's control grid and the tuned portion of the grid circuit, for the purpose of preventing oscillation due to feedback through the tube's internal capacity. *See illustration.*

grid swing.—The total variation of *grid voltage* caused by a signal; it is double the peak voltage of the signal.

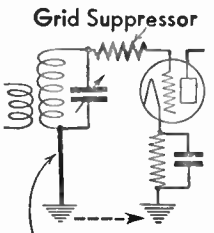
grid variometer.—A *variometer* used in the grid circuit of an amplifying tube for the purpose of tuning by variable inductance.

grid voltage.—The potential difference between a grid and some particular points of the cathode in a tube. The combined effect of the grid bias and the signal voltage. The symbol is E_g *or* e_g. See *grid bias.*

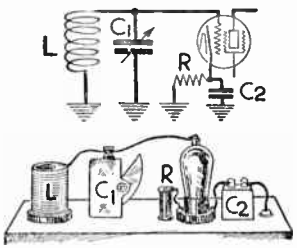
grid winding.—A transformer winding which forms a part of a *grid circuit.*

grinder.—A form of *static.*

ground.—1—The metallic framework and all parts conductively



Ground Clamp



Ground Return Circuit

connected to it in a radio device. 2—A connection to such a framework or a short circuit to it. 3—The lower portion of a *capacity antenna.* 4—The earth and all parts conductively connected to it.

ground absorption.—The power dissipated from a radio wave in the ground or earth.

ground antenna.—1—An antenna system having its aerial wire laid on or close to the earth and insulated. 2—An *underground antenna.*

ground clamp.—A metal clamp through which connection is made to an earth ground, usually to a water pipe. *See illustration.*

ground condenser.—A condenser in series with the *ground wire* of a radio device; allowing passage of radio frequency currents but providing protection against direct current for which the condenser acts as an insulator.

ground detector.—A special form of meter standing at zero under normal conditions but deflecting when an accidental *ground* occurs on one circuit.

ground equalizer.—An inductance coil connected in one of the

ground leads of an *antenna* system for the purpose of distributing the antenna current in the antenna circuit.

ground noise.—*Background noise.*

ground noise eliminator.—See *noiseless recording.*

ground potential.—Zero voltage or the earth's voltage. The voltage of the framework or ground connections in a radio device, which may be higher than zero referred to the earth.

ground resistance.—The resistance of the ground or earth portion of an *antenna* system.

ground return circuit.—A circuit having one side carried through insulated metallic conductors and the other through the *ground. See illustration.*

ground switch.—An *antenna switch*

ground system.—The part of the *antenna circuit* on the ground side of the transmitter circuits and including the earth ground.

ground wave.—The portion of a transmitter's radiated wave which travels along the earth's surface.

ground wire.—1—A conductor connecting with the earth or ground. 2—In a transmitting antenna system, a network of metallic conductors buried under the earth's surface in the space under the aerial.

grounding.—See *ground.*

group frequency.—The number of complete trains of *damped oscillations or waves* occurring in one second.

Grove cell.—A primary cell using a platinum electrode in nitric acid electrolyte within a porous cup outside of which is a zinc plate in a sulphuric acid electrolyte. A *closed circuit cell.*

guard ring.—A grounded conductive ring extending across the insulating path between the electrodes of a *photocell* for the purpose of shunting leakage currents out of the amplifying circuit.

guided wave radio.—*Wired radio.*

Gunn altimeter.—A *capacity altimeter.*

gutta-percha.—A natural vegetable gum similar to rubber and used for insulation. Dielectric constant 3.0 to 5.0.

gyro compass.—A device which indicates geographical direction by action between an electrically rotated wheel and the earth which is rotating on its axis, the two spinning bodies acting as two gyroscopes.

H

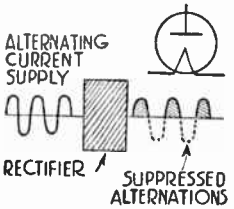
H.—A symbol for *magnetizing force.*

h.—Symbol for *henry* (of inductance).

half-wave antenna.—A transmitting antenna in which the radiator has a length equal to one-half the wavelength to be used by the connected transmitter.

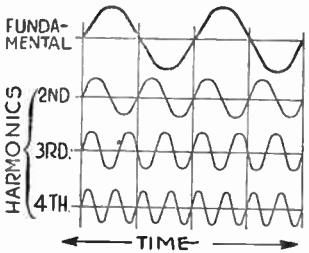
half-wave rectifier.—A *rectifier* which prevents the passage of alternations of one polarity while allowing those of the opposite polarity to pass into its output circuit, thus producing a pulsating direct current. *See illustration.*

hand capacity.—*Body capacity.*



Half-wave Rectifier

Hand Microphone



Harmonic

hand microphone.—A small *microphone,* usually of the carbon type, arranged to be held in one hand of a speaker. *See illustration.*

hard drawn copper wire.—A copper wire having high tensile strength.

hard rubber.—Rubber which has been vulcanized at high temperatures and pressures. Used chiefly for insulation. Dielectric constant 2.5 to 3.5.

hard tube.—A vacuum tube which has been highly evacuated and within the bulb of which but little gas remains. The action is entirely thermionic, no intentional *ionization* taking place.

harmonic.—An alternating quantity or a wave motion of which the frequency is an odd or even multiple of a lower frequency called the fundamental. A second harmonic is of double the fundamental frequency, a third harmonic of three times the fundamental frequency and so on. Harmonic and fundamental waves may exist together to form an irregular or *complex wave.* Compare *subharmonic. See illustration.*

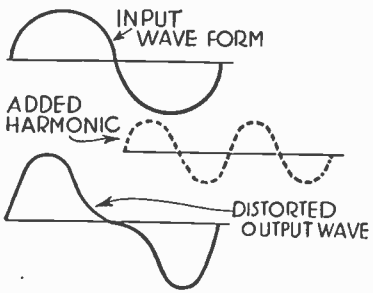
harmonic amplifier.—An amplifier with the tube so biased as to distort the applied frequency and produce strong *harmonic* frequencies in the output. The desired harmonic is separated by filtering or by passing it through another amplifying stage tuned to its frequency. The process may be carried through several stages, ending with one of the higher harmonics of the fundamental frequency.

harmonic analyzer.—A device for separating *complex waves* into the component *sine waves* of which they are formed.

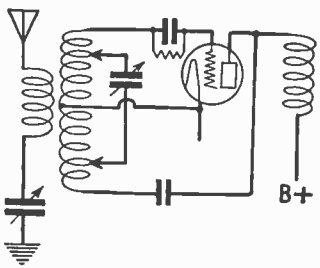
harmonic current.—A *sine wave* current.

harmonic distortion.—A type of *distortion* in which the output of a tube or circuit contains not only the input frequencies, but also harmonic frequencies of the input. *Wave form distortion. See illustration.*

harmonic frequency.—A frequency which is a multiple of another lower frequency called the fundamental; both the fundamental and the harmonic frequencies existing together in a circuit.



Harmonic Distortion



Hartley Oscillator

harmonic mean.—Twice the product of two quantities, divided by their sum.

harmonic motion.—See *simple harmonic motion.*

harmonic suppressor.—A circuit which reduces the strength of carrier frequency harmonics in the antenna circuit of a transmitter, usually by the use of *band exclusion filters,* for the purpose of limiting the radiation of carrier harmonics.

harmony.—A pleasing combination of tones.

harness.—Wires, cables and terminal connections arranged in such manner that they may be removed as a unit from the apparatus with which they are regularly used.

harp antenna.—An antenna consisting of a number of approximately vertical conductors arranged side by side. A fan antenna.

Hartley oscillator.—A *vacuum tube oscillator* in which the tuned circuit includes two windings in series connected between the tube's grid and plate, and in which the tube's cathode or filament is con-

nected to the junction between the coils. The feedback is through *inductive coupling* between the windings. *See illustration.*

haywire.—Descriptive of apparatus in poor condition or of carelessly made temporary connections.

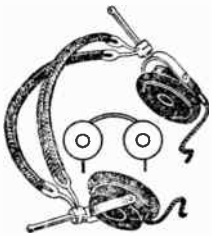
headphone.—One or two small *telephone receivers* with suitable ear pieces attached to a band or harness going over the head and holding the receivers over the ears.

head set.—A pair of *headphones* attached to a band for support on a listener's head. *See illustration.*

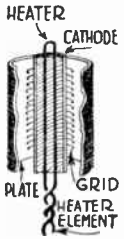
heat loss.—The power which is dissipated from an electrical system in the form of heat. The I^2R *loss.*

heater.—A tube part which is itself heated by flow of current through it and which heats a cathode to a temperature required for *electron emission.*

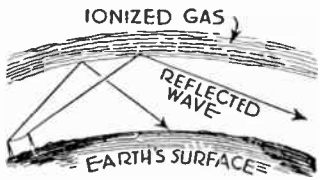
heater bias.—A difference of potential maintained between the heater and the cathode of a *heater tube* for the purpose of reduc-



Head Set



Heater Tube



Heaviside Layer

ing the hum tendency. The heater is usually positive with respect to the cathode.

heater circuit.—All of the parts through which flows current passing through a tube heater.

heater current.—The current flowing through the cathode heating element of a tube. The symbol is I_h.

heater resistance.—The *ohmic resistance* of a tube *heater.* The symbol is R_h.

heater tube.—A tube in which the electron emitting *cathode* is electrically separate from the heating element. Within the cathode is a conductor heated to incandescence by alternating current or direct current flowing through it, heat then passing from this element into the cathode. *See illustration.*

heater voltage.—The potential drop across the *heater* of a tube. The symbol for the voltage of the source is E_a, and for voltage across the heater is E_h.

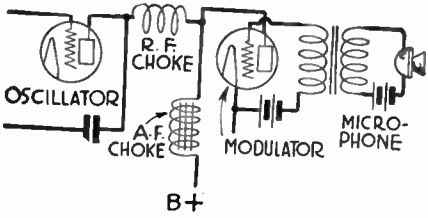
Heaviside layer.—A layer of ionized and somewhat conductive gas

existing near the upper part of the earth's atmosphere, the *ionization* being produced by radioactive rays from the sun. This layer reflects and refracts radio waves from a transmitter back toward the earth. Also called the Kennelly-Heaviside layer. *See illustration.*

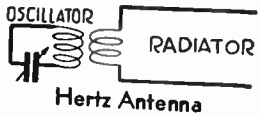
hecto-.—A prefix meaning one hundred times the unit.

Hefner lamp.—A lamp used as a standard of *luminous intensity;* equal approximately to 0.88 candlepower.

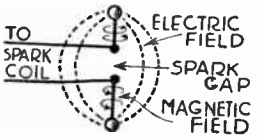
Heising modulation.—A *modulation* system in which the plates of both the oscillator tube and modulator tube are fed through a single choke having high impedance at both audio and radio frequencies. The audio frequency variations in the modulator tube's plate current can not appreciably change the total plate feed current because of the choke, consequently they cause audio frequency variations in the current passing through the oscillator's



Heising Modulation



Hertz Antenna



Hertz Radiator

plate circuit. Also called constant current modulation. *See illustration.*

helix.—A coil wound in a spiral form.

Helmholtz resonator.—An *acoustic resonator.*

henry.—The practical unit of *inductance.* The inductance in which a current changing its rate of flow one ampere per second induces an electromotive force of one volt. Abbreviated *h.*

hertz.—One *cycle* per second.

Hertz antenna.—An antenna circuit in which the ground forms no essential part. A *capacity antenna* employing a counterpoise instead of a ground. *See illustration.*

Hertz radiator.—A spark gap between the inner ends of two rods which terminate at their outer ends in balls providing capacity which, with the inductance of the rods, forms an *oscillatory circuit* capable of radiating radio waves. *See illustration.*

Hertzian waves.—*Radio waves.* Waves of frequencies from the

lowest used in radio transmission up to the lower limits of infra-red or heat rays.

heterodyne.—A separate force; a combination of two separate forces.

heterodyne frequency meter.—An *autodyne frequency meter.*

heterodyne interference.—*Beat interference.* Also, interference caused by *re-radiation* from a receiver.

heterodyne reception.—Radio reception by the combination of a received frequency with another frequency produced in an oscillatory circuit within the receiver. *Superheterodyne reception* and *autodyne reception.* A form of reception making use of the action of *beating.*

Heusler's alloy.—An alloy metal containing copper, aluminum and manganese. It forms a magnetic material.

h-f.—Abbreviation for *high-frequency.*

high frequency.—By definition, frequencies between 6,000 and 30,000 kilocycles. Generally used as having the same meaning as *radio frequency.* Abbreviated *h-f.*

high frequency alternator.—An alternating current generator of the rotating type which produces high frequency currents without the help of other devices.

high frequency amplification.—*Radio frequency amplification.*

high frequency amplifier.—A *radio frequency amplifier.*

high frequency buzzer.—A buzzer which opens and closes a circuit at *audio frequency.*

high frequency choke.—1—A choke coil connected between the secondary of the supply transformer and the oscillatory circuits in *spark transmission* to prevent flow of high frequency currents back into the transformer windings. 2—Any *radio frequency choke.*

high frequency circuit.—An *oscillatory circuit.*

high frequency generator.—A generator which directly produces currents at *radio frequency.*

high frequency instrument.—An instrument capable of measuring currents at high frequencies. A *hot wire meter* or a *thermocouple instrument.*

high frequency oscillator.—A *radio frequency oscillator.*

high frequency resistance.—The effective resistance in a high frequency circuit; the total of all effects which result in energy losses. High frequency resistance includes losses due to *eddy currents, skin effect, distributed capacity, dielectric losses* and *ohmic resistance.*

high frequency transformer.—A *radio frequency transformer.*

high-mu tube.—A tube having a high *amplification coefficient.*

high pass filter.—A filter which allows comparatively free passage through it of frequencies above a certain *cutoff frequency,* but which greatly attenuates all lower frequencies. *See illustration.*

high resistance voltmeter.—A voltmeter having resistance suffi-

ciently great that very little current is drawn by the meter from the circuit in which potential is measured. Generally a *moving coil instrument* taking not more than one milliampere of current for its own movement.

high tension.—High voltage.

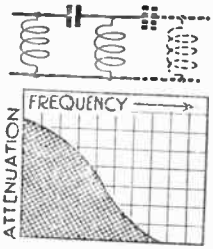
high tension battery and circuit.—*Plate battery* and *plate circuit.*

high voltage winding.—In a transformer, the winding having the greater number of turns.

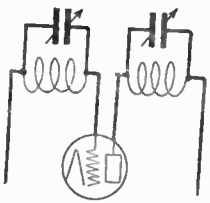
Hoffman oscillator.—A *vacuum tube oscillator* securing feedback through *inductive coupling* between one winding in the plate circuit and another in the grid circuit, each winding being tuned with a variable condenser. *See illustration.*

hold controls.—Television receiver controls for manually adjusting the frequencies of the horizontal and vertical sweep circuit oscillators.

homodyne reception.—*Zero beat reception.*



High Pass Filter



Hoffman Oscillator

Honeycomb Coil

honeycomb coil.—A multi-layer *inductance coil* in which the turns are spaced apart and in which the turns in each layer lie at an angle with those of adjacent layers. *See illustration.*

hook-up.—The circuit of an electrical device, or a diagram showing the circuit.

hook-up wire.—Tinned copper wire, solid or stranded, with either fabric or rubber insulation which is removed easily.

hoop antenna.—A *cage antenna.*

horizontal oscillator.—A television receiver oscillator which employs the blanking signal and horizontal synchronizing signal for operation of the horizontal deflecting plates or coils in the picture tube.

horizontal scanning.—A *scanning* system in which the successive small areas of the picture form lines running horizontally across the frame. *See illustration, page following.*

horn.—A tubular member of varying shape attached to a loud speaker driver for assisting the radiation of sound waves.

horn gap.—A spark gap with two conductors arranged in V-shape

with a small opening between them at the bottom of the V.

horsepower.—A unit of *power* equal to 746 watts. A rate of work equal to 33,000 foot-pounds per minute.

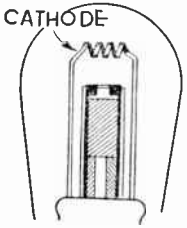
horse shoe magnet.—An electromagnet or a permanent magnet in which the poles or ends of the *core* are brought close together.

hot cathode grid-glow tube.—A *grid-glow tube* having as a primary source of electrons a heated cathode, the resulting ability to handle large currents allowing this tube to carry considerable power directly between its elements. These tubes are filled either with mercury vapor or with neon gas. Compare *grid-glow tube. See illustration.*

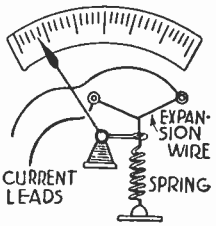
hot cathode rectifier.—Generally a *mercury vapor rectifier.* Any *thermionic* or *gaseous conduction rectifier* obtaining primary electron emission from a heated cathode.

hot cathode X-Ray tube.—A tube from which *X-rays* are secured by electron emission from a heated filament.

Horizontal Scanning



Hot Cathode Grid Glow Tube



Hot Wire Meter

hot side.—The high voltage portion or side of an electric circuit.

hot wire meter.—1—A current measuring instrument in which movement of the pointer is allowed by expansion and lengthening of a conductor carrying the current, the expansion being due to heating of the conductor by the current being measured. *See illustration.* 2—A *thermocouple instrument* in which the thermocouple is heated by a separate conductor carrying the current to be measured.

hot wire telephone.—A *thermal receiver.*

howling.—A sound which is the result of audio frequency *feedbacks* or *acoustic feedbacks* causing vibration of the elements in an amplifying tube.

H-section attenuator.—An *attenuation network* having its elements arranged in the manner of the capital letter "H"; a *constant impedance unit. See illustration.*

Hubbell battery.—An *alkaline storage battery* using a cadmium

negative plate, a nickel oxide positive plate, and a solution of potassium hydrate in water for electrolyte.

hum bucking.—Reduction of audible hum in alternating current receivers by combining with the hum-producing voltage another voltage of the same frequency but opposite in phase.

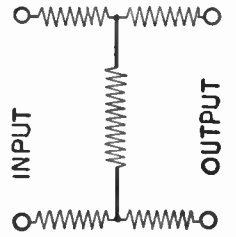
hum voltage.—*A ripple voltage.*

hunting.—Periodic changes in speed of a generator or motor as it passes through *synchronism* or passes through its normal speed.

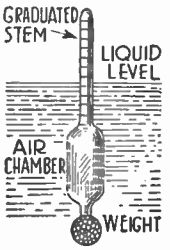
hydrometer.—A weighted bulb with a graduated stem at the top, used for measuring the *specific gravity* of liquids such as storage battery electrolyte. *See illustration.*

hyp.—A unit of *attenuation.*

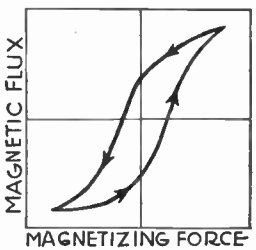
hysteresis.—1—A delay or lag in the increase of *magnetic flux* with increase of the *magnetizing force* and the similar lag in decrease of flux with a decrease of the force; the rates of increase and of decrease in flux not being the same with a rise of magnetizing force



H-section Attenuator



Hydrometer



Hysteresis Loop

as with a falling off in force. 2—*Dielectric hysteresis.*

hysteresis coefficient.—The energy in ergs dissipated in one cubic centimeter of iron by the *hysteresis* effects during one cycle of *magnetizing force.*

hysteresis loop.—Two curves meeting at their ends and forming a loop; one of them showing the rise and the other showing the fall of *magnetic flux* during one cycle of an alternating *magnetizing force.* The power loss due to *hysteresis* is roughly proportional to the area of the loop. *See illustration.*

hysteretic.—Pertaining to the effects of *hysteresis.*

hysteretic angle.—The phase difference from *quadrature* caused by hysteresis.

hysteretic loss.—The amount of power in watts dissipated because of *hysteresis.*

I

I.—Symbol for *effective* value of current in amperes.

i.—Symbol for *instantaneous* value of current in amperes.

Iconoscope.—A television camera tube in which an area called the mosaic carries minute photosensitive elements, a conductive plate, and a collector. Lights and shadows of an image focused on the mosaic result in varying voltage.

icw.—Abbreviation for *interrupted continuous waves.*

idle current.—The *reactive current.*

I. E. C.—Abbreviation for *International Electrotechnical Commission.*

i.f. or i-f.—Abbreviation for *intermediate frequency.*

I_f.—Symbol for *filament current.*

I_g or i_g.—Symbol for *grid current.* For current through the grid nearest the cathode in a multigrid tube the symbol is I_{g1}, and for the grid second from the cathode it is I_{g2}.

ignitron.—A gas-filled tube (or tank) with mercury pool cathode. A controlled rectifier in which starting of electron flow is controlled by an ignitor element.

I_h.—Symbol for *heater current.*

I_j.—Symbol for current in a tube electrode.

illumination.—The volume of light reaching a body. The density of *luminous flux.* Units are the *foot-candle,* the *lux* and the *phot.*

I_m.—Symbol for *maximum* value of current.

image.—An optical reproduction or picture of objects formed by *reflection, refraction* or transmission of light. A *real image* or a *virtual image. See illustration.*

image dissector.—A television camera tube which converts lights and shadows of a focused image into corresponding changes of voltage.

image effect.—An increase in the *effective height of an antenna* due to its ground system.

image frequency.—The carrier frequency of an undesired signal which is capable of combining with the oscillator frequency in *superheterodyne reception* to produce the intermediate frequency. The image frequency is as far above the oscillator frequency as the desired carrier frequency is below that of the oscillator, differing from the desired carrier by twice the intermediate frequency.

image impedance.—The impedance which, when used at the end of a transmission network allows no *reflection loss* at the junction between network and impedance.

image transfer constant.—In a transmission network terminated in

its *image impedances,* one-half the natural logarithm of the vector ratio of the apparent power entering the network to the apparent power leaving the network. The factor by which power is reduced in a network.

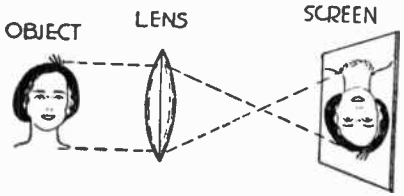
imaginary component.—The *reactive current or component.*

impact excitation.—*Impulse excitation.*

impact transmitter.—A transmitter in which the *oscillatory circuit* is excited by energy transferred to it during one pulse of current in the coupled exciting circuit.

impedance.—The total opposition to flow of alternating current, the opposition caused by *resistance* and *reactance* in the circuit. Equal to the square root of the sum of the squares of the net reactance and the resistance. Measured in *ohms.* The symbol is Z or z. The ratio of the voltage to the current in an alternating current circuit.

impedance-capacity coupled amplifier.—An amplifier providing coupling between tubes through voltage drops across *inductance*



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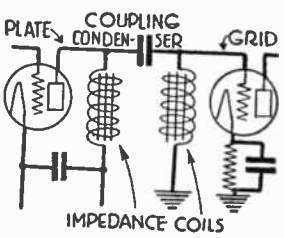


Impedance-capacity Coupled Amplifier

coils, these voltages being applied through a coupling condenser to the grid of a following tube. *See illustration.*

impedance coil.—A *choke coil.*

impedance coupled amplifier.—An *impedance-capacity coupled amplifier.*

impedance coupling.—Coupling obtained by making a single impedance a part of each of the coupled circuits. *Direct coupling.*

impedance factor.—The ratio of the *impedance* to the *ohmic resistance* in an alternating current circuit.

impedance match.—The condition wherein the impedance of a connected load is equal to the internal impedance of the source, or the condition wherein a coupling device between source and load has a ratio of its input to its output impedances equal to the ratio of impedances of the source and the load. The condition with which there is maximum power transfer from source to load. *See illustration, page following.*

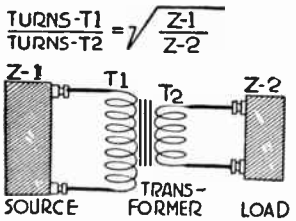
impedance triangle.—A right angle triangle in which, when the

lengths of the two sides are proportional to the *resistance* and the *reactance,* the length of the hypotenuse is proportional to the *impedance* of a circuit. *See illustration.*

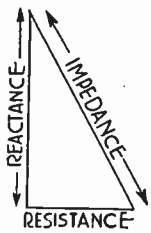
impedance wave trap.—A *parallel resonance* circuit in series with an antenna circuit; the greatest impedance being offered to currents of an undesired frequency to which the trap circuit is tuned. *See illustration.*

impregnation.—Filling the spaces between conductors, laminations or other parts with an insulating or binding material, usually under the action of heat or vacuum.

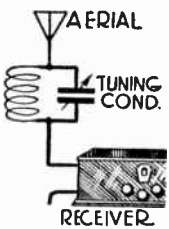
impressed voltage or e.m.f.—The voltage applied to a circuit or device. The potential difference applied by an external source of e.m.f. to the ends of a circuit or to the terminals of an electrical device.



Impedance Match



Impedance Triangle



Impedance Wave Trap

impulse.—A sudden and brief change in current or voltage in a circuit.

impulse electromotive force.—A voltage which decreases rapidly at the beginning of a current which it causes. A diminishing voltage, the average value of which is taken over a period equal to the circuit's *time constant.*

impulse excitation.—Momentary application of an exciting voltage to an oscillatory circuit in which are produced damped oscillations at the circuit's *natural frequency,* these oscillations continuing after the applied voltage has ceased. Shock excitation.

incandescence.—Lighting or glowing of a substance because of its heat.

index of refraction.—An indication of the amount of bending or *refraction* undergone by light rays upon entering and leaving a medium; equal to the ratio of the rate of travel of light in a vacuum (or in air) to its rate of travel in the medium considered.

indication range.—The range of an instrument within which values are indicated without reference to accuracy. Compare *measurement range.*

indirect current.—*Alternating current.*

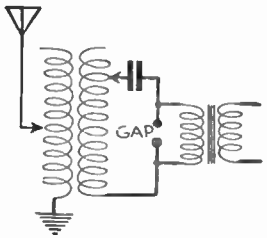
indirect excitation.—Descriptive of a *spark transmission* system in which the antenna is coupled to a separate oscillatory circuit containing the discharging condenser and spark gap. *See illustration.*

indirect inductive coupling.—*Inductive coupling.*

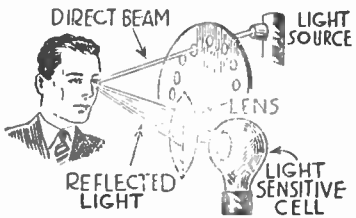
indirect lighting.—Illumination of the light sensitive device of a television transmitter by light reflected from an object. *See illustration.*

indirect wave.—The *sky wave.*

indirectly heated cathode.—A tube cathode which is heated from a separate conductor carrying the heating current, placed within



Indirect Excitation



Indirect Lighting

or close to the cathode but electrically insulated from it. The cathode of a *heater tube.*

indoor antenna.—An antenna system having its aerial wire within a building. *See illustration.*

induced charge.—An *electrostatic charge* produced on a conductor by the field around another nearby conductor.

induced current.—A current produced by changes of *magnetic flux* and the resulting induced voltage.

induced voltage or e.m.f.—A voltage produced by *induction.*

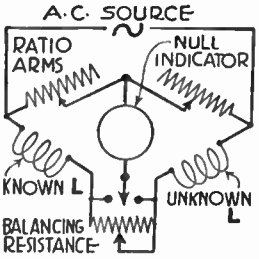
inductance.—The property of a circuit by which a varying current in it produces a varying magnetic field of which the moving lines of force cause voltages in the same circuit or in other nearby circuits. The ratio of the magnetic flux to the current which produces it. *Self-inductance* or *mutual inductance.* Measured in *henrys.*

inductance bridge.—A *Wheatstone bridge* especially arranged for

measurement of *inductance* by the balancing out of resistance and capacity in a circuit. *See illustration.*

inductance coil.—A coil possessing *inductance* or the ability to produce voltage in its own winding or in other nearby conductors. The coil may be used to provide *inductive reactance* in a circuit. *See illustration.*

Indoor Antenna

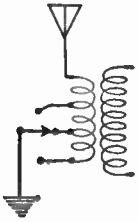


Inductance Bridge

Inductance Coil

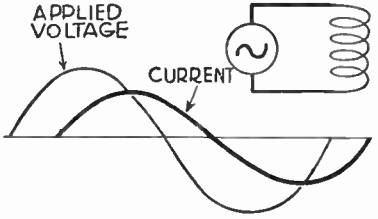
inductance switch.—A switch for connecting or disconnecting portions of a winding. *See illustration.*

induction.—The action by which an electrostatic charge, an electromotive force or a magnetic condition is produced in a material by magnetic or electrostatic lines of force. *Electrostatic induction, electromagnetic induction* and *magnetic induction.*



Inductance Switch

Induction Coil



Inductive Circuit

induction coil.—1—A coiled conductor, with or without an iron core, which utilizes *electromagnetic induction* to cause changes in a current. *See illustration.* 2—An iron-core coil with primary only or with both primary and secondary windings used to produce sudden changes of current or voltage. A *Ruhmkorff coil.*

induction density.—*Flux density.*

induction field.—In the electric or magnetic field existing around a

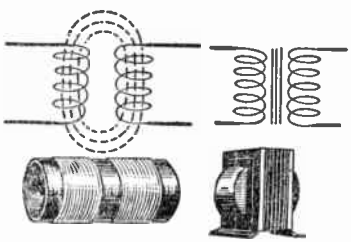
conductor, the portion of that field from which the energy is returned to the conductor rather than being radiated as part of the *radiation field.*

induction generator.—An alternating current machine which acts as a generator when driven at higher than synchronous speed, and as an induction motor operating below synchronism.

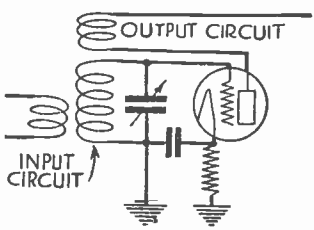
induction instrument.—An instrument in which movement of the pointer results from the action of fixed coils on moving parts in which currents are produced by *electromagnetic induction.*

induction loud speaker.—A *moving coil loud speaker* in which the current reacting with the stationary field is induced in the moving member.

induction machine.—An alternating current machine having one stationary and one rotating winding; an *induction generator* or *induction motor.*



Inductive Coupling



Inductive Feedback

induction motor.—A motor using alternating current to produce a magnetic field which revolves within the machine. This moving field induces currents in the windings of a rotor. Reaction between the rotating field and the conductors carrying the induced currents causes the rotor to revolve with the moving field.

induction regulator.—A voltage regulating transformer with a movable core, or a choke coil with movable core.

induction signalling.—Transmission of intelligence over short distances by means of signals impressed on an *induction field.*

induction voltage regulator.—A voltage regulator in which the relative position of two windings is variable.

inductive capacity.—Specific inductive capacity or *dielectric constant.*

inductive circuit.—A circuit containing considerably more *inductive reactance* than *capacitive reactance,* more inductance than capacity. *See illustration.*

inductive coupling.—A form of coupling in which energy transfer results from *electromagnetic induction,* a single magnetic field

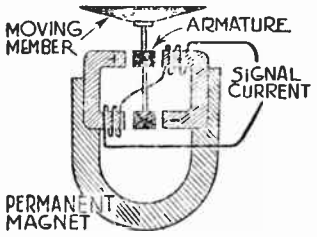
passing through the two coupled circuits. Voltage is induced in the one circuit by the moving lines of force which arise from the changing current in the other circuit. Coupling in which a single *mutual inductance* forms a part of the total inductance associated with each of the two coupled circuits. *See illustration.*

inductive disturbance.—Interference produced by voltages picked up from *inductive fields* close to an antenna.

inductive feedback.—A feedback of energy from an output circuit to an input circuit through an *inductive coupling. See illustration.*

inductive load.—A load circuit in which the *inductive reactance* exceeds the *capacitive reactance.* A load in which the current lags behind the applied voltage. Compare *capacitive load.*

inductive reactance.—The part of the *reactance* which is due to inductance in an alternating current circuit. Measured in *ohms.* Equal to the number of ohms resistance which would have an effect in opposing current flow equal to the effect of the *counter-*



Inductor Dynamic Loud Speaker

electromotive force developed by the moving field around the conductor. The symbol is X_l.

inductive susceptance.—The reciprocal of the *inductive reactance* in a circuit containing negligible resistance. Measured in *mhos.*

inductivity.—*Dielectric constant.*

inductometer.—An instrument for the measurement of *inductance.*

inductor.—An *inductance coil* or *choke coil.* A device used to introduce inductance into a circuit.

inductor alternator.—An *alternator* having a stationary field and stationary armature, the flux changes being caused by a rotating mass of iron called the inductor. A type of alternator used for the direct production of high frequency currents.

inductor dynamic loud speaker.—A *moving iron loud speaker* in which a stationary field, produced by a permanent magnet, is varied in strength by the fields of coils carrying the signal currents. The variation in field strength results in movement of an iron armature between the magnet poles. *See illustration.*

inertia.—The property of continuing at rest when in that condition, or of continuing in motion without change of direction when so in motion. Self-inductance is called electrical inertia.

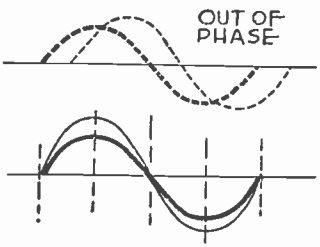
infinite impedance circuit.—A name sometimes applied incorrectly to a *parallel resonance circuit.*

infra-red rays.—*Radiant energy* of frequencies lower than those which are visible; rays lower in frequency than the red rays of the visible spectrum and extending down to the highest radio frequencies.

in phase.—Descriptive of two currents, two voltages, or a current and a voltage which are alike in frequency and which pass through their zero and maximum values at the same instant. *See illustration.*

in-phase component.—The *active component.*

input.—1—The terminals of an electrical instrument at which it receives current or voltage from some other instrument. The



In Phase

entering point for incoming current or voltage from some other part. 2—The power, voltage or current absorbed or used in an electrical device.

input admittance.—The reciprocal of the *input impedance.*

input circuit.—The circuit through which power, voltage or current is applied to any electrical device.

input impedance.—The ratio of the alternating voltage applied at the input of a device to the alternating current produced in the input circuit, other impressed voltages being absent.

input reactance.—The *reactance* presented by a load or an input circuit to the source. The ratio of the sine wave input voltage to the resulting sine wave current of the same frequency and ninety degrees out of phase with the voltage.

input resistance.—The *internal resistance* between the input terminals of any device. The ratio of the sine wave input voltage to the resulting sine wave input current which is in phase with the voltage.

input transformer.—A transformer through which voltages are applied to an amplifying stage, a complete amplifier or other part. *See illustration.*

inside antenna.—An *indoor antenna.*

instantaneous value.—The value of an alternating power, current or voltage at any one point in its cycle. A value intermediate between zero and the peak value. *See illustration.*

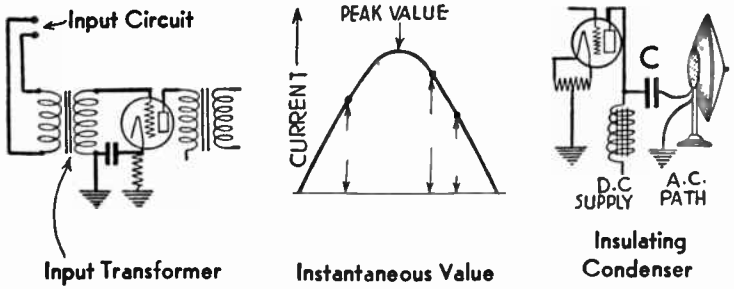
Institute rating.—A rating according to the standards of the American Institute of Electrical Engineers.

instrument.—A device for measuring the existing value of a quantity or effect.

instrument transformer.—A *current transformer.*

insulating condenser.—A fixed condenser for preventing direct current in one circuit from flowing into another circuit. A stopping condenser. *See illustration.*

insulation.—Material which opposes passage of electric current



through it and which is used to electrically separate conductors from other conductors. A non-conductor.

insulation leakage.—The combined effect of *surface leakage* and *volume leakage* of an insulator.

insulation resistance.—1—The *ohmic resistance* of a material to voltage tending to break through it. 2—The net resistance resulting from *volume resistance* and *surface resistance* in parallel.

insulator.—A device or part which separates conductors and sometimes supports them while preventing flow of continuous electric current through itself.

integrating instrument.—An instrument which records the total quantity of current or the total power used during a period of time.

intelligibility.—The percentage of the total number of ideas sent over a transmission system which may be identified or understood at the far end.

intensifier.—A separate radio frequency *stage of amplification* connected between an antenna and the input to a receiver.

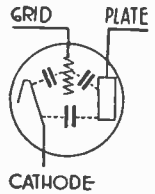
intensity.—The quantity or amount of a force or pressure per unit of cross section, area, volume, etc.

interelectrode capacity.—The *electrostatic capacity* between the elements of a vacuum tube. *Grid-plate capacitance, plate-cathode capacitance, grid-cathode capacitance,* etc. *See illustration.*

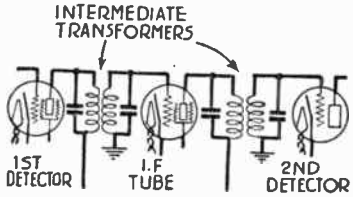
interference.—1—Radio interference is the effect of any electrical waves or fields, other than a desired signal, in producing confused sounds or other signal indications from a receiver. 2—Sound interference is the effect of two sound waves on each other whereby the sound intensity is raised or lowered. 3—Light interference is the effect on each other of two light beams whereby the resulting beam is weakened or broken into bands.

interference eliminator.—A *wave trap,* a bypassing resistance or other device for reducing the effects of radio *interference.*

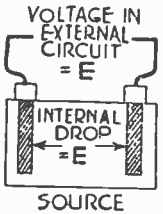
interference guard bands.—The additional range of frequencies above and below those occupied by the modulated carrier and the



Interelectrode Capacity



Intermediate Frequency Amplifier



Internal Drop

tolerance frequency, being allowed for avoidance of *interference.*

interference level.—The *static level.*

interlaced scanning.—A television scanning system in which alternate lines are scanned during successive downward travels of the beam.

intermediate frequency.—1—A frequency higher than that used as *modulation frequency,* but lower than a *carrier frequency.* 2—In *superheterodyne reception,* the frequency produced by beating together of the received modulated carrier and the locally generated oscillator frequency. Abbreviated *i.f.* or *i-f.*

intermediate frequency amplifier.—The portion of a superheterodyne receiver which amplifies the *intermediate frequency.*

intermittent current.—Direct current interrupted at intervals.

intermittent transmitter.—In *facsimile transmission,* a machine which is stopped for reloading after each transmission.

internal capacity.—The *electrostatic capacity* between conductors inside an electrical device; such as the capacity between the elements of a tube. *Distributed capacity.*

internal drop.—The potential difference existing inside a source between the output terminals; equal to the e.m.f. acting to send current through a generator or other source. *See illustration.*

internal output admittance.—The reciprocal of the *internal output impedance.*

internal output impedance.—The ratio of the alternating voltage across the output terminals of a device to the resulting alternating current between these terminals, there being no other impressed voltages.

internal resistance.—The resistance of that part of a circuit which is inside of a source between its output terminals.

international ampere.—The unvarying current which causes a deposit by electrolysis of 0.001118 gram of silver per second with a silver anode from a fifteen per cent silver nitrate solution as electrolyte.

international candle.—A unit of *luminous intensity.* The light emitted by the flame of a sperm candle seven-eighths inch in diameter burning at the rate of 120 grains or 7.776 grams per hour.

international Morse code.—The *continental code.*

international ohm.—The resistance offered to an unvarying electric current by a column of pure mercury of uniform cross section, 106.3 centimeters long, weighing 14.4521 grams, at a temperature of zero centigrade .

international volt.—The electrical pressure or electromotive force which sends a current of one international ampere through a resistance of one international ohm.

interrupted continuous waves.—A *carrier wave* which is broken up into a series of wave trains, the groups of waves occurring at an audio frequency. The interrupted wave is further broken up into the dots and dashes of the telegraphic *code.* Abbreviated *icw. See illustration.*

interrupter.—A device for producing momentary breaks of current in a circuit, such as in the primary of an *induction coil.* A *magnetic interrupter.*

interstage coupling.—The coupling used between the several tubes in *cascade amplification.*

interstage shielding.—Metal *shields* designed to prevent feedbacks between stages in an amplifying system. *See illustration.*

interstage transformer.—A transformer having its primary connected in the plate circuit of one amplifying tube and its secondary connected to the grid circuit of the tube in a following stage in *cascade amplification.*

intervalve.—A British term having the meaning of *interstage.*

intrinsic brightness.—The total *luminous intensity* of a source in any direction divided by the apparent area of the source viewed from that direction. See *brightness.*

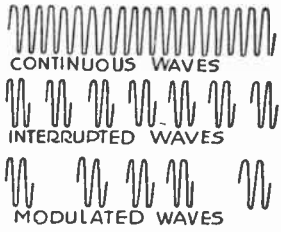
inverse duplex amplification.—A *reflex circuit* in which each reflexed tube carries either a light radio frequency and a heavy audio frequency load, or else a heavy radio frequency and a light audio frequency load.

inverse peak voltage.—*Peak inverse voltage.*

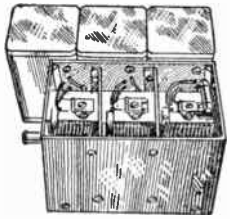
inverse resonance.—*Parallel resonance.*

inverted converter.—A *rotary converter* operated to change direct current to alternating current power, by working as a direct current motor and alternating current generator.

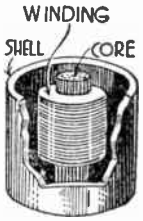
inverted-L antenna.—An *L-antenna.*



Interrupted Continuous Waves



Interstage Shielding



Iron-clad Electromagnet

ion.—An extremely minute particle of an element or compound, a gas or a solid, which has acquired a positive charge or a negative charge for which the ion acts as a carrier through a gaseous space or an electrolyte between electrodes. A positively charged ion is called a *cation* and one negatively charged is called an *anion.*

ionic tube.—A *vacuum tube.*

ionization.—An action by which a gas is made conductive. A result of collisions of *electrons* with atoms of the gas, wherein other electrons are detached from the atoms which then are *positive ions.* This increase of negative electrons and positive ions corresponds to an increase of current passing through the gas. Ionization may be induced by heat, light, electric potential or other conditions which cause greater acceleration of electrons.

ionization potential.—The potential (in volts) required to separate

an electron from an atom in the process of *ionization.* The voltage through which an electron must pass to acquire sufficient energy to liberate an electron from an atom.

ionized layer.—The *Heaviside layer.*

I_p or i_p.—Symbol for *plate current.*

IR drop.—The drop in voltage due to *resistance* in a circuit through which current is flowing. Equal to the current times the resistance.

I^2R loss.—The amount of power which is dissipated as heat in a circuit's resistance. Equal to the square of the current times the resistance. Measured in *watts.*

I.R.E.—Abbreviation for Institute of Radio Engineers.

iron-clad electromagnet.—An *electromagnet* placed within a cup of soft iron so that one end of the magnet core and the rim of the cup form the two poles. *See illustration, page preceding.*

iron-core coil.—An inductance coil having a center of iron which increases the *permeability* of the magnetic path and increases the *inductance* of the winding.

iron loss.—The energy dissipated in the iron core of a transformer or choke coil through production of *eddy currents* and by *hysteresis.* The core loss. Measured in *watts.*

iron pyrites.—A sulphide of iron, used as one of the contacts in a *crystal detector.*

iron vane instrument.—A *vane type instrument.*

I_s.—Symbol for *total emission* current.

isochronous.—Maintaining an unvarying frequency or period.

isolantite.—An insulating and supporting material having small power loss at high frequencies. Dielectric constant 3.6.

isolated.—Descriptive of apparatus not easily accessible to unauthorized persons.

isolated plant.—A private electrical installation having its own generator and prime mover.

isolating switch.—A switch for disconnecting a circuit from its source of power after the circuit has been opened by some other means.

iterative impedance.—In a transmission line, the ratio of the applied *electromotive force* to the resulting *steady state* current in a uniform circuit of infinite length or in a circuit of periodically repeating structures. The geometric mean of the open circuit impedance and the short circuit impedance of a recurrent symmetrical structure.

J

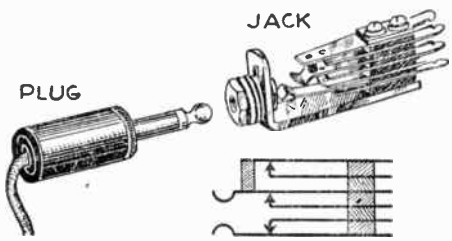
jack.—A set of contacts which open or close to change circuit connections upon insertion or removal of a plug carrying the ends of another circuit. *See illustration.*

jack switch.—A switch of the single or double throw and single- or multi-pole variety with contacts which are opened and closed by means of a cam. *See illustration.*

jamming.—*Interference* from a transmitter which it is not desired to receive.

jar.—A unit of *electrostatic capacity* equal to 0.0011 microfarad or to 1,000 centimeters of capacity.

jigger.—A variable ratio transformer used in transmission. The transformer through which the antenna circuit of a transmitter is coupled to the oscillator circuit.



Jack

Jack Switch

Johnsen-Rahbek effect.—*Electrostatic adhesion.*

joule.—The practical unit of electrical *energy* or *work*. The work done by a power of one watt in one second. The work expended in sending one ampere of current through one ohm of resistance for one second. Equal to 10,000,000 *ergs*.

joulean heat.—The heat produced by the current flowing against the *resistance* of a conductor.

Joule's law.—A law which states that the energy in heat units liberated in a circuit or part of a circuit is equal to the product of the current squared, the resistance and the time in seconds.

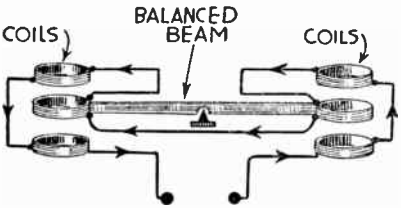
K

K.—Symbol for *dielectric constant* or specific inductive capacity.

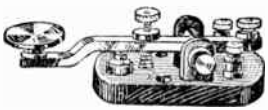
k.—Symbol for a constant, usually for *coupling coefficient*. Abbreviation for the prefix *kilo-*.

kallirotron.—A type of vacuum tube having the property of *negative resistance*.

Karolus light valve.—Apparatus consisting of a *Kerr cell* between two *Nicol prisms*, used to vary in accordance with a signal the amount of light passing through the valve. The first prism polarizes the light, and the second is in such angular position that it freely passes the polarized beam. Signal voltages applied to the Kerr cell rotate the beam, displacing its plane, whereupon the



Kelvin Balance



Key

second Nicol prism shuts off an amount of light proportional to the rotation and to the signal voltage.

kathode.—A *cathode*.

kc.—Abbreviation for *kilocycles* (per second).

keep-alive circuit.—A circuit connected to a *mercury arc rectifier* for the purpose of maintaining heat sufficient to keep mercury vapor in the tube.

keeper.—A piece of iron placed between the poles of a *permanent magnet* to prevent loss in magnetic strength.

Kelvin balance.—An arrangement of coils in which flow of current produces fields which react with springs or weights for measurement of e.m.f. applied to the system. *See illustration.*

Kelvin temperature.—*Absolute temperature*. Equal to the centigrade temperature plus 273.1. Abbreviation is *K*.

Kennelly-Heaviside layer.—The *Heaviside layer*.

kenotron.—A high-vacuum hot-cathode rectifier tube capable of handling high voltages.

Kerr cell.—A device in which the plane of a beam of *plane polarized light* may be rotated or tilted proportionately to a voltage applied on the cell. The light beam is passed transversely through a space between two conductive plates and through a quantity of nitrobenzene contained between the plates. The controlling voltage is applied across the two plates.

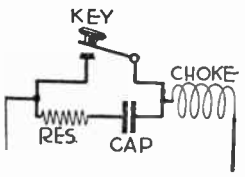
Kerr effects.—*(a) Double refraction* of a beam of *polarized light* when passed through an electrostatic field. (*b*) Rotation of a beam of *polarized light* which is reflected from the surface of a magnet.

key.—A lever operating contacts for opening and closing an electric circuit in the production of *code* signals. *See illustration.*

key chirp.—A sound produced in a receiver when the circuits of a telegraph transmitter continue to oscillate for a short time after the key has been opened.

key click.—*Key thump.*

key filter.—A combination of inductance, capacity and resistance



Key Filter

Key Switch

Knife Switch

or any of these in series or shunt with a transmitter key to prevent too sudden building up of voltages and currents in the controlled circuits. *See illustration.*

key modulation.—Variation of amplitude or frequency of a *carrier wave* by operation of a key in a transmitter circuit to form code signals.

key station.—A station at which a broadcast program originates and from which it is sent over wire lines to a number of other transmitters included in *chain broadcasting.*

key switch.—A switch operated by means of a cam and a small extension handle. *See illustration.*

key thump.—A sound produced in a receiver when a telegraph transmitter commences *oscillation* with great intensity upon closing of its key, also when there is excessive sparking at the key contacts.

keying.—Control of antenna circuit *radiation* by a key switch or relay in such manner that radiation of the carrier wave takes place

when the key is closed and is prevented at the operating frequency when the key is open.

kilo-.—A prefix meaning one thousand times the unit. Abbreviated *k*.

kilocycle.—One thousand cycles per second, a unit of *frequency*. Abbreviated *kc*.

kilogram.—A unit of weight in the metric system. Equal to 2.205 pounds.

kilohertz.—One thousand cycles; one *kilocycle*.

kiloline.—A unit of *magnetic flux* equal to 1,000 magnetic lines of force.

kilometer.—A unit of length in the metric system of measurements. Equal to 0.6214 mile.

kilovolt-ampere.—A unit of measurement for *apparent power* in an alternating current circuit. The product of the number of amperes and the number of thousands of volts. Abbreviated *kva*.

kilowatt.—1,000 watts of electrical *power*. Abbreviated *kw*.

kilowatt-hour.—A unit of electrical *power* equal to 1,000 *watt-hours*.

Kinescope.—A trade name for a type of television picture tube.

kinetic energy.—The energy or working ability which is a result of motion. Energy stored in a moving thing, an electric current, a moving field, etc., is called electro-kinetic energy. Compare *potential energy*.

Kino lamp.—A trade name for a *television lamp*.

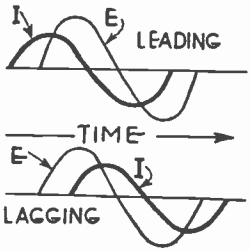
Kirchoff's laws.—1—The sum of all the currents flowing toward any point or junction in an electric circuit is equal to the sum of all the currents flowing away from that point. 2—In any closed electric path the sum of all the impressed *e.m.fs.* is equal to the sum of all the *IR drops* of potential drops around the path.

knife switch.—A switch in which one contact is formed by a flat metal blade and the other by a piece or pieces of metal with which the blade makes contact. *See illustration.*

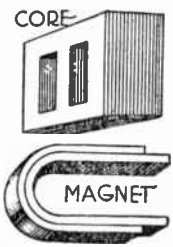
kw.—Abbreviation for *kilowatt*.

L

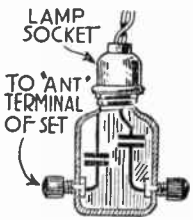
L.—Symbol for *self-inductance* in henrys.
l.—Symbol for *length.*
lag.—*Angle of lag.*
lagging current.—A current in which maximum and zero amplitudes occur after the corresponding amplitudes of the applied voltage. The current in an *inductive circuit. See illustration.*
lagging phase.—Descriptive of an alternating quantity of which the zero point occurs after the zero point of another alternating quantity in the same circuit.
lambda (λ).—Greek letter symbol for *wavelength* in meters.



Lagging Current



Laminated Core
Laminated Magnet



Lamp Socket Antenna

lambert.—A unit of *brightness.* The brightness of a surface which is emitting or reflecting one *lumen* per square centimeter.
laminated core.—A magnetic core composed of many thin sheets of iron laid one over another, individually insulated by coatings of scale or varnish. Reduces the formation of *eddy currents. See illustration.*
laminated insulation.—Insulation made up of many thin layers.
laminated magnet.—A magnet having a *core* made up of several sheets or rods. *See illustration.*
lamp cord.—A flexible cord having a conductor of suitable size for use with incandescent lamps.
lamp socket antenna.—A connection made through a *fixed condenser* to one of the wires entering a lamp socket for the purpose of receiving radio waves picked up by the electric wiring. *See illustration.*
land line.—A transmission line carried over land areas.
landing beam.—A high frequency, sharply directive radio signal

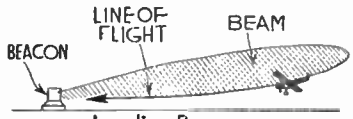
projected along a line slanting upward from the horizontal, used to allow aircraft to make a gliding landing by following the path of constant signal intensity toward the transmitter. *See illustration.*

L-antenna.—An elevated horizontal aerial having the down lead connected at one end; having the form of an inverted "L". *See illustration.*

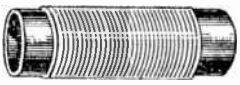
laryngophone.—A device attached to the outside of a person's throat and varying the resistance of an electric circuit in the manner of a *microphone* through vibrations of the flesh.

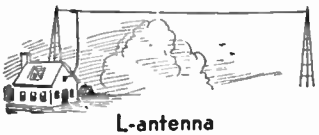
lateral vibration.—*Flexural vibration.* Compare with *transverse vibration.*

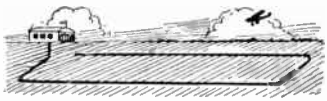
Latour alternator.—A *frequency multiplier* consisting of several stators and rotors on one shaft, in which a supply frequency in one system furnishes power to produce a higher frequency in the following system.



Landing Beam


Layer Winding


L-antenna


Leader Cable

lattice wound coil.—A *honeycomb coil.*

lavite.—An insulating material.

layer winding.—A coil winding in which the adjacent turns are laid evenly side by side along the length of the winding. The entire winding may consist of one or more layers. *See illustration.*

lead.—1—The *angle of lead.* 2—An insulated conductor attached to an electrical device.

lead-acid battery.—A storage battery using a lead peroxide positive plate and a sponge lead negative plate in an electrolyte of sulphuric acid and water. The open circuit voltage is 2.1 per cell.

leader cable.—A long conductor buried in the vicinity of an aviation landing field, *induction signaling* from this conductor allowing a pilot to circle downward toward the field, to locate the runways and determine their direction. *See illustration.*

lead-in.—The conductor connecting the aerial of an antenna to the circuits in a transmitter or receiver. A down lead.

lead-in-bushing.—A tube of porcelain or other insulating material in which a *lead-in* is carried through walls or partitions. *See illustration.*

leading current.—A current in which maximum and zero amplitudes occur before the corresponding amplitudes of the applied voltage. The current in a *capacitive circuit.* Compare *lagging current.*

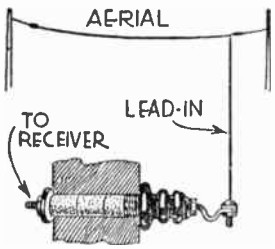
leading phase.—Descriptive of one alternating quantity of which the zero point occurs before the zero point of another alternating quantity in the same circuit.

leakage coefficient.—The ratio of the total magnetic flux to the flux which is useful in producing coupling. See *leakage flux.*

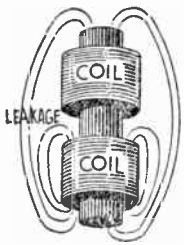
leakage current.—1—The current resulting from *volume leakage* or *surface leakage* in insulators. 2—The *dark current* of a photocell. 3—Current resulting from *condenser leakage.*

leakage detector.—A *ground detector.*

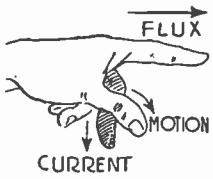
leakage flux.—The lines of force in a magnetic field which do not



Lead-in Bushing



Leakage Flux



Left Hand Rule

encircle all of the turns in a coil and which are not effective in producing induction and *coupling. See illustration.*

leakage inductance.—That value of *self-inductance* of which the inductive reactance would equal the *leakage reactance.*

leakage reactance.—The number of ohms representing the energy loss which is due to failure of some of the lines of force from one winding to link with another winding to which the first is coupled. The loss due to deficient coupling.

leakage resistance.—The resistance to direct current of a condenser's *dielectric.*

leakance.—The conductance which allows flow of *leakage current.* A name sometimes applied to *dielectric conductance.*

leaky condenser.—A condenser having a low *equivalent shunt resistance.*

leaky grid detection.—*Grid current detection.*

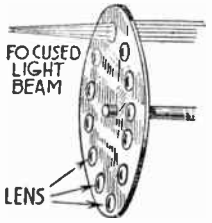
Lecher wires.—A device for measurement of short *wavelengths.* Two long parallel wires are connected to a loop which is coupled to the output of an oscillator, *standing waves* being produced on

the wires. Movement of a short-circuiting bridge along the wires will allow resonance with the oscillator frequency to be indicated at certain points. The length of the wires will be equal to an odd number of quarter-wavelengths.

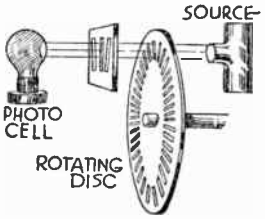
Leclanche cell.—A primary cell using a cylindrical electrode of carbon and dioxide of manganese inside of which is a zinc rod electrode with a solution of sal-ammoniac for electrolyte.

left-hand rule.—A method of showing relative directions of magnetic flux, current flow and conductor motion in an electric motor. Extending the thumb, forefinger and middle finger of the left hand at right angles to one another, if the forefinger points in the direction of magnetic flux and the middle finger in the direction of current through the conductor, then the thumb points in the direction that the conductor is moved in the field. Compare *right-hand rule. See illustration, page preceding.*

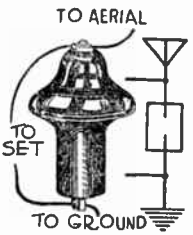
Lenard rays.—*Cathode rays* which are driven through a specially



Lens Disc



Light Chopper



Lightning Arrester

prepared "window" of a *cathode ray tube* into the space outside the tube where they may be applied to various materials.

lens.—A piece of transparent material, as glass, which is so shaped as to cause *refraction* and change the direction of rays of light passing through it.

lens axis.—The *optical axis.*

lens disc.—A form of television *scanning disc* in which each opening is fitted with a condensing lens for the purpose of securing greater brilliancy or light concentration. *See illustration.*

Lenz's laws.—1—An e.m.f. which is produced from a magnetic field by induction tends to set up a current which has a second field opposing any change in the original magnetic field. 2—The total number of cuttings per second between the magnetic lines and the conductors in which induction produces an e.m.f., divided by 100,000,000, equals the number of induced volts.

level.—The *power level.*

level indicator.—A *volume indicator.*

Leyden jar.—A glass vessel having a thin layer of metal on the

outer surface and a similar layer on the inner surface, thus forming a *condenser* with the glass as the dielectric and the metal as the plates.

l-f.—Abbreviation for *low frequency.*

life test.—Operation of a device under conditions approximating normal use for a period of time sufficient to determine changes which would occur in actual service.

light.—Visible light is radiation at wavelengths which affect the sense of sight; wavelengths lying approximately between 0.000039 and 0.000076 centimeters, or between 3900 and 7600 *Angstrom units,* from violet to red. The word also is used to mean *luminous flux,* and in some cases to mean any form of radiation or *radiant energy.*

light cell.—A *photoelectric cell.*

light chopper.—A device for interrupting the light passing to a photocell, thus producing a pulsating current required for *carrier frequency amplification. See illustration.*

light flux.—*Luminous flux.*

light socket antenna.—A *lamp socket antenna.*

light spectrum.—The *visible spectrum.*

light unit.—A unit of *luminous intensity* equal to about 9.615 candlepower. A *carcel.*

light valve.—1—A device utilizing variations in frequency and intensity of current resulting from sounds to vary the width of an opening through which passes the light falling on a photoelectric cell. 2—A *Karolus light valve.*

light waves.—Waves of radiant energy at frequencies which affect the sense of sight, the waves consisting of vibrations taking place transversely to the lines of propagation but otherwise having no definite direction of motion. See *light.*

lightning arrester.—A device which allows current surges in an *antenna circuit* to pass directly to ground without flowing through the receiver circuits. A small gap between two electrodes in air or a vacuum, connected between aerial and ground. Sometimes several small gaps in series between antenna and ground. *See illustration*

lightning switch.—An *antenna switch.*

line.—1—A metallic conductor in a circuit between devices at a distance from each other. 2—Line of force; see *magnetic lines of force* and *electrostatic lines of force.* 3—Line of induction; lines which represent the *magnetic flux* in a magnetic circuit. In air, having unit permeability, the number of lines of induction is the same as the number of *magnetic lines of force.* 4—In television; one of the horizontal or vertical strips into which a complete picture or image is divided during the process of *scanning. See illustration, page following.*

line amplifier.—An *audio frequency amplifier* taking the output of one or more microphones and, after amplification, feeding the

signals to a transmission line.

line drop.—The electromotive force used in sending current through the conductors between a source and its load. Measured in *volts*. *See illustration.*

line-drop voltmeter compensator.—A device which allows a voltmeter to indicate the voltage at some distant point of a circuit.

line equalizer.—An *attenuation equalizer.*

line impedance.—*Iterative impedance.*

line linkage.—*Flux linkage.*

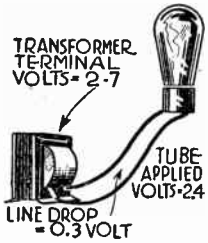
line loss.—*Attenuation* occurring in a transmission line and in devices forming a part of the line.

line radio.—*Wired radio.*

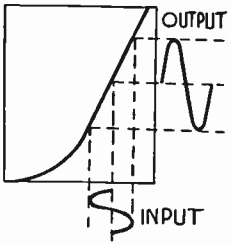
line relay.—A *relay* having its coil connected in a main line.

line voltage regulator.—A device which reduces the effects of changes in supply line voltage and applies a fairly uniform voltage to a connected circuit, such as to the power unit for a receiver. A *ballast tube* or any type of *voltage regulator.*

Line



Line Drop



Linear Amplification

linear.—A relation between electrical quantities such that change in one is accompanied by an exactly proportional change in another.

linear amplification.—Amplification in which signal output voltage at any frequency and any value is directly proportional to the input voltage. *See illustration.*

linear constant.—An electrical constant measured per unit length of transmission line.

linear decrement.—The difference between successive amplitudes in the same polarity of a *damped oscillation or wave* in which these differences are of the same or constant value.

linear detection.—Any form of detection which results in output voltages directly proportional to the applied signal voltages throughout the useful range of the system.

linear distortion.—Amplitude distortion.

link circuit.—Two *inductance coils*, conductively connected together, each being inductively coupled to one of a pair of additional cir-

cuits between which a transfer of energy is desired. *See illustration.*

link coupling.—Coupling provided between two circuits by an intermediate *link circuit.*

link fuse.—A *fuse* consisting of a short length of open wire between two fastenings.

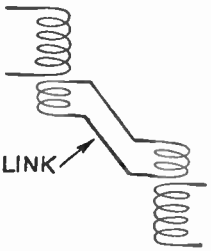
linkage.—*Flux linkage.*

liquid rectifier.—An *electrolytic rectifier.*

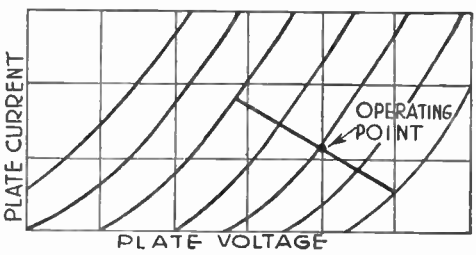
liquid rheostat.—A *rheostat* using the resistance of water in which is dissolved some salt or acid, adjustment being secured by moving one of the electrodes in the liquid.

Lissajous figures.—Curves which are the result of combining two *simple harmonic motions,* such as the motions of two pendulums differing in phase.

lithium.—An alkali metal, somewhat similar to sodium, employed in photocell cathodes having maximum response at the extreme violet end of the visible spectrum.



Link Circuit



Load Line

litzendraht wire.—A conductor formed of numerous separately enamelled strands which are transposed at intervals so that each one takes up successively all possible positions in the cross section of the whole conductor. Used to reduce *skin effect.* The name often is abbreviated to "litz".

load.—A *resistance, reactance, impedance,* or combination of these in which work is done by electric power.

load center.—A point in a circuit at which, for purposes of calculation, it may be assumed that the whole load is located.

load compensator.—A device which varies the power of a motor driving a high frequency alternator in accordance with the load.

load factor.—The ratio of the *average* power to the *peak* power during a specified period of time.

load line.—A line drawn upon a series of *plate characteristics* and used for determination of plate current change with grid voltage change, also for determination of *harmonic distortion,* when a specified plate load is used. The load line crosses the intersection

of the grid bias curve with the plate voltage ordinate, and the slope of the line is made proportional to the reciprocal of the plate load in ohms. The ratio of milliamperes plate current change to volts change in plate potential, as shown by the load line slope, is made equal to the ratio of 1000 to the load resistance in ohms. *See illustration.*

loaded antenna.—An antenna circuit containing a *loading coil.*

loaded line.—A circuit in which the normal reactance has been altered by addition of *lumped reactances* to improve the performance.

loading coil.—A coil inserted in a circuit for the purpose of increasing the total inductance without providing additional coupling with any other circuit. Used to lower the *resonance frequency* of the circuit.

local action.—An effect within a *galvanic* or *electrolytic cell* by which electromotive forces are generated between active material and impurities or between separate portions of the active material.

local amplifier.—An *audio frequency amplifier* placed near one or more loud speakers, to increase the strength of a transmission line signal to the degree required for speaker operation.

local oscillations.—1—Any *oscillatory current* generated within apparatus at the receiving end of a radio transmission system. 2—Oscillatory currents produced in certain receivers, as superheterodynes, or in frequency meters; and combined with other oscillations received from external sources to generate *beat frequencies* or create the condition of *zero beat.*

log.—A record of tuning dial settings. A record of stations with which a transmitter has been in communication.

logarithm.—The power to which a number, called the base, must be raised to equal another number called the antilogarithm. The base for common logarithms or Briggs logarithms is 10; the base for natural logarithms is 2.71828.

logarithmic decrement.—A quantity which is a measure of the *damping* in an oscillatory circuit, and which is inversely proportional to the *selectivity.* It is the natural logarithm of the ratio of two successive maximum amplitudes of the same polarity. In a simple radio circuit the logarithmic decrement is equal to the square root of the quotient of the capacity divided by the inductance, multiplied by π (3.1416) times the resistance. The symbol is the Greek letter delta (δ). *See illustration.*

logarithmic horn.—An *exponential horn.*

long waves.—Radio waves having a length of 600 meters or more; frequencies lower than 500 kilocycles.

longitudinal effect.—Electrical polarization and mechanical extension in the same direction in a *piezo-electric crystal.*

longitudinal vibration.—Motion of the disturbed particles forming a wave in the direction of wave propagation. A characteristic of sound waves. Compare *transverse vibration.*

loom.—*Circular loom.*

loop.—1—An *antinode.* 2—A *loop antenna.*

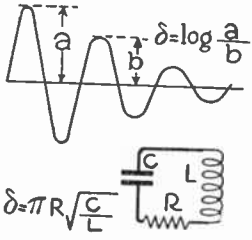
loop antenna.—A radio *antenna* consisting of one or more turns or loops of conductor supported on an open framework which is approximately rectangular or circular. A tuning condenser is connected across the ends of the loop conductor, the combination being made resonant at the received or transmitted frequency. *See illustration.*

loop circuit.—A circuit in which all energy consuming devices are at the same electrical distance, through conductors, from the source.

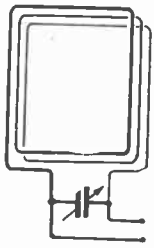
loop receiver.—A receiver especially designed for operation with a *loop antenna.*

loose coupler.—An inductive coupling device providing a small *coupling coefficient.*

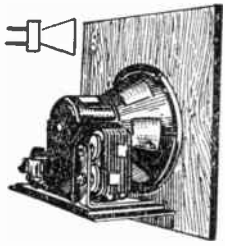
loose coupling.—A coupling providing little transfer of energy;



Logarithmic Decrement



Loop Antenna



Loud Speaker

usually one in which the *coupling coefficient* is less than 0.5. A coupling between two circuits in which the *mutual inductance* is small compared with the *self-inductance.*

Lorenz coil.—An inductance coil using a *basket winding.*

loss.—*Attenuation.*

losser circuit.—An oscillatory circuit having an amount *of high frequency resistance* sufficient to prevent *sustained oscillations* at the circuit's natural frequency.

loud speaker.—A device which produces sound waves from electric power applied to it, the sounds being of sufficient intensity to provide good audibility in a room or the open air. *See illustration.*

low frequency.—A frequency below radio frequencies; *a commercial frequency* or an *audio frequency.* Sometimes defined as a frequency lying between 10 kilocycles and 100 kilocycles. Abbreviated *l-f.*

low-loss.—Having but little *high frequency resistance,* consequently having but little loss of radio frequency energy.

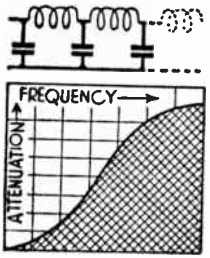
low pass filter.—A filter system which is designed to allow comparatively free passage of low frequency and direct currents in a circuit but which greatly attenuates all frequencies above a certain *cutoff frequency*. *See illustration.*

low tension.—Relating to parts in a *filament circuit*, which operate at low voltages.

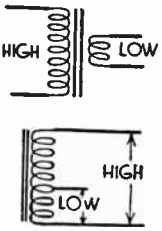
low voltage winding.—In a transformer, the winding having fewer turns. *See illustration.*

lower side band.—The *side frequency* which is less than the *carrier frequency*.

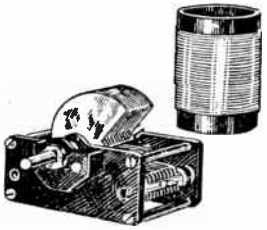
lumen.—A unit of light. That *luminous flux* from a point source of one *international candle* which passes through a solid unit angle, or passes through one square centimeter of a surface at a distance of one centimeter from the source. Equal approximately to the total flux from such a source divided by 12.57. The light reaching an



Low Pass Filter



Low Voltage Winding


Lumped Capacity and Inductance

area of one square foot when the illumination intensity is one *foot-candle*.

lumen-hour.—A unit of quantity of light, equal to a luminous flux of one *lumen* flowing for one hour.

luminescence.—An emission of light not due to heating, but resulting from electrical action, chemical action, etc. Compare *incandescence*.

luminosity.—The quality of being *luminous*.

luminosity curve.—A curve showing the relation between *wavelength* of light and the *luminous flux*.

luminous.—Descriptive of a body which is emitting *light*.

luminous efficiency.—The ratio of the *luminous flux* to the *radiant flux* in the radiation from a given source. The unit is lumens per watt.

luminous flux.—1—The rate of flow of light radiation with respect to the sense of sight. Measured in *lumens*. The symbol is *F* or *f*. 2—Sometimes used as meaning quantity of light, the product of flux and time.

luminous intensity.—The amount of light per unit of area of the emitting source. The *luminous flux* emitted by a source through a solid unit angle. The unit is the *international candle*. The symbol is *I*.

lumped capacity.—A capacity existing in a relatively small physical space, such as in a condenser of usual construction. *See illustration.*

lumped inductance.—An *inductance* existing in coil windings.

lumped plate voltage.—The plate voltage plus the product of amplification coefficient and grid voltage on the tube.

lumped reactance.—A condenser having capacity or a coil having inductance concentrated within small space.

lux.—A unit of illumination equal to one lumen per square meter. Equal to 0.1 *milliphot* and approximately to 0.093 *foot-candle*.

M

M.—Symbol for *mutual inductance* in henrys. Abbreviation for the prefix *mega-*.

m.—Symbol for *meter,* a measure of length. Abbreviation for the prefix *milli-*.

magnesium.—An alkaline earth of which compounds are used as cathodes in photocells having maximum response in the ultra-violet.

magnet.—A piece of iron or steel which has the property of attracting other pieces of iron and steel. A *permanent magnet* or a temporary magnet. Compare *electromagnet.*

magnet wire.—Insulated copper wire of gage sizes generally used for windings of electromagnets, choke coils, transformers, etc.

magnetic.—Having the properties of a *magnet:* utilizing magnetic lines of force.

magnetic amplifier.—A *magnetic modulator.* A variable impedance for controlling antenna current in a transmitter.

magnetic bearing.—A bearing or direction determined with reference to a magnetic pole of the earth.

magnetic blowout.—An *electromagnet* with its field at right angles to the path of an arc formed between two electrodes or between two current carrying contacts as they separate. The field displaces the charged *ions* in the arc, thus forcing it to one side and quickly stopping flow of current. *See illustration.*

magnetic brake.—A metal disc turning between magnet poles; the resulting production of *eddy currents* in the disc causing development of a retarding force.

magnetic bridge.—An instrument for measuring *permeability.*

magnetic circuit.—A completely closed path through which pass *magnetic lines of force* or magnetic flux. With a magnet; the circuit consists both of the path within the magnet and the path external to the magnet. *See illustration.*

magnetic compass.—A device which indicates geographical direction by action of the earth's magnetic field on a suspended bar magnet.

magnetic component.—The *electromagnetic component.*

magnetic core.—See *core.*

magnetic coupling.—*Inductive coupling.*

magnetic current.—The rate of change of *magnetic flux.*

magnetic curve.—The *magnetization curve.*

magnetic cycle.—The series of changes which occur in the magnetization of a material being affected by an alternating *magnetomotive force.*

magnetic damping.—*Damping* of instruments by means of the reaction between two magnetic fields acting to make the pointer dead beat in its movement. The magnetic fields are produced from eddy currents set up in a piece of metal attached to the pointer and free to move between the poles of the instrument's permanent magnet.

magnetic detector.—A device in which the magnetism of an iron member is varied by a modulated carrier; the effect of *hysteresis* so distorting the signal that an audio frequency component is produced.

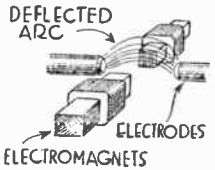
magnetic energy.—*Electrokinetic energy.*

magnetic fatigue.—An increase of *hysteresis* occurring after many changes of magnetism. *Aging* of iron.

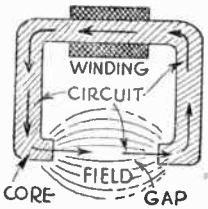
magnetic field.—The space occupied by magnetic lines of force. The space within which there are magnetic effects. *See illustration.*

magnetic field intensity.—*Magnetizing force.*

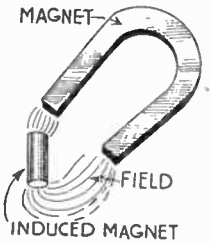
magnetic flux.—The total flow of *magnetic lines of force* or magnetism through a magnetic circuit. Measured in *maxwells* or in number of magnetic lines. The number of lines is equal to the *magnetomotive force* in gilberts divided by the *reluctance* in oersteds. The symbol is the Greek letter phi (ϕ).



Magnetic Blowout



Magnetic Circuit and Field



Magnetic Induction

magnetic flux density.—The number of *magnetic lines of force* in a unit cross sectional area of a magnetic field. Measured in *gausses* or in lines per square inch. The symbol is B.

magnetic force.—The force exerted on a unit pole in a magnetic field. Sometimes used as meaning *magnetomotive force*, or in the sense of *flux density.*

magnetic friction.—The retarding force exerted on a *magnetic material* moving in a *magnetic field.*

magnetic hysteresis.—*Hysteresis.*

magnetic induction.—1—The effect of a magnetic field by which it makes a piece of iron or steel into a magnet. *See illustration.* 2—*Magnetic flux density.*

magnetic inductive capacity.—*Permeability.*

magnetic instrument.—An instrument which indicates the current

in a circuit by using the reaction between magnetic fields which are produced or controlled by the measured current. *Moving coil instruments, vane type instruments,* etc.

magnetic intensity.—*Magnetic flux density.*

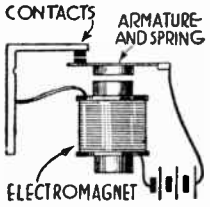
magnetic interrupter.—Two contacts arranged to suddenly open and close an electric circuit. The contacts are automatically operated by an *electromagnet* connected in the circuit, opening of the contacts stopping the magnetizing current and allowing the contacts to again close. *See illustration.*

magnetic key.—A *key switch* in which the current carrying contacts are held together by an electromagnet and are allowed to open only at an instant of zero current after the key is released.

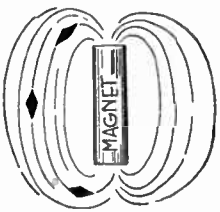
magnetic lag.—*Hysteresis.*

magnetic leakage.—*Leakage flux.*

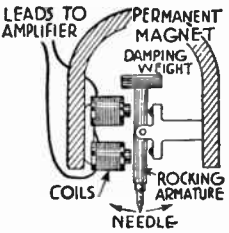
magnetic lines of force.—1—In the space around a current carrying conductor, or a magnet, lines which represent the direction in



Magnetic Interrupter



Magnetic Lines of Force



Magnetic Pickup

which a short magnetized needle would point as moved through the space. Also called unit lines of force or G.G.S. lines of force. The *magnetizing force* at any point is indicated by the number of lines per unit of area. In a unit magnetic field there is one line per square centimeter of cross section. *See illustration.* 2—The magnetic line of force is a unit of *magnetic flux.* Lines per square centimeter or per square inch are measures of *magnetic flux density.*

magnetic linkage.—*Flux linkage.*

magnetic loud speaker.—Any *loud speaker* in which the sound producing mechanical movements are the result of magnetic reactions. See *electromagnetic loud speaker.*

magnetic material.—Any substance which may become a *magnet.* Iron and steel are the chief magnetic materials. Nickel and cobalt are slightly magnetic.

magnetic microphone.—Any *microphone* with which the signal output is generated in a coil which is moved within a magnetic field. An *electromagnetic microphone.*

magnetic modulator.—A device which causes *modulation* by the unequal changes of magnetic flux in an iron core acted upon by a magnetizing current which varies at the modulating frequency.

magnetic moment.—The product of the strength of a magnetic pole and the distance between the poles.

magnetic needle.—A small permanent magnet pivoted or suspended so that it moves into line with the direction of a *magnetic field* surrounding it.

magnetic pickup.—A *phonograph pickup* in which the electrical output results from needle controlled movement of a portion of a magnetic field, the changing flux producing signal currents in a coil associated with the field. *See illustration.*

magnetic polarity.—See *polarity.*

magnetic pole.—The place at which *magnetic lines of force* leave or enter a magnet or source of magnetic flux. See *unit pole.*

magnetic potential.—The potential through which a *unit pole* is moved in bringing it from infinity (zero potential) to the point being considered.

magnetic rectifier.—A *vibrating rectifier.*

magnetic saturation.—The magnetic condition of an iron core when further increase in *magnetizing current* in the winding produces but little increase of *magnetic flux.*

magnetic shield.—An iron enclosure for protecting apparatus against *magnetic fields* which are forced to flow in the shield rather than through the apparatus.

magnetic shunt.—A piece of iron located near field poles of a magnet and used to weaken or control the strength of the magnetism in the space between the poles. Often used to regulate the deflection of pointers in *magnetic instruments. See illustration, page following.*

magnetic spectrum.—The effect on a fluorescent screen of *cathode rays* which have passed through a magnetic field.

magnetic storm.—Irregular changes in the paths taken by the earth's magnetic field, movements of these lines of force causing *static* interference.

magnetic strength.—*Magnetic flux density.*

magnetic stress.—A *stress* due to the forces existing in a magnetic field.

magnetic tick.—A faint ticking sound heard upon suddenly magnetizing or demagnetizing iron. The Page effect.

magnetic vane instrument.—A *vane type instrument.*

magnetism.—The force which produces magnetic effects and which appears in a *magnet.*

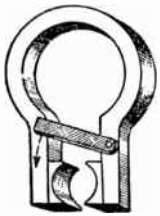
magnetite.—An oxide of iron, sometimes found in a naturally magnetized state and called loadstone or lodestone.

magnetization.—The magnetic strength of a body. Also, the act of making magnetic or *magnetic induction.*

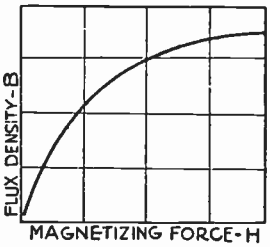
magnetization curve.—A curve showing the relation between *magnetizing force (H)* in ampere-turns or gilberts per centimeter and the *magnetic flux density (B)* in lines per square centimeter produced in a magnetic material. A B-H curve. *See illustration.*

magnetizing current.—The current which is required in magnetizing an iron *core,* a current just sufficient to produce a *counter-electromotive force* equal to the applied voltage. Generally used as meaning the current which flows in the primary of a transformer when the secondary is open circuited, this being equal to the above magnetizing current plus that required to overcome eddy current and hysteresis losses.

magnetizing force.—The *magnetomotive force* per unit length of magnetic circuit. The magnetic pressure or force required to produce a given number of flux lines in a certain length of a magnetic path. Measured in *gilberts* or *ampere-turns* per centimeter length



Magnetic Shunt



Magnetization Curve

Magnetostriction Oscillator

of path, or else in ampere-turns per inch length of path. The symbol is *H.*

magneto.—An electric generator using *permanent magnets* to produce its field.

magnetomotive force.—The force which acts to produce *magnetic flux* or lines of force in a magnetic circuit. Measured in *ampere-turns* or in *gilberts.* Magnetomotive force in gilberts is equal to the product of the magnetic flux in lines and the reluctance in oersteds. The symbol is *F.* Compare *magnetizing force.*

magnetophone.—A *magnetic microphone* in which the moving coil is flat and of light weight, being moved in the magnetic field by sound waves striking directly against it.

magnetostriction.—The effect which produces a change in the shape or size of a body which is magnetized. The quality is possessed by nickel and some magnetic alloys.

magnetostriction loud speaker.—A *magnetic loud speaker* in which the mechanical forces producing sound waves are the result of *magnetostriction.*

magnetostriction oscillator.—A low frequency oscillator using a rod possessing magnetostriction qualities as a means for regenerative coupling in a vacuum tube circuit. The circuit generates oscillating currents controlled in frequency by the natural frequency at which the rod vibrates. This frequency is dependent on sound velocity in the rod's material and on the dimensions of the rod. The action is similar to the *piezo-electric effect. See illustration.*

magnetron.—A two-element vacuum tube or diode used as an *oscillator.* A varying magnetic field around a large filament carrying alternating current deflects the electron stream and causes variations in the electron flow to the plate, which forms a cylinder enclosing the filament.

magnification.—*Amplification.*

main.—A circuit supplying current to several consuming circuits connected to it through fuses or circuit breakers.

mains.—Electric light and power supply lines.

manganese steel.—A steel alloy which is nearly *non-magnetic.*

manganin.—A resistance metal composed of copper, manganese and nickel.

Mansbridge condenser.—A *fixed condenser* having metal foil for plates and waxed paper for dielectric. A paper condenser.

manual regulation.—Control or adjustment by hand operated devices.

Marconi antenna.—An antenna circuit of which the ground forms an essential part. *See illustration, page following.*

Marconi coherer.—A *coherer* detector using particles of iron and silver.

marine galvanometer.—A *galvanometer* so mounted that motion of the instrument does not alter its readings.

marker beacon.—A transmitter of limited power placed along airways to indicate obstructions, to indicate the ending of one and the beginning of another radio range beam, to indicate flying field boundaries, etc.

marking wave.—The *working wave* in compensation signalling.

masking effect.—The effect by which one sound which is increasing in intensity finally prevents hearing another sound of different pitch.

mass.—The quantity of matter contained in a body. The quality of a body by which it exhibits *inertia,* and which allows it to be acted upon by gravity. Measured in units of weight; pound, gram, etc.

mass resistivity.—The resistance of a certain mass or weight of a substance when it occupies a certain length. For example, the resistance of a wire of uniform cross section, weighing one gram and having a length of one meter.

mast.—An elevated support for a radio antenna.

master disc.—A *wax master* or a *metal master* in the disc method of sound recording.

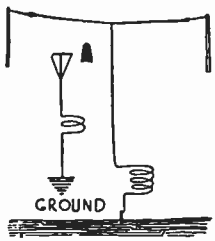
master negative.—The *metal master* in disc recording.

master oscillator.—A *radio frequency oscillator* determining and controlling the frequency of an amplifier which delivers an output power greater than that of the oscillator itself.

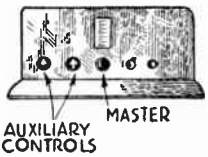
master oscillator, power amplifier system.—A transmitting circuit in which the output of an oscillator is amplified by one or more stages of *radio frequency* amplification.

master positive.—The *mother* in disc recording.

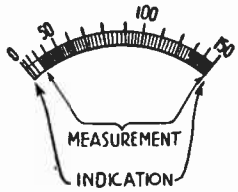
master selector.—A receiver tuning control which brings all *tuned*



Marconi Antenna



Master Selector



Measurement Range

circuits into approximate resonance, with auxiliary means for exact tuning of one or more circuits. *See illustration.*

matched impedance.—The condition under which there is an *impedance match* between two connected circuits.

matrix.—The *metal master* in disc recording.

maximum peak inverse volts.—The highest peak voltage which may be applied to a *rectifier* without causing excessive current flow in a reverse direction.

maximum signal method.—A method of direction finding in which the finder's loop antenna is set in the position of greatest signal strength, the transmitting station then being approximately in the plane of the loop. Compare *minimum signal method.*

maximum undistorted power output.—The output power obtainable from a tube when the input signal does not exceed a value which produces a five per cent distortion due to the second and higher *harmonic* components which are introduced by the tube.

maxwell.—The C.G.S. unit of *magnetic flux,* equal to one magnetic line of force.

May effect.—The effect of light on electrical resistance, as observed in *selenium.*

mean effective value.—The *effective* value.

mean free path.—The average distance traveled in a gas by *electrons* between collision with atoms, or the distance traveled by atoms between collisions with other atoms. See *ionization*

mean spherical candlepower.—The average candlepower of a source in all directions. Equal approximately to 12.566 times the *luminous flux* in lumens.

measurement range.—The range of values within which an instrument's requirements for accuracy are satisfied. Compare *indication range. See illustration.*

mechanical axis.—A *Y-axis* of a quartz crystal.

mechanical impedance.—The opposition of a mechanical system to motion; determining the velocity of motion which results from a certain applied alternating mechanical force. Equal to the applied force divided by the resulting velocity in the same direction, measured at the point of application. One unit of mechanical impedance exists when a force of one dyne produces a velocity of one centimeter per second. A similar unit is used for measurement of *mechanical resistance* and *mechanical reactance.*

mechanical reactance.—That portion of the *mechanical impedance* which results from the *compliance* of the mechanical part. The portion of the mechanical impedance which is analogous to the reactance in an alternating current circuit.

mechanical rectifier.—A rectifier operating by mechanical movement rather than purely electrical action. A *vibrating rectifier.* A *commutator rectifier.*

mechanical resistance.—The result found by dividing the power absorbed in a mechanical system by the square of the alternating velocity at the point where force is applied. The component of the *mechanical impedance* corresponding to ohmic resistance in an alternating current circuit.

medium frequency.—A frequency between 100 kilocycles and 1500 kilocycles.

medium high frequency.—A frequency between 1500 kilocycles and 6000 kilocycles.

meg- or mega-.—A prefix meaning one million times the unit. Abbreviated *M.*

megger.—An *ohmmeter* for measuring high resistances. A magneto sends current through two coil systems, one containing the resistance to be measured in its circuit. The relative torque of the two systems determines the position of an indicating pointer.

Meissner oscillator.—A *radio frequency oscillator* in which a winding in the tube plate circuit and another in the grid circuit are both coupled to a third winding or to a *link circuit* which is tuned

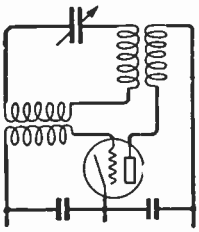
to the desired frequency. Feedback takes place from plate circuit to grid circuit through the link. *See illustration.*

meniscus lens.—A lens which is concave or depressed on one side and is convex or outwardly curved on the opposite side. *See illustration.*

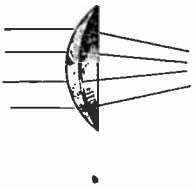
mercury arc lamp.—A lamp in which mercury vapor is made incandescent by a *glow discharge* through the vapor between a negative electrode of mercury and a positive electrode of iron. The light is strong in actinic rays but weak in red rays.

mercury arc rectifier.—A *gaseous conduction rectifier* in which primary electron emission takes place from a heated spot in a pool of mercury, the electrons producing ionization and a heavy current in a vapor of mercury between the heated spot and an anode. Rectified current passes from either of two anodes to the mercury. *See illustration.*

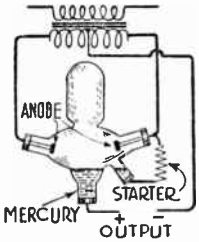
mercury condenser.—A *variable condenser* with air dielectric, the



Meissner Oscillator



Meniscus Lens



Mercury Arc Rectifier

active plate area being varied by moving the plates into and out of a mercury bath.

mercury interrupter.—A device for rapidly opening and closing a circuit which is carried through a jet of mercury striking against a toothed wheel or a metallic grid which completes the circuit.

mercury switch.—An electric switch consisting of two metallic terminals passed through the walls of an insulating tube containing a small amount of mercury. With the tube level, the mercury connects the two terminals and with the tube tilted the mercury flows to one end and breaks the contact.

mercury vapor rectifier.—A *gaseous conduction rectifier* having a heated cathode and a cold plate or anode in a gas consisting of mercury vapor at low pressure. The cathode may be of the filament type or of the heater type. *See illustration.*

Mershon condenser.—The trade name for an *electrolytic condenser* using a liquid electrolyte.

mesh connection.—A *delta connection.*

messenger cable.—A wire or cable supporting conductors, but not itself carrying current.

metal master.—A sound record disc built up from a shell formed by copper plating the *wax master,* and used for making the *mother.*

metal raceway wiring.—Building wiring carried in flat metal tubes having a removable cover on one side.

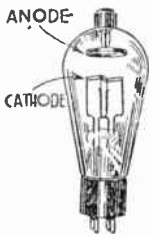
metal rectifier.—A *copper oxide rectifier* or a *sulphide rectifier.* Any rectifier utilizing the one-way conductivity through a contact between different metals or metallic compounds.

metallic line or circuit.—An electric circuit with both sides carried by wires, neither side being grounded.

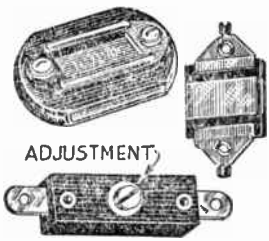
meteorological.—Relating to the atmosphere, the weather, etc.

meter.—1—A device which indicates a value of a measured electrical quantity. 2—A unit of length in the metric system of measurements; equal to 39.37 inches, 3.281 feet, 1.094 yards. Abbreviated *m.*

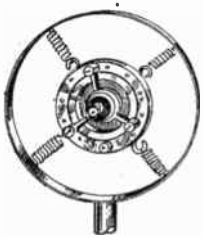
meter-amperes.—A measure of the *radiation* strength of a radio



Mercury Vapor Rectifier



Mica Condenser



Microphone

transmitter. The number of meter-amperes is equal to the maximum antenna current in amperes multiplied by the antenna effective height in meters.

meters per millimeter.—In a *piezo-electric resonator,* the fundamental wavelength in meters divided by the dimension (in millimeters) along which vibrations take place.

metric system.—A system of units based on the meter for length and the gram for mass with decimal divisions and multiples of these for the derived units.

mfd.—Symbol for *microfarad* of capacity.

mho.—A unit of *conductivity* or of *admittance.* The reciprocal of one *ohm.*

mica.—A mineral occurring in crystalline laminations or layers. One of the best insulators and condenser dielectrics. Dielectric constant 3.5 to 6.0.

mica condenser.—A condenser using mica as its dielectric. *See illustration.*

micabond.—Sheet insulation consisting of mica and shellac, or of mica laminated with paper or cloth.

micanite.—Insulation made by holding together small pieces of mica with a binder cement.

micarta.—An insulating composition made of paper and mica.

micro-.—A prefix meaning one-millionth of the unit. The symbol for micro- is the Greek letter mu (μ).

microfarad.—A unit of electrostatic capacity equal to the one-millionth of a *farad*. Abbreviated *mfd*.

microhenry.—A unit of *inductance* equal to the one-millionth part of a *henry*.

microhm.—A unit of *resistance* equal to the one-millionth part of an *ohm*.

micromho.—A unit of *conductivity* or of *conductance* equal to the one-millionth part of a *mho*. The usual unit for measuring *mutual conductance* of a vacuum tube.

micromicro-.—A prefix meaning one-millionth part of the millionth of a unit.

micron.—1—The one-millionth part of a meter. A unit of *wavelength*. See *millimicron*. 2—A unit of pressure equal to that exerted by a column of mercury 0.001 millimeter in height.

microphone.—A device for converting *sound waves* into corresponding changes of electric power. An instrument in which an impedance formed by inductance, capacity, resistance or a combination of these is altered in value by changes in air pressure which result from sounds. A *carbon microphone, condenser microphone,* etc. *See illustration, page preceding.*

microphone amplifier.—1—An *audio frequency amplifier* placed close to a microphone and amplifying the microphone output to a value suitable for line transmission or for application to a station amplifier. 2—An *audio frequency amplifier* in which variations of signal current passing through a magnet winding cause the magnet to vary the pressure on a carbon contact, thus varying the resistance of a second circuit containing the carbon.

microphone button.—A mass of loosely held carbon particles of which the resistance is altered by variations of pressure on the housing.

microphone hiss.—A hissing sound existing in the amplified audio frequency output of a *carbon microphone,* the result of current flow between particles of carbon in the microphone.

microphone hummer.—A device making use of a vibrating electromagnetically operated reed and a *microphone button* for the production of alternating currents at audio frequencies. *See illustration.*

microphone response.—The ratio of the signal voltage applied from a *microphone* on a connected tube control grid to the pressure in *bars* on the microphone diaphragm.

microphone singing.—A sustained audible note from a loud speaker

whose sound waves reach the microphone connected to the input of the amplifying system feeding the loud speaker. See *acoustic feedback*.

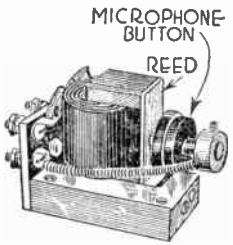
microphone transformer.—A transformer having impedance suitable for coupling a *microphone* to a tube, a line, a volume control, an amplifier or other device. *See illustration.*

microphone transmitter.—A *microphone.*

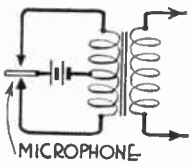
microphonic.—Descriptive of a device, such as an amplifying tube, in which mechanical movement of internal elements causes a corresponding variation of circuit impedance. If the mechanical movements are produced originally by sound waves from a loud speaker, the result is a sustained audible note.

microphonic contact.—An imperfect joint between two conductors such that slight relative movement between them causes a corresponding change in *resistance.*

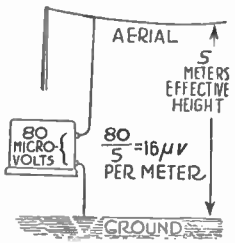
microphonic relay.—An instrument by which signal currents in one



Microphone Hummer



Microphone Transformer



Microvolts per Meter

circuit produce mechanical motion which controls the impedance of a second circuit by microphonic action. See *microphone amplifier (2).*

microvolter.—An instrument for generating measured values of radio frequency voltages at very low potentials.

microvolts or millivolts per meter.—A measure of the *radio field intensity* at a given point of reception. Equal to the number of microvolts or millivolts potential developed between the aerial and ground of an antenna system, divided by the *effective height of the antenna* in meters. *See illustration.*

mike.—A *microphone.*

mil.—One one-thousandth of an inch of length.

mile of standard cable.—See *standard cable.*

mil-foot.—A unit of conductor size; equal to a cross sectional area of one *circular mil* and a length of one foot.

milli-.—A prefix meaning one one-thousandth of the unit. Abbreviated *m.*

milliammeter.—A current measuring meter calibrated in milliamperes or thousandths of an ampere.

millimeter.—A measure of length in the metric system of measurements. Equal to 0.03937 inch. Abbreviated *mm.*

millimicro-.—A prefix meaning the thousandth part of a millionth of the unit.

millimicron.—A unit of *wavelength* equal to the one-billionth part of a meter, or to ten *Angstrom units.* The symbol is $m\mu$.

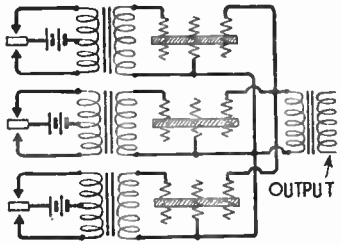
milliphot.—A unit of *illumination* equal to one-thousandth of a lumen per square centimeter. Equal to 10 *lux* or approximately to 0.93 *foot-candle.* See *phot.*

millivolt.—The one-thousandth part of a volt. Abbreviated *mv.*

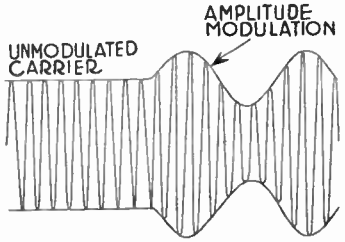
millivoltmeter.—A voltmeter calibrated to read directly in millivolts or in thousandths of a volt.

millivolts per meter.—See *microvolts or millivolts per meter.*

minimum signal method.—A method of direction finding in which the *direction finder's* loop antenna is set in the position of weakest signal, with the transmitting station in a line perpendicular to the



Mixer



Modulated Wave

plane of the loop. Compare *maximum signal method.*

mirror galvanometer.—A *reflecting galvanometer.*

mitis iron.—A steel alloy containing a small quantity of aluminum.

mixer.—A control device which allows varying of the intensities of signal voltage from several different microphones or other sources which are combined or blended in various proportions to form the input to an amplifier. *See illustration.*

mixer tube.—The *first detector* in superheterodyne reception.

mm.—Symbol for *millimeter,* a unit of length.

mmfd.—Abbreviation for *micro-microfarad* of capacity.

mobile receiver.—A radio receiver designed to function while in motion. A receiver for use in an airplane, an automobile, a ship, etc.

modulated oscillator.—A radio frequency oscillator of which the output carries *modulation* at an audio frequency.

modulated wave.—*Continuous waves* of which the amplitude or the frequency is periodically varied in accordance with a signal. *See illustration.*

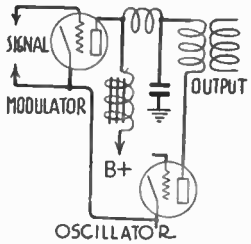
modulation.—The process of varying the *amplitude* or the *frequency* of a wave in accordance with a signal. The wave may be a radio carrier or a guided carrier current. The signal may be that corresponding to voice or music, or to key and buzzer interruptions, or to picture transmission. See *absorption, Alexanderson, buzzer, chopper, grid, Heising* and *key* modulation.

modulation capability.—The greatest *percentage modulation* that may be used without appreciable distortion.

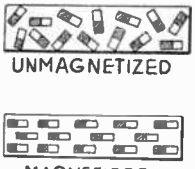
modulation distortion.—An increase in *percentage modulation* of a received signal, due to the signal working on the bend of the grid voltage-plate current characteristic of a radio-frequency amplifying tube and being affected by rectification or *detection.*

modulation factor.—The variation in amplitude of a *modulated wave* from its mean value, expressed as a ratio to the mean value or as a percentage.

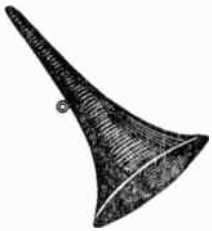
modulation frequency.—The frequency which is impressed upon a *carrier current* or a *carrier wave* in the process of *modulation.* The frequency which conveys the signal or intelligence to be communicated.



Modulator Tube



Molecular Theory of Magnetism


Morning Glory Horn

modulation-frequency ratio.—The ratio of the *modulation frequency* to the *carrier frequency.*

modulation meter.—A device which indicates the *percentage modulation.* Generally an *oscilloscope* showing the wave form of the modulated carrier, or a meter indicating maximum and minimum values of audio frequency wave forms.

modulation percentage.—See *percentage modulation.*

modulation transformer.—A transformer which couples a modulating tube or other modulating device to the oscillator or amplifier whose output is to be modulated.

modulator tube.—1—A vacuum tube which impresses signal variations on the output of an oscillator or amplifier system. Usually a tube with its plate resistance forming part of the power circuit of the oscillator or amplifier. Signal voltages on the grid of the modulator tube vary its effective plate resistance and there are corresponding variations in output power of the oscillator or amplifier. *See illustration.* 2—A name sometimes applied to the *first detector* of a superheterodyne receiver.

molded core.—A *dust core.*

molded insulation.—Insulation which is shaped under the influence of heat and pressure.

molded mica.—Small mica sheets bound together with shellac or other cementing material.

molecular theory of magnetism.—The theory that the particles forming a magnetic material are like small magnets and when acted upon by a magnetic field they align themselves with all negative poles in one direction and all positive poles in the opposite direction, thus forming negative and positive poles at the ends of the body. *See illustration, page preceding.*

molecule.—The smallest particle of a substance which can exist and still have all the attributes of the substance. If the substance is a compound, further breaking up results in chemical change. If the substance is an element, the molecule is the same as an *atom.*

molybdenite.—A *crystal detector* material, sulphide of molybdenum, blue-gray in color and having a metallic lustre.

monaural.—Affecting only one ear of a listener. Compare *binaural.*

monel metal.—A natural alloy composed of nickel, copper and iron.

monitor.—A loud speaker, a headset or a receiver operated from the output of a transmitter or amplifier and used as an aural check on performance. Sometimes the word is used as meaning a *frequency meter, modulation meter,* etc., used in observing a transmitter's performance.

monochromatic.—Of only one color.

monochromatic sensitivity of photocell.—Sensitivity of a photocell to a limited range of light frequencies, or to one color. See *color sensitivity.*

Monoscope.—A tube producing a design suitable for testing the performance of a television receiver.

M. O. P. A.—An abbreviation for *master oscillator, power amplifier.*

morning glory horn.—A type of *exponential horn* commonly used with public address loud speakers. *See illustration.*

Morse code.—A system of signals used in American wire telegraphy.

mosaic.—The sensitive surface of an Iconoscope on which the picture image is focused.

mother.—A sound record disc formed from a shell which is produced by copper plating the *metal master.* Used for the production of the *stamper.*

motional impedance.—The vector difference between the normal impedance and the blocked impedance of an *electro-acoustic transducer.*

motor.—A machine which changes electrical power into mechanical power.

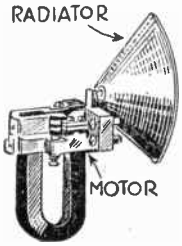
motorboating.—Pulses of sound at low *audio frequencies* produced from a loud speaker as a result of *feedbacks* between amplifying

stages. The feedbacks generally occur through resistance couplings in power unit voltage dividers.

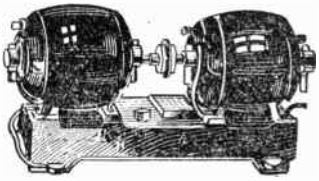
motor-converter.—A machine consisting of an *induction motor* structure electrically and mechanically connected to a *rotary converter* structure so that the change from alternating to direct current is made both electrically and mechanically. The secondary circuit of the induction motor feeds directly into the armature of the converter.

motor-element.—The part of a loud speaker or telephone receiver which converts power from an electrical system into mechanical power. *See illustration.*

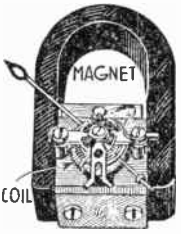
motor-generator.—One or more generators mechanically driven by one or more motors. Used to change one alternating frequency to a



Motor Element



Motor-generator



Moving Coil Instrument

different one, or to change alternating to direct current or direct to alternating current. Also used for changing one direct current voltage to another direct current voltage. *See illustration.*

moulded.—See *molded.*

mouth of horn.—The larger end or outer end of a loud speaker horn.

movietone.—Sound pictures employing the *variable density system.*

moving armature loud speaker.—A *moving iron loud speaker.*

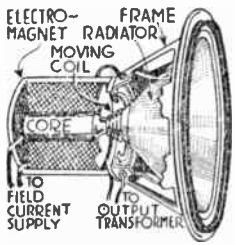
moving coil instrument.—A *direct current* type of measuring instrument consisting of a coil carrying all or a definite fraction of the current to be measured and mounted in the field of a permanent magnet. Reaction between the permanent field and the field set up by the coil causes movement of the coil and an attached pointer. *See illustration.*

moving coil loud speaker.—A loud speaker in which the radiating member is attached to a small coil located in the field of an electromagnet, this coil carrying the signal currents. The varying current in the coil produces around it a varying field which reacts with the field of the electromagnet to move the small coil and radiating member in unison with the signal. *See illustration.*

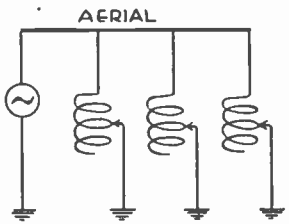
moving coil oscillograph.—A *Duddell oscillograph.*

moving iron instrument.—A current measuring instrument in which one or more pieces of soft iron are caused to move by the magnetic field of a coil, thereby moving the indicating pointer. Used for *alternating current* measurements. Includes *plunger, vane* and *repulsion* types of instrument.

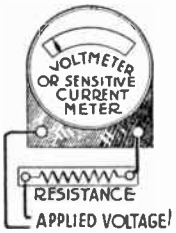
moving iron loud speaker.—A loud speaker in which the sound producing member is vibrated by movement of a piece of iron which is a part of the magnetic circuit energized by signal currents. Includes *magnetic, electromagnetic* and *balanced armature loud speakers.*



Moving Coil Loud Speaker



Multiple Tuned Antenna



Multiplier

mu (μ).—Greek letter symbol for *amplification coefficient* of a tube, or for *permeability* of a magnetic material. Also as a prefix meaning the one-millionth part of a unit.

mu-factor.—In a tube having the current of one electrode affected simultaneously by the potentials of two separate electrodes, the ratio of change between these two potentials which will maintain a constant current in the first electrode considered.

multi-beacon.—A *triple modulation beacon.*

multi-layer coil.—A *honeycomb coil* or a coil having *a banked winding.* Any coil in which the winding consists of two or more superimposed layers of wire.

multi-mu tube.—A *variable-mu tube.*

multiple condenser.—A *gang condenser.*

multiple connection.—A connection in a *parallel circuit.*

multiple regeneration.—*Regeneration* applied to two or more radio frequency amplifying stages, or to the detector and one or more amplifying stages.

multiple selector.—Independent control of two or more tuning units in a receiver.

multiple-series.—Several units or parts connected in a number of series circuits, these circuits then being connected together in multiple or a *parallel circuit*.

multiple tuned antenna.—An antenna system in which inductances are connected at several points between the aerial and the ground or counterpoise, these inductances tuning with the antenna capacity at the operating frequency. *See illustration.*

multiplex circuit.—A telegraph circuit carrying one or more messages in both directions at the same time.

multiplex transmission.—Transmission of two or more signals on one carrier by *double modulation.*

multiplier.—A resistance placed in series with a *voltmeter* to increase the range of the meter. *See illustration.*

multipolar.—Having more than two field poles.

multi-stage amplifier.—An amplifier consisting of two or more stages of *cascade amplification.*

multivalve.—A tube containing two or more complete sets of elements; cathodes, plates and grids.

multivibrator.—A *radio frequency oscillator* producing an accurately controlled fundamental frequency and numerous strong *harmonic frequencies* which are used as standards for the calibration of various instruments, such as frequency meters.

mush.—*Interference* from arc transmitters caused by emission of various irregular frequencies. Any similar interference.

musical oscillator.—An arrangement of circuits oscillating at radio frequencies and producing various audible *beat frequencies* to form musical notes controlled in pitch by altering the circuit constants, usually by alteration of capacity in the oscillatory circuits.

musical spark.—*Spark transmission* in which the frequency of the spark discharge is at a rather high audio frequency.

mute antenna.—An *artificial antenna.*

mutual characteristic.—A graph showing the relation between *grid voltage* and *plate current* in a tube.

mutual conductance.—A measure of the alternating plate current which results from application of a given alternating (signal) voltage to the control grid of a vacuum tube. Mutual conductance in *mhos* is equal to the ratio of small changes of plate current to the changes of grid voltage which produce them, the plate voltage remaining constant; or is equal to the alternating plate current divided by the alternating grid (signal) voltage. Also equal to the *amplification coefficient* divided by the *plate resistance.* The value in mhos generally is reduced to *micromhos.* The symbol is G_m.

mutual detection coefficient.—The ratio of a change in direct *plate current* in a tube to the square of the effective alternating control *grid voltage* which produces the current change; there being no external resistance in the grid circuit or the plate circuit.

mutual inductance.—A property of coupled circuits (usually coils) by which each produces in the other an *electromotive force* whenever there is a change of current and resulting change of flux in either circuit. Measured in *henrys*. Mutual inductance exists in addition to the *self-inductance* of each separate circuit and is equal to the increase in total inductance of two circuits when they are coupled. The mutual inductance in henrys is equal to the number of volts induced in one circuit by a current changing at the rate of one ampere per second in the other circuit. The symbol is *M*.

mutual induction.—Production of an *electromotive force* in one circuit by movement through it of a field arising from a changing current in another nearby circuit.

mv.—Abbreviation for *millivolt*.

mycalex.—A molded insulating material prepared from ground mica and lead borate.

myria-.—A prefix meaning ten thousand times the unit.

N

N.—Symbol for number of turns in a winding.

n.—Symbol for speed, usually in revolutions per second.

napier.—A *neper.*

Napierian or Naperian logarithm.—A system of logarithms based on natural logarithms. See *logarithm.*

National electric code.—A set of rules governing construction and installation of electrical apparatus as approved by the National Board of Fire Underwriters.

natural attenuation unit.—A measure of the ratio between two currents, one being that nearer the source and the other that at a point farther from the source. The number of attenuation units is equal to the natural logarithm of the ratio of the two currents.

natural crystal.—A crystalline mineral compound which may be used in a *crystal detector* because of one-way conductivity through a contact made with its surface.

natural detector.—A *crystal detector.*

natural frequency.—A *resonance frequency* which is determined by the effective inductance and effective capacity in a circuit. In an antenna circuit it is the lowest resonance frequency with no added lumped inductance or capacity.

natural impedance.—*Iterative impedance.*

natural logarithm.—See *logarithm.*

natural period.—The *period* corresponding to the *natural frequency.*

natural wavelength.—The *wavelength* corresponding to the *natural frequency.*

navy socket.—A vacuum tube socket with a high cylindrical shell slotted at one point for the locating pin on a tube base. *See illustration.*

N. E. C.—An abbreviation for *National electric code.*

needle gap.—Two pieces of sharply pointed metal used for measurement of high voltages by breakdown of the air resistance and passage of a spark between them.

needle scratch.—Audio frequency voltages produced by movement of a phonograph pickup needle over unintentional irregularities on the surface of the record.

negative.—Electrical potential below that of the earth. Any potential which is below another potential being considered as the reference point. A part toward which electric current flows outside of a source.

negative bias.—A grid bias potential which is less than that of the filament center or cathode in an alternating current tube or less

than that of the negative end of the filament in a direct current tube. See *grid bias.*

negative carrier.—A *negative ion.*

negative charge.—The quantity of electricity in a body which is at a negative potential with reference to another body which carries an equal positive *charge.*

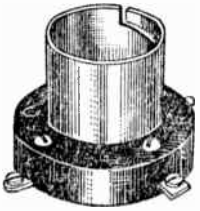
negative compliance.—The condition under which an initial small movement of a mechanical part results in still further movement in the same direction. A decreasing amount of stiffness.

negative corpuscle.—An *electron.*

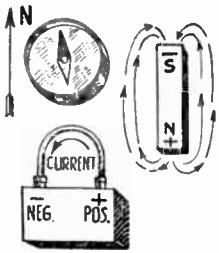
negative electrification.—The condition of a body which is carrying an excess of negative electrons. See *electrification.*

negative electrode.—A *cathode.*

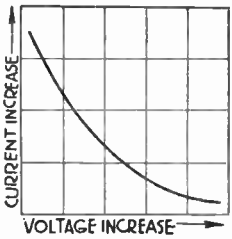
negative glow.—A luminous discharge existing near the cathode of a gaseous tube in which there is a flow of current accompanied by *ionization.*



Navy Socket



Negative Pole



Negative Resistance

negative grid.—The condition in which a control grid is provided with *negative bias.*

negative image.—An image or picture in which lights and shadows are reversed in position from those of the original.

negative ion.—An atom having an extra electron, having a negative charge. An ion which moves toward an *anode.* An anion.

negative modulation.—Television transmission in which decrease of illumination of the picture image causes increase of radiation power.

negative picture.—A *negative image.*

negative pole.—1—The end of a magnetic needle which points toward the south; the south pole. The end of a magnet into which pass the *magnetic lines of force* from the external field. 2—The terminal of an electric source to which returns current from the external circuit, the terminal at lower potential. *See illustration.*

negative reactance.—*Capacitive reactance.*

negative resistance.—1—A condition in an electric circuit wherein an increase of voltage is accompanied by a decrease of current.

A characteristic of an electric *arc* and of a *dynatron* tube. A condition resulting from *secondary emission* in a tube. *See illustration.* 2—The condition under which there is a *feedback* of sufficient energy from a tube's plate circuit to completely overcome the effect of resistance in the grid circuit and to allow sustained oscillations.

negative temperature coefficient.—A characteristic of a substance in which the resistance becomes less as the temperature increases. Carbon and most liquid conductors have negative temperature coefficients.

negative wire.—A wire connected to the *negative* side of the source.

negatron.—A four-element tube having two plates and exhibiting the property of *negative resistance.*

neon arc.—A light source in which ionization allows a *glow discharge* through neon gas. The intensity of the glow is increased by concentrating the effect within a small area.

neon lamp or bulb.—A glass bulb containing two electrodes in neon gas at low pressure. With voltage in excess of a critical value across the electrodes, ionization takes place and the cathode (connected to the negative side of the voltage source) becomes covered with a pink glow.

neon oscillator.—A *neon lamp* and a condenser incorporated in a circuit of which the time constant may be varied over a wide range by adjustment of the condenser's capacity. Variation in the frequency of current fluctuations results from change of condenser capacity. *See illustration, page following.*

neper.—A *transmission unit* in the napierian system. The unit for power measurements is one-half the natural logarithm of the ratio between the two powers considered.

net.—1—A group of two or more radio stations, which may or may not operate on the same frequency, and which habitually communicate with each other. 2—An *attenuation network.*

net reactance.—The difference between the *inductive reactance* and the *capacitive reactance* in an alternating current circuit. The difference is positive when the inductive reactance is the greater and is negative when the capacitive reactance is the greater of the two.

neutral.—Neither negative or positive. A point which is positive with reference to some points and negative with reference to others in an electric or a magnetic circuit.

neutral atom.—A *normal atom.*

neutral relay.—A relay which operates upon change of current without regard to polarity.

neutral wire.—The center wire of a *three-wire system.*

neutralizing.—*Balancing.*

neutralizing condenser.—A *balancing condenser.*

neutrodyne receiver.—A receiver using *tuned radio frequency amplification* in which oscillation in the radio frequency stages is

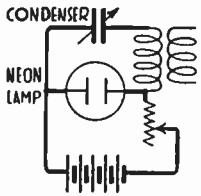
prevented by balancing the tubes' internal capacities with external capacities, allowing a *feedback* equal in effect but opposite in phase to the feedback through the tubes. The tendency toward oscillation which would result from tube feedback is balanced by an opposite effect from the external feedback. *See illustration.*

nichrome.—An alloy of nickel, chromium and iron having high electrical resistance and the ability to withstand high temperatures.

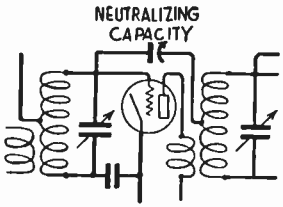
nickel iron.—An alloy of nickel and iron having high permeability, used for *cores* in transformers and chokes.

nickel silver.—A *resistance* alloy composed of copper, nickel and zinc. German silver.

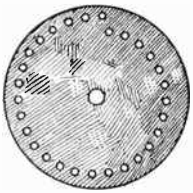
Nicol prism.—A device for producing a beam of *plane polarized light*. Two pieces of transparent calcite, formed by cutting diagonally through a natural crystal, are cemented together. A light beam entering the prism is subjected to *double refraction*, one beam of plane polarized light passing on through the prism while



Neon Oscillator



Neutrodyne Receiver



Nipkow Disc

the second beam (of ordinary light) is reflected from the cemented joint and is deflected to one side.

night effect.—1—An error introduced into aircraft beacon direction determination by the *sky wave*, causing an apparent wavering of the signal beam. 2—*Fading*.

Nipkow disc.—A flat, round plate with a series of openings spaced at equal angles near the outer edge, successive openings being at gradually increasing distances from the center so that the series forms a spiral. At a *television* receiver, rotation of the disc allows viewing or scanning a television lamp to form the small elementary areas of an image, while at a transmitter the disc either directs a light beam over all the elementary areas making up an image or directs illumination from an image to a photocell. A scanning disc. *See illustration.*

noctovisor.—A television apparatus operated with *infra-red rays* which are invisible to the human eye.

nodal point.—A *node*.

node.—A point in a series of sound waves, radio waves or other

vibrations at which there is no motion of the transmitting medium in any direction. A point at which *direct* and *reflected waves* neutralize each other, resulting in no motion of the transmitting medium. A point on a conductor, such as an antenna, at which there is zero voltage or zero current. *See illustration, page following.*

Nodon or Noden valve.—An *electrolytic rectifier.*

noise.—Sound produced by confused or irregular frequencies of wave motion.

noise field intensity.—*Radio noise field intensity.*

noiseless recording.—A film recording system designed to reduce background noises during periods of weak signals or no signals. A device called a ground noise eliminator makes opaque that portion of the *sound track* normally transparent, this being the portion not used at any given instant for the sound record.

no-load current.—*Magnetizing current.*

non-break system.—*Simplex transmission.*

non-conductor.—Any material used to obstruct flow of electricity; an *insulator.*

non-inductive circuit.—A circuit in which the value of *inductance* is negligible in comparison with the *resistance.*

non-inductive resistor.—A resistance unit having negligible inductance. A resistor having a *non-inductive winding;* or one made from a straight conductor, a mass of carbon, etc.

non-inductive winding.—A winding in which half the turns run in one direction and the other half in the opposite direction around the core. The field of one half then neutralizes the field of the other half and there is very little *self-inductance.*

non-linear.—A relation between electrical quantities such that change in one quantity is not exactly proportional to change in another controlling quantity through the working range of a device.

non-magnetic.—Descriptive of any substance which does not become a *magnet;* including practically all common materials except iron and steel.

non-oscillatory circuit.—An *aperiodic circuit;* a circuit which does not exhibit resonance.

non-reactive load.—A load in which the current and voltage are *in phase.*

non-synchronous gap.—A *rotary spark gap* in which separations between the fixed and moving electrodes do not occur in time with instants of maximum voltage.

normal.—A line or a plane which is perpendicular to another line or plane, or to a tangent of a curve.

normal atom.—An *atom* in which the positive and negative charges are equally balanced.

normal cut.—An *X-cut* for a quartz crystal.

normal emission.—*Photoelectric emission* which changes gradually

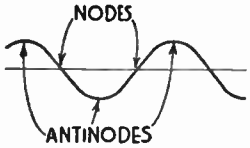
and only slightly as the light frequency is varied over the visible spectrum, as distinct from *selective emission. See illustration.*

normal impedance.—The impedance at the terminals of the electrical or the mechanical system of an *electro-acoustic transducer* when the other system is connected to its normal load.

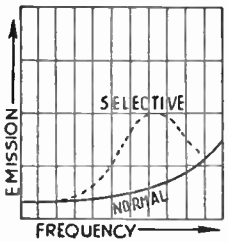
normal input voltage.—The r-m-s voltage of a signal which is modulated at 400 cycles, *percentage modulation* of 30, applied to a receiver's input during standard tests.

normal radio field intensity.—The *radio field intensity* of a carrier wave modulated at 400 cycles with *percentage modulation* of 30, which allows the *normal test output* from a receiver.

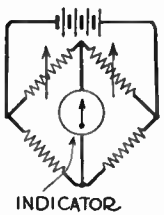
normal test output.—A power of 0.05 watt developed in a *non-inductive resistor* carrying only alternating current of *audio frequency* and connected across the loud speaker terminals of a radio receiver. The resistance is selected of a value which allows



Node



Normal Emission



Null Indicator

maximum power output from the receiver.

north pole.—The end of a magnetic needle which points north. The positive pole of a magnet.

notation by powers of 10.—See *standard notation.*

note magnifier.—A British term for *audio frequency amplifier.*

no-voltage release.—A device including a magnet which holds a switch in its operating position until the line voltage drops to zero, whereupon a spring opens the switch.

***N*-phase.**—More than one phase; *polyphase.*

null indicator.—Any device which indicates zero current flow or an equality of potentials, as required in bridge measurements. *Headphones, galvanometers, vacuum tube voltmeters, etc.,* may be used as null indicators. *See illustration.*

null (test or measurement) method.—An electrical test in which the pointer of an instrument is brought to zero when a balance or other desired condition is attained.

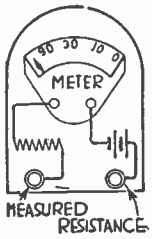
O

observed radio bearing.—A *radio bearing.*

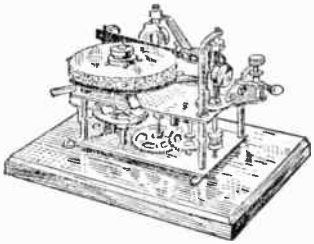
oersted.—The C.G.S. unit of *reluctance.* The opposition offered to flow of magnetic lines of force by one cubic centimeter of a vacuum. The C.G.S. oersted is equal to 0.796 oersteds in the English system of units.

ohm.—The practical unit of electrical *resistance* to flow of current. The resistance which allows one *volt* potential difference to cause a current flow of one *ampere.* The approximate resistance of 1,000 feet of number 10 copper wire or 380 feet of number 14 copper wire. The *international ohm.*

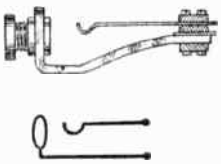
ohmic drop.—The *potential difference.*



Ohmmeter



Omnigraph



Open Circuit Jack

ohmic resistance.—The resistance to flow of *direct current.* That part of the total opposition to flow of any current that is caused by the conductor's material, length, cross section and temperature without consideration of *inductance* or *capacity.*

ohmmeter.—An instrument for measuring and indicating the value of a *resistance* directly in ohms. In one type the unknown resistance is proportional to the deflection of a meter in a circuit including a battery *(see illustration)* while other types are based on *slide wire bridges,* etc.

Ohm's law.—The law which defines the relation between *electromotive force* in volts, *current* in amperes and *resistance* in ohms of a circuit carrying a steady direct current. Using the symbols: E for volts, I for amperes and R for ohms, the law is expressed as follows: $E = I \times R$ $\quad I = E/R$ $\quad R = E/I$

oiled cloth.—Linen or cotton coated with linseed oil.

omega (ω or Ω).—Greek letter symbol for *resistance* in ohms, also for *angular velocity.*

omnigraph.—An instrument for producing audible *code* signals from a buzzer operated with current suitably interrupted by a perforated tape or disc of insulating material. *See illustration, page preceding.*

ondometer.—A *frequency meter.*

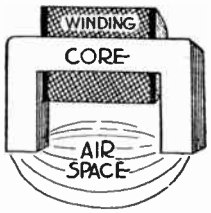
one hundred per cent modulation.—*Complete modulation.*

one-spot tuning.—In *superheterodyne reception*, production of the intermediate frequency by beating of the signal frequency with but one oscillator frequency, rather than with either one of two oscillator frequencies. The given signal frequency is then received at only one position of the tuning control.

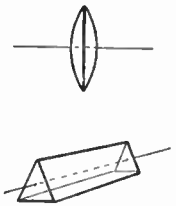
opaque.—Not permitting passage of light, not transparent.

open antenna.—An antenna consisting of an elevated aerial and the ground underneath. A *capacity antenna.*

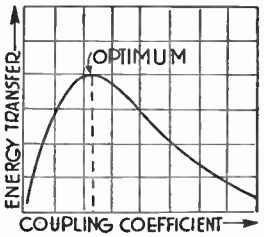
open circuit.—A circuit which is not electrically continuous and in which current can not flow.



Open Core



Optical Axis



Optimum Coupling

open circuit characteristic.—A graph showing relations between voltage, current or other electrical values when external circuits are disconnected or open.

open circuit current.—Magnetizing current.

open circuit jack.—A *jack* which normally opens a circuit and closes it only upon insertion of the *plug. See illustration, page preceding.*

open circuit voltage.—The voltage across the terminals of a source when no current is flowing from it.

open core.—A magnetic *core* extending little if any beyond the ends of its winding, the *magnetic circuit* containing a considerable amount of air or non-magnetic material. *See illustration.*

open fuse.—A fuse wire which is not covered. A *link fuse.*

open gap.—A *plain spark gap.*

open oscillator.—An *oscillatory circuit* in which the elements providing inductance, capacity or both occupy considerable space or extend approximately in a line, the fields set up at all points then

acting together and producing effective *radiation*. *Capacity antennas* and *loop antennas* are open oscillators.

open radiator.—A *capacity antenna*.

open wiring.—Wiring carried in the open upon knobs and cleats.

operation.—*See class A, B, C operation.*

opposite phase.—A *phase difference* of 180 electrical degrees.

optical axis.—In a lens or a crystal, the imaginary straight line following the path taken by the light rays which are not changed in direction in passing through the lens or crystal. The path followed by rays which are not *refracted* or *reflected*. The *Z-axis* in a piezo-electric crystal. A straight line through the center of curvature of a lens. *See illustration.*

optical center.—A point within or near a lens and on the *optical axis*, where rays of light are not changed in direction.

optical lever.—A television *scanning* mechanism in which one element, such as a scanning disc, explores the elementary area image of a preceding element in the system, thus increasing the rate of scanning.

optics.—The science which deals with light and with vision.

optimum coupling.—The degree of coupling or the *coupling coefficient* with which there is maximum transfer of energy. *See illustration.*

optimum reverberation.—The degree of *reverberation* which results in maximum apparent loudness of a sound without greatly lessening the *intelligibility*.

ordinate.—A distance measured vertically on a graph to locate points on a curve. See *coordinates*.

orient.—To turn or to place in a certain position relative to other parts or to the points of the compass.

orthochromatic.—Capable of preserving the natural relations between lights and shades or between colors in photography.

oscillating.—See also under *oscillation* and *oscillatory*.

oscillating arc.—An electric arc used in the oscillatory circuit with continuous wave *arc transmission*. An *arc generator*.

oscillating circuit.—An *oscillatory circuit*.

oscillating component.—The *oscillatory current*, considered by itself, which exists simultaneously with a direct current in a circuit.

oscillating crystal.—A *piezo-electric crystal*.

oscillating current.—An *oscillatory current*.

oscillating tube.—A tube in whose plate or anode circuit, and in whose grid or control circuit there is *sustained oscillation*. A tube which is carrying *oscillatory current*.

oscillation.—1—A high frequency alternating current, especially such a current existing in an *oscillatory circuit* when the energy swings back and forth between inductance and capacity. 2—The condition in which there is *sustained oscillation* in a circuit or an amplifier. 3—See definitions under *oscillating* and *oscillatory*.

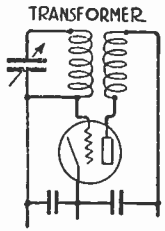
oscillation constant.—The square root of the product of an *inductance* and a *capacity* which together cause *resonance* at the frequency considered.

oscillation frequency.—The frequency at which a circuit exhibits *resonance*.

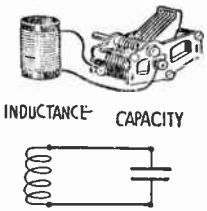
oscillation transformer.—1—A transformer supplying power for a tuned circuit in *spark transmission*. 2—A transformer through which there is a feedback of energy from the plate to the grid circuit of an oscillating tube. *See illustration*. 3—A transformer which couples the output of an *oscillator* to another circuit, or any transformer coupling two *high frequency* circuits.

oscillation valve.—A name sometimes applied to a *thermionic rectifier*.

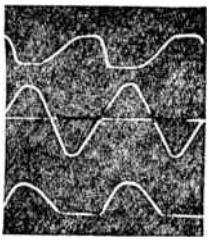
oscillator.—A device without rotating parts which produces alternating voltages and currents of a frequency depending on the electrical characteristics of the device. An *audio frequency oscillator* or a *radio frequency oscillator*.



Oscillation Transformer



Oscillatory Circuit



Oscillogram

oscillatory.—See also under *oscillating* and *oscillation*.

oscillatory circuit.—A low resistance circuit in which periodically reversing currents will flow between the inductance and the capacity at the *natural frequency* of the circuit when an e.m.f. is applied. A circuit in which the square of the resistance in ohms times the capacity in farads is less than four times the inductance in henrys. *See illustration*.

oscillatory current.—A high frequency current flowing back and forth between the inductance and the capacity in an *oscillatory circuit*. Usually such a current of steadily diminishing amplitude.

oscillion.—A *three-element tube*.

oscillogram.—A record of readings from an *oscillograph*. *See illustration*.

oscillograph.—An instrument which makes visible the changes occurring in values of voltage or current in an electric circuit, the *wave form* being viewed on a screen or photographed. Various

types are used, including the *cathode ray oscillograph*, the *string oscillograph*, the *Duddell oscillograph*, etc.

oscilloscope.—An *oscillograph.*

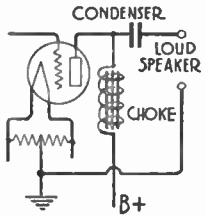
outdoor antenna.—An antenna system having the *aerial* conductor erected out of doors.

output.—The power, current, voltage or field delivered by a source into external circuits or to any form of load.

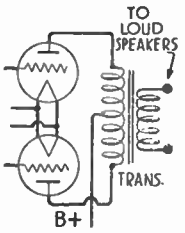
output choke.—An *inductance coil* in the plate circuit of the last tube or tubes in an *audio frequency amplifier*, arranged so that voltage changes across the coil are carried through a coupling condenser to a loud speaker. A means for preventing direct current in the plate circuit from flowing through loud speaker windings. *See illustration.*

output circuit.—A circuit through which energy from a source is delivered to external circuits or to the load.

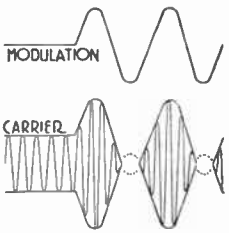
output impedance.—*Internal output impedance.*



Output Choke



Output Transformer



Overmodulation

output resistance.—1—The *plate resistance* of a vacuum tube. 2—*Internal resistance.*

output transformer.—A transformer which couples the *output* of a source, such as a tube's plate circuit, to the *load* on the source. *See illustration.*

overall selectivity.—The net effective *selectivity* of an entire receiver or amplifier; the result of the cascaded selectivities of the separate circuits or stages. Equal to the *n*th root of the product of *n* separate selectivities.

overhead ground wire.—A wire placed above service conductors and grounded for protection against lightning.

overload circuit breaker.—A switch held closed by a catch and released by magnetic action whenever the current in the circuit rises above a certain value.

overload level.—The input power or output power at which a device suffers in performance because of distortion, breakage, overheating, burnout, etc.

overload relay.—A relay which opens a circuit upon a flow of abnormally high current.

overloading.—Operation of any amplifying tube or detector tube at control grid signal voltages having peak values greater than the negative *grid bias,* the result being that the *grid voltage* becomes positive on peak signal amplitudes with consequent *harmonic distortion.*

overmodulation.—Modulation in which *modulation frequency* amplitudes are periodically made greater than the *carrier current* amplitude, resulting in distortion due to complete stoppage of radio frequency oscillations during such periods. *See illustration, page preceding.*

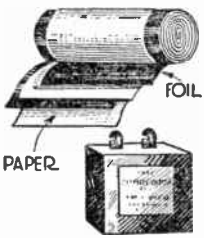
overtone.—A *harmonic* of a sound frequency.

oxide coated filament.—A tube filament consisting of a platinum alloy covered with oxides of barium, calcium and strontium. Has large *electron emission* at low temperatures.

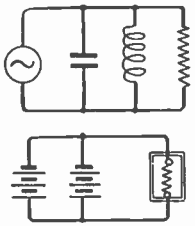
oxide rectifier.—A *copper oxide rectifier.*

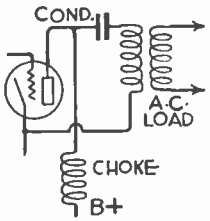
P

P.—Symbol for *average* power in watts.
p.—Symbol for *instantaneous* value of power in watts.
packing of microphone.—Reduction in resistance and response of a *carbon microphone* as a result of excessive pressure on the contacting particles.
pad.—An *attenuation network.*
Page effect.—The *magnetic tick.*
pancake coil.—A *spiderweb coil.* Any coil formed by a spirally wound conductor.
panchromatic.—Capable of preserving or reproducing the natural contrasts between colors which are visible to the human eye.



Paper Condenser


Parallel Circuit



Parallel Feed

panel.—A sheet of metal or of insulating material on which are mounted the various controls, meters and other parts of a radio device.
panel box.—A wood or metal box containing distribution center switches and cut-outs.
paper condenser.—A condenser using paper as its *dielectric. See illustration.*
paraffin.—A vegetable wax used for its insulating and dielectric properties. Has low radio frequency losses. Dielectric constant 2.0 to 2.5.
parallel circuit.—A circuit including several parts, either sources or loads, with one end of every part connected to one of a pair of conductors and the opposite end of every part connected to the second conductor, the pair of conductors thus having between them all the several parts so that current divides between the parts proportionately to their e.m.fs. or to their impedances. A shunt circuit or a multiple circuit. *See illustration.*

parallel cut.—A *Y-cut* for a quartz crystal.

parallel feed.—A connection of the direct current power supply for the plate of a tube to the plate through a choke coil, the audio frequency or radio frequency alternating plate current then taking a separate path through a condenser to a load winding or coupler. Compare *series feed. See illustration, page preceding.*

parallel feed oscillator.—An *oscillator* circuit employing *parallel feed.*

parallel loop distribution.—A series circuit with the outgoing and return conductors kept close to each other.

parallel modulation.—*Heising modulation.*

parallel phase resonance.—*Parallel resonance* with the entering current in phase with the circuit voltage.

parallel resistance.—1—A resistance in a *parallel circuit.* 2—An *equivalent resistance* (in parallel).

parallel resonance.—The condition in a circuit containing capacity and inductance in parallel with each other, and of such values that they produce *resonance* at the frequency existing in the main circuit. The *impedance* offered to flow of current in the main circuit is very great. The total current circulating in the capacity and inductance is greater than the current in the main circuit, and is in phase with the applied e.m.f. Compare *series resonance. See illustration.*

parallel-series.—*Multiple-series.*

parallel-series switch.—A *series-parallel switch.*

paramagnetic.—Having the ability to become a magnet. Having a *permeability* greater than that of air or greater than unity. Iron and steel are the chief paramagnetic materials. See *diamagnetic.*

parasites.—*Static* disturbances.

parasitic currents.—*Eddy currents.*

parasitic oscillations.—Oscillations produced by the *distributed capacities* and *distributed inductances* in circuits; especially such oscillations at frequencies above audibility, which add to the load on amplifying tubes without producing useful sound ouput.

partial tones.—The separate frequencies, or *pure tones,* which enter into a *complex wave* or tone. The fundamental and the separate harmonics each are partial tones.

Paschen's law.—A law stating the relation between the *ionization potential* in a gaseous tube and the product of gas pressure and distance between electrodes.

passive transducer.—A *transducer* supplying no power from itself but taking from the first system all of the power supplied to the second system connected to the transducer.

peak inverse voltage.—The peak voltage applied to a device, such as a rectifier, in a direction opposite to that of normal current flow.

peak separation.—The difference in frequency between the two resonant peaks of the two coupled circuits as used in a *band selector circuit.* See *double hump resonance.*

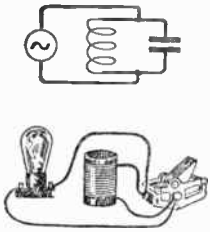
peak value.—The *amplitude* of an alternating quantity. The greatest value of current, voltage, power, etc., reached during an *alternation.* With sine wave currents the peak value is equal to 1.414 times the effective value, and the effective value is equal to 0.707 times the peak value. The symbol for peak voltage is E_m, for peak current is I_m and for peak power is P_m. *See illustration.*

peak voltmeter.—A voltmeter which indicates the maximum value reached by an alternating voltage during an alternation. A *vacuum tube voltmeter.*

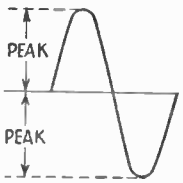
peaked transformer.—An *audio frequency transformer* in which the combination of inductance and distributed capacity produces *resonance* and high sensitivity at some one frequency.

peanut tube.—A small three-element tube about 5/8" diameter.

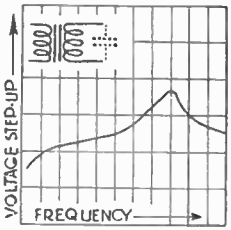
PEC.—An abbreviation for *photoelectric cell.*



Parallel Resonance



Peak Value



Peaked Transformer

PEC amplifier.—Amplifier for the output of a *photoelectric cell.*

Peltier effect.—The change of temperature caused at a joint between two metals by flow of current through the joint.

pentagrid converter.—A single tube which, in a superheterodyne receiver, combines the functions of *oscillator* and *first detector* by employing *electron coupling* to combine an oscillator frequency with the frequency or amplitude of a signal. A grid and anode nearest the cathode produce the oscillator frequency in the single electron stream which is modulated by the signal in other elements between cathode and plate.

pentane lamp.—A type of lamp burning pentane and forming a standard of *luminous intensity* which is equal to 10 candlepower.

pentode.—A five-element vacuum tube. See *power pentode* and *screen grid pentode.*

percentage coupling.—The *coupling coefficient* percentage.

percentage modulation.—The percentage of its mean value by which a *modulated wave* varies from that mean. The ratio (expressed as a percentage) of half the difference between maximum and minimum *amplitudes* to the average amplitude of a modulated wave. *See illustration, page following.*

perfect minimum in direction finding.—The setting of a *direction finder's* loop antenna for the weakest signal with a balancing

condenser properly adjusted, the transmitting station being in a line at a right angle to the plane of the loop.

Perikon detector.—A *crystal detector* formed by contact between a piece of zincite and a piece of chalcopyrite or bornite. A combination crystal detector.

period.—1—The time in seconds required to complete one *cycle* of an alternating quantity. 2—The time required for the pointer of an instrument to make two full swings, one in each direction.

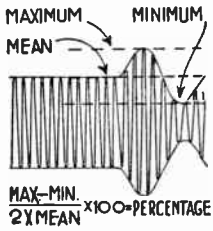
periodic.—Repeating regularly in form and time.

periodic current.—An *oscillatory current* having a frequency determined by the inductance and capacity in its circuit.

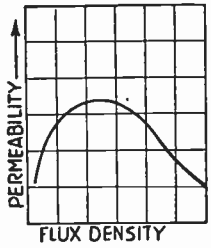
periodic line.—A telegraph or telephone line in the sections of which the capacity, inductance, etc., are not uniformly distributed.

periodic wave.—Any form of *wave motion* which repeats regularly, successive cycles exhibiting similar changes of values.

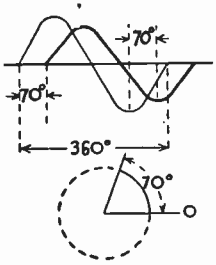
periodicity.—*Frequency.*



Percentage Modulation



Permeability Curve



Phase Angle

permalloy.—An alloy consisting of iron and nickel, having very great *permeability* and used for the cores of audio transformers, chokes and similar parts.

permanent magnet.—A piece of hardened steel which has been magnetized and which retains its magnetic strength.

permanent magnet dynamic loud speaker.—A *moving coil loud speaker* in which the usual electromagnet is replaced by a suitably shaped permanent magnet.

permanent-magnet moving-coil instrument.—An instrument having a coil moving in the field of a *permanent magnet.*

permeability.—A measure of the ability of a material to carry or conduct *magnetic flux* or lines of force. The ratio of the *flux* in lines *(B)* to the *magnetizing force* in gilberts or in ampere-turns per unit length of magnetic path *(H)*. The permeability of air or non-magnetic materials is 1, or unity, and the permeability of magnetic substances is measured in multiples of the permeability of air. The symbol is the Greek letter mu (μ).

permeability curve.—A graph showing the relation between *magnetic flux density (B)* and *permeability* (μ) of a substance.

permeameter.—An instrument for measuring the *permeability* of a magnetic material by testing its effect in a magnetic circuit.

permeance.—The property of a material which allows passage through it of magnetic flux. The reciprocal of *reluctance* in a magnetic circuit.

permittance.—The ability of a *dielectric* to transmit forces accompanying an electrostatic charge. The *electrostatic capacity.*

permittivity.—The *permittance* of a centimeter cube of a substance, measured between opposite faces. Equal to the *dielectric constant.*

perpendicular cut.—An *X-cut* for a quartz crystal.

persistence of vision.—A characteristic of the human eye in which the impression of an image remains for one-twentieth to one-tenth of a second after the real image or object is no longer being viewed.

p.f.—Abbreviation for *power factor.*

phanotron.—A gas-filled hot-cathode rectifier tube handling large currents at moderately high voltages.

phantom antenna.—An *artificial antenna.*

phantom circuit.—In telegraphy or telephony, the use of two separate complete circuits, each employed as one side of a third circuit which is called a phantom circuit.

phantomed cable.—A cable adapted for a *phantom circuit.*

phase.—The position which an alternating force or wave occupies in its *cycle* at a given instant. The position may be defined in number of *electrical degrees,* or in a fraction of the cycle, measured from the preceding zero value or maximum value. The word denotes the portion of a *period* through which an alternating quantity has progressed since passing through zero value.

phase angle.—A time difference in alternating quantities, the difference being expressed in *electrical degrees.* A difference in time between similar values of two alternating quantities, or a difference between two time instants of one such quantity. *See illustration.*

phase angle difference.—The difference between ninety *electrical degrees* and the actual number of degrees by which the current in a condenser leads the applied voltage. In an ideal condenser the current would lead the voltage by ninety degrees and the phase angle difference would be zero. The phase angle difference is a measure of power loss in a condenser and it depends largely on the kind of *dielectric.* The symbol is the Greek letter theta (θ).

phase converter.—A machine which changes the number of phases of alternating current without changing the frequency. See *single-phase, two-phase,* etc.

phase difference.—The number of *electrical degrees* separating similar values (zero or maximum) of two alternating quantities existing together and having the same *frequency.* The position of either quantity may be taken as the reference point. See *angle of lag and of lead.*

phase displacement.—An advancing or retarding of the *phase* of

the current in an alternating circuit with reference to the applied voltage.

phase distortion.—A change in *phase* relation between voltage and current at certain frequencies during their passage through a transmission line or a *transducer* of any form.

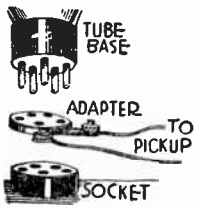
phase opposition.—A *phase difference* of 180 degrees, or one-half cycle.

phased.—In *synchronism*.

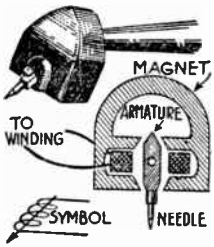
phenol fibre.—Fibre impregnated with a *phenolic compound*.

phenolic compound.—The basic substance of many insulating materials such as bakelite, formica, celeron, etc. It consists of phenol and formaldehyde treated with heat and pressure and moulded into various forms. Dielectric constant 4.5 to 7.5. These compounds are resistant to heat, gases, acids and moisture, while having good mechanical strength.

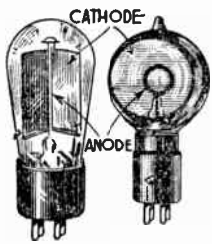
phi (ϕ).—Greek letter symbol for *magnetic flux*.



Phonograph Adapter



Phonograph Pickup



Photocell

phone.—A contraction of "telephone" or "radio telephony".

phonetic.—Pertaining to speech sounds, to the voice and its use.

phonetics.—The science of speech; analysis and classification of speech sounds.

phonic wheel.—A disc or wheel on which are mounted iron bars rotating close to electromagnetic poles energized by an alternating current, the action being to maintain a speed proportionate to the current frequency.

phono-electric wire.—A copper alloy wire of great tensile strength.

phonograph adapter.—A fitting for a tube base or socket to allow the output of a phonograph pickup to be connected to the tube's grid circuit. *See illustration.*

phonograph amplifier.—An *audio frequency amplifier* especially designed to operate with a *phonograph pickup* as a signal source.

phonograph pickup.—A device which produces *audio frequency* currents or voltages from movement of a needle over a phonograph record. *See illustration.*

phonograph recorder.—A device for cutting into the surface of a phonograph disc the variations in form or contour representing *audio frequency* changes in a current controlling the operation.

phosphor bronze.—An alloy metal of copper, phosphorus and tin having good conductivity and great mechanical strength.

phosphorescence.—An emission of light resulting from exposure to light rays or other radiant energy and continuing after the exciting radiation has been removed. A form of *luminescence.*

phot.—A unit of *illumination* equal to one *lumen* per square centimeter.

photoactive.—Affected by light. A property of *photoelectric cells,* of photographic film, etc.

photocell.—A *photoelectric cell* in which primary electron emission results from the effect of light on one of the electrodes. A *photo-emissive* cell. See also *gas photocell* and *vacuum photocell. See illustration.*

photocell conductance.—The ratio of changes of current in a photocell to the changes of voltage which produce them. It represents the slope of the cell's current-voltage curve.

photocell current.—The entire current passing through a photocell between anode and cathode. The *primary photoelectric current* plus the current due to *gas amplification.*

photocell resistance.—The reciprocal of *photocell conductance.*

photocell sensitivity.—The ratio of changes of current in a photocell to the changes of *luminous flux* or of *radiant flux* which cause them. It represents the slope of the cell's current-illumination curve. The symbol is *S.* Static sensitivity is the ratio of direct current to steady light or steady radiant flux. Dynamic sensitivity is the ratio of alternating current to a varying flux. See *color sensitivity.*

photo-chemical.—Pertaining to the chemical effects of light. See *actinic ray.*

photo-conductive.—Exhibiting a change of electrical conductivity or *ohmic resistance* when acted upon by light. A quality of the element *selenium.*

photo-current.—The electric current which corresponds to an electron flow caused by the action of light on a cathode surface in a *photocell.*

photo-current coefficient.—The *variational sensitivity* of a photocell under short circuit conditions with unit variation in light flux.

photodynamic.—Relating to *radiant energy* of light.

photoelectric.—Pertaining to the effects of *light* on electric circuits.

photoelectric cell.—Any device in which light controls *(a)* the electron emission from a cathode, *(b)* the electrical resistance of an element, or *(c)* the e.m.f. produced by a cell. A device which is respectively *photo-emissive, photo-conductive* or *photo-voltaic* in action. See also *photocell.*

photoelectric effect.—The emission of electrons under the influence of *light* or other *radiant energy*.

photoelectric emission.—*Electron emission* from the surface of the cathode in a *photocell* as a result of light or other radiant energy striking the cathode surface. Measured as the ratio of the *primary photoelectric current* to the power, work or energy in the light; as amperes per watt, coulombs per erg or coulombs per calorie.

photoelectric material.—A metal which is capable of emitting electrons under the influence of light in a *photocell*. These metals include *barium, strontium, sodium, potassium, lithium, caesium* and *rubidium*.

photoelectric spectrum.—All of the radiant energy which affects photocells. It includes the entire *visible spectrum* and parts of both the *infra-red* and the *ultra-violet rays*.

photoelectric threshold.—The lowest frequency or longest wavelength at which it is possible for *photoelectric emission* to take place from the surface of a given cathode metal, this frequency or wavelength being a characteristic of the metal and varying with different metals. The frequency or wavelength at which the *quantum voltage* reaches the value of the *work function* voltage.

photoelectric tube.—A *photocell*.

photo-electron.—An *electron* emitted from a cathode as a result of the action of *light*.

photo-emissive.—Capable of emitting *electrons* under the influence of radiant energy such as light. A quality of a *photocell*.

photogene.—The impression remaining in the eye during *persistence of vision*.

photo-glow tube.—A gas filled *photocell* with which is used an operating voltage sufficiently high to cause ionization and a *glow discharge* with application of a certain illumination. The cell passes considerable current and is used as a relay.

photographic recorder.—A device which makes a photographic film record of *code* signals which are caused to move a spot of light over a moving film.

photolytic cell.—A photoelectric cell of the *photo-voltaic* type.

photomagnetism.—Effects resulting from the combined action of light and magnetism; or the science relating to such effects.

photometer.—A device for measuring intensity of *light* or for comparing the relative intensities of sources of light.

photometry.—Measurement of the visual effect of light.

photon.—1—A *positive ion*. 2—A *quantum* of energy.

photophone.—1—A device which effects the transmission of sounds by means of variations in a beam of light, or by the effect of light in producing changes in current, voltage or resistance which correspond to changes in the light. 2—A sound picture system employing *variable area* film recording.

photoradio transmission.—Facsimile transmission of pictures, type, etc.

photo-telegraphy.—*Telephotography.*

phototube.—A *photocell.*

photo-voltage coefficient.—The ratio of *variational sensitivity* to the *photocell conductance* with fixed values of light flux and tube terminal voltage.

photo-voltaic.—Relating to the production of *electromotive force* by physical or chemical action in substances which are affected by *radiant energy.* A quality of certain electrolytic cells which may be used in a manner somewhat similar to photocells. A *cuprous oxide cell. See illustration.*

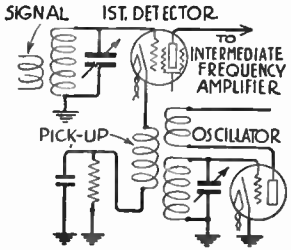
physical unit.—A unit based on natural or material values as opposed to values which are abstract or imaginary.

pi (π).—Greek letter symbol for 3.14159 . . ., a circle's circumference divided by its diameter.

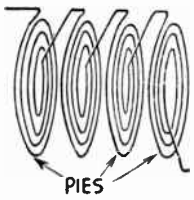
pickup.—A *phonograph pickup.*

pickup circuit.—A *stand-by circuit.*

Photo-voltaic Cell



Pickup Coil



Pie Winding

pickup coil or winding.—In *superheterodyne reception,* the winding which is connected in the control grid circuit of the *first detector* and is coupled to the output of the oscillator, thus carrying the oscillator frequency into the first detector tube. *See illustration.*

picofarad.—One *micro-microfarad.*

picture area.—A television *frame.*

picture element.—The smallest portion of a television image transmitted and reproduced at the receiver.

picture frequency.—The number of separate pictures projected in one second in *television* or motion pictures.

picture tube.—The television receiver cathode-ray tube on whose screen is reproduced the image being viewed at the transmitter.

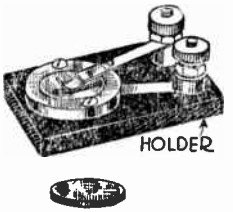
pie winding.—An inductance or choke coil formed by a number of sections one against the other, each of little width but of comparatively great outside diameter. *See illustration.*

piezo-electric crystal.—A mineral exhibiting the *piezo-electric effect.* The most common are quartz, rochelle salts and tourmalin. *See illustration.*

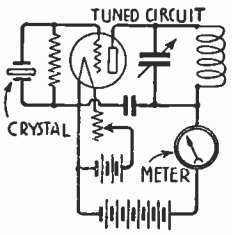
piezo-electric effect.—The production of an *electrostatic charge* between opposite faces of certain crystalline substances (generally quartz) when they are compressed or twisted, and the opposite effect of a change in form of the same crystals when placed between electrostatic charges of opposite polarity. The mechanical extension and contraction, or vibration, of the crystal occurs most easily and energetically at certain frequencies determined by the crystal's physical dimensions, the action being analogous to electrical resonance in a tuned circuit.

piezo-electric loud speaker.—A loud speaker in which the mechanical movement for production of sound waves is obtained with a *piezo-electric crystal.*

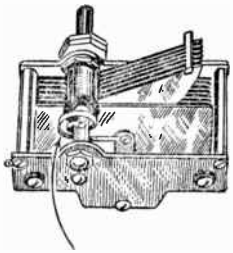
piezo-electric monitor.—A *piezo-electric resonator, oscillator* or



Piezo-electric Crystal



Piezo-electric Oscillator



Pigtail

stabilizer used to control the frequency of another oscillator which generally has greater power output than that of the control circuit.

piezo-electric oscillator.—A circuit containing a piezo-electric *crystal* maintained in a state of vibration by energy supplied from the circuit, the operating frequency being near one of the frequencies at which mechanical vibration of the crystal is naturally most energetic and easily maintained. The circuit in itself, without the crystal, is not capable of maintaining oscillations. The most common form places the crystal in the grid circuit of a vacuum tube. *See illustration.*

piezo-electric pickup.—A phonograph pickup in which audio frequency currents result from varying mechanical pressure on a *piezo-electric crystal.*

piezo-electric resonator.—A body exhibiting the *piezo-electric effect;* having the ability to be set into resonant vibration by electrical means.

piezo-electric stabilizer.—A *piezo-electric crystal* or resonator used

to fix the exact frequency at which oscillatory current is maintained in a circuit which is capable of maintaining oscillations within a narrow range of frequencies without the crystal. A *piezo-electric oscillator* circuit in which there is sufficient regeneration to maintain oscillation.

piezo-electricity.—Voltage and current which are the result of a *piezo-electric effect.*

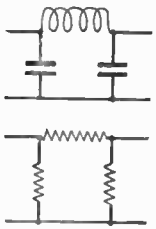
pigtail.—A flexible electrical conductor between two parts which have relative motion. *See illustration.*

pile winding.—A *banked winding.*

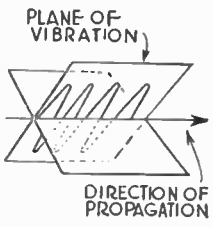
pilot lamp.—A small lamp which is lighted while a piece of apparatus is in operation.

pin jack.—A small receptacle into which is pushed a pin-like member to complete a circuit connected to the two parts.

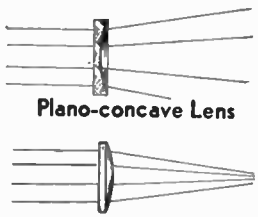
pi-section.—A part of an electric circuit having two similar elements in parallel or across the circuit, and one element in series with one



Pi-section



Plane-polarized Light



Plano-convex Lens

side of the circuit and connected between the two parallel elements. *See illustration.*

pitch.—The frequency of a *tone.*

pitch limit.—The sound frequency above which or below which the sense of hearing is no longer affected. See *auditory sensation area.*

plain aerial.—A direct coupled antenna; the tuned inductance being part of the antenna circuit.

plain antenna transmitter.—A system of *spark transmission* having the spark gap in series with the antenna circuit.

plain spark gap.—A *spark gap* consisting of two fixed metal electrodes.

plane-polarized light.—Light waves which vibrate (transversely to the line of propagation) in only one of the planes within which lies the line of propagation. *See illustration.*

plano-concave lens.—A lens having one plane or flat surface and another concave or depressed surface. *See illustration.*

plano-convex lens.—A lens having one flat or plane surface and another which is convex or outwardly bulging. *See illustration.*

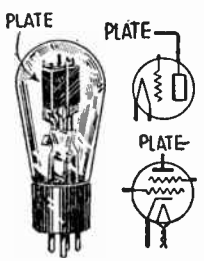
plate.—One of the elements in a tube. The element toward which electrons are attracted from the cathode and into which current flows from the outside circuit. The *anode*. *See illustration.*

plate battery.—A battery which furnishes current for the *plate circuit* of a vacuum tube.

plate bypass condenser.—A condenser externally connected between the *plate* and *cathode* of a tube, usually a detector, for the purpose of bypassing high frequency currents which exist in the output of the tube.

plate capacitance.—The sum of the separate *direct capacitances* between the plate of a tube and all the other elements in the tube. In a three-element tube, the sum of the *plate-filament capacitance* and the *grid-plate capacitance*. The symbol is C_p.

plate-cathode capacitance.—The *electrostatic capacity* between the plate and the cathode of a tube. The symbol is C_{pf}.



Plate

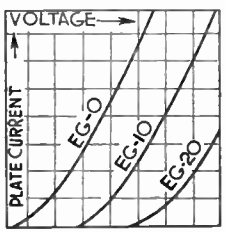


Plate Characteristic

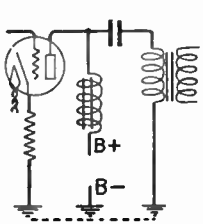


Plate Circuit

plate characteristic.—A graph showing the effect of *plate voltage* on *plate current* in a tube. *See illustration.*

plate circuit.—The electrical paths followed by current flowing through the *plate* of a tube. *See illustration.*

plate coil.—Any inductance coil forming part of the *plate circuit* of a tube.

plate condenser.—A condenser connected in the *plate circuit* of a tube.

plate condenser antenna.—An antenna with a *counterpoise*.

plate conductance.—The ratio of a small change in *plate current* to the change in *plate voltage* which produces it, the *grid voltage* remaining constant.

plate current.—The direct current flowing in the *plate circuit* of a tube and from the plate to the cathode inside the tube. The symbol is I_p or i_p.

plate current cutoff.—The condition under which control *grid bias*

is sufficiently negative to completely stop the flow of steady plate current in a tube.

plate current detection.—A method of *detection* in which the control grid of the detector tube has a *negative bias* sufficiently great that signal voltages are distorted. Positive swings of control grid voltage then result in changes of plate current that are greater than the changes resulting from equal negative grid voltages. These unequal plate current changes result in a rise and fall of average plate current corresponding to the signal *modulation frequency*. *See illustration.*

plate detection coefficient.—The *mutual detection coefficient.*

plate detector.—A detector tube using the principle of *plate current detection.*

plate dissipation.—The power in *watts* which is used up in heating

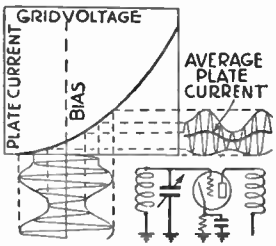


Plate Current Detection

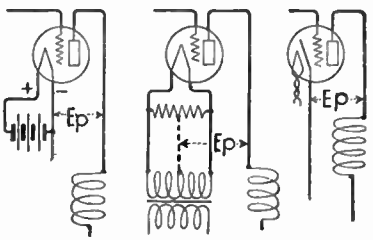


Plate Voltage

of the plates or anodes of tubes. Equal to the product of the *plate voltage* and *plate current.*

plate-filament capacitance.—The *direct capacitance* between the plate and the filament in a tube. In a three-element tube, one-half of the quantity found by adding the *plate capacitance* and *filament capacitance*, and subtracting the *grid capacitance.*

plate-grid capacitance.—The *electrostatic capacity* existing between the plate and grid of a tube. The *grid-plate capacitance.*

plate impedance.—The impedance of the path between *plate* and *cathode* in a tube. Approximately the same as the *plate resistance.*

plate inductor.—A high impedance *choke coil* placed in a plate circuit to maintain a fairly constant value of direct plate current while the total plate current is changed by the varying grid voltages.

plate modulation.—*Heising modulation.* Any method of introducing modulating changes into the plate circuit of an *oscillator* tube.

plate potential.—Plate voltage.

plate rectification detector.—A detector utilizing the principle of *plate current detection.*

plate resistance.—The resistance in ohms to flow of alternating currents between the *plate* and the *cathode* of a tube. The reciprocal of the *plate conductance.* The ratio of plate voltage changes to the resulting plate current changes in a vacuum tube, the grid voltage remaining constant. The symbol is R_p.

plate variometer.—A *variometer* used in the plate circuit of a tube to tune this circuit to resonance with the frequency of the signal applied to the tube's grid circuit. *Regeneration* then results from feedback through the tube's plate-grid capacitance.

plate voltage.—The direct current potential difference between the *plate* and the *cathode* of a tube. In a D.C. filament tube the plate voltage is measured between the plate and the negative end of the filament. In an A. C. filament tube the plate voltage is the difference between the plate potential and the potential at a point midway between the ends of the filament. In an indirectly heated cathode tube the plate voltage is the potential difference between plate and cathode. The symbol for plate circuit voltage (at the source) is E_b, and for the true plate voltage as defined above the symbol is E_p *or* e_p. *See illustration, page preceding.*

plate winding.—A transformer winding connected in the *plate circuit* of a tube.

platinoid.—A resistance alloy composed of copper, nickel, zinc and a small amount of tungsten.

platinum.—A whitish, malleable metal little affected by high temperatures, by acids or by arcing on its surface.

platinum filament.—A tube filament of platinum alloy. The rate of *electron emission* is low for the energy consumed in heating the filament.

pliodynatron.—A four-element vacuum tube having the plate and one grid operating as in a *dynatron* and having the second grid operating as a *control grid* of the usual type, thus allowing operation as an oscillating detector with *negative resistance* characteristics to greatly strengthen the signal amplification.

pliotron.—A high-vacuum hot-cathode tube with one or more grids for controlling anode or plate current. A *triode, tetrode,* or *pentode.*

plug.—A metal sleeve and insulated tip inserted in a jack to complete a circuit. *See illustration.*

plug cut-out.—A *fuse block* for plug fuses.

plug fuse.—A fuse designed to slide or screw into a socket and make the necessary connections.

plug-in.—Descriptive of a part having its terminal connections made to metallic extensions or prongs which are slipped into corresponding openings or jacks to complete the circuit or circuits in which the device operates. *See illustration.*

plunge battery.—A single-fluid *chromic acid cell* from which the electrodes are lifted while the cell is not in use.

plunger magnet.—A *solenoid* with a sliding core or plunger moved by magnetism in the solenoid.

plunger type instrument.—A *moving iron instrument* in which a long, slender piece of iron attached to the pointer is drawn into the core of a winding which carries the current to be measured. *See illustration.*

P_m.—Symbol for *maximum* power in watts.

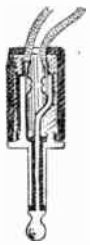
point lighting.—*Spot lighting* in television.

point-to-point.—*Beam transmission.*

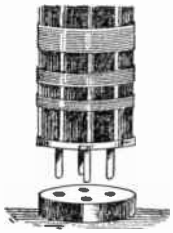
poisoning of cathode.—Presence of impurities or gases which reduce the electron emitting ability of a surface.

polar relay.—A *polarized relay.*

polarity.—Descriptive of parts which are positive or negative in *potential* or in *electrification* when considered with reference to

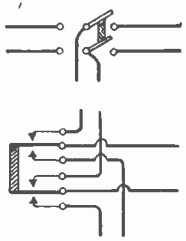


Plug



Plug-in Coil

Plunger-type Instrument



Pole Changing Switch

other similar parts at the opposite end of an electric or magnetic circuit. Having qualities at one end which are opposite or complementary to the similar properties at the other end.

polarization.—1—Formation of gas on the electrodes of a cell which is carrying an electric current, this gas producing a *counter- e.m.f.* which reduces the cell's effective voltage. Also, the difference between a cell's open circuit voltage and its working voltage as reduced by polarization. 2—A result of refraction, or reflection or of the effect of certain materials by which light waves are made to vibrate in definite directions or only in certain planes rather than vibrating in all directions which are transverse to the line of propagation. See *plane-polarized light.*

polarized light.—A light beam which has been subjected to *polarization,* so that all wave motion is in a single plane.

polarized magnet.—A magnet consisting of a current-carrying winding on a permanent magnet core, a small current then causing considerable change in the magnetic flux.

polarized relay.—A relay which operates upon flow of current in one direction but not with flow in the other direction.

polarizing unit.—Any electrical element, as a battery or a rectifier, which applies a steady direct potential to other parts, generally to parts such as microphones or loud speakers which are carrying alternating currents.

pole.—A terminal or a surface at which is exerted an *electromotive force* or at which an *electric current* or *magnetic lines of force* may enter or leave either a source or an energy consuming device. An *electrode.* A terminal of a source or a load. One end of a magnet.

pole changing switch.—A *double-pole, double-throw* switch arranged to connect both sides of one circuit to both sides of either one of two other circuits. *See illustration, page preceding.*

polydirectional radio range.—A *radio beacon* which transmits signals in more than four directions.

polyphase.—More than one alternating electromotive force acting in a single circuit. *Two-phase* or *three-phase.*

porcelain.—A chinaware made from clay and feldspar; used for insulation. Dielectric constant 4.5.

portable receiver.—A radio receiver with self-contained power supply, antenna system, amplifying stages and loud speaker, and sufficiently light in weight to allow carrying about. *See illustration.*

portable transmitter.—A low power transmitter which is completely self-contained and designed to be moved from place to place.

position finding.—Determination of an aircraft's location by two or more *direction finding stations,* the information being communicated to the ship by radio.

positive.—Electrical *potential* higher than that of the earth. Any potential which is higher than another potential being considered as the reference point. A part away from which electric current flows while outside the source.

positive bias.—A grid bias potential higher than that of the filament center or the cathode in an alternating current tube or higher than that of the negative end of the filament in a direct current tube. See *grid bias.*

positive carrier.—A *positive ion.*

positive charge.—The quantity of electricity in a body which is at a positive potential with reference to another body carrying an equal negative charge.

positive column.—The luminous discharge existing near the anode in a gaseous tube in which *ionization* is taking place.

positive electrification.—The condition of a body on which there is a deficiency of negative electrons. See *electrification.*

positive electrode.—An *anode.*

positive electron.—A name sometimes applied to the positive nucleus of an atom, a *proton.*

positive grid.—The condition in which a control grid in a tube is

provided with *positive bias.*

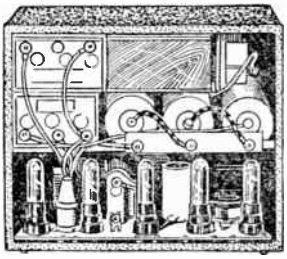
positive image.—An image or picture in which lights and shades are the same in relative position as in the original.

positive ion.—An *atom* deficient in electrons, having a positive charge. An ion which moves toward a cathode. A *cation.*

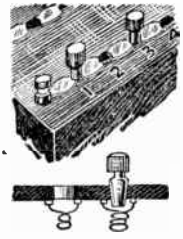
positive modulation.—Television transmission in which increase of illumination of the picture image causes increase of radiation power.

positive nucleus.—That part of an *atom* which carries the positive charge, the negative charge being carried by the electrons which are associated with the nucleus in the atom.

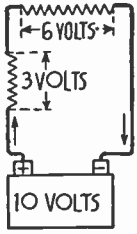
positive pole.—1—The end of a magnetic needle which points toward the north; the north pole. The end of a magnet from which issue lines of force forming the external field. 2—The terminal of an electric source from which current flows to the external circuit, the terminal at higher *potential.* See *negative pole.*



Portable Receiver



Post Office Bridge



Potential Drop

positive reactance.—*Inductive reactance.*

positive temperature coefficient.—A characteristic of a substance in which the *resistance* increases with rise of temperature. True of all metals and most metallic alloys.

positive wire.—A wire connected to the positive terminal of a source.

post-office bridge.—A form of *Wheatstone bridge* using metal plugs to short circuit and thus cut out certain values of resistance, leaving the remaining resistances to form the arms of the bridge. *See illustration.*

potassium.—An alkali metal employed in photocell cathodes showing maximum response to blue light.

potassium hydride cell.—A *photocell* of which the sensitivity has been increased by the introduction of hydrogen and treatment by an electric discharge for the purpose of changing the surface condition of the cathode metal.

potential.—A measure of the relative voltage, the amount of electric charge or the degree of electrification at a point in either an electric circuit or an electric field when that point is considered with reference to some other point in the same circuit or field. Measured in *volts*.

potential difference or drop.—The difference in electric pressure which causes movement of electricity from a point of higher pressure to one of lower pressure or potential. Measured in *volts*. The symbol is *V*. Abbreviated *p.d.* *See illustration, page preceding.*

potential divider.—A *voltage divider.*

potential energy.—The energy or working ability contained in anything because of its position or shape. An electric charge on the plates of a condenser represents potential energy. Compare *kinetic energy*.

potential gradient.—1—The rate at which the *potential* decreases within the space between two points. The number of volts change in a given distance, divided by the distance. The maximum possible potential gradient is that of the material's *dielectric strength.* 2—The *electrostatic field intensity.*

potential winding.—A winding in parallel with a circuit, connected across the two sides of the circuit.

potentiometer.—1—An instrument for measurement of an unknown *electromotive force* by opposing a known e.m.f. against an equal potential difference of which the ratio to the unknown e.m.f. is determined by a variable calibrated resistance. 2—A name often applied to a *voltage divider.*

potentiometer control.—A method of *regeneration* control in which grid bias is varied by means of a voltage divider. *See illustration.*

Poulsen arc.—An arc used in the production of *continuous waves* for high power transmission. The arc is formed between a water cooled copper electrode and a rotating carbon electrode in a chamber containing a hydrocarbon gas and fitted with a magnetic blowout.

power.—The rate at which work is done or at which energy is used: as by movement of a given weight through a given distance within a given time. Electric power is measured in *watts*. The symbol for average power in watts is P, for instantaneous power it is p., and for maximum or peak power it is P_m.

power amplification.—The ratio of the alternating output power to the alternating input power.

power amplifier.—1—An audio frequency amplifier with one or more power tubes in its output stage. 2—A radio frequency amplifier between oscillator and antenna in a transmitter.

power component.—The *active current* in an alternating current circuit.

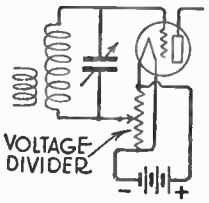
power condenser.—A condenser used in a transmitting circuit.

power converter.—A name sometimes applied to the portions of a

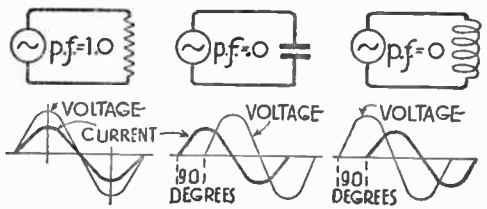
receiver in which commercial alternating current produces other currents suitable for filament, heater, plate and screen circuits. A *power unit.*

power detector.—1—A detector tube with its output coupled to the power tube grid circuit without the use of audio frequency amplifying stages between detector and power stage. 2—Any detector tube operated with plate voltage sufficiently high to allow handling strong radio frequency signals without distortion.

power factor.—1—A measure of the ability of a circuit or device to turn alternating voltage and current into useful power or to dissipate power. The greatest possible ability corresponds to a power factor of 1.0 (unity) and inability to produce or dissipate any real power corresponds to a power factor of 0.0 (zero). The power factor is equal to the ratio of the actual power in *watts* to the apparent power in *volt-amperes,* or is equal to the cosine of the angle by which the current either lags or leads the applied voltage. 2—Power factor of a coil is equal to the coil's *resistance* divided by



Potentiometer Control



Power Factor

its *impedance,* or to the cosine of the angle of lag. 3—Power factor of a condenser is equal to the condenser's *resistance* divided by its *capacitive reactance,* or to the cosine of the angle of lead. Abbreviated *p. f. See illustration.*

power factor correction.—The addition of condensers to an *inductive circuit* to bring the current and voltage more nearly in phase and thus to increase the proportion of volt-amperes turned into real power or to increase the *power factor.*

power factor influence.—The percentage change of reading in a wattmeter caused by lowering the *power factor* from unity to 0.50 lagging current.

power frequency.—A *commercial frequency.*

power grid detector.—A *power detector* employing *grid-current detection.* The action is due almost wholly to rectification of signal impulses and not to voltages developed across the grid resistance or grid leak.

power grid-glow tube.—A *hot cathode grid-glow tube.*

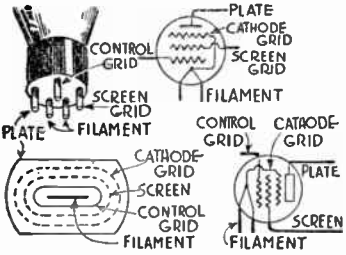
power level.—The amount of power at a given point in a transmission circuit.

power level indicator.—A volume indicator calibrated to read in units of power, or in power ratios expressed in *transmission units, decibels,* etc.

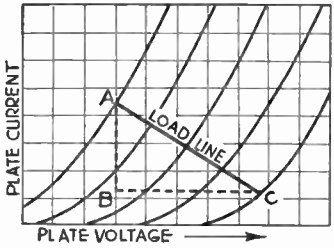
power modulation.—*Heising modulation.*

power pentode.—A five-element power amplifier type of vacuum tube containing a filament or cathode, a plate, a control grid, a screen grid and an additional element called a cathode grid or a suppressor grid placed between the plate and the screen grid. The cathode grid is internally connected to the cathode and acts to reduce the *secondary emission* from plate to screen grid. The tube has a high *amplification coefficient* and delivers considerable output power. *See illustration.*

power rheostat.—A *rheostat* capable of dissipating considerable power, generally a number of watts.



Power Pentode



Power Triangle

power stage.—A stage of *audio frequency* amplification in which a power tube is employed. Usually the final stage in an amplifier, from which power goes to the loud speaker.

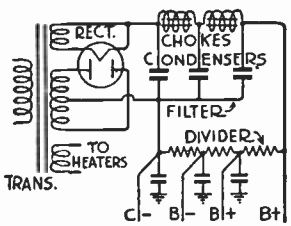
power transformer.—A transformer which produces from line power the alternating currents for filaments and heaters, also the currents which are rectified and filtered for the plate, screen and grid circuits in radio apparatus.

power triangle.—A right angled triangle constructed on a series of vacuum tube *plate characteristics;* the hypotenuse being the *load line* between permissible grid voltage limits, one of the sides being a horizontal projection of this load line and the other side joining the ends of the load line and the projected line. The product of the two sides of this triangle is proportional to the tube's relative power output with changes of operating voltages. *See illustration.*

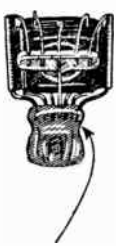
power tube.—A receiver amplifying tube having a *maximum undistorted power output* in excess of one-half watt and generally having a low amplification coefficient. A tube capable of amplifying a large signal voltage without distortion.

power tube adapter.—A device inserted in a tube socket and receiving the base of a power tube, connections allowing the use of voltages suitable for the power tube instead of those voltages applied to the original tube in the socket.

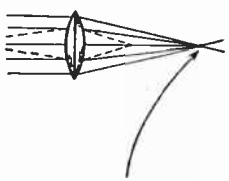
power unit.—All of the apparatus which furnishes filament and cathode heater current, plate current, screen current and bias voltages for radio receivers and other electrical devices using commercial line power, either alternating or direct current, for the primary source of energy. The power unit includes a *filter* and a *voltage divider*, and if used with A.C. line supply, it also includes a *power transformer* and a *rectifier*. *See illustration.*



Power Unit



Press



Principal Focus

practical unit.—A unit of convenient value, a unit equal to certain multiples or certain portions of the *absolute units*. Practical units include the *ohm, volt, ampere, farad, henry, watt,* etc.

preselector.—A *band selector circuit.*

press.—The glass support which carries supporting wires and connections for the elements of a tube. *See illustration.*

pressure.—The amount of force acting on a given area or space. Electric pressure is called *electromotive force, voltage* or *potential.*

primary battery.—A number of *primary cells* electrically connected together.

primary cell.—A combination of electrodes and chemicals which produce an *electromotive force* at the expense of changes in the chemical composition of the parts. The changes are such as cannot be reversed for restoration of the cell upon exhaustion. A cell which must be replaced or in which the elements must be replaced after the production of a certain amount of electrical energy, as

distinguished from a *storage cell* or secondary cell in which a flow of current from an external source restores the elements to their original forms.

primary circuit.—The circuit in which appears the applied electromotive force; as the circuit through which power enters a transformer, or the circuit taking power from a source and delivering it to the load or to a secondary circuit.

primary colors.—1—The colors into which white light may be separated; violet, indigo blue, green, yellow, orange and red. 2—The colors (as red, green and blue) which may be combined in various proportions to produce any other color.

primary electrons.—Electrons resulting from *primary emission.*

primary emission.—The *electron emission* due to primary causes such as heating of a cathode, and not to secondary effects such as *ionization* or *electron bombardment.*

primary inductance.—In *spark transmission,* the inductance contained in the closed circuit and coupled inductively to the antenna circuit.

primary photoelectric current.—1—That part of the photocell current which is due to *electron emission* from the cathode, as distinguished from the additional current which is due to *ionization.* 2—That photocell current which is not increased to any useful extent by further increase of applied voltage; the *saturation current.*

primary piezo-electric effect.—The *direct piezo-electric effect.*

primary winding.—A winding connected in a *primary circuit.*

principal focus.—The focus for rays which are parallel before being acted upon by a lens. Also the *virtual focus* for parallel rays acted upon by a diverging lens. *See illustration, page preceding.*

prism.—A piece of transparent material having three or more plane sides symmetrically arranged around a central axis.

prismatic disc.—A television *scanning* device in which light rays are bent first one way and then another by *refraction* in a prism having a gradually changing angle between its sides, the prism being mounted around the circumference of a rotating member. *See illustration.*

progressive illumination.—Television scanning by means of *spot lighting.*

progressive observation.—Television scanning by means of *flood lighting.*

projector.—The sound radiating portion of a loud speaker. A horn, baffle or the like. *See illustration.*

propagation.—Passage of a disturbance through a medium; such as the passage of radio waves through the ether, passage of sound waves through air, etc.

propagation constant.—In a transmission network or line consisting of an infinite number of similar sections, the natural logarithm

of the vector ratio of the current entering one such section to the current leaving it.

protective device.—Any device which keeps dangerously large currents out of a circuit.

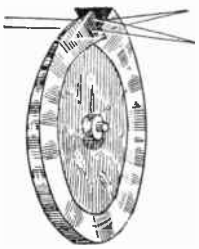
protective reactor.—An *inductance coil* used to limit the flow of alternating current in a circuit containing an accidental short circuit.

protective relay.—A relay which opens a circuit upon appearance of abnormal conditions in the same or another circuit.

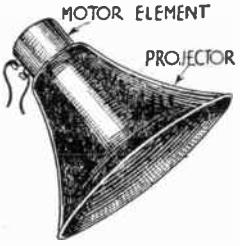
protective resistance.—A resistance placed in series with a *photocell,* a *glow lamp* or other device for the purpose of preventing destructively large currents through the device when operating conditions are abnormal.

protective tube.—A tube containing a resistance element which prevents application of excessive line voltages to electrical apparatus.

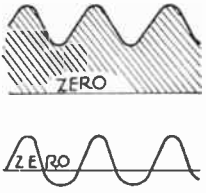
proton.—The *positive nucleus* of an atom. The smallest quantity



Prismatic Disc



Projector



Pulsating Current

of positive electricity which can exist in a free state.

psi (ψ).—Greek letter symbol for *dielectric flux.*

public address system.—Electrical and acoustic apparatus used for reproduction of speech and music with volume and tone quality suitable for large audiences or large spaces.

pulsating current.—A direct current which rises and falls regularly. A current equivalent to a *direct current* and an *alternating current* in one circuit. The *amplitudes* in one polarity are greater than those in the opposite polarity so that the average value is not zero. *See illustration.*

pulse.—A momentary flow of electricity.

puncture voltage.—*Dielectric strength.*

pup jack.—A small receptacle into which fits a single contact plug to join two conductors. A *tip jack.*

Pupin coils.—*Inductance coils* connected at intervals in telephone lines to balance reactive effects.

pure inductance.—An inductance assumed as existing without

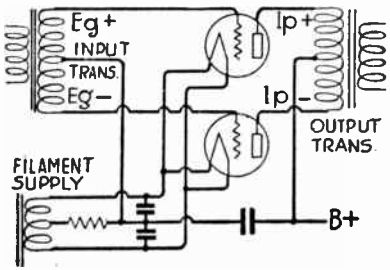
capacity or resistance in the same element. See *apparent inductance.*

pure resistance.—A resistance with which is associated neither capacity nor inductance in the same unit.

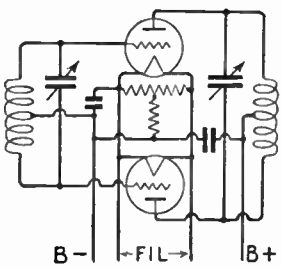
pure tone or note.—A sound produced by waves of a single frequency, without *harmonic frequencies.*

pure wave.—A wave in which nearly all the energy is concentrated at one sharply defined frequency.

push-pull amplification.—An amplifying system employing two tubes with their control grids connected to opposite ends of the input transformer secondary winding, the center of this winding being connected to the tube's cathodes. Maximum *grid voltage* on one tube then occurs simultaneously with minimum grid voltage on the other, and the sum of the plate currents remain constant. However, the *plate currents* are fed into opposite ends of an output transformer or choke which has its center connected



Push-pull Amplification



Push-pull Oscillator

through the plate current supply to the cathodes so that direct current plate components cancel but alternating signal components add in the output. *See illustration.*

push-pull microphone.—A *microphone* employing two elements operating in opposite phase, at exactly opposite points in a cycle.

push-pull oscillator.—A vacuum tube oscillator using two tubes with their control grids and plates connected to opposite ends of tuned circuits, the operation being similar to that in *push-pull amplification.* Each tube works on alternate half cycles of the high frequency currents. *See illustration.*

push-pull transformer.—A transformer having a center tapped secondary, a center tapped primary, or both and designed for use in a *push-pull amplification.*

pyrite detector.—A *crystal detector* utilizing a piece of iron pyrites as one of the contacts.

Q

Q.—Symbol for quantity of electricity in *coulombs* or in *ampere-hours.*

Q-signals.—Telegraphic *code* signals consisting of letter combinations always commencing with *Q,* and standing for various complete phrases and sentences, usually for commonly used questions and their answers.

quadded cable.—A cable adapted for use in a *phantom circuit.*

quadrant of inductance.—An obsolete expression for an inductance of one *henry.*

quadrature.—A difference of ninety *electrical degrees* or one-fourth of a cycle between alternating current values. The *phase difference* between voltage and current in an alternating current circuit containing only inductance or only capacity, with no resistance present.

quadrature component.—The *reactive component.*

quadrode.—A *four-element tube.*

quadruplex circuit.—A telegraph circuit for carrying two messages in each direction at the same time.

quality.—*Fidelity,* especially with reference to *tone.*

quantity.—Quantity of electricity, measured in *coulombs* or *ampere-hours.*

quantum.—A unit of *energy.*

quantum theory.—A theory of radiation or emission stating that the radiating or emitting body does not emit energy uninterruptedly but rather intermittently in units called quanta (quantums), the value of which is dependent on the operating frequency of the radiating body and on a constant.

quantum voltage.—The *energy,* expressed in volts, which is acquired by an electron from light of a given *wavelength;* the voltage varying inversely with the wavelength.

quarter phase.—*Two-phase.*

quartz.—A natural mineral forming an excellent insulator with low radio frequency losses. Dielectric constant 4.5. The most important piezo-electric crystal. Quartz is transparent to ultra-violet light, to which ordinary glass is opaque.

quartz crystal oscillator.—A *piezo-electric oscillator.*

quartz plate.—A *piezo-electric crystal* made from quartz.

quartz resonator.—A *piezo-electric resonator.*

quenched gap.—A *spark transmission* gap consisting of many short gaps in series, formed by a number of metal discs with airtight

spaces between them. The spark is quickly extinguished because of rapid *deionization* in the well cooled spaces.

quenched spark.—A quickly extinguished spark, the result of large cooling surfaces, of enclosing the spark in a vacuum, etc.

quiescent aerial radiation.—Radio telephony in which the *carrier wave* is radiated only while *modulation* takes place or while signals are being sent.

R

R. or r.—Symbol for *resistance* in ohms.

radian.—An angle formed at the center of a circle by lines drawn to the ends of an arc which has a length equal to the circle's radius. This angle is equal to 360 degrees divided by 2 π, which is 57° 17′ 44.8+″, or about 57.2958 degrees. The word sometimes is used as meaning the arc included by this angle. *See illustration, page following.*

radiant energy.—Any form of energy which may be sent through space by means of *electromagnetic waves*. Light, radiant heat and radio waves are forms of radiant energy.

radiant flux.—The rate of flow of *radiation* with respect to energy. Measured in watts or in ergs per second.

radiant heat.—Heat energy carried through space by wave motion at frequencies lower than those of visible light, the waves manifesting themselves by raising the temperature of matter in their path.

radiant matter.—Gases in a highly evacuated space from which *radiation* takes place upon passage of an electric discharge through the space.

radiate.—To send *electromagnetic waves* into space.

radiating system.—An *antenna* circuit for *radiation* of signals.

radiation.—Transfer of *radiant energy* through space by wave motion. Specifically, the action by which *radio waves* are produced and sent into space by the antenna system of a transmitter.

radiation coefficient.—*Radiation resistance.*

radiation current.—The current in the *antenna* of an operating transmitter.

radiation efficiency.—The ratio of *radiation resistance* to the *antenna resistance,* or the ratio of radiated power to the total power input to an antenna at a given frequency.

radiation field.—The force which detaches itself from an antenna or other circuit carrying *oscillatory current* and travels through space, this force resulting from combinations of the *magnetic* and *electrostatic fields* set up by the transmitting antenna system or other circuit.

radiation power.—The power in *watts* radiated from an antenna; equal to the square of the maximum effective *antenna current* multiplied by the *radiation resistance.*

radiation resistance.—The value of *resistance* which, inserted at a point of maximum current in an antenna system, would consume the same amount of power that leaves the antenna through *radia-*

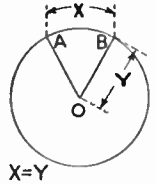
tion. The ratio of the total *radiation power* to the square of the maximum effective current in the antenna.

radiator.—1—An *acoustic radiator.* 2—An antenna used for *radiation* of signals.

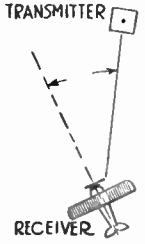
radio.—1—The art of communicating and reproducing intelligence of any form by means of *wave motion* radiated through space or by means of carrier currents in conductors. Also, that part of electrical science relating to this art. 2—A *radio receiver.* 3—A message sent by radio, or the act of sending such a message.

radioactive rays.—Rays capable of penetrating materials which are opaque to ordinary light. *X-rays* and other rays of short wavelength.

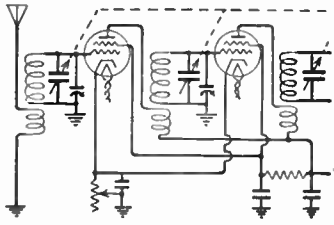
radioactive substance.—A substance which emits waves capable of penetrating materials through which *visible light* does not pass. A substance from which electrically charged particles are emitted upon breaking down of its atoms. Among such substances are the elements *radium, thorium* and *uranium.*



Radian



Radio Bearing



Radio Frequency Amplifier

radio beacon.—A stationary radio transmitter sending special signals which allow mobile receivers in a ship, an airplane, etc., to determine their direction and course with reference to the transmitter.

radio bearing.—The angle formed between a fixed line associated with a moving receiver and the line of travel of a received *radio wave. See illustration.*

radio channel.—The band of frequencies within which the *modulated wave* of a transmitter is allowed to operate. A band of frequencies sufficient in extent to allow transmission of some form of signal without causing interference above a certain intensity in frequencies outside the band.

radio chemistry.—Chemistry dealing with *radioactive substances.*

radio circuit.—All the elements which allow *radio* transmission of one signal in either direction between two points.

radio communication.—Transmission of signals by means of a *radiation field* from a transmitter.

radio compass.—A *mobile receiver* allowing determination of the direction from which a radio signal is coming to the receiver. A *direction finder* used in navigation.

radio conductor.—A device which indicates the presence of electric waves. A *coherer*, etc.

radio field.—A *radiation field.*

radio field intensity.—The effective value of the electric or magnetic field of a signal at a given point, as expressed in number of *microvolts or millivolts per meter* of height of a receiving antenna.

radio frequency.—A frequency sufficiently high to allow effective *radiation.* By definition, a frequency of thirty kilocycles or more. A term sometimes used to mean any frequency above the limits of normal audibility, although some frequencies which are audible also can cause radiation. Abbreviated *R.F.*, *r.f.* or *r-f.*

radio frequency alternator.—A *high frequency alternator.*

radio frequency amplification.—An increase in the voltage or power of a signal at *radio frequencies.* The amplification between the antenna and first detector of a receiver.

radio frequency amplifier.—Vacuum tubes and coupling circuits which increase signal voltage or power at *radio frequencies. See illustration.*

radio frequency choke.—An air-core *inductance coil* providing high impedance at radio frequencies. A *high frequency choke.*

radio frequency coil.—An air-core *inductance coil* designed to operate at high frequencies without excessive loss.

radio frequency oscillator.—A device including one or more *tuned circuits* in which are produced radio frequency currents and from which may be secured current at radio frequency or *radiation fields.* The circuits may be excited by means of vacuum tubes, a buzzer or other suitable devices. See under names of oscillators: *Hartley, Colpitts, Meissner, tuned-grid tuned-plate,* etc.

radio frequency pentode.—A *screen grid pentode.*

radio frequency resistance.—*High frequency resistance.*

radio frequency selectivity.—The ratio of a circuit's effective voltage or current at *resonance* to the effective voltage or current when the circuit is detuned by one per cent of the *resonance frequency.*

radio frequency transformer.—A transformer designed for operation at *radio frequencies,* generally having an air core but sometimes having a small amount of iron in its core. *See illustration, page following.*

radio frequency tube.—A vacuum tube especially designed for use in radio frequency circuits, having low inter-electrode capacity. Any tube used in apparatus working at *radio frequency.*

radiogoniometer.—A *goniometer.*

radiogram.—Message transmitted by *radio telegraphy* or *telephony.*

radiometer.—A device consisting of rotating vanes in a gaseous or evacuated chamber, used to indicate the intensity of *radiant energy. See illustration*

radio noise field intensity.—The field intensity of the electromagnetic waves which produce *interference* at a given point.

radiophare.—A radio telegraphic transmitter employed in determining the position of ships.

radiophone.—1—Pertaining to *radio telephony*. 2—Apparatus for production of sound from radio signals.

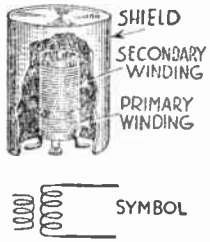
radio photography.—*Telephotography.*

radio pictures.—Pictures transmitted by radio. *Telephotography. Television.*

radio range.—A *radio beacon* sending out directed waves from which a receiver in motion may note any deviation from a given course of travel.

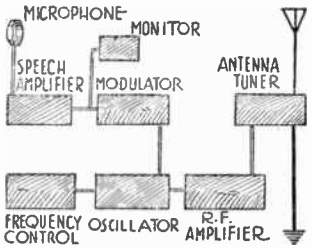
radio receiver.—Apparatus including *tuned circuits* and a *detector,* with or without *radio frequency amplification* and *audio frequency amplification,* used to produce audible sounds from *modulated wave* signals.

radio relay station.—A radio station which receives messages from another and transmits them to a third station which is their final destination or which is nearer to the destination.



Radio Frequency Transformer


Radiometer



Radio Transmitter

radioscope.—A device showing the effect of *radioactive rays.* A *fluoroscope.*

radio spectrum.—1—All of the frequencies included within the limits of *radiant energy.* 2—The frequencies employed in one certain class of radio communication.

radiostat.—See *stenode radiostat.*

radio telegraphy.—Radio communication by means of *code* signals.

radio telephony.—Radio transmission and reception by means of *carrier waves* modulated by speech, music and other sounds.

radiotherapy.—Treatment of physical disorders by rays from *radioactive substances,* by *ultra-violet rays,* etc.

radio transmission.—Transmission of signals by *radio waves* originating at a circuit especially arranged for such work.

radio transmitter.—Apparatus for production and signal *modulation* of radio frequency power. Oscillating, amplifiying and modulating circuits with all their associated apparatus, operating to energize an antenna system for *radiation* of radio waves into space. *See illustration.*

radiotron.—A trade name for *vacuum tubes.*

radiovision.—*Television.*

radiovisor bridge.—A trade name for a *photo-conductive cell.*

radio wave.—An *electromagnetic wave* capable of carrying signal modulation.

random winding.—A coil winding in which the turns and layers are not regularly positioned or spaced.

range beacon.—A *radio range.*

range finder.—A *direction finder.*

ratio.—The relation between two quantities. The numerical value of a ratio is equal to the first quantity divided by the second. Thus, the ratio of 3 to 6 is 3/6 or ½.

rat tail.—Conductors connecting the several wires of a multi-wire aerial to the down-lead.

rat tail joint.—A wire joint made by laying two wire ends side by side and twisting them together.

Rayfoto cell.—A form of *photo-voltaic* cell.

Rayleigh disc.—A means for measuring the air pressure due to a *sound wave,* a light metal disc being suspended in the path of the wave so that the disc is deflected proportionately to the intensity of the sound.

Raytheon rectifier.—The trade name of a *cold cathode rectifier.*

reactance.—In an alternating current circuit, that part of the opposition to current flow which is due to inductance, to capacity, or to both inductance and capacity in the circuit. That part of the impedance which results from self-inductance and capacity. *Inductive reactance, capacitive reactance,* or the net effect of both. Reactance is measured in *ohms.* The symbol is X or x. *See illustration, page following.*

reactance coil.—A *choke coil.*

reactance variation method.—A method of measuring *high frequency resistance* according to the change in current caused by a known alteration of the *reactance* in a resonant circuit.

reaction.—1—The mutual effects of two quantities upon each other. With one body being affected by a force from a second, reaction is the opposite force exerted by the second body upon the first one. 2—*Regeneration.*

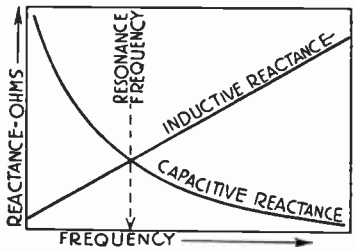
reactivation of filament.—A method of improving the emission of a *thoriated filament* by applying a voltage much higher than normal for a few seconds and continuing with a moderately high voltage for a considerable time. The process brings a fresh layer of thorium atoms to the filament surface.

reactive circuit.—A circuit in which the *inductive reactance,* the *capacitive reactance* or both are of comparatively high value with respect to the circuit's *resistance.*

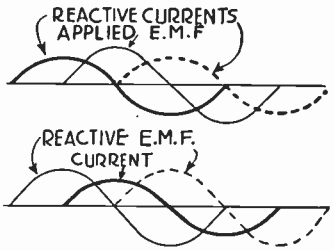
reactive current or component.—In an alternating current circuit, the portion of the current which is ninety degrees out of phase with the applied voltage, or the voltage which is ninety degrees out of phase with the current it produces. The current or voltage which charges the *capacity* or produces a field around the *inductance* in a circuit, from both of which energy is returned to the circuit so that this reactive component does no useful work and dissipates no *power.* The wattless current or component. Compare *active current or component. See illustration.*

reactive drop.—The drop in voltage due to *reactance* in a circuit.

reactive electromotive force.—The *reactive component* of the applied voltage in an alternating current circuit.



Reactance



Reactive Component

reactive load.—A load in which the current is not in phase with the applied voltage, either leading or lagging the voltage. A *capacitive load* or an *inductive load.*

reactor.—A part providing *inductive reactance* for operation, control or protection of electrical circuits and apparatus.

real component.—The *active component.*

real focus.—The position at which an image is formed by a lens.

real image.—An image which may be focused upon a screen, an image which is formed by the light rays themselves after *refraction* or *reflection,* and which always is inverted. *See illustration.*

receiver.—1—A *radio receiver.* 2—A *telephone receiver.*

receiver response.—1—The ratio of sound intensity or pressure in bars on a conveying medium (such as air) at a specified distance from the source to the applied signal voltage acting across a suitable resistance connected to the receiver terminals. The "receiver"

is a loud speaker. 2—The receiver output in *decibels* when using a reference level resulting from the condition of 1-volt signal across 1-ohm resistance with a 1-bar sound pressure.

reciprocal.—In the most common use of the word, the reciprocal of a quantity is equal to 1 divided by the quantity.

reciprocal ohm.—A unit of *conductivity*, the reciprocal of one ohm. One *mho*.

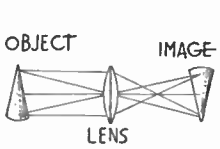
reciprocal piezo-electric effect.—The *converse piezo-electric effect*.

recorder.—A *phonograph recorder*.

recording instrument.—A device which makes a permanent record of electrical values.

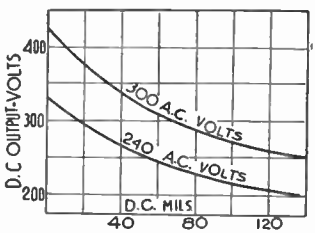
recording lamp.—A light source of which the intensity is varied at sound frequencies in sound picture recording by the *variable density system*.

rectification.—1—The process of changing *alternating current* into pulsating current or into a current having a direct component.



Real Image

Rectification



Rectification Characteristic

See illustration. 2—A name applied to the process of *detection*.

rectification characteristic.—A series of curves showing the relations between direct current, direct current voltage and applied alternating voltage in a *rectifier*. *See illustration.*

rectification factor.—The ratio of change of *direct current* in a rectifier circuit to the change of applied *alternating* voltage, other voltages remaining constant.

rectified current.—A current having a *direct component*, as delivered from a *rectifier*.

rectified signals.—Signals at audio frequency which result from passing a modulated carrier through a *detector* system.

rectifier.—A device for changing an alternating current into a pulsating direct current or into a current having a direct component. A *thermionic rectifier, gaseous conduction rectifier, electrolytic rectifier, vibrating rectifier, copper oxide rectifier*, etc. See *full-wave rectifier* and *half-wave rectifier*.

rectifier instrument.—An instrument for the measurement of *alternating* voltages or currents, the alternating current being rectified in a *bridge rectifier* consisting of contact rectifier elements, and the resulting direct current operating a *moving coil instrument*. *See illustration.*

rectifier tube.—A *thermionic rectifier* or a *gaseous conduction rectifier.*

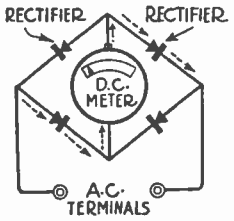
rectigon rectifier.—A trade name for an *argon rectifier.*

rectilinear lens.—A lens in which the effects of *aberration* are prevented, all lines being correctly focused.

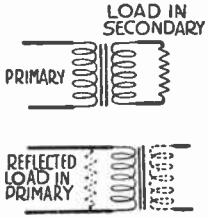
reed indicator.—A *visual reed indicator.*

reed receiver.—A type of loud speaker in which a flexible reed is moved by variations in signal current, the reed being attached to the sound radiating diaphragm.

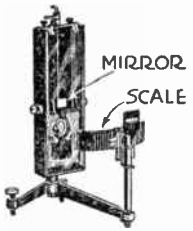
reference level.—The power, voltage, current or other value chosen as a starting point for calculations of *gain* or of *attenuation.* The zero level.



Rectifier Instrument



Reflected Value



Reflecting Galvanometer

referred value.—A *reflected value.*

reflected value.—The effective or apparent value of a quantity or electrical effect as it appears to exist in one circuit, this value being due to real quantities or effects in a coupled or connected circuit. *See illustration*

reflected wave.—1—The *sky wave* in space radio. 2—That portion of any wave which is turned back from a surface, as distinguished from the portions absorbed or transmitted through the surface.

reflecting galvanometer.—A galvanometer to the moving part of which is attached a mirror for reflection of a beam of light onto a scale or for reflection of the image of a scale into a telescope. *See illustration.*

reflection.—1—The turning back from a surface of light, heat, sound, radio or other wave motions reaching the surface. Radio waves are reflected from a conductive medium. 2—In transmission lines, a result of incorrect terminal impedance relations because of which certain frequencies cause *nodes* and *antinodes*

of voltage and current, or *standing waves,* at various points along the line.

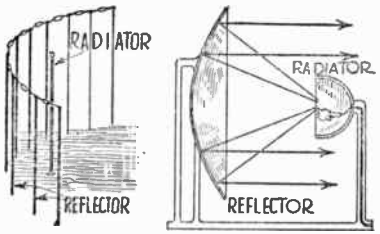
reflection alternator.—A *Goldschmidt alternator.*

reflection altimeter.—A device for determining an aircraft's height above the ground by the effect on an oscillator's frequency of *phase difference* between a radiated wave and the wave which is received after being reflected back from the ground below. Determination also may be made by measurement of *beat frequencies* resulting from reflected waves produced at two different radiated frequencies.

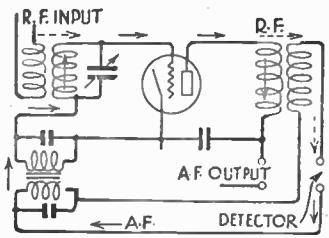
reflection coefficient.—The percentage of light or other energy of wave motion which is reflected back from a surface reached by the energy.

reflection loss.—Energy loss due to an incorrect *impedance match,* the loss caused by *reflection* effects in transmission lines.

reflector antenna.—A directional antenna or *beam antenna* having



Reflector Antenna



Reflex Circuit

some of its elements disposed to reflect and concentrate the radiation. *See illustration.*

reflex circuit.—A vacuum tube receiving system in which one tube is made to amplify at both *radio frequency* and *audio frequency,* or is made to operate both as an amplifier and a detector, or is made to perform all three functions at the same time. *See illustration.*

refraction.—A bending or change in the direction of travel of light, heat, sound or radio waves which takes place as they pass obliquely from one medium into another or pass between portions having different characteristics in a medium. The refraction takes place at the boundary where there is a change in rate of penetration or in speed of the waves. *See illustration, page following.*

refraction index.—The *index of refraction.*

regeneration.—A method of increasing the total energy input to any amplifying system by returning to the input a part of the energy appearing in the output. In a radio frequency amplifier, a vacuum tube detector or an audio frequency amplifier, a *feedback*

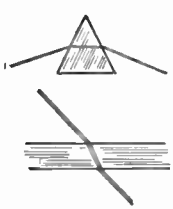
of plate circuit voltage to a preceding grid circuit in such phase relation that the grid voltage changes are increased in amplitude.

regenerative circuit.—A circuit in which *regeneration* occurs.

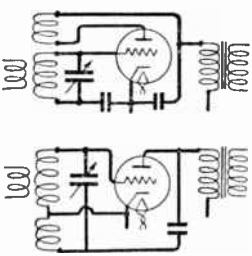
regenerative coupling.—A coupling through which there is an energy feedback to cause *regeneration.* In amplifying tube circuits this coupling may be of any type and external to the tube, or it may be through the plate-grid capacitance inside the tube. *See illustration.*

regenerative detector.—A vacuum tube detector, usually of the grid current detection type, with which a *feedback* of radio frequency energy from plate circuit to control grid circuit produces *regeneration.*

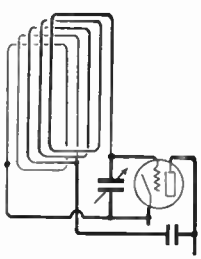
regenerative loop.—A receiving *loop antenna* in which part of the turns carry output current or plate current and provide a *feedback* of energy to the turns which are connected across the input or grid circuit of an amplifying tube thus allowing *regeneration. See illustration.*



Refraction



Regenerative Coupling



Regenerative Loop

regenerative receiver.—A radio receiver in which amplification is intentionally increased by *regeneration,* generally in the detector circuit.

regulation.—*Voltage regulation.*

regulation curve.—A graph showing the relation between voltage and current in an electrical system, a graph showing *voltage regulation.*

regulator tube.—A *voltage regulator tube.*

reignition.—Formation of an arc in a direction opposite to that of the steady current in *arc transmission.*

Reinartz circuit.—A regenerative circuit using a capacitive and inductive *feedback. See illustration.*

rejector circuit or rejector resonance.—A *parallel resonance* circuit tuned to a frequency to be kept out of a second circuit with which the first one is in series, the parallel resonance circuit offering maximum impedance to series currents of the tuned frequency.

rejuvenation of tube.—*Reactivation of filament.*

relative permeability.—*Permeability.*

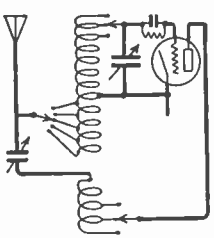
relay.—A device which employs electromagnets, vacuum tubes, grid-glow tubes or other means to control the current or alter the connections in one circuit when there are changes in another controlling circuit or instrument, the relay being connected to both parts. Compare *vacuum tube relay. See illustration.*

relay amplifier.—A *telephone repeater.*

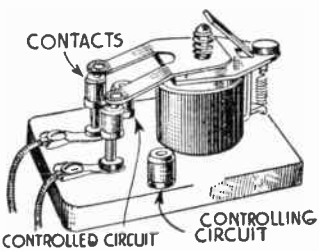
relay station.—1—A point in a transmission line at which are installed *telephone repeaters, attenuation equalizers* and other control equipment. 2—A *radio relay station.*

reluctance.—Opposition to the passage of *magnetic lines of force* in a magnetic circuit. Similar to resistance in electric circuits. Measured in *oersteds.* Reluctance in oersteds is equal to *magneto-motive force* in gilberts divided by the *flux* in lines. The symbol is the script letter "*R*".

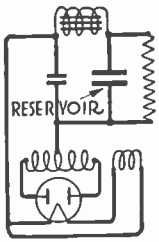
reluctivity.—Specific reluctance; the *reluctance* between opposite faces of a centimeter cube of a substance. The reciprocal of



Reinartz Circuit



Relay



Reservoir Condenser

permeability.

remanence.—*Residual magnetism.*

remote control.—Electrical or mechanical control of tuning, volume, switching and other functions of a radio receiver or other device from a point distant from the device.

repeater.—A *telephone repeater.*

repeater coil.—A *transformer* with one-to-one ratio, used for transferring voltages from one circuit into another.

repetition rate.—The *picture frequency.*

reproducer.—A *loud speaker.*

repulsion-induction motor.—An alternating current motor which starts as a *repulsion motor,* then changes over to an *induction motor* at a certain speed.

repulsion instrument.—A current measuring instrument employing the repulsion effect between two similarly magnetized iron poles or between the fields of two windings to move the indicating pointer. A *vane instrument.*

repulsion motor.—An alternating current motor making use of the reaction between a field produced by the supply current and a field produced by the armature conductors, the two fields repelling each other to produce motion.

re-radiation.—1—Radiation from a receiver's antenna of a signal which has been received and so greatly amplified by *regeneration* as to make such radiation possible. 2—Radiation from a receiver's antenna of unmodulated waves generated by oscillating receiver circuits which are coupled to the antenna.

reservoir condenser.—In a *power unit* filter, the condenser connected across the filter output and farthest from the rectifier. *See illustration, page preceding.*

residual capacity.—A name sometimes applied to the small capacity between plate and control grid of a *screen grid tube.*

residual charge.—The electric charge which remains in a condenser after the initial discharge, and which will cause a second smaller discharge. The charge represented by flow of *absorption current.*

residual magnetism.—The magnetism which remains in a piece of iron or steel after the *magnetizing force* has dropped to zero.

resistance.—1—Opposition to flow of either direct or alternating electric current. The opposition which results in production of heat in the material carrying the current. Resistance increases directly with the length and inversely with the cross section of a conductor; it increases with rise of temperature in all metals and most metallic alloys and decreases with rise of temperature in carbon and most liquids. *Ohmic resistance.* Measured in *ohms.* The symbols are R, r, or the Greek letter omega (ω or Ω). 2—A *resistor.*

resistance box.—A number of resistance elements so arranged that various combinations may be used in a circuit.

resistance bridge.—A *Wheatstone bridge* arranged to measure resistances.

resistance-capacity coupling.—A coupling method by which voltage changes developed across a *resistance* in the plate circuit of one tube are applied to the grid circuit of a following tube through the *electrostatic capacity* of a condenser. *See illustration.*

resistance coupled amplifier.—Generally an amplifier utilizing *resistance-capacity coupling.*

resistance coupling.—A transfer of energy from one circuit into another by voltages developed across a *resistance* which forms a part of each of the two circuits. *See illustration.*

resistance drop.—The difference in voltage between the two ends of a resistance. Potential difference which is due to *ohmic resistance.*

resistance feedback.—A feedback of energy through a *resistance coupling.*

resistance loss.—*The I^2R loss.*

resistance ratio.—The ratio of a conductor's resistance at alter-

nating current frequencies to its resistance with direct current.

resistance stabilization.—Prevention of oscillation by use of a *grid suppressor.*

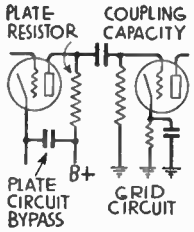
resistance variation method.—A method of measuring *high frequency resistance* by noting the change in current which is brought about when a known amount of resistance is added to a resonant circuit.

resistance wire.—A wire conductor having *ohmic resistance* high enough to allow its use in control of current and voltage.

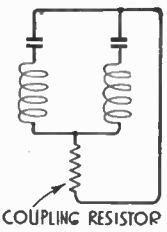
resistive coupling.—*Resistance coupling.*

resistivity.—Specific resistance; the resistance between opposite faces of a unit cube of a substance, or the resistance of one mil-foot of a conductor, these two being expressions of *volume resistivity.* Also expressed as *mass resistivity,* which see.

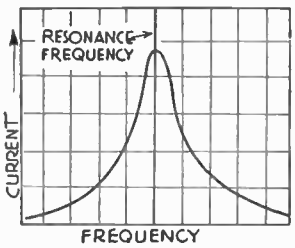
resistor.—A device containing *resistance* used in the operation, control or protection of electrical circuits. Usually a non-adjustable resistance unit.



Resistance-capacity Coupling



Resistance Coupling



Resonance Characteristic.

resonance.—1—The condition in an *oscillatory circuit* or in any alternating current circuit having its (positive) inductive reactance equal to its (negative) capacitive reactance at a certain frequency called the *resonance frequency.* The two reactances balance and leave only the circuit *resistance* to oppose current flow, so that the current is maximum for a given applied voltage. The condition in which the current is in phase with the applied voltage. Circuits are "in resonance" when both or all show resonance at the same frequency. Compare *parallel resonance* and *series resonance.* 2—*Acoustic resonance.*

resonance characteristic.—A graph showing the relation between frequency and the current or voltage in an *oscillatory circuit,* covering frequencies on both sides of *resonance.* A graph showing changes of current in an oscillatory circuit when the frequency is varied from that of resonance. *See illustration.*

resonance circuit.—An *oscillatory circuit.*

resonance constant.—An *oscillation constant.*

resonance curve.—A *resonance characteristic.*

resonance efficiency.—The ratio of the energy absorbed from *damped oscillations or waves* to the energy absorbed from equivalent *sine waves.*

resonance frequency.—The frequency at which *inductive reactance* and *capacitive reactance* balance or are equal in an *oscillatory circuit* or in any circuit containing inductance and capacity, the flow of current then being maximum for a given applied voltage of this frequency. The frequency at which current and applied voltage are in phase in a *reactive circuit.* The resonance frequency is equal to the reciprocal of 2π (pi) times the square root of the product of the circuit's inductance and capacity.

resonance indicator.—Any device which indicates by visible or audible means the condition of *resonance* at an applied frequency in an *oscillatory circuit.* Such indicators include small lamps, crystal detectors and various forms of alternating current voltmeters and ammeters.

resonance peak.—An increase of voltage upon application of a certain frequency to a device or circuit in which the combination of capacitance and inductance produce *resonance* at that frequency. *See illustration.*

resonance ratio.—The ratio of the current at *resonance* to the current in the same circuit with the capacity removed.

resonance transformer.—A transformer having a capacity connected to its secondary winding so that the secondary circuit shows *resonance* at the frequency of the voltage applied to the primary. Allows a secondary voltage higher than normal because of the elimination of reactive effects in the secondary.

resonance wave coil.—A form of receiving *antenna* consisting of a coil with one end grounded, the receiver circuits being inductively coupled to this coil.

resonant.—Exhibiting the condition of *resonance.* As generally used, the word has the same meaning as resonance.

resonant circuit.—An *oscillatory circuit* which exhibits *resonance* at the frequency existing in some associated part in an electrical or radio device.

resonant frequency.—A *resonance frequency.*

resonating.—Assisting in the production of *resonance;* a part or portion of a resonant circuit or an *oscillatory circuit.*

resonator.—1—An enclosure of such size and form as to allow *acoustic resonance* at certain frequencies. 2—A name sometimes applied to an *oscillator.*

response.—*Receiver response. Microphone response.*

response color relation of photocell.—Photocell current in rela-

tion to different colors of light affecting the tube. *Color sensitivity.*

response-frequency characteristic.—A graph showing the relation between the response of an *electro-acoustic transducer* and the frequency of operation.

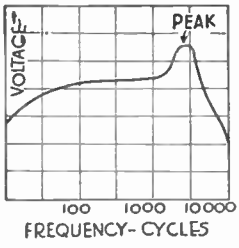
resultant.—A single force, effect or value which is the equivalent in action of two or more separate similar quantities.

retard or retardation coil.—An iron-core *inductance coil* used in a telephone circuit to prevent too rapid rise of currents at certain frequencies when the circuit is closed.

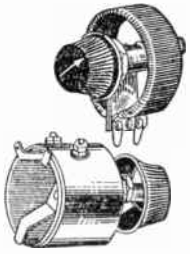
retentivity.—The ability of a magnetic material to retain magnetism or to remain a magnet after the *magnetizing force* has been removed. The ratio of the *residual magnetism* to the maximum magnetism. Sometimes the word is used also in the meaning of *coercive force,* which see.

retrace period.—The *flyback period.*

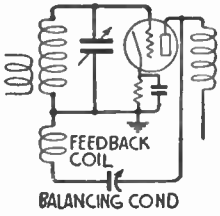
reverberation.—Continuation of sound within an enclosure because



Resonance Peak



Rheostat



Rice Circuit

of *reflection* of the waves back and forth between surfaces forming the enclosure. The effect of numerous *echoes* following closely upon one another.

reverberation period, time or damping.—The number of seconds required for a sound to drop 60 *decibels* in intensity after the source of sound has ceased to act. See *Sabine's formula.*

reverse current relay.—A *relay* which opens a circuit upon reversal of direction of current flow.

reversed grid current.—Direct current passing from some other element to a grid in a vacuum tube.

R.F., r.f. or r-f.—Abbreviation for *radio frequency.*

R_f.—Symbol for *filament resistance* in ohms.

R_g.—Symbol for *grid resistance* from grid to cathode.

rheostat.—A device providing circuit resistance in a form allowing easy change of value. *See illustration.*

rho (ρ).—Greek letter symbol for *resistivity* or *resistance.*

rhythm.—A recurring effect, such as successive beats in music.

ribbon antenna.—An *aerial* conductor which is of flat cross section.

ribbon microphone.—A *microphone* in which the member moved by sound waves is a light, thin aluminum ribbon located in a powerful magnetic field. Movement of this ribbon results in voltages from the device.

Rice circuit.—A circuit for *balancing* and eliminating the effect of internal plate-grid capacitance in a vacuum tube. A continuation of the grid circuit winding beyond the point of cathode connection is connected through an adjustable condenser to the tube's plate. Voltages developed in the extension winding oppose those fed back through the tube capacity. *See illustration, page preceding.*

Richardson's law.—A law stating the relation between the temperature of a given heated cathode in a vacuum tube and the *emission current.*

right hand rules.—1—A method of showing relative directions of magnetic flux, conductor motion and induced current in an electric generator (Fleming's rule). Extending the thumb, forefinger and middle finger of the right hand at right angles to one another, if the forefinger points in the direction of magnetic flux and the thumb in the direction the conductor is moved, then the middle finger points in the direction that induced current flows in the conductor. 2—For movement of lines of force around a conductor: If a conductor be grasped with the right hand, the thumb pointing in the direction of current flow, the finger tips point in the direction of the magnetic lines of force around the conductor. Compare *cork screw rule. See illustration.*

rigid iron conduit.—Iron pipe, galvanized or enameled on the outside, used for the support and protection of any type of wiring.

ring circuit.—A feeder or main circuit forming a complete closed loop and extending around a considerable area within which are energy consuming devices.

ring side.—The side of a circuit which is connected with the ring of a telephone *jack.* Compare *tip side.*

ripple filter.—A low pass filter designed to reduce the amplitude of *ripple voltage* currents, while passing direct current.

ripple percentage.—The ratio of the *ripple voltage* to the average value of the total voltage in a circuit.

ripple voltage.—A slight rise and fall of voltage in a circuit carrying direct current. The *alternating component* of the output voltage from a rectifier, filter or generator. The ratio of the effective value of the alternating component to the average value of the total voltage, usually expressed as a percentage.

R.M.A.—Abbreviation for Radio Manufacturers' Association.

r-m-s.—Abbreviation for *root-mean-square value.*

R_o.—Symbol for resistance of an *output circuit.*

Rochelle salt crystal.—A crystal of sodium potassium tartrate

(Rochelle salts) which exhibits the *piezo-electric effect.*

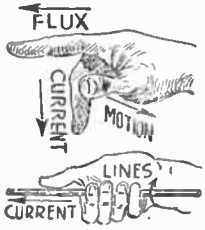
Rontgen rays.—The *X-rays.*

Rontgenography.—Photography by means of *X-rays.*

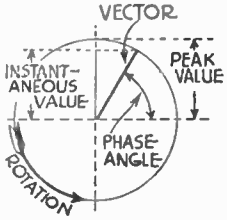
root-mean-square value.—The square root of the mean of the squares of all the instantaneous values in one cycle of alternating voltage or current. The *effective* value. With sine wave currents it is equal to the maximum value divided by 1.41421, or multiplied by 0.7071. Abbreviated *r-m-s.*

rotary converter.—A machine for changing *alternating current* to *direct current* or vice versa by the use of a single armature having alternating current slip rings and direct current commutator and brushes. The change is made electrically, while in a motor-generator it is made mechanically.

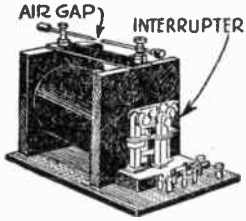
rotary spark gap.—In *spark transmission,* a gap consisting of two electrodes between which rotates a disc carrying projections to and from which sparks pass in traveling between the electrodes. Deter-



Right Hand Rules



Rotating Vector



Ruhmkorff Coil

mines the time interval between condenser discharges.

rotating grid tube.—A tube in which the control grid is mounted in a manner to allow rotation and is formed in a series of vanes against which electrons strike on their way from cathode to plate, causing the grid structure to revolve.

rotating radio beacon.—A *radio beacon* employing a rotating *directive antenna* emitting distinctive signals upon passing through north and through east, thus allowing an aircraft pilot to learn true direction of travel in degrees from north.

rotating vector.—A vector considered as rotating anticlockwise about one of its ends, the rate of rotation being equal to the cycles per second of an alternating frequency, each cycle being represented by one full turn of the vector. When the angle of the rotating vector with a horizontal line is equal to the *phase angle,* a projection of the vector on a vertical line represents the *instantaneous value* of the alternating quantity. See also *vector. See illustration.*

rotor.—A movable or moving part.

rotor plates.—The movable plates of a *tuning condenser*, generally the plates connected to ground or to the low voltage side of the tuned circuit. Compare *stator plates*.

R_p or r_p.—Symbol for *plate resistance*. In some cases the symbol R_p indicates external resistance in series with a tube plate, while the symbol r_p indicates the tube's internal plate resistance.

rubidium.—An alkali metal employed in photocell cathodes showing maximum response to blue-green light.

Ruhmkorff coil.—An *induction coil* fitted with a *magnetic interrupter* producing a spark discharge across an air gap. *See illustration, page preceding.*

S

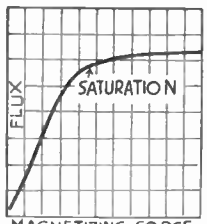
S.—Symbol for *photocell sensitivity,* also for *elastance.*

s.—Symbol for *conductance* of vacuum tube element.

Sabine's formula.—A formula stating that the *reverberation period* in seconds is equal to one-twentieth of the room volume in cubic feet divided by the total *absorption units for sound* in the room.

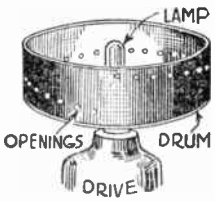
saturation.—*Magnetic saturation.*

saturation current.—The maximum plate or anode current in a vacuum tube or photocell; the current which cannot be increased by further increase of applied voltage and which is limited by *electron emission* from the cathode. The current resulting when all the emitted electrons are drawn away from a surface, none falling back to it. See *emission current.*



Saturation Curve

Scanning



Scanning Drum

saturation curve.—A *magnetization curve* exhibiting the change in slope which indicates *magnetic saturation. See illustration.*

scan frequency.—The number of times in each second that the scanning beam moves across the image in television. Equal to the product of the number of *lines* and the *picture frequency.*

scanning.—Conversion of lights and shadows of an image at the television transmitter into corresponding changes of voltage which are transmitted to the receiver and there used to reproduce lights and shadows on the picture tube which match those of the scene being viewed at the transmitter.

scanning disc.—A *Nipkow disc.*

scanning drum.—A hollow, cylindrical member employed in some systems of television to scan the image through openings arranged in spiral lines around the drum's circumference. *See illustration.*

S. C. C.—Abbreviation for *single cotton covered wire.*

S. C. E.—Abbreviation for single cotton over enamel (wire covering).

scratch filter.—A *low pass filter* used in connection with a phonograph pickup to attenuate the higher audio frequencies at which occur *needle scratch* resulting from motion of the pickup needle over the surface of a record.

screen.—A *shield.*

screen grid.—An electrode placed between two other electrodes of a tube and maintained at a suitable potential for reducing the electrostatic capacity between those other electrodes.

screen grid pentode.—A *screen grid tube* with an additional *space charge grid.* A five-element vacuum tube containing all the electrodes of a screen grid tube (cathode, control grid, screen grid and plate), also a space charge grid between cathode and control grid. The space charge grid is maintained at a positive potential with reference to the cathode, thus reducing the space charge and increasing the *electron emission. See illustration.*

screen grid tube.—A four-element *vacuum tube* having a cathode, plate and control grid, and in addition a perforated metallic shield almost completely surrounding the plate and called the screen grid. Through connections in the external circuits this screen grid is electrostatically grounded and maintained at such a potential that the capacity between plate and control grid is reduced to a small value. *See illustration.*

screen grid voltage.—The potential difference between a *screen grid* and the *cathode* of a vacuum tube. The symbol for the voltage at its source is E_d, for the voltage between screen and cathode it is E_s.

screened aerial.—An antenna system using a *counterpoise.*

screened anode photocell.—A *photocell* having an additional grid element which electrostatically shields the anode from the control grid. A form of cell suitable for *carrier frequency amplification.*

screened plate tube.—A *screen grid tube.*

search coil.—An *exploring coil.*

second channel interference.—Interference from a signal which has a frequency differing from that of the desired tuned signal by twice the *intermediate frequency* of a superheterodyne receiver.

second channel selectivity.—The ability of a superheterodyne receiver to reject signals from a transmitter operating at a frequency separated from the desired tuned frequency by twice the *intermediate frequency.*

second detector.—In *superheterodyne reception,* a detector tube which follows the *intermediate frequency amplifier* and which pro-

duces audio frequency currents from the intermediate frequency voltages impressed upon its grid circuit.

second harmonic superheterodyne.—A type of superheterodyne receiver in which the second *harmonic* of the oscillator frequency is used in production of the *intermediate frequency.*

secondary battery.—A *storage battery.*

secondary cell.—A *storage cell.*

secondary circuit.—A circuit which obtains its energy through coupling or connection with another (primary) circuit. A circuit connected to the output side of a transformer, a load circuit.

secondary electrons.—Electrons emitted from a cold cathode in the process of *secondary emission.*

secondary emission.—Liberation of electrons from a cold body which is being struck or "bombarded" by other rapidly moving electrons which have been emitted from a cathode in the usual way. A form of *electron emission* which takes place from a vacuum tube plate or grid. For example, in a screen grid tube operated at a comparatively low plate voltage, secondary electrons liberated from the plate are attracted to the positively charged screen, thus lessening the total number of electrons remaining on the plate and correspondingly lessening the plate current.

secondary foci.—*Conjugate foci* which are at equal distances from the *optical center* of a lens.

secondary winding.—A winding connected in a *secondary circuit.*

Seebeck effect.—The effect producing *thermoelectricity.*

selectance.—A measure of selectivity. *Selectivity factor.*

selective consonance.—The quality of *resonance,* enabling a circuit to respond to some one frequency.

selective emission.—*Photoelectric emission* occurring in greatest amount only within a rather narrow range of light frequencies or wavelengths and falling off sharply on either side of this range. The only form of emission sufficient in amount to be practically useful in photoelectric work. See *color sensitivity.*

selective fading.—A kind of *fading* in which there is attenuation, during one interval, of the high frequencies and then, during another interval, attenuation of lower frequencies. The apparent effect is fading either of the high or else the low frequencies in the signal or the modulation.

selective network.—A *filter* circuit which attenuates certain frequencies.

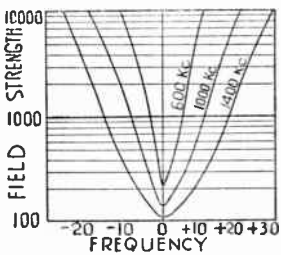
selectivity.—The degree to which a receiver or a circuit differentiates between signals at different *carrier frequencies.* A measure of ability to respond to signals at one frequency while excluding those of all other frequencies, this ability being proportional to the change which occurs in the current of a *resonant circuit* when

the capacity or the inductance is varied by a specified amount from the value at *resonance*. Selectivity increases with increase of the ratio of *inductive reactance* to *resistance* in a circuit, and it decreases as the *logarithmic decrement* becomes larger.

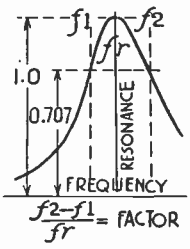
selectivity curve.—A curve showing the increase of *radio field intensity* which is required in order to maintain a *normal test output* from a receiver as the frequency of the applied signal is varied either side of the resonance point for a *standard test frequency*. The steeper the sides of the curve, the greater the receiver's selectivity. *See illustration.*

selectivity factor.—In a *resonant circuit*, the frequency of resonance divided into the difference between the two frequencies on either side of resonance at which the current has fallen to 0.707 times its peak value. Another selectivity factor is the reciprocal of the *logarithmic decrement*. *See illustration.*

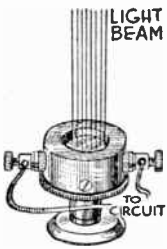
selector.—The tuning control of a receiver.



Selectivity Curve



Selectivity Factor



Selenium Cell

selector circuit.—A *band selector circuit.*

selector switch.—A multiposition switch used for changing wavebands, tone values, instrument ranges or for connecting together any combinations of circuits.

selenium.—An element of which the electrical resistance is lowered when light strikes against it. A *photo-conductive* material.

selenium cell.—A device in which the element *selenium* is employed to change electrical resistance proportionately to the amount of light reaching the cell. Changes of current through the cell may be used for operation of relays or other electrical instruments. A *photo-conductive* cell. *See illustration.*

self-biased.—Having *automatic grid bias.*

self-capacity.—*Distributed capacity.*

self-heated thermocouple.—A *thermocouple* which carries and is heated by current to be measured, instead of being indirectly heated through contact with or radiation from a separate conductor heated by the current.

self-heterodyne reception.—*Autodyne reception.*

self-inductance.—The property of a circuit by which it opposes any change in the rate of current flowing in it, or the property of a

circuit in which a current changing its rate of flow produces in the circuit a voltage having a polarity opposite to that causing the original current flow. This voltage of self-inductance is called *counter-electromotive force.* Self-inductance is measured in *henrys* and is proportional to the lines of magnetic flux linked with the circuit per ampere of current causing the flux; 100,000,000 lines per ampere corresponding to a self-inductance of one henry. The symbol is *L.*

self-induction.—The action by which any change of current in a circuit (either an increase or decrease) produces an *electromotive force* which opposes the change of current.

self-oscillation.—*Self-sustained oscillation.*

self-rectified transmitter.—A transmitting *oscillator* circuit using two tubes with their plates connected to opposite ends of a power transformer secondary, each tube oscillating while its plate supply is on a positive alternation and remaining idle on the negative alternation.

self-shielded coil.—An *astatic coil.*

self-sustained oscillation.—Oscillations which are maintained by energy *feedback* from an output or plate circuit to an input or grid circuit.

Selsyn motors.—Two specially designed synchronous machines connected to a single A.C. source in such manner that any position, or any speed and direction of rotation of the rotor in one machine is accompanied by a similar position, or similar speed and direction of rotation of the rotor in the other machine.

sending end impedance.—In a transmission line, the ratio of the *applied voltage* to the *steady-state* current there produced.

sensation level.—The number of *sensation units* or decibels by which a given sound power is above the power at the *threshold sound intensity* of audibility.

sensation unit.—The smallest change in power of a sound which can be distinguished by the ear as a change. A change of one *decibel* in the power level of a sound.

sense.—One particular direction of two opposite directions; one phase relation of two possible phase relations, etc.

sense finder.—Apparatus used in connection with a *direction finder* to tell from which of the two diametrically opposite directions in the wave path the signal is approaching the finder.

sensitivity.—1—The response of a receiver to signals at the tuned frequency; the ability of a receiver to change *radio wave* signals into *sound* energy. Measured in various ways; as the ratio of the output power to the received power at various frequencies, or according to the input voltage required to produce a *normal test output,* or as the reciprocal of the *normal radio field intensity.* 2—*Photocell sensitivity.*

sensitized photocell.—A *vacuum photocell* or *gas photocell* in which the cathode surface has been rendered more sensitive by

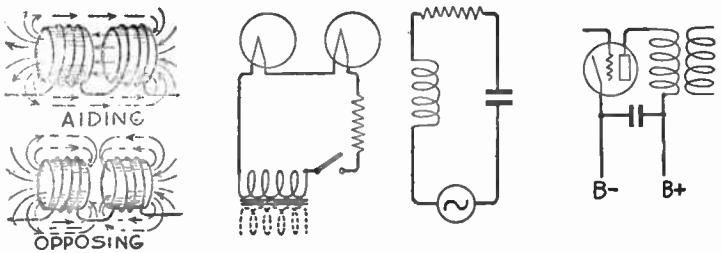
passing a glow discharge through an atmosphere of hydrogen within the bulb during manufacture of the cell.

sensitometer.—An instrument for determining or measuring the response of photographic film to various intensities of light. Used in sound picture film recording processes.

separate heterodyne.—Production of a *beat frequency* or *zero beat* by combining in one tube the signal frequency with a local frequency generated in a separate oscillator tube, this separate oscillator taking no other part in the process of signal amplification or detection.

series aiding.—A connection of two *inductance coils* in series while they are in such positions that the fields of both act in the same polarity, the total field strength and total inductance being increased. Compare *series opposing*. *See illustration.*

series circuit.—A circuit with all its parts and conductors connected end to end so that all the current flowing through any one portion must flow also through every other portion. *See illustration.*



Series Aiding **Series Circuits** **Series Feed**

series feed.—A connection of the direct current power supply for the plate of a tube to the end of an impedance which forms part of the active plate circuit, or part of the path for audio or radio frequency plate current. The direct current then flows to the plate through this impedance. Compare *parallel feed*. *See illustration.*

series feed oscillator.—A vacuum tube oscillator employing *series feed* for the tube plate circuit.

series filaments or heaters.—A series connection of the filaments or heaters of two or more tubes, the voltage across the entire circuit being equal to the sum of the voltage drops across the filaments or heaters plus the drop in the intermediate connections.

series inductance of line.—The *self-inductance* possessed by the conductors forming a transmission line.

series loaded line.—A *loaded line* with the added reactances in series with the line.

series modulation.—*Modulation* obtained by placing the plate circuit of a modulating tube in series with the plate circuit of an

oscillator tube. Change of plate resistance in the modulator, due to signal voltages on its grid, then varies the plate voltage on the oscillator. *See illustration.*

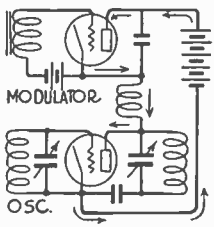
series-multiple.—A number of parts connected in multiple or *parallel circuits,* these circuits then being connected together in a *series circuit.*

series opposing.—A connection of two *inductance coils* in series while they are in such relative positions that their fields act in opposite polarity, the total field strength being reduced and the *self-inductances* cancelling wholly or in part, leaving the *mutual inductance* as the chief characteristic. Compare *series aiding.*

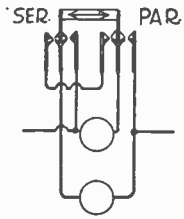
series-parallel.—*Series-multiple.*

series-parallel switch.—A switch allowing two parts or two circuits to be connected together either in series or in parallel. *See illustration.*

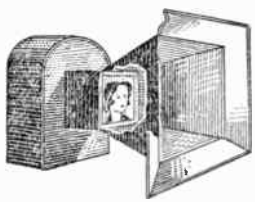
series phase resonance.—*Series resonance* with the entering current in phase with the circuit voltage.



Series Modulation



Series-parallel Switch



Shadow Box

series resistance.—1—A resistance connected in series with a circuit. 2—The *feed resistance* of a multiple tuned antenna. 3—An *equivalent resistance* (in series). 4—The *ohmic resistance* possessed by the conductors forming a transmission line.

series resonance.—The condition in a circuit which contains capacity and inductance in series, the values of the two being such that they produce *resonance* at the frequency of the applied voltage. The impedance to current flow is minimum, since the inductive reactance and capacitive reactance balance and leave only the circuit resistance. The current is in phase with the applied voltage. Compare *parallel resonance.*

series transformer.—A *current transformer.*

service area.—The localities in which the *radio field intensity* from a transmitting station is high enough to insure satisfactory reception of signals. Depends on the ratio of the signal strength to the interference field strength.

service band.—The *radio channels* employed for a certain kind or class of transmission.

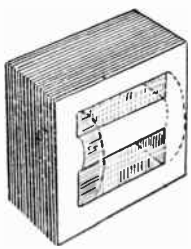
set analyzer.—An instrument containing one or more meters and means for making necessary connections with receiver circuits, generally through tube sockets, so that voltages and currents in the several tube circuits may be read simultaneously or one after another.

shading.—*Average shading.*

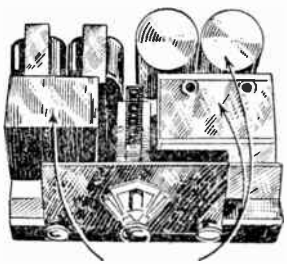
shading coil.—1—A copper ring placed around the central pole of the field magnet in a *moving coil loud speaker* for the purpose of preventing hum pickup in the moving coil. 2—An extra winding used with alternating current electromagnets to prevent their pull from dropping to zero between alternations.

shadow.—A region or area not reached or penetrated by light waves, sound waves or radio waves.

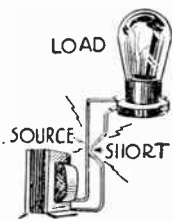
shadow box.—A partial enclosure placed around the viewing lens or screen of a *television* reproducer to prevent surrounding light



Shell Transformer



Shield



Short Circuit

from reducing the apparent brilliancy of the image. *See illustration, page preceding.*

shape factor.—The *elongation factor.*

sharp tuning.—The condition existing when a circuit or receiver has great *selectivity.*

sharp wave.—*Radiation* in which the frequencies are confined to a narrow band.

sharpness of resonance.—*Selectivity.*

shear vibration.—*Transverse vibration.*

shell transformer.—A transformer of which the magnetic *core* includes a straight central portion, surrounded by the windings, and extensions of the core which pass around the outside of the windings and join the ends of the straight central portion. *See illustration.*

shield.—A conducting metallic plate between electrical parts, or a complete metallic enclosure around such parts, this metal usually being grounded. External *electromagnetic* and *electrostatic fields* are prevented from reaching the enclosed or protected parts, and

fields generated by the parts are not radiated through the metal barrier. *See illustration.*

shield grid tube.—A *screen grid tube.*

shielded plate tube.—A *screen grid tube.*

shock excitation.—*Impulse excitation.*

short circuit.—A low resistance connection between the two sides of an electrical circuit, allowing current from a source to return to the source without flowing through the normal load. *See illustration.*

short wave receiver.—A receiver designed to operate on short wave transmission or on frequencies above 3000 kilocycles.

short wave transmitter.—A transmitter radiating signals with short wavelengths or with frequencies above 3000 kilocycles.

shorted out.—The condition in which a device or part of a circuit is made inactive by placing in parallel with it a conductor of very low resistance or impedance through which currents may flow around the part shorted out.

shortening condenser.—A condenser connected in series with an *antenna circuit* to shorten the wavelength of *resonance.*

shot effect.—A rapid fluctuation of *saturation current* in a vacuum tube, due to minute changes in the rate of electron emission. The result is tube noise in a receiver's audio output provided sufficient amplification follows the tube exhibiting the shot effect.

shroud.—A *shield.*

shunt.—1—One of the current paths in a *parallel circuit.* 2—A resistor connected in parallel with an ammeter to allow extension of the meter's current range. See *ammeter shunt.* Any similar resistance used to allow only a portion of the total current to flow through a device.

shunt capacity.—1—A capacity in parallel. 2—In a transmission line, the *distributed capacity* existing between the two sides of the circuit.

shunt circuit.—One of the branches in a *parallel circuit.*

shunt conductance of line.—The *conductance* existing between the two conductors or two sides forming a transmission line, and allowing a *leakage current* to flow.

shunt feed oscillator.—A *parallel feed oscillator.*

shunt law.—A law expressing the relation between currents in a *parallel circuit;* the currents in two branches being inversely proportional to the resistances of the branches.

shunt loaded line.—A *loaded line* with the added reactances in parallel across the line.

shunt resistance.—*Parallel resistance.*

shunt transformer.—A *voltage transformer.*

shunted telephone measurement.—A method of measuring *audibility* by reducing the value of a resistance connected across a telephone receiver until signals are just audible, the audibility being inversely proportional to the required resistance.

shunting condenser.—A condenser connected between an aerial and ground, in *parallel* with the *antenna capacity*, to lower the frequency at which the antenna circuit becomes resonant.

side band.—All of the frequencies which are produced by *modulation* of a carrier, including the frequencies both above and below the *carrier frequency*.

side band transmission.—A system of transmission in which the *carrier current* is eliminated after modulation has taken place at the transmitter, the *side bands* being transmitted alone and received by apparatus which generates and supplies the missing carrier at the receiver. Carrier suppression. See *balanced modulator*.

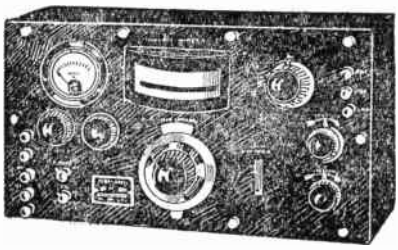
side circuit.—One side of a *phantom circuit*.

side frequency.—A frequency which is produced by modulating the carrier current with a single additional frequency.

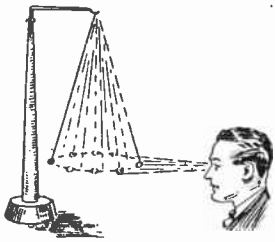
side wave.—A *side frequency*.

sign.—*Polarity*.

signal.—Any form of intelligence transmitted by radio waves or by wire communication.



Signal Generator



Simple Harmonic Motion

signal frequency.—The frequency of the *modulated wave* arriving at a radio receiver. Sometimes used as meaning the *modulation frequency*.

signal generator.—A device consisting of a *radio frequency oscillator* and an *audio frequency oscillator* arranged to furnish current at a known radio frequency, modulated, and to deliver a measured voltage only at the terminals of the generator without appreciable radiation at any other points. *See illustration.*

signal intensity.—The *amplitude* of a carrier current. The *radio field intensity*.

signal-noise ratio.—The ratio of the *radio field intensity* to the *radio noise field intensity* at a given point.

signal relay.—A *relay* which controls a visible or audible signal.

signal strength.—*Signal intensity* as measured by *audibility*.

signal wave.—A wave motion in which variations of frequency or amplitude convey a signal.

silent switch.—A switch, usually located at a distance from a receiver, and arranged to temporarily stop production of sound without cutting off the power supply to the receiver.

silicon detector.—A *crystal detector* employing fused silicon, under rather heavy pressure, as its principal element.

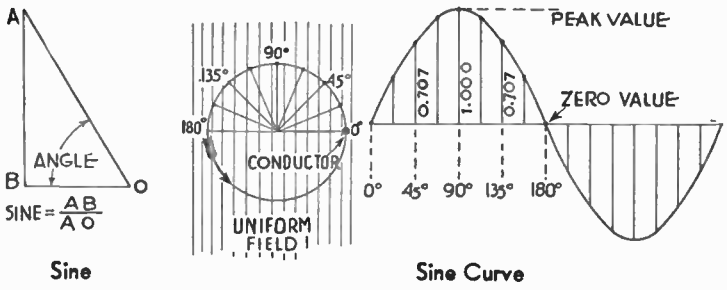
silicon steel.—A steel alloy having rather high electrical resistance, used for magnetic *cores*.

silver.—The metal having greatest conductivity. Sometimes used for switch contact points.

simple alternating current.—A *sine-wave* current.

simple circuit or element.—A circuit containing an *inductance*, a *capacitance* and a *resistance* in series.

simple harmonic motion.—The apparent motion of a point traveling at uniform speed around a circle when viewed from a position in the circle's plane, from the edge of the circle. *See illustration.* Approximately the motion of the lower end of a freely swinging pendulum.



Sine — Sine Curve

simple lens.—A lens consisting of a single piece of glass or other refracting material.

simple tone.—A *pure tone.*

simplex circuit or transmission.—A communication channel which can be used in only one direction at one time.

simplexed circuit.—A two-wire telephone circuit with a superposed signal circuit, the signal circuit having a ground return.

simulative network.—An *attenuation equalizer.*

simultaneous broadcasting.—*Chain broadcasting.*

sine.—The sine of either of the smaller angles in a right triangle is the ratio of the length of the side opposite the angle to the length of the hypotenuse of the triangle. *See illustration.*

sine curve.—A curve representing rise and fall of the voltage induced in a conductor moving in a uniform magnetic field at constant speed around a circle whose plane is parallel to the direction of the magnetic lines. If measured from a horizontal line representing zero, the ordinate (vertical distance) of each point in

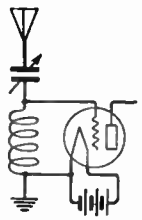
the curve is equal to the *sine* of the angle through which the conductor has passed up to that instant, and the abscissa (horizontal distance) of this point is equal to the angle itself. *See illustration.*

sine galvanometer.—A *galvanometer* with which the *sine* of the angle of needle deflection is proportional to the current measured.

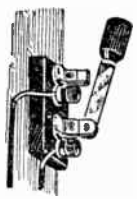
sine wave.—An alternating current or voltage in which the wave form is sinusoidal, varying according to a *sine curve.* This is the wave form assumed in all simple calculations of alternating current values.

singing arc.—A direct current electric arc operating in open air and having across it an inductance and a capacity in series. *Audio frequency* oscillations are produced in the circuit. A *Duddell arc.*

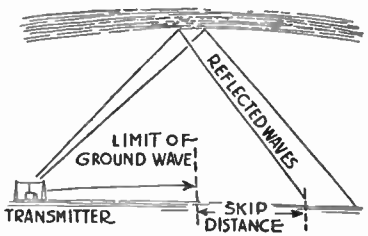
single circuit receiver.—A receiver in which the grid of the detector tube is connected through its grid condenser directly to the aerial and in which the filament is connected to the ground. The grid circuit coil is connected between aerial and ground. *See illustration.*



Single Circuit Receiver



Single-pole Single-throw Switch



Skip Distance

single control.—Operation of all the *tuning* elements in a receiver from a single knob or dial.

single cotton covered wire.—Copper wire insulated with a single layer of cotton threads. Abbreviated *S. C. C.*

single layer coil.—An *inductance coil* having its entire winding arranged in one layer with turns side by side.

single-phase.—Descriptive of a circuit or apparatus in which there exists but one alternating voltage and its corresponding current.

single-pole switch.—A switch which opens and closes only one side of a circuit, having but one set of contacts. *See illustration.*

single side band transmission.—A transmitting system in which only one *side band* is radiated, the other band being suppressed. The *carrier wave* may be suppressed or radiated.

single silk covered wire.—Copper wire insulated with a single layer of silk threads. Abbreviated *S. S. C.*

single-throw switch.—A switch which may be closed in only one position, completing a circuit in only one path. *See illustration.*

sink.—A power consuming device or any device in which energy of one form is changed into energy of another form. A *transducer.*

sinusoidal.—Having the form of a *sine curve.*

skeleton form.—An open framework on which an *inductance coil* is wound.

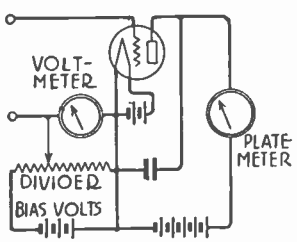
skiagraph.—The shadow-like image produced by *X-rays.*

skid-fin antenna.—An airplane *antenna* consisting of conductors carried on a wing.

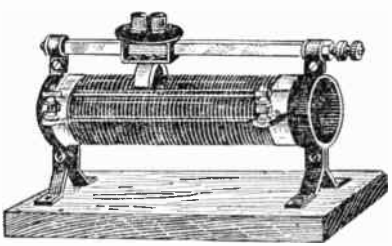
skin effect.—An increase of *effective resistance* which accompanies increase of frequency in conductors carrying alternating current. *Eddy currents* and *counter-e.m.fs.* generated in the conductor's interior oppose flow of current in that portion, leaving the outer "skin" to carry most of the current, and thus reducing the current carrying ability of the conductor as a whole.

Skinderviken button.—A form of *microphone button.*

skip distance.—The space or region within which signals from a transmitter are not received. It extends from the farthest point



Slide Back Voltmeter



Slide Rheostat

reached by the *ground wave* to the nearest point at which the reflected wave or *sky wave* comes back to earth. The skip distance exists only with high frequency transmission and increases in extent with increase of frequency. *See illustration.*

sky wave.—The portion of a transmitter's radiated wave which is reflected back to the earth's surface from the layer of ionized gases near the top of the atmosphere. See *Heaviside layer.*

slab winding.—A winding placed on a thin, flat strip of insulating material. The inductance is low but the distributed capacity is rather high.

slide back voltmeter.—A *vacuum tube voltmeter* which measures *effective voltage,* this voltage being assumed as equal to the change required in *grid bias* voltage to return the plate current to the value it had before application of the measured voltage. The bias is altered by a *voltage divider. See illustration.*

slide contact.—A movable metal piece or brush which may be placed on various points in the length of a coil, a resistance or

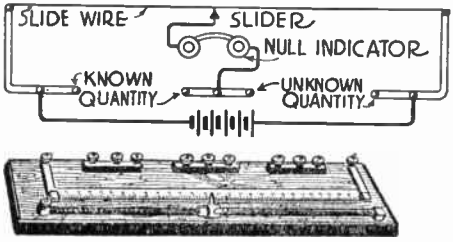
other electrical element to include more or less of the element in an *active circuit*.

slide coupler.—An *inductive coupling* device in which movement of a contact over the turns of one winding allows inclusion of a varying number of turns in the active circuit, thus changing the amount of coupling with the second winding.

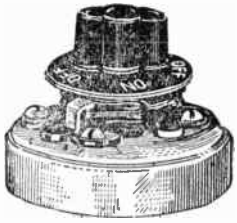
slide rheostat.—Any *rheostat* in which the amount of resistance placed in circuit is altered by sliding a contact along the resistance element. *See illustration.*

slide tuner.—A *tuning coil* in which the inductance is varied by a sliding contact bringing more or less of the turns into the active circuit.

slide wire bridge.—A form of *Wheatstone bridge* in which the ratio is changed by a contact sliding on a single wire, the portions of this wire on either side of the slider forming the ratio arms of the bridge. *See illustration.*



Slide Wire Bridge



Snap Switch

slider.—A movable contact.

slip.—The difference between the speed of rotation of the revolving field and the speed of the rotor in an *induction motor*. The speed of field rotation is called the synchronous speed.

slip ring motor.—A variable speed *induction motor* having external resistances connected to the motor windings through slip rings.

slow-burning weather-proof conductor.—Wire with weather-proof coating around the conductor and fire-resisting coating on the outside.

slow-burning wire.—Wire covered with insulation which has been treated to make it resist fire.

smooth line.—In telephony or telegraphy, a line having uniformly and continuously distributed electric elements; inductance, capacity, etc.

smoothing circuit.—A *low pass filter* following the rectifier in a *power unit*.

snap switch.—A switch in which movement of the contacts is restrained until tension has been placed upon a spring which throws the contacts together or apart very quickly. *See illustration.*

sneak current.—A current of very small amperage which has escaped from its proper circuit.

socket.—A *tube socket.*

socket adapter.—A device which allows a tube having one style of base to be used in a socket designed for a different base.

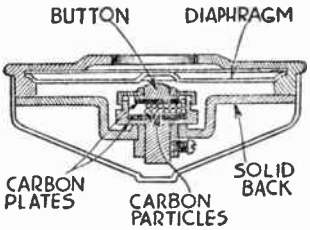
socket antenna.—A *lamp socket antenna.*

socket power.—A *power unit* using lighting circuits as its source of primary power.

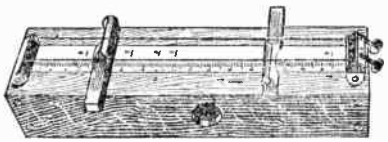
socket-powered set.—A radio receiver designed for battery operation but used with a *socket power* unit.

sodium.—An alkali metal employed in photocell cathodes having maximum response at the violet end of the visible spectrum.

soft tube.—A tube within the bulb of which a small amount of gas



Solid Back Microphone



Sonometer

remains, allowing slight *ionization* and increase of plate current with the tube in operation. Used as a *detector.* Compare *gassy tube.*

solenoid.—A spirally or helically wound conductor which exhibits the properties of a *magnet.*

solid back microphone.—A *microphone* having a mass of carbon particles between the diaphragm and a solid support in the housing or case of the instrument. *See illustration.*

sonic altimeter.—A device for determining height of an aircraft above the ground by measurement of the time taken for *sound waves* to reach the ground and to return.

sonometer.—An instrument for production of *sound waves;* a vibrating string stretched over movable bridges, the distance between which is measured by a fixed scale. *See illustration.*

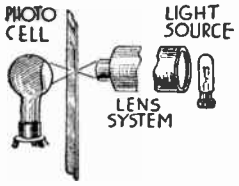
sonorous.—Having the ability to emit sound when struck. Having *acoustic resonance.*

S O S.—The letters which, in the radio telegraphic *code*, form the distress signal. Selected because of the easily recognized and distinctive sound of this signal.

sound.—A form of *wave motion* capable of affecting the sense of hearing; the waves being transmitted by *longitudinal vibration* of a material substance such as air, metal, glass, etc., whereas radiant energy, such as heat, light and radio, is transmitted through space without motion of any form of matter.

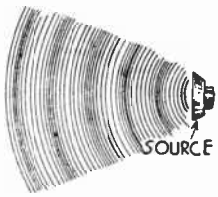
sound gate.—The part of a sound picture film system through which the film is passing while being acted upon by the light beam which excites the photocell. *See illustration.*

sound lens.—A double convex vessel containing a heavy gas or other medium which refracts sound waves, thus causing them to be focused or condensed at a particular point in space.



Sound Gate

Sound Track



Sound Wave

sound pickup.—In sound picture projection, the device which translates the sound record from film or disc into electrical impulses. A *photocell* and *lens* combination, or a *phonograph pickup.*

sound picture.—A motion picture synchronized with a reproduction of the sounds normally accompanying the action shown by the picture.

sound shadow.—A space within which sounds are not heard because of a screening object.

sound spectrum.—The frequencies included within the range of audible sound. *Audio frequencies.*

sound track.—In the film system of sound picture production, that portion of the strip of film occupied by the record of sound. See *variable area system* and *variable density system. See illustration.*

sound wave.—The alternate compressions and rarefactions of the air or other medium through which sound is traveling. These

waves cause motion longitudinally, or back and forth along the line of propagation. *See illustration.*

source.—A part which furnishes energy in any form; as electromotive force, light, sound, etc.

south pole.—The end of a magnetic needle which points south. The negative pole of a magnet.

space charge.—Negative *electrons* which have been emitted from a cathode in a vacuum tube but which have not been drawn to the plate, remaining around the cathode as a *negative charge.* This negative space charge repels additional electrons emitted from the cathode. The space charge is made greater by a negative charge on a *control grid* or on any other electrode located near the cathode, and is made less by a positive charge on any such electrode.

space charge grid.—A vacuum tube electrode maintained at positive potential with reference to the cathode for the purpose of lessening the *space charge* and allowing greater *electron emission.* See *screen grid pentode.*

space charge pentode.—A *screen grid pentode.*

space current.—The current between a vacuum tube anode or plate and the tube's cathode or filament, this current corresponding to the flow of *electrons* between these electrodes.

space factor.—1—In a winding, the ratio of the space occupied by the conductor with its insulation to the space occupied by the conductor alone. 2—In a magnetic *core,* the ratio of space occupied by iron to the total cubic content of the core.

space radio.—Radio transmission of signals through space by *radiation,* without the aid of metallic conductors to carry the signals. Compare *wired radio.*

space wave.—The *sky wave.*

spaced winding.—A coil winding in which adjacent turns are separated by an air space. *See illustration, page following.*

spacing wave.—The *compensation wave.*

spade tuning.—See *detuning spade.*

spaghetti tubing.—Small diameter insulating tubing made of varnished cloth.

spark.—A momentary discharge of electricity across a space separating two electrodes. Compare *arc.*

spark circuit.—An *oscillatory circuit* containing a spark gap.

spark coil.—A *Ruhmkorff coil.*

spark frequency.—*Group frequency.*

spark gap.—The space between electrodes in which a spark discharge takes place during *spark transmission.* Production of the spark closes the oscillatory circuit at a voltage determined by the

distance between electrodes. A *quenched gap*, a *rotary gap*, or a *plain gap*.

spark signals.—Radio telegraphic or *code signals* sent during *spark transmission*.

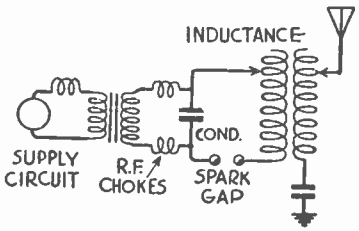
spark suppressor.—A fixed resistance of about 25,000 ohms placed in series with conductors carrying high tension current in an automotive ignition circuit, the purpose being to make these circuits *aperiodic* and non-radiating. *See illustration.*

spark transmission.—Radio transmission using waves set up by the oscillatory discharge of a condenser through a circuit containing an inductance coil and a spark gap in series. When the condenser is highly charged, at the peak of an alternation in the supply current, the gap breaks down and a spark is formed. The low resistance of the spark closes the circuit and *oscillatory currents* are produced. *See illustration.*

spark transmitter.—A radio transmitter using the *spark transmission* system.

Spaced Winding

Spark Suppressor



Spark Transmission

sparking voltage.—1—The *potential difference* at which current will pass across an air gap. 2—The breakdown voltage in a *grid-glow tube*.

speaker.—A *loud speaker*.

specific gravity.—The weight of a substance expressed as the ratio of its weight to the weight of an equal volume of pure water. The weight of water is taken as unity, or as 1.0.

specific inductive capacity.—*Dielectric constant*.

specific value.—An electrical characteristic, such as resistance, conductance, etc., expressed in the quantity or value of such characteristic existing in a unit volume (centimeter cube) of the substance considered. The unit volume for conductors sometimes is the mil-foot.

spectrograph.—1—An illustration of a *spectrum*. 2—An instrument for forming a *spectrum*.

spectrometer.—An instrument which may be used for the indirect measurement of the *wavelength* of light.

spectrophotometer.—An instrument for measuring relative intensity of two like colors from different sources.

spectroscope.—An instrument which separates a light beam into a *spectrum,* into various colors and wavelengths.

spectrum.—An arrangement of rays of *radiant energy* in the order of frequency or wavelength. *See illustration.*

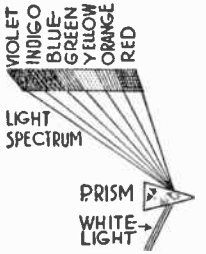
speech amplifier.—An *audio frequency amplifier.*

speech envelope.—An *envelope.*

speech modulation.—*Modulation* of a carrier by signals representing spoken words, music or other sounds. The modulation used for *radio telephony.*

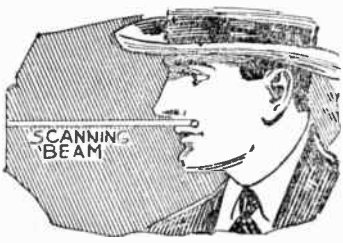
speed controls.—Television receiver controls for frequencies of the horizontal and vertical oscillators, permitting them to be synchronized with received signals.

sphere gap.—Two metal balls, the distance between which is proportional to the voltage which produces a spark in the gap.



Spectrum


Spiderweb Coil



Spot Lighting

spherical aberration.—An effect which results in failure of all the light rays passing through a lens to come to a single focus, the fault being due to curvature of the lens.

spiderweb coil.—An *inductance coil* in which the radius of successive turns increases from a center outward. *See illustration.*

spilling over.—The condition in the operation of a receiver at which *regeneration* changes suddenly into *self-sustained oscillation,* resulting in whistling in the audio frequency output.

spiral disc.—A *Nipkow disc.*

spiral loop.—A *loop antenna* in which the turns lie in one plane, the winding being formed of concentric turns of increasing diameter.

split conductor.—A conductor divided into two or more parts by thin insulation, the whole enclosed in heavier insulation.

split variometer.—A *variometer* in which the stationary and rotating windings have been disconnected from each other so that the device acts as a means for variable *inductive coupling.*

spot lighting.—The illumination at one time of only one small spot or area of an object being scanned in *television*. Point lighting. *See illustration, page preceding.*

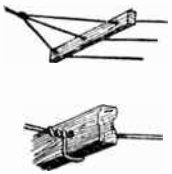
spot tuning.—Control which allows reception only when tuned circuits have been correctly adjusted to the carrier frequency.

spreader.—An insulating or supporting member holding two or more *aerial* conductors apart. *See illustration.*

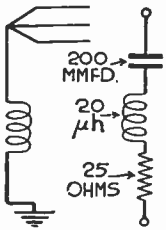
spurious radiation.—Radiation by a transmitter of frequencies lying above or below its assigned channel.

square law condenser.—A *straight line wavelength condenser.* A variable tuning condenser in which the capacity is proportional to the square of the wavelength to which the condenser's circuit is resonant.

square law detector.—A tube detector with which variations of average plate current are proportional to the squares of the variations in signal voltage applied to the grid. A detector employing either *grid current detection* or *plate current detection* and operating at comparatively low plate voltages, as distinguished from a *power detector* or one providing *linear detection.*



Spreader



Standard Antenna

Standard Cell

square mil.—The area of a square having sides one mil or one thousandth of an inch long.

squirrel cage motor.—An *induction motor* in which the rotor conductors are plain bars of metal having no external connections.

S.S.C.—Abbreviation for *single silk covered wire.*

S.S.E.—Abbreviation for single silk over enamel (wire covering).

stability.—Freedom from regenerative feedbacks and resulting *self-sustained oscillation* in a radio frequency or audio frequency amplifier.

stabilizing.—*Balancing.*

stage of amplification.—An *amplifying tube* with its grid circuit and plate circuit.

stagger-wound coil.—A coil with *basket winding.*

stamper.—In the disc method of sound recording, a die built up from the *mother* and used for pressing out the final records used for sound reproduction.

standard antenna.—A real or *artificial antenna* having definite

electrical characteristics suitable for receiver testing. A series circuit with a resistance of 25 ohms, a capacitance of 200 microfarads and a self-inductance of 20 microhenrys. *See illustration.*

standard cable.—An ideal uniform line used as a reference value for measurement of *attenuation* or *gain* in actual lines. The standard cable has a resistance of 88 ohms per loop mile, a capacitance between wires of 0.054 microfarad per loop mile, and has no inductance or leakage.

standard candle.—A form of candle which burns at a fixed rate and is used as a standard unit of *luminous intensity*. See *international candle.*

standard cell.—A *galvanic cell* which, under certain specified conditions, maintains a voltage constant enough to serve as a standard for comparison. *See illustration.*

standard frequency signal.—A signal at a *standard test frequency.*

standard notation.—A system of writing large or small numbers as the product of two factors; one of which is a positive or negative power of 10, and the other a number with only one figure to the left of the decimal point. Thus 2.8×10^{3} means to move the decimal point three places to the right, giving 2800.0; and 2.8×10^{-3} means to move the decimal point three places to the left, giving 0.0028.

standard ohm.—The *international ohm.*

standard test frequencies.—Frequencies used in receiver tests; these being 600, 800, 1000, 1200 and 1400 kilocycles, or sometimes only 600, 1000 and 1400 kilocycles.

standard test output.—The *normal test output.*

standard test voltage.—The *normal input voltage.*

standard wire gage.—The legal wire gage in Great Britain.

stand by.—To wait for further transmission of signals at a later time.

stand-by battery.—A *storage battery* held in reserve for emergency use.

stand-by circuit.—A broadly tuned receiving circuit which responds to any of several carrier frequencies on which messages may be received.

standing waves.—1—Points of minimum and maximum voltage and current which remain fixed in position along the length of a conductor from the terminus of which wave *reflection* takes place. The distance between two adjacent points of minimum voltage or current *(nodes),* or the distance between two adjacent maximum points *(antinodes)* is equal to one-half wavelength. 2—A similar effect produced by interference of direct and reflected sound waves. *See illustration, page following.*

stand-off insulator.—An insulator of length sufficient to hold a conductor at a required distance from a building or other support. *See illustration, page following.*

star connection.—Connection of the load circuit elements of *poly-*

phase apparatus at a common point or center, the supply being connected to the outer or free ends of the load elements.

stat-.—A prefix used in the names of *electrostatic units.*

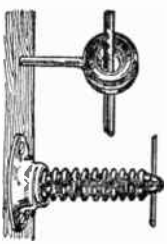
static.—1—*Interference* resulting from radio waves produced by atmospheric electrical disturbances, or from antenna currents produced by contact with the receiving aerial of electrically charged gases, rain, snow, etc. 2—A contraction of *electrostatic.*

static characteristic.—A curve showing the relations between steady values existing in a circuit or system. A curve made by application of direct currents and voltages to a system ordinarily operated with alternating or rapidly changing values, such as those of signal currents. Compare *dynamic characteristic. See illustration.*

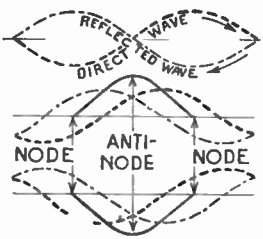
static coupling.—*Capacitive coupling.*

static electricity.—*Electrostatic charges,* or electricity at rest.

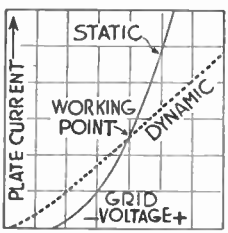
static eliminator.—Any device intended to reduce the ratio of *static* to desired signal in the antenna circuit of a receiver.



Stand-off Insulator



Standing Wave



Static Characteristic

static frequency transformer.—Two transformers with their primaries in series and their secondaries in series. Magnetizing force in one unit is strong enough to cause *magnetic saturation* of the iron during current peaks, thus producing in the secondary a distorted wave form which is combined with the wave from the other secondary to result in a new wave form of triple the frequency applied to the primaries.

static level.—The field strength of the combined effects of all forms of *interference* acting upon a receiving antenna and producing in the loud speaker output sounds which tend to overcome the desired signals.

static sensitivity.—See *photocell sensitivity.*

static transformer.—A transformer without moving parts.

stationary wave.—A *standing wave.*

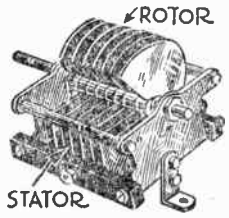
stator.—The stationary portion of any device.

stator plates.—The fixed or stationary plates of a *tuning condenser,* generally the plates insulated from the framework and connected

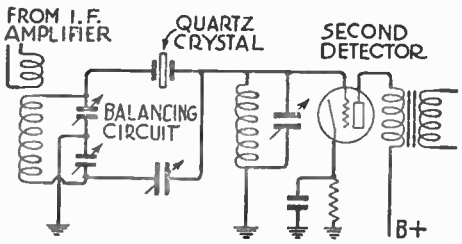
to the high voltage or grid side of the tuned circuit. Compare *rotor plates*. *See illustration.*

steady current.—A current which does not change, or one which changes regularly within certain limits or according to certain laws.

steady-state.—Descriptive of actions, such as currents or voltages, which continue without change or which repeat regularly after



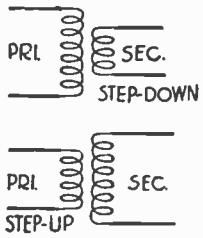
Stator Plates



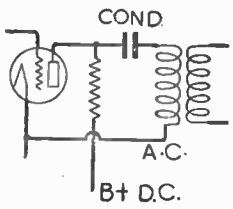
Stenode Radiostat

transient phenomena have ceased.

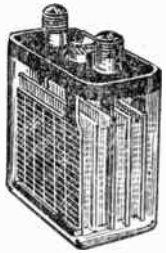
stenode radiostat.—A *superheterodyne receiver* providing selectivity by use of a *piezo-electric resonator* (quartz crystal) in the intermediate frequency amplifier. All currents except those at the frequency controlled by the crystal are balanced out of the tuned circuit by a bridge connection. *See illustration.*



Step-down Transformer



Stopping Condenser



Storage Cell

step-down transformer.—A transformer in which the secondary voltage is less than the primary voltage, the secondary current then being greater than the primary current. *See illustration.*

step-up transformer.—A transformer in which the secondary voltage is greater than the primary voltage, the secondary current then being less than the primary current. *See illustration.*

stereoscopic vision.—*Binocular vision.*

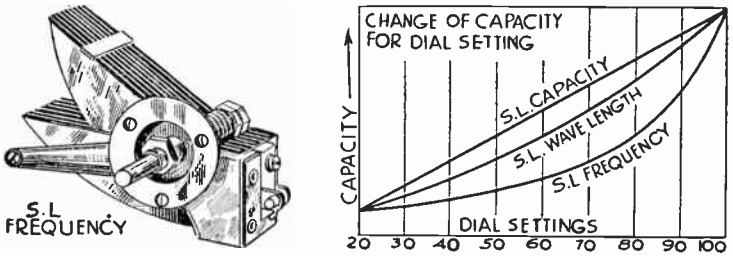
stopper circuit.—A circuit exhibiting *parallel resonance.*

stopping condenser.—A condenser which impedes the flow of low frequency currents or prevents the flow of direct currents in parts of a circuit, while allowing comparatively free passage of high frequency currents. A blocking condenser. *See illustration.*

stopping potential.—The voltage to which the terminal potential of a photocell, a photo-glow tube or a grid-glow tube must be dropped in order to stop a *glow discharge* after such a discharge has once commenced. It is less than the *glow potential.*

storage battery.—Several *storage cells* electrically connected together.

storage cell.—A combination of electrodes and chemical electrolyte producing *electromotive force.* The chemical and electrical actions are reversible, the original chemical state being restored after discharge by forcing a charging current through the cell in a reverse direction. *Lead-acid* and *alkaline storage batteries* are in use. *See illustration, page preceding.*



Straight Line Condenser

straight line condenser.—One of several types of *tuning condenser* in which the amount, or the number of degrees, of rotation of the shaft is proportional to the change produced in *(a)* the condenser's capacity, *(b)* the wavelength to which the condenser's circuit becomes tuned, or *(c)* the frequency to which the condenser's circuit becomes tuned. These are called *(a)* straight line capacity condenser, *(b)* straight line wavelength condenser, and *(c)* straight line frequency condenser. *See illustration.*

strain.—A change in the electrical condition or in the shape or size of a body, the change being produced by an applied force.

strain insulator.—1—An insulator for mechanically connecting aerial guy wire sections, while electrically separating the sections into short electrical lengths to prevent their being *resonant* at frequencies near that of the antenna. 2—Any type of insulator capable of withstanding considerable pull or strain.

stranded conductor.—A wire made up of a number of small metal

filaments twisted or braided together and not insulated from one another. See also *litzendraht wire.*

stray capacities.—Capacities existing between parts of a circuit other than in its condensers. *Distributed capacities.*

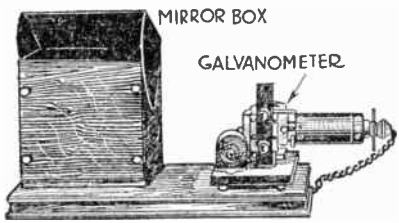
stray field.—The portion of a magnetic field which spreads to some distance from a winding and which does not enclose the turns of the winding. *Leakage flux.*

strays.—*Static,* and also other electromagnetic field disturbances not caused by radio transmitters.

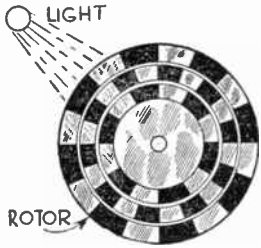
stress.—Force or forces which act to produce a change of shape or size in a body; also the body's opposition to such changes by counter-forces set up within it. The reaction which opposes electrostatic effects.

string galvanometer.—A *vibration galvanometer.*

string oscillograph.—The combination of a *vibration galvanometer* with a rotating mirror system which allows *wave forms* of current and voltage to be observed. *See illustration.*



String Oscillograph



Stroboscope

stroboscope.—An instrument for measuring *frequency* or studying any periodic action. The usual form consists of a rotating member illuminated by intermittent light. Regularly spaced lines or figures on the rotating member then appear stationary or appear to move in either direction, depending on the relation between speed of rotation and frequency of illumination. *See illustration.*

strontium.—A metal somewhat similar to calcium, compounds of which are employed in photocell cathodes showing maximum response to wavelengths shorter than the violet.

strut antenna.—A *vertical aircraft antenna.*

S.U.—Abbreviation for *sensation unit.*

sub-control.—A British term for an audio frequency amplifier preceding a *modulator.*

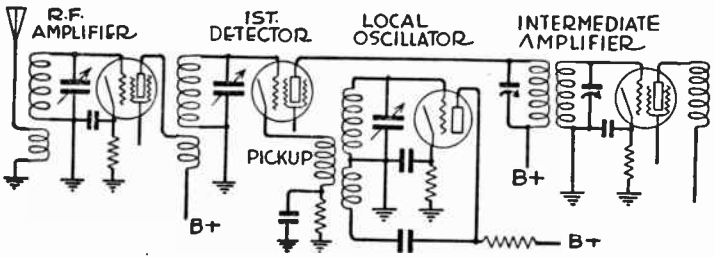
sub-harmonic.—A frequency which is lower than the *fundamental frequency* of a wave, which is equal to the fundamental divided by some whole number.

sub-panel.—A flat surface used to support parts inside of a radio device.

substitution method.—A method of measuring an unknown value by first observing its effect in a circuit, then substituting in the circuit a similar but measurable value which may be adjusted to produce a like effect, the unknown value then being equal to the adjusted known value. In measuring *high frequency resistance*, current is measured in a resonant circuit containing the unknown resistance, the unknown is replaced with an adjustable resistance which is set to allow the same current, the two resistances then being equal.

subtractive process.—A method of making and projecting colored motion pictures in which shades and tones of desired colors are formed by filtering unwanted colors from white light.

sulphide rectifier.—A *contact rectifier* employing copper sulphide and either magnesium or aluminum as elements. Current flows easily from sulphide to magnesium or aluminum but with difficulty



Superheterodyne Reception

in the opposite direction.

super-audible.—A frequency higher than any audible frequency.

superheterodyne receiver.—A radio receiver employing the principles of *superheterodyne reception.*

superheterodyne reception.—A receiving system in which part of the amplification is carried out at an "intermediate frequency" produced by *beating* the *carrier wave* frequency and a locally generated frequency in a "mixer" or first detector tube. This beat frequency or intermediate frequency retains the modulation of the signal carrier, and after amplification this intermediate frequency is impressed upon the second detector which precedes the audio frequency amplifier. *See illustration.*

superposed circuit.—A circuit using the conductors already employed for another circuit, without causing interference.

super-power station.—A transmitter employing more than the usual *radiation power.* Generally a transmitter having more than five kilowatts in its antenna.

super-regeneration.—A *regenerative detector circuit* in which maximum regeneration is used, but in which *sustained oscillation* is prevented by periodically applying to the tube's grid circuit a positive biasing voltage. This bias is generated in a separate oscillator circuit connected between the tube's plate and grid. *See illustration.*

supersonic reception.—*Superheterodyne reception.* Supersonic means just above audibility.

suppressed carrier transmission.—*Side band transmission.*

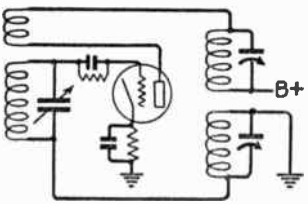
suppressor.—A *grid suppressor.* A *spark suppressor.*

suppressor grid.—The cathode grid in a *power pentode.*

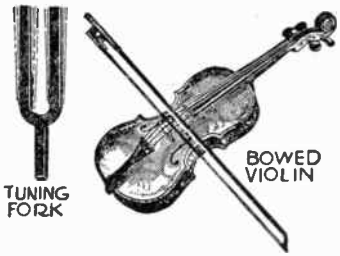
surface leakage.—Escape of *current* over the surface of an insulator because of moisture, dust, etc., providing a conducting path on the surface.

surface resistance.—Resistance to flow of current over the surface of a material.

surface tension.—The *work function* of a metal.



Super-regeneration



Sympathetic Vibration

surge.—A sudden increase of voltage or current in a circuit.

surge impedance.—*Image impedance.*

susceptance.—The reciprocal of that portion of an impedance which is due to inductive and capacitive reactances; the part of the *admittance* which is due to *reactance.* Measured in *mhos.* The symbol is *b.*

suspension insulator.—An insulator supported from a suspended wire or hook.

sustained oscillation.—The condition in an *oscillatory circuit* to which energy is added continually in an amount just sufficient to make up for the energy dissipated. The *oscillatory current* then rises to a value determined by circuit losses and thereafter maintains this value. Compare *self-sustained oscillation.*

sustained radiation.—*Radiation* from a conductor carrying alternating current.

sustained waves.—*Continuous waves.*

swing.—See *grid swing.*

swinging.—1—A frequency variation due to momentary changes in a transmitter's circuits. The variation may be due to motion of the aerial with reference to the ground, causing a change in antenna circuit capacity. 2—*Hunting* of synchronous alternating current machines.

switch.—A device for closing, opening or changing the connections in an electric circuit.

sympathetic vibration.—Periodic vibration at a body's natural frequency, the motion being produced by waves from another body which is vibrating at that frequency. *See illustration, page preceding.*

sync separator.—The filters of a television receiver which separate the synchronizing signal from other signals.

sync signal.—A *synchronizing signal.*

synchronism.—1—The condition in which the operating speeds of two devices are alike; or the condition in which the speed of an alternating current machine bears a definite and unchanging relation to the frequency of its current. 2—In television or telephotography, the condition under which the receiving devices and the transmitting devices operate at the same speed, or, at the same speed and also in such manner that similarly placed areas in the original and the reproduction are scanned at the same instant. See *framing.*

synchronize.—1—To cause *synchronism* in alternating current machines, or in television apparatus. 2—To correctly time the combination of pictures and accompanying sound effects in sound picture work.

synchronized transmission.—The operation of two or more radio transmitters at a single *carrier frequency,* the *carrier waves* being synchronized in time and phase to prevent heterodyne interference in receivers within the service areas.

synchronizing frequency.—A frequency used for automatically producing *synchronism* of a received television picture, this frequency being transmitted on the same *carrier wave* which transmits the television frequency and possibly a sound frequency as well.

synchronizing signal.—The portion of a television signal which carries the *synchronizing frequency.*

synchronous.—The relation between actions which are taking place at the same time, and usually in the same manner.

synchronous converter.—A *rotary converter.*

synchronous gap.—A *rotary spark gap* driven by a synchronous motor from the alternating current supply which excites the tuned circuit. The separation between sparking electrodes is a minimum when the voltage is at its maximum value.

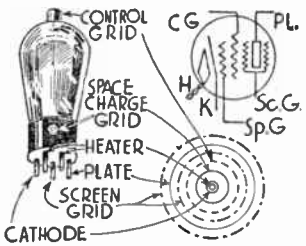
synchronous machine.—An alternating current machine in which the frequency is proportional to the speed of rotation.

synchronous motor.—A *synchronous machine* acting as an alternating current motor, the speed of rotation keeping step with the alternating current supplied to it.

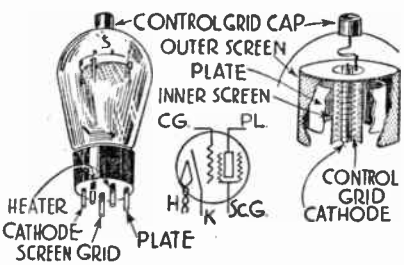
synchroscope.—An instrument for indicating *synchronism* in alternating current machines and for indicating whether a connected machine is fast or slow.

syntony.—The condition under which two *oscillatory circuits* have the same natural frequency, the two circuits then being in syntony.

syphon recorder.—A device for making an inked record of *code* signals by means of an ink syphon moved by electromagnetic effects in a mechanism similar to a galvanometer.



Screen Grid Pentode



Screen Grid Tube

system ground conductor.—A well grounded conductor in a central station, which connects together the individual grounding conductors in a given area, but which is not part of a circuit wire.

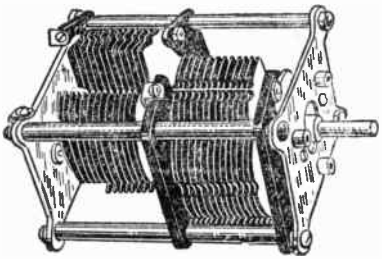
system grounding conductor.—A conductor connecting to ground one of the current-carrying conductors of an interior wiring system or a distribution system.

T.—Symbol for *period,* time of one cycle.

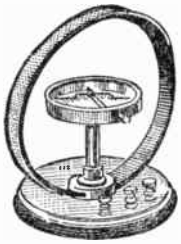
talking motion pictures.—*Sound pictures.*

tandem condenser.—Two or more *tuning condensers* placed end to end, operated by a single rotor shaft passing through all units or by connecting the separate rotor shafts together. The stator plates of each unit are electrically independent of the other stators. *See illustration.*

tangent galvanometer.—A direct current measuring instrument consisting of a magnetic needle mounted within a coil winding through which flows the measured current. The current is very nearly proportional to the tangent of the angle to which the needle



Tandem Condenser



Tangent Galvanometer

is deflected by the field of the coil. *See illustration.*

tank circuit.—1—An *oscillatory circuit* excited by the output of a transmitter's oscillator or radio frequency amplifier, and delivering high frequency current to the antenna through some form of coupling. *See illustration.* 2—The auxiliary absorbing circuit used in *absorption signalling.*

tantalum rectifier.—An *electrolytic rectifier* employing the metal tantalum for the active electrode and a sulphuric acid solution for the electrolyte.

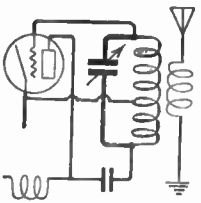
T-antenna.—An antenna consisting of horizontal aerial conductors to which connection is made at the approximate center, forming a T-shaped structure. *See illustration.*

tap.—A connection to one of the turns in an inductance coil, to a midpoint in a resistor or to any point between the ends of a circuit.

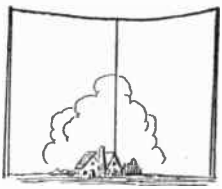
tap joint.—A joint made between one conductor running straight

through and another one attached to it, usually by winding the end of the attached wire around a bared place on the through wire.

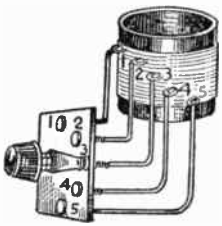
tap switch.—A multi-point switch that places additional turns in the *active circuit* of an inductance coil or other electrical element. *See illustration.*



Tank Circuit



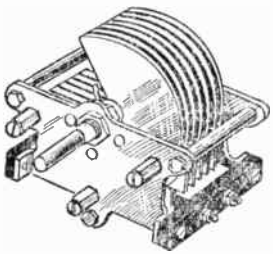
T-antenna



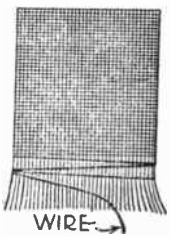
Tap Switch

taper plate condenser.—A variable *tuning condenser* in which the entering edges of the plates are thinner than the trailing edges, allowing construction of a *straight line condenser* of wavelength or frequency type within limited space. *See illustration.*

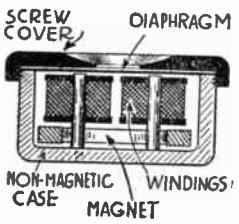
tape-wound resistor.—A form of conductor used for resistors, formed by weaving a tape with metal wire for the woof and fabric



Taper Plate Condenser



Tape-wound Resistor



Telephone Receiver

threads for the warp. *See illustration.*

tapped winding.—A coil winding with connections brought out from turns at various points so that more or less of the winding may be made active.

tapper.—A device for separating the particles in a *coherer.*

target bearing.—A *radio bearing* taken from a *radio range,* allowing guidance of aircraft toward the range from any point.

tau (τ).—Greek letter symbol for *time constant.*

T-connection.—A connection of coils arranged in the form of the letter "T"; used for changing three-phase to two-phase current or vice versa.

telautograph.—A communication system in which characters impressed by a stylus or pencil on the transmitter are sent to the receiver by levers, electromagnets and connecting circuits, where the characters are reproduced by a moving pen.

telegraph.—A communication system including apparatus for production and transmission of signals through electric circuits by means of changes in current, and associated apparatus for reproduction of the signals in audible or visible form at the far end of the circuit.

telegraph modulated wave.—A *continuous wave* varied in frequency or in amplitude by *keying.*

telegraph repeater.—Apparatus for repeating signals from one telegraph circuit into another.

telegraph sounder.—An instrument operated by electromagnets to produce telegraph signals in sound.

telegraphone.—A sound recording and reproducing device in which a moving wire, tape or disc of steel is unevenly magnetized at different points in its length or surface by means of signal currents. This unevenly distributed magnetism then is used to produce inductive effects which make sounds in a reproducer.

telegraphy.—The method of signalling which employs various arrangements of short and long, dot and dash, impulses sent by electrical means such as conducting wires, space radio and the like.

telemeter.—A device which furnishes visible or audible indications of the operation and functioning of apparatus located at a distance.

telephone.—A communication system which includes apparatus for the variation of electric current in accordance with sound waves, also a circuit carrying the current and associated apparatus for the reproduction of sound from the variations in current.

telephone condenser.—1—Any condenser made with paper dielectric and metal foil plates, rolled and wax impregnated. 2—A *fixed condenser* connected across a *telephone receiver* to bypass high frequency currents. Such a condenser may be charged by a wave train and then discharge through the receiver to produce one audible pulse.

telephone cord.—A very flexible double conductor, usually of tinsel or of small braided wires, covered with fabric and suitable for carrying currents to *telephone receivers.*

telephone drop.—A small metal piece which drops when released by an electromagnet to indicate the use or disuse of a telephone circuit.

telephone jack and plug.—See *jack* and *plug.*

telephone receiver.—A device which changes variations of electric

current into sound waves equivalent in form to the current waves. An *electro-acoustic transducer*, driven by an electric system and supplying power to an acoustic system. A *loud speaker* or a *headphone*. *See illustration, second page preceding.*

telephone repeater.—An *audio frequency amplifier* placed in a long transmission line, with suitable input and output impedance matching transformers, so that the signal strength is increased before passing farther in the line.

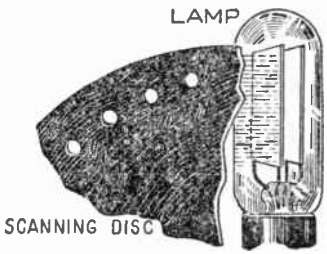
telephone transformer.—A transformer coupling the plate circuit of an amplifying tube to the movement of a *loud speaker.*

telephone transmitter.—A device in which sounds produce changes in resistance and current in a telephone circuit. A *microphone.*

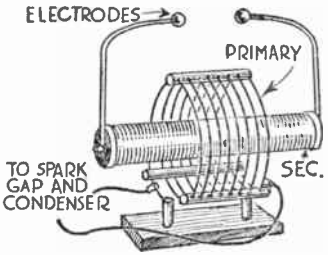
telephony.—A method of reproducing sounds, especially those of the voice, at a distance. See *telephone.*

telephotography.—Transmission of still pictures by radio or wire circuits. *Facsimile transmission* or *picture transmission.*

television.—The transmission and reproduction at a distance of



Television Lamp



Tesla Coil

images of moving objects, the transmission means being *space radio, wired radio* or other electric circuits. Transmission of a succession of images in such manner as to produce the illusion of continuous motion.

television frequency.—A frequency used to modulate a carrier wave or current in the transmission of television images. A *modulation frequency.*

television lamp.—The source of light which forms a television picture at the receiver. A *neon lamp* in one system of television. *See illustration.*

televisor.—A name sometimes applied to the apparatus used at a television transmitter for *scanning* the object of which an image is to be transmitted.

telharmonium.—A musical instrument from which desired effects are produced by the mixing of various *fundamental tones* and *overtones* in circuits which include special types of transformers and impedance control devices. The original tones are secured

from inductor alternator machines working at the required frequencies.

tell-tale.—A signal, lamp, or equivalent device which indicates the continued operation or the failure of electrical apparatus or circuits.

temperature coefficient of resistance.—The change in a material's *resistance* per centigrade degree of rise in its temperature, the change being expressed as a fraction of the resistance of the material at a reference standard of temperature. The reference temperature usually is either 0° or 20° centigrade.

temperature effect.—The *thermal effect.*

temperature influence.—The percentage of change caused in the reading of an instrument by a change in room temperature of ten degrees centigrade from a reference temperature.

temperature refraction.—Sound wave *refraction* due to movement of sound waves through regions at different temperatures.

temperature relay.—A relay which operates because of a change in temperature.

tension.—*Electromotive force* or *potential difference.*

terminal.—A screw, clamp, lug or other suitable means for attaching conductors together or to circuits.

terminal impedance.—The *impedance* of a circuit or electrical device as measured between the input terminals or between the output terminals.

terminal voltage.—The voltage difference between the terminals of an electrical source or load.

Tesla coil.—A high ratio, air-core *transformer* having its primary excited by an oscillatory discharge across a spark gap, which results in secondary currents of high frequency and very high voltage capable of producing a *brush discharge* between widely separated electrodes. *See illustration, page preceding.*

tetrode.—A *four-element tube.*

thalofide cell.—A *photo-conductive* cell designed to have good response at the red end or long wavelength end of the visible spectrum.

theatre amplifier.—A *public address system* with its reproducers, designed for use in theatres and halls.

Theremin.—A form of *musical oscillator.*

thermal ammeter.—1—A current measuring instrument utilizing the heating effect of a current to produce expansion in a *hot wire meter* or a thermoelectric effect, in a *thermocouple instrument.* 2—A name sometimes applied to a *calorimeter instrument.*

thermal detector.—A device which indicates the presence of small high frequency currents by their heating effect in a conductor.

thermal effect.—Slight fluctuations of current flow resulting from the effect of heat on motion of a conductor's *electrons* and *ions.*

thermal receiver.—1—A *telephone receiver* in which varying signal currents cause temperature variations in a conductor, the tempera-

ture changes being communicated to air around the conductor. Resulting expansion and contraction of the air produces sound waves. 2—A *telephone receiver* in which expansion and contraction of a wire carrying signal current causes movement of a diaphragm attached to the wire.

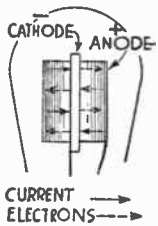
thermionic.—Relating to *electron emission* under the influence of heat.

thermionic amplifier.—A *vacuum tube amplifier.*

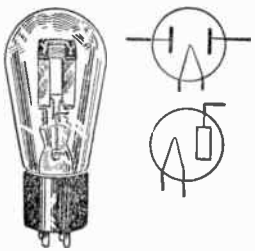
thermionic conduction.—Flow of current through a vacuum, the result of *electron emission* from a heated cathode and attraction of the electrons to a positively charged electrode. *See illustration.*

thermionic current.—The electric current passing between a cathode and a positively charged electrode in a *vacuum tube.*

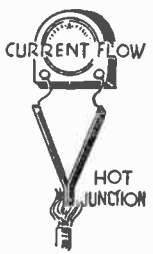
thermionic detector.—A *vacuum tube detector* in which flow of current is due entirely to *thermionic conduction* and not to *ionization,* as distinguished from a *gaseous tube* used as a detector.



Thermionic Conduction



Thermionic Rectifier



Thermocouple

thermionic emission.—*Electron emission* due to the action of heat.

thermionic oscillator.—A *vacuum tube oscillator.*

thermionic rectifier.—A *rectifier* having one or two cold plates or anodes and a hot cathode or filament enclosed within a vacuum bulb. Current can flow only from an anode to the cathode. The entire electron stream and the corresponding current flow are due to passage of electrons through the vacuum, no ionization being employed to increase the current. *See illustration.*

thermionic tube.—A vacuum tube in which *electron emission* takes place from a heated cathode.

thermionic voltmeter.—A *vacuum tube voltmeter.*

thermoammeter.—A *thermocouple instrument.*

thermocouple.—A junction between two dissimilar materials which, when heated, produces an *electromotive force* across the junction. With the opposite extremities of the materials also joined, there is a flow of current when the two junctions are maintained at different temperatures. *See illustration.*

thermocouple instrument.—A current measuring instrument in which a *moving coil instrument* is actuated by current from a *thermocouple* heated either by the measured current flowing through it, by contact with a conductor heated by the measured current, or by being in close proximity to such a heated conductor. *See illustration.*

thermodetector.—A *thermal detector.*

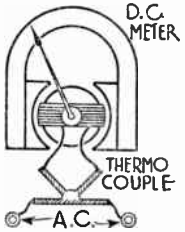
thermoelectric battery.—A *thermopile.*

thermoelectric couple.—A *thermocouple.*

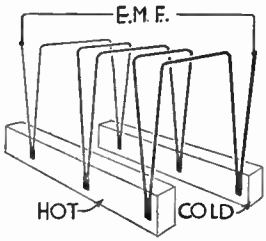
thermoelectric current.—Current produced by action of a *thermocouple.*

thermoelectric instrument.—A *thermocouple instrument.*

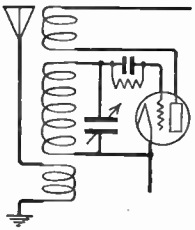
thermoelectric power.—The ability of a metal, when used in a *thermocouple,* to produce electromotive force. The voltage pro-



Thermocouple Instrument



Thermopile



Three-circuit Receiver

duced by a temperature difference of one degree centigrade in a thermocouple using the metal as one part and lead as the other.

thermoelectricity.—Electricity produced by the direct action of heat, as in a *thermocouple.*

thermoelectromotive force.—1—An electromotive force produced by heating the junction between two different materials. 2—*Thermoelectric power.*

thermoelement.—A *thermocouple* and a heating member arranged for current measurement.

thermogalvanometer.—A current measuring instrument including a *moving coil instrument* connected to a *thermocouple* which is heated by a conductor carrying the current.

thermojunction.—A *thermocouple.*

thermophone.—A *thermal receiver.*

thermopile.—Several *thermocouples* connected together in series for

production of greater voltage than that obtained from a single couple. *See illustration.*

thermostat.—A device which, upon change in the degree of heat applied to it, exerts mechanical force used to operate a switch, a valve, or other control.

theta (θ).—Greek letter symbol for *phase angle difference.*

thirty-degree cut.—A *Y-cut* for a quartz crystal.

Thomson effect.—The carrying of heat or cold by an electric current between parts of iron or copper pieces when the parts are at different temperatures.

thoriated filament.—A vacuum tube filament containing a compound of *thorium* which forms a surface layer one atom deep and allows a greater *electron emission* with a given temperature than can be had from a plain tungsten filament.

thorium.—A metallic element which is *radioactive.* Used in vacuum tube filaments.

three-circuit receiver.—A *regenerative receiver* having as parts of its antenna coupler one winding in the antenna circuit, another in the detector grid circuit and a third acting as a *tickler coil* in the plate circuit. *See illustration.*

three-element tube.—A tube containing three electrodes; a filament or cathode, a plate or anode, and a third element called the control grid or simply the grid. The potential of the grid with reference to the cathode controls the electron flow and current flow between plate and cathode. *See illustration, page following.*

three-phase.—Descriptive of an *alternating current* system in which are three separate e.m.fs. and three currents at one time, the angles between phases being 120 degrees.

three-way switch.—A switch which connects one conductor to any one of three other conductors.

three-wire system.—A circuit including three conductors between the outer two of which there is a voltage twice as great as between either of the outside wires and the center wire.

threshold current.—The current flowing in a *gria-glow* tube at the instant of *breakdown voltage;* the maximum current with which there still is a stable relation between applied voltage and flow of current.

threshold frequency.—See *photoelectric threshold.*

threshold sound intensity.—1—Threshold of audibility is the sound intensity which is just sufficient to affect the sense of hearing. It varies with frequency of the sound waves. 2—Threshold of feeling is the intensity of a sound wave at which it commences to affect the sense of feeling; the upper limit of hearing with respect to intensity. See *auditory sensation area.*

threshold wavelength.—See *photoelectric threshold.*

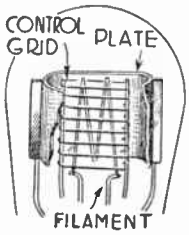
throat of horn.—The smaller end of a loud speaker horn.

throttle control.—A *regeneration* control having in the tube's plate circuit a variable condenser and a radio frequency choke. Change of condenser capacity allows more or less of the radio frequency current in the plate circuit to pass into a *feedback* circuit, or it so alters the plate circuit impedance that the tube feedback is altered. *See illustration.*

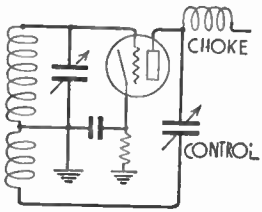
thumb rule.—The *right-hand rule* for movement of lines of force around a conductor.

thump filter.—A *key filter.*

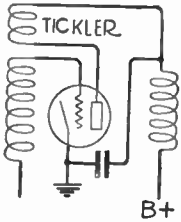
thyratron.—A three-electrode *gaseous tube* containing cathode, anode and grid; a current conducting arc or glow discharge being controlled by the grid. The tube is used as a rectifier (changing A.C. to D.C.), as an inverter (changing D.C. to A.C.) and as a current or power control device, usually operating according to phase lag of grid voltage behind anode voltage.



Three-element Tube



Throttle Control



Tickler Coil

tickler coil.—A winding connected in series with the radio frequency path of an amplifying or detector tube's plate circuit and coupled to the tube's grid circuit to allow *feedback* and *regeneration. See illustration.*

tight coupling.—*Close coupling.*

tikker.—A device which breaks up *continuous wave* signals into groups occurring at audio frequency. A *chopper.*

timbre—The combination of *overtones* which distinguishes one voice from others, or one musical instrument from others when both produce the same *fundamental tone.*

time constant.—1—In a *capacitive circuit,* the number of seconds required for the capacity to receive 63.2 per cent of its full charge after the e.m.f. is applied. With steady applied voltage the time constant is equal to the product of the circuit's *capacity* in farads and its *resistance* in ohms. 2—In an *inductive circuit,* the number of seconds required for the current to reach 63.2 per cent of its final value after the e.m.f. is applied. With steady applied

voltage the time constant is equal to the circuit's *inductance* in henrys divided by its *resistance* in ohms. The symbol for either time constant is the Greek letter tau (τ).

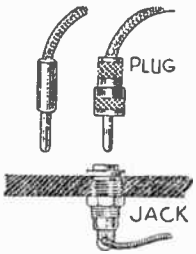
time limit overload release.—A device which allows the starting current to be applied to a motor for a certain limited time, after which the circuit is opened should the heavy load continue.

time limit relay.—A relay which operates after a definite time, during which a given condition exists, or operates according to a combination of time and circuit conditions.

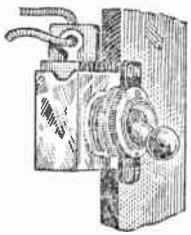
timed spark transmission.—A *spark transmission* system using a number of *rotary gaps* to produce a substantially *continuous wave* from the antenna by suitable timing of the sparks in the several gaps.

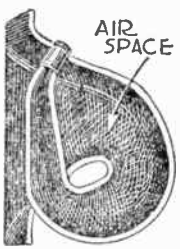
tip jack.—A small receptacle into which fits a metal tipped conductor to complete a circuit. *See illustration.*

tip side.—The side of a circuit which is connected with the tip of a



Tip Jack


Toggle Switch



Tone Chamber

telephone *jack*. Compare *ring side*.

toggle switch.—A switch operated by moving a small projecting lever. *See illustration.*

tolerance frequency.—An additional range of frequencies above and below those normally used by a modulated carrier, this range caring for unavoidable variations from the assigned *carrier frequency*.

tone.—The character of a sound, especially with reference to regularity of wave form, harmonics, and other attributes affecting the pleasantness of the sound to the hearing.

tone chamber.—The air space enclosed by the walls of a horn or sound projector; also the *projector* itself. *See illustration.*

tone circuit.—A circuit for producing *modulation*.

tone color.—*Timbre*.

tone control.—In an *audio frequency amplifier*, a method of emphasizing either low notes or high notes at will. Various methods are employed; such as bypassing higher frequencies to ground through

an adjustable capacity, the use of tuned filter circuits for reduction of either high or low frequencies, the control of energy in transformers having desired frequency response, etc. *See illustration.*

tone-modulated wave.—A continuous wave to which *modulation* is applied by an audio frequency.

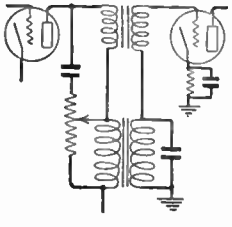
tone source.—A calibrated audio frequency oscillator producing a practically pure *sine wave* current of known amplitude.

tone wheel.—A disc carrying toothed metallic points contacting with a brush to interrupt a received *continuous wave* signal at a high frequency, thus producing audible notes in the receiver circuits. Compare *chopper.*

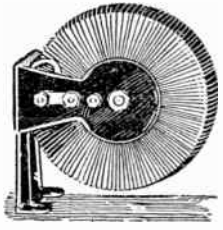
tonic transmission.—Radio-telegraphic transmission with a carrier wave modulated by an *interrupter* so that the signal has an audible tone or note.

toroid.—The surface of a ring which has a circular cross section.

toroidal coil.—A *closed field coil* in which the winding as a whole



Tone Control



Toroidal Coil

is formed into a nearly closed circle, the ends of the winding being brought together to form the coil into a large ring. *See illustration.*

torque of instrument.—The turning force produced in an instrument's movement by the current or voltage to be measured; also the force developed in the mechanism tending to return the instrument pointer to zero position.

torsional vibrations.—Motion of disturbed particles in a body or substance as it is twisted around its axis.

total emission.—The current resulting from drawing away from a cathode of all the emitted electrons. See *saturation current.*

total luminous sensitivity of photocell.—The ratio of *photocell current* to *luminous flux* affecting the cell.

total sensitivity of photocell.—The ratio of *photocell current* at a certain voltage to the total *radiant flux* affecting the tube.

tracer.—Threads of contrasting color woven into the principal color of wire insulation for identification of a conductor with its circuit.

tractive electromagnet.—An *electromagnet* used for moving another part through space toward the magnet.

traffic.—The messages handled by radio stations in regular communication with one another.

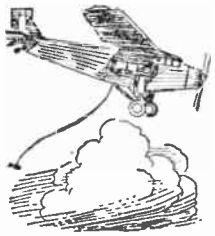
trailing wire antenna.—A form of airplane antenna consisting of a length of bare wire fed out from a reel through the lower part of the airplane and having a weight attached to the free end, which trails backward from the airplane. *See illustration.*

train frequency.—*Group frequency.*

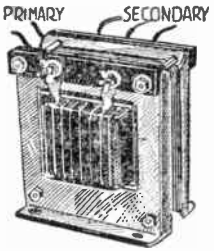
transconductance.—The ratio of change of current in the circuit of one vacuum tube electrode to the change of voltage on another electrode in the same tube, the voltage change being the cause of the current change, and other potentials remaining constant. The term has the same meaning as *mutual conductance* and is used when referring to *four-* and *five-element tubes.*

transducer.—Any device taking power from one electrical, acoustical or mechanical system and furnishing power to another system of the same or different type.

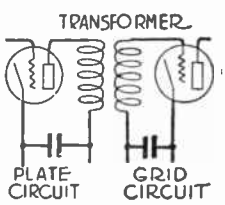
transfer characteristic.—A graph showing the effect of voltage



Trailing Wire Antenna



Transformer



Transformer Coupled Amplifier

applied to one electrode on the current of another electrode in a tube; as the effect of grid voltage on plate current.

transfer constant.—The *image transfer constant.*

transfer voltage.—In a *grid-glow tube,* the value of applied voltage at which there is a transfer of the discharge from the cathode-grid path to the cathode-anode path.

transformation ratio.—The ratio of the primary to the secondary voltage of a *transformer.*

transformer.—Two windings with a common *magnetic circuit,* allowing an alternating or fluctuating current in one winding to produce an alternating electromotive force in the other winding because of *mutual inductance.* Energy transfer between the two electric circuits results from the *mutual induction* in the transformer. *See illustration.*

transformer action.—Reproduction of signals or interference in one circuit from the *induction field* of another circuit.

transformer core.—That part of a transformer's *magnetic circuit*

which is composed of iron, or that portion of a transformer's magnetic circuit in which there is the greatest concentration of lines of force whether this part of the circuit consists of magnetic or of non-magnetic material.

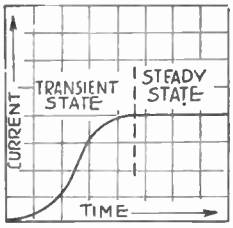
transformer coupled amplifier.—An amplifier using inductive coupling by means of a *transformer* between the plate circuit of one tube and the control grid circuit of the following tube. *See illustration, page preceding.*

transformer coupling.—*Inductive coupling.*

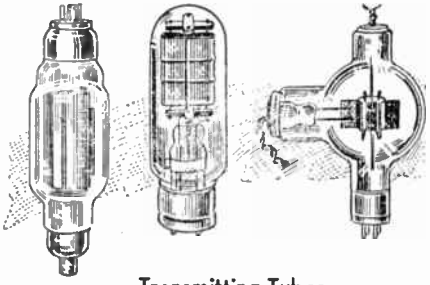
transformer loss.—The *transmission loss* which would be eliminated at a junction between circuits or networks by the use at that junction of an *ideal transformer* to match the impedances.

transformer oil.—A petroleum or mineral oil used for filling transformer cases to provide insulation and cooling.

transformer ratio.—Generally the *turns ratio.* Sometimes the *voltage ratio.*



Transient Current



Transmitting Tubes

transformer regulation.—The *voltage regulation* of a transformer.

transient current.—A current which changes in an irregular manner, in which similar changes do not occur in any regular order. *See illustration.*

transient phenomena.—Actions which occur during the interval between two permanent or continually recurring conditions, such as slight changes taking place between peaks of an alternating current, changes during the charging of a condenser, etc.

transition loss.—The *transmission loss* which would be eliminated by the use of a loss-less *passive transducer* at a junction point in a line. *Transformer loss.*

translucent.—Partially transparent; allowing passage of light but not permitting clear vision.

transmission efficiency.—The ratio of the power delivered from a transmission line or other apparatus to the power put into the line or apparatus.

transmission-frequency characteristic.—A graph showing the re-

lation between signal frequency and transmission efficiency of a path through which transmission takes place.

transmission level.—The signal power or the *radio field intensity* at some point in a communication system, either in relation to some reference value or in absolute units of measurement.

transmission line.—An audio frequency circuit in which the distortion producing effects of distributed capacity and inductance have been reduced.

transmission loss.—The loss of energy suffered by a wave while passing through any circuit, any instrument, or other carrying medium. The transmission loss in any given part is equal to the ratio of the power which would be transmitted without the part in circuit to the power transmitted with the part acually in circuit.

transmission system.—A system of conductors carrying current which is of different form from that finally used by the power consuming devices; or a system of conductors carrying energy which is translated into a different form at the receiving end or load end of the circuits.

transmission unit.—Any unit which gives the logarithmic ratio of currents, voltages or powers in a transmission system. A *bel* (or *decibel*) and a *neper* (or *decineper*) are examples of transmission units. One transmission unit, in the usual meaning of the term, is the same as one decibel.

transmitter.—1—A *radio transmitter.* 2—A *microphone.*

transmitting tube.—A vacuum tube especially designed for use in radio transmitting circuits, generally a tube of large power rating.

transparent.—Permitting passage of light rays in such manner as to allow clear and distinct vision.

transposition.—Changing the relative positions of line wires at intervals to reduce or prevent magnetic, inductive and electrostatic unbalancing and disturbances to nearby electric devices.

transrectification.—*Rectification* occurring in the circuit of one tube electrode when voltage is applied to a different electrode.

transverse piezo-electric effect.—Electrical polarization and mechanical extension at right angles in a *piezo-electric crystal.*

transverse vibration.—1—Motion of the disturbed particles forming a wave in a direction at right angles to the direction of wave propagation. A characteristic of radio waves, light waves and the waves of radiant heat. Compare *longitudinal vibration.* 2.—A name sometimes applied to *flexural vibration.*

trap circuit.—A *wave trap.*

tree circuit.—A main or feeder circuit from which other circuits branch off like the limbs of a tree.

TRF.—Abbreviation for *tuned radio frequency.*

triangulation.—Calculation of a *radio bearing* from observations on two or more beacons, the signals from which intersect at certain angles at the *direction finder.*

trickle charger.—A storage battery charger operating at a very

low current rate, generally from one-tenth to one-half ampere. As generally used, the charger is automatically placed in operation each time a receiver is turned off.

trigger action.—The action of a *tube* used as an *amplifier* or a *relay.*

trimming condenser.—An *aligning condenser.*

triode.—A *three-element tube.*

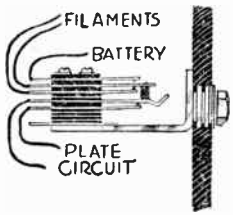
triple circuit jack.—A *jack* which, in addition to allowing connection to the plate circuit of an amplifying tube, also controls the filament current for tubes in following stages. *See illustration.*

triple modulation beacon.—A *radio range* transmitter using three amplifying channels and capable of providing beams for twelve courses at arbitrary angles.

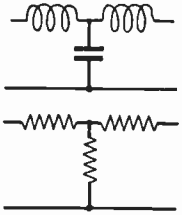
triplex cable.—Three insulated conductors twisted together.

true focus.—The *real focus.*

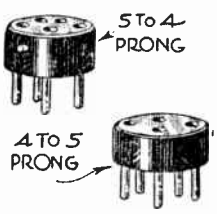
true inductance.—A value of inductance which has been corrected from that of apparent inductance to take into consideration the



Triple Circuit Jack



T-section



Tube Adapter

distributed capacity of the circuit in its effect on frequency of resonance. Compare *apparent inductance.*

true power.—The effective power in an alternating current circuit; the power measured in *watts* as distinguished from the apparent power in *volt-amperes.* The number of volt-amperes multiplied by the *power factor.*

true radio bearing.—The angle formed between a line drawn from a radio receiver to the true north, and a straight line drawn between the receiver and the transmitting section.

T-section.—A part of an electric circuit having two similar elements in series with one side of the circuit and another element in parallel with the circuit and connected between the two series elements. *See illustration.*

T.U.—Abbreviation for *transmission unit.*

tube.—1—A *vacuum tube,* a *gaseous tube,* a *photocell,* etc. 2—Tube of force—A *line of force.*

tube adapter.—A device which allows a tube of one type to be used in a socket intended for a different type. *See illustration.*

tube base.—An insulating support carrying the glass bulb of a tube and having extended metal prongs which connect to the tube's internal elements.

tube capacities.—The electrostatic capacities between the elements of a vacuum tube. See *grid-plate capacitance, grid-filament capacitance, plate-filament capacitance;* also *grid capacitance, plate capacitance* and *filament capacitance.*

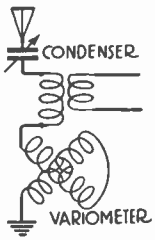
tube checker.—An instrument which indicates some of the simple characteristics of a vacuum tube; such as filament emission and the control of plate current by change of grid voltage.

tube impedance.—The *plate resistance* or plate impedance of a vacuum tube.

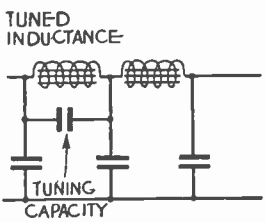
tube noise.—Audible noise, or "hiss", resulting from *beating* of the carrier frequency with radio frequencies produced in amplifying tubes by *shot effect* and *thermal effect.*

tube regeneration.—*Regeneration* produced by feedback through

Tube Socket



Tuned Antenna



Tuned Filter

the *grid-plate capacitance* of a vacuum tube.

tube rejuvenator.—Apparatus for the *reactivation of filaments.*

tube socket.—A device for supporting a tube while allowing circuit connections to be made with the prongs on the tube base. *See illustration.*

tube tester.—A device for measurement of vacuum tube characteristics, such as *mutual conductance, plate resistance* and *amplification coefficient.*

tuned.—Descriptive of an *oscillatory circuit* in which the capacity, the inductance or both have been adjusted in value to cause *resonance* at some certain frequency.

tuned anode amplification.—*Tuned impedance amplification.*

tuned antenna.—An antenna circuit which is made *resonant* at the frequency to be transmitted or received by adjustment of capacity or inductance. *See illustration.*

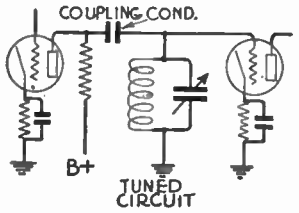
tuned audio frequency amplifier.—An audio frequency coupling system in which certain frequencies or certain frequency ranges

are emphasized by using in these circuits values of inductance and capacity which produce *series resonance.*

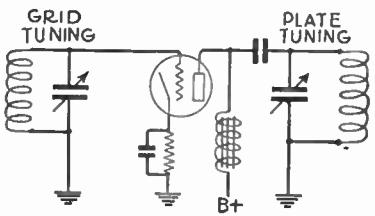
tuned circuit.—An *oscillatory circuit.* A circuit containing capacity and inductance of such values as to produce *resonance.* Usually either the capacity or the inductance is variable in order that the resonance frequency may be changed at will.

tuned filter.—A *band exclusion filter* consisting of one or more *parallel resonance* circuits tuned to a particular frequency which is most troublesome, and which is thus most attenuated. The band exclusion circuit may be incorporated as part of a *low pass filter* in a power unit. *See illustration, page preceding.*

tuned grid coupling.—A radio frequency amplifying system in which the control grid of an amplifying tube is connected to a *parallel resonance* circuit, signal voltages being impressed on this



Tuned Grid Coupling



Tuned-grid Tuned-plate Oscillator

circuit through a coupling condenser in a *parallel feed* circuit for the plate of the preceding tube. *See illustration.*

tuned-grid, tuned-plate oscillator.—A vacuum tube oscillator having a *parallel resonance* circuit in series with the tube's plate circuit and another parallel resonance circuit in series with the grid circuit. With both parallel resonance circuits tuned to the operating frequency, oscillation is maintained by capacitive feedback through the tube's internal capacity and also by inductive coupling in some instances. *See illustration.*

tuned impedance amplification.—A radio frequency amplifying system in which the plate circuit of the amplifying tube contains a *parallel resonance* circuit tuned to the frequency to be amplified, thus producing maximum plate impedance and maximum amplification at this frequency. *See illustration.*

tuned plate coupling.—*Tuned impedance amplification.*

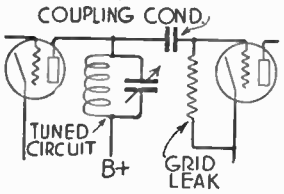
tuned-plate, tuned-grid oscillator.—A *tuned-grid, tuned-plate oscillator.*

tuned radio frequency amplification.—Voltage amplification at radio frequencies by means of vacuum tubes, the coupling being provided by means of air-core transformers having either tuned or aperiodic primaries and having secondaries tuned to *resonance* by means of variable condensers for the frequency of a signal to be received. Abbreviated *TRF*. *See illustration.*

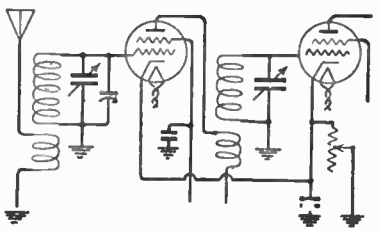
tuned reed indicator.—A *visual reed indicator.*

tuned reed rectifier.—A *vibrating rectifier.*

tuned transformer.—A *radio frequency transformer* having its secondary, its primary, or both secondary and primary windings tuned to *resonance* with the frequency applied to the primary. A similarly tuned *audio frequency transformer* or *intermediate frequency transformer.*



Tuned Impedance Amplification



Tuned Radio Frequency Amplification

tuner.—That portion of a *radio frequency amplifier* in which are located the circuits tuned to *resonance* with the received frequency.

Tungar rectifier.—A trade name for an *argon rectifier.*

tungsten.—A rare metal used in the manufacture of vacuum tube filaments and heaters, also for switch contacts.

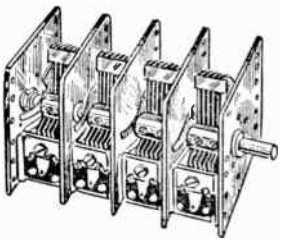
tungsten sensitivity of photocell.—The ratio of *photocell current* to *luminous flux* from a tungsten filament lamp operated under definite conditions, at certain color temperatures.

tuning.—Variation of the capacity or inductance in an alternating current circuit to cause *resonance* at a certain frequency called the tuned frequency, and thus to secure maximum power in reception or transmission of signals at this frequency.

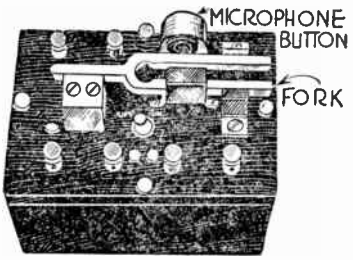
tuning coil.—An inductance coil used in a circuit which may be tuned to *resonance.*

tuning condenser.—A *variable condenser,* generally of the air dielectric type, which is used as the adjustable part of a circuit to be tuned to *resonance.* Also, several such condensers arranged for simultaneous operation from one control. *See illustration.*

tuning dial.—A device which indicates the setting of a tuning inductance or capacity either in kilocycles, wavelengths or on an arbitrarily numbered scale.



Tuning Condenser

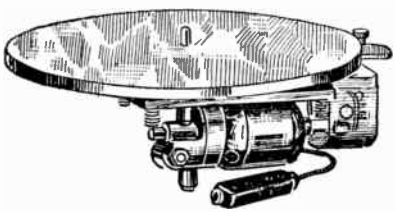


Tuning Fork Oscillator

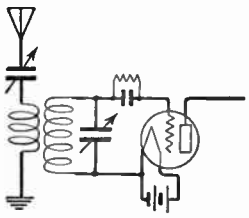
tuning fork oscillator.—An *audio frequency oscillator* in which the frequency is determined by vibrations of a metallic tuning fork. The circuit for supply current passes through a *microphone button* attached to one tine of the fork. *See illustration.*

tuning inductance.—A *tuning coil.*

tuning note.—A characteristic audio signal or tone sent out from a transmitter to allow *tuning* of receivers before a program.



Turntable



Two-circuit Tuner

turns ratio.—The ratio of the number of turns in a high-voltage winding to the number of turns in the low-voltage winding of a *transformer.*

turntable.—That portion of a phonograph apparatus which supports and rotates the disc record as it passes underneath the pickup needle. *See illustration.*

twin cable.—Two insulated stranded conductors laid parallel and enclosed within a single covering.

twin speakers.—Two loud speakers connected to a single amplifier; one speaker being adapted to reproduction of low audio frequencies and the other to reproduction of higher frequencies.

twisted pair.—Two separate insulated conductors twisted together but having no common covering.

two-button microphone.—A *double button microphone.*

two-circuit tuner.—A *tuner* in which the antenna circuit and the first circuit coupled to the antenna are individually tuned to resonance. *See illustration.*

two-element tube.—A *diode.*

two-fluid cell.—A *primary cell* having one electrode immersed in one fluid within a porous jar and the second electrode in a different fluid outside the jar.

two-phase.—Descriptive of an alternating current system in which there are two separate e.m.fs. and two currents at one time, the angle between phases being 90 degrees.

two-pole switch.—A *double-pole switch.*

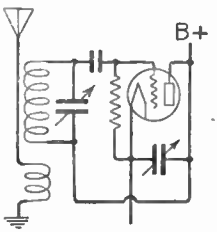
two-way switch.—A *double-throw switch.*

two-wire circuit.—A metallic circuit using paralleled conductors.

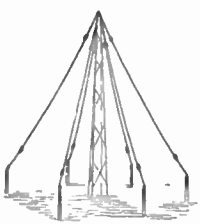
U

ultraudion circuit.—A *regenerative detector* system in which a tuned *parallel resonance* circuit is connected between the grid and plate of the vacuum tube, a blocking condenser being placed between the grid and the high voltage circuit. Regeneration is controlled by a variable condenser between the tube's plate and cathode. Increasing the reactance of this condenser increases the feedback and the intensity of regeneration. *See illustration.*

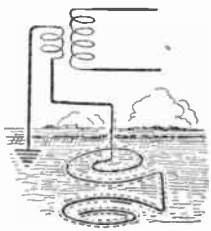
ultra-violet rays.—*Radiant energy* at higher frequencies or shorter wavelengths than those which compose *visible light*. Rays lying between those which are visible and the lower frequency limits of X-rays.



Ultraudion Circuit



Umbrella Antenna



Underground Antenna

umbrella antenna.—An antenna having a number of aerial conductors extending outward and downward toward the earth from a central support. *See illustration.*

undamped oscillations or waves.—Oscillations which continue with undiminishing amplitude because of energy supplied to overcome the circuit damping. *Continuous waves.*

underground antenna.—A receiving type of *capacity antenna* having one long insulated conductor buried in the earth or immersed in water, either in an extended or a coiled form. *See illustration.*

undistorted power.—*Maximum undistorted power output* of a vacuum tube.

undulatory theory.—The theory that *radiation* is propagated through space by wave-like disturbances.

unidirectional current.—A current (or voltage) always acting in one direction, not reversing, although it may vary in amplitude.

unidirectional direction finder.—A *direction finder* with which is combined a *sense finder.*

unifilar winding.—A winding using but a single conductor.

unilateral antenna.—An antenna which radiates or receives more effectively in one direction than in any other direction.

unilateral conductivity.—Having less resistance to flow of current in one direction than to flow in the opposite direction; the chief property of a *rectifier.*

uniselector.—The single control for operating all the *tuning* devices in a receiver which has no auxiliary tuning controls regularly used by the operator.

unit charge.—The quantity of electricity which exerts a force of one dyne upon an equal quantity one centimeter distant.

unit flux density.—A *magnetic flux density* of one *gauss.*

unit force.—A *force* of one *dyne.*

unit magnetic field.—A *magnetic flux density* of one *gauss.*

unit magnetic flux.—A flux of one *maxwell* or one *line of force.*

unit magnetomotive force.—A *magnetomotive force* of one *gilbert.*

unit permeability.—The *permeability* of non-magnetic material, which is equal to 1.

unit pole.—A magnetic pole of such strength that when placed in a vacuum one *centimeter* from an equal pole it repels the other pole with a force of one *dyne.*

unit pressure.—A pressure of one *dyne* per square centimeter.

unit reluctance.—A *reluctance* of one *oersted.*

unit surface.—A surface of one square centimeter.

unit velocity.—A velocity of one centimeter per second.

unit volume.—A volume of one cubic centimeter.

unity power factor.—A *power factor* of 1.0, which exists when the current and voltage are in phase. The condition in a circuit containing resistance but no *reactance,* or the condition at *resonance* in a reactive circuit.

universal motor.—A motor which operates either on direct or alternating current. The construction is like that of a series wound direct current motor.

uniwave signalling.—*Absorption signalling.*

unloaded circuit.—A circuit having no added inductance or capacity in addition to the values resulting naturally from its structural form.

unshunted hot wire meter.—A *hot wire meter* in which the measured current is led into the heated conductor at several different points, placing the several sections of the conductor electrically in a *parallel circuit* while mechanically in one length.

untuned.—*Aperiodic.*

untuned radio frequency transformer.—A coupling transformer operating over a wide range of radio frequencies but not *tuned* to resonance at any particular frequency.

u. p. o.—Abbreviation for *undistorted power output.*

upper side band.—The *side band* frequency which is higher than the *carrier frequency.*

uranium.—A metallic element which is a *radioactive substance.*

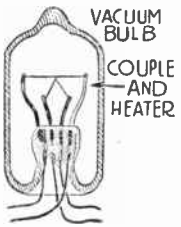
V.—Symbol for *potential difference.*

v.—Symbol for *velocity,* also for *volts.*

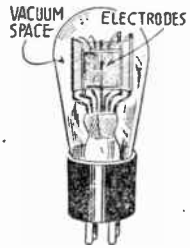
vacuum circuit breaker.—A *circuit breaker* the contacts of which are located in a vacuum for the purpose of lessening the arc.

vacuum photocell.—A *photocell* having a vacuum sufficiently high that *ionization* has little or no part in the tube's operation. Compare *gas photocell.*

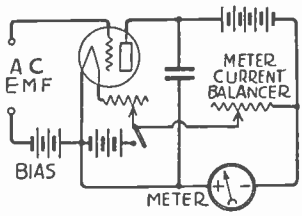
vacuum thermocouple.—A *thermocouple* and heating element enclosed within an evacuated chamber for the purpose of increasing the sensitivity through a decrease in the rate of heat radiation from the element. *See illustration.*



Vacuum Thermocouple



Vacuum Tube



Vacuum Tube Voltmeter

vacuum tube.—A glass bulb from which gases have been almost completely exhausted and within which are various electrodes required for operation of the tube as an amplifier, a rectifier, a modulator, an oscillator, a detector, etc. Action of a vacuum tube is due entirely to *thermionic* action or electron flow through the evacuated space between electrodes. However, the name vacuum tube has been rather generally applied also to gaseous tubes which depend on ionization as well as on thermionic action. *See illustration.*

vacuum tube amplifier.—A radio frequency or audio frequency amplifier utilizing the amplification of *vacuum tubes* to increase the signal voltage or power.

vacuum tube detector.—A detector employing a vacuum tube for *grid current detection,* for *plate current detection,* or for detection as a diode.

vacuum tube generator.—A *vacuum tube oscillator.*

vacuum tube modulator.—A *modulation* system in which the signal changes are applied to the carrier wave by means of a vacuum tube.

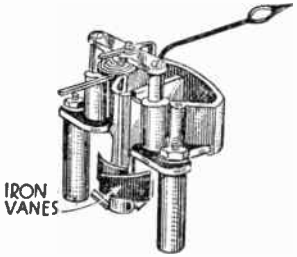
vacuum tube oscillator.—A device employing a vacuum tube using direct current power for the production of alternating currents at desired frequencies.

vacuum tube rectifier.—A *thermionic rectifier.*

vacuum tube relay.—An oscillating tube with a control circuit connected to its control grid; increase of grid voltage resulting in an increase of plate current sufficient to operate an electromagnetic *relay* in the plate circuit.

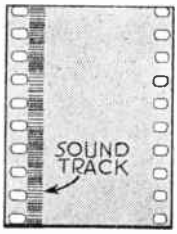
vacuum tube transmitter.—A *radio transmitter* employing vacuum tubes for the production of radio frequency power.

vacuum tube voltmeter.—A device for measuring or for comparing the values of alternating voltages at any frequency while taking an exceedingly small amount of power from the measured circuit.



Vane Type Instrument

Variable Area



Variable Density

The meter consists chiefly of a vacuum tube having a *negative bias* sufficient to cause rectification and a direct component in the plate current. The changes in value of the rectified plate current are measured and form an indication of the value of alternating voltages applied to the control grid circuit. See also *slide back voltmeter. See illustration, page preceding.*

vacuum valve.—A *vacuum tube.* Generally such a tube used as a *rectifier.*

valve.—A *tube.*

valve effect.—Any effect which offers greater opposition to flow of electricity in one direction than in the opposite direction.

valve holder.—A British term for *tube socket.*

valve metal.—A metal which, when immersed in an electrolyte, allows electric current to flow in only one direction between the metal and the liquid. A metal used as the active electrode in an *electrolytic rectifier.*

vane type instrument.—1—A current measuring instrument

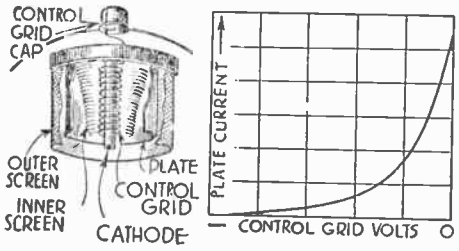
employing the repulsion force between fixed and movable magnetized iron vanes to move the pointer. 2—An instrument employing the reaction between the field of a coil carrying the measured current and a magnetized piece of soft iron. *See illustration.*

V-antenna.—An *antenna* having two aerial conductors extending in different directions from a central support.

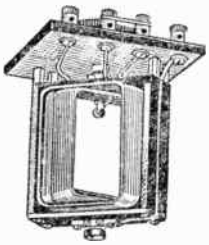
variable area system.—A method of sound recording on film in which part of the total width of *sound track* is opaque and the remainder transparent, an irregular line of separation between these parts representing variations of sound frequency and intensity. *See illustration.*

variable condenser.—Any condenser in which the effective *capacity* may be continuously changed while operating in a circuit.

variable density system.—A method of sound recording on film in which alternate light and dark lines across the *sound track* represent the sounds. The number of lines per unit of film length is proportional to frequency and the contrast between light and



Variable-mu Tube



Variometer

dark is proportional to intensity of the sound. *See illustration.*

variable grid leak.—A *grid leak* in which the resistance may be conveniently changed while the leak is in use.

variable inductance.—A *variometer,* a *slide tuner,* a coil with movable iron core or any form of *inductance* which may be altered in value while operating in a circuit.

variable-mu tube.—A *screen grid tube* in which the electrodes, especially the *control grid* and *cathode,* have a relative spacing or physical structure resulting in high amplification (large plate current changes) for small negative biases and in low amplification (small plate current changes) for greater negative bias. Plate current cutoff occurs only at highly negative values of control grid voltage. *See illustration.*

variable resistance.—A resistance element of which the value may be changed while used in an active circuit.

variational sensitivity of photocell.—The ratio of change in *photocell current* to the change in total flux affecting the cell.

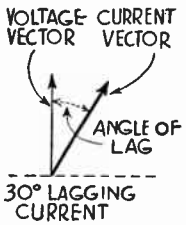
variocoupler.—A radio frequency *inductive coupling* device in which the *coupling coefficient* may be changed by relative movement between two windings or by using more or less of the turns in one of the windings.

variometer.—A continuously variable *inductance* consisting of two windings, one of which may be rotated inside the other so that the two fields either aid or oppose each other to vary the total inductance. *See illustration, page preceding.*

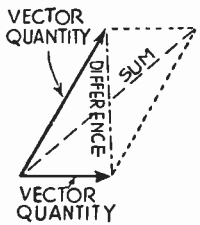
variometer coupling.—A *radio frequency amplifier* in which the plate circuit of the amplifying tube is tuned to resonance by variation of inductance in a *variometer* contained in the plate circuit.

varnished cloth.—Linen or cotton coated with oils or resins.

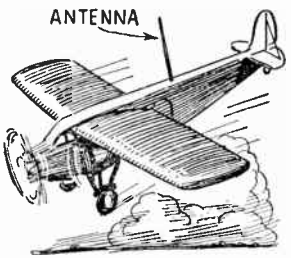
vector.—A symbol for a changing quantity which, at a given instant, has definite direction and magnitude. A straight line representing by its length the magnitude of an alternating quantity and by its angular position in relation to other lines the *phase* relation



Vector



Vector Sum or Difference



Vertical Aircraft Antenna

between this quantity and others. Thus it is possible to represent alternating voltages and currents and to show their phase relations. Compare *rotating vector. See illustration.*

vector sum or difference.—The result of adding or subtracting quantities vectorially. Two *vectors* form the two sides of a parallelogram, which is completed. Then the longer diagonal represents the sum and the shorter one the difference of the two quantities both in magnitude and in phase relation. *See illustration.*

velocity.—The rate of movement, the distance traveled in a given direction during a given time. The symbol is *v*.

vernier condenser.—A *tuning condenser* in which the capacity may be changed by a very small amount through an auxiliary control acting upon a small portion of the total capacity.

vernier dial.—A device by means of which the shaft of any variable unit may be turned through a very small angle of rotation or may be turned very slowly with the control knob turned comparatively fast.

vertical aircraft antenna.—An antenna system consisting of a vertical metal rod six to ten feet long as aerial, and of the bonded metal portions of the aircraft as the counterpoise. *See illustration.*

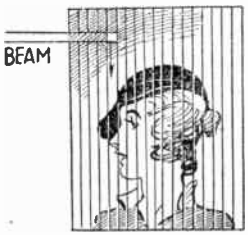
vertical oscillator.—A television receiver oscillator which employs the blanking and vertical synchronizing signals for operating the vertical deflectors.

vertical scanning.—A *scanning* system in which lines run vertically across the frame. *See illustration.*

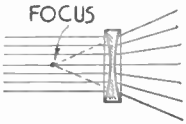
vibrating rectifier.—Magnetically operated contacts which move in time with the alternations of a current to be rectified, thus sending the current through a circuit in one direction.

vibrating reed receiver.—A *telephone receiver* in which a flexibly mounted piece of iron is moved by the signal magnetic effects.

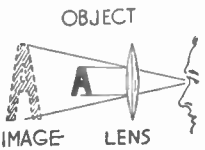
vibration galvanometer.—A device for observing the effect of alternating or pulsating electrical values. Current passes through a small conductor stretched under adjustable tension between poles of a magnet. Reaction between the fields of the conductor



Vertical Scanning



Virtual Focus



Virtual Image

and of the magnet causes vibration of the conductor, which is observed as a shadow on a screen or by reflection of a light beam from a mirror attached to the conductor.

video amplifier.—A television amplifier for voltages corresponding to lights and shadows of the image.

video frequency.—The output frequency from a television camera while a scene is being scanned.

video signal.—Television signal voltages corresponding to lights and shadows of the scene or image.

violet rays.—A term usually meaning *ultra-violet rays.*

virtual focus.—The point at which imaginary extensions of diverging rays from a *lens* would meet were they extended back through the lens. *See illustration.*

virtual image.—An image formed by *reflection* or *refraction.* Such an image as appears to the eye but which cannot be focused on a screen. *See illustration.*

virtual value.—An effective value, or *root-mean-square value.*

visible light.—Light rays of such wavelength or such color as will

affect normal vision; distinguished from *ultra-violet rays* and from *infra-red rays* which are not visible. Wavelengths between 3,900 and 7,600 *Angstrom units* and including the colors violet, indigo, blue, green, yellow, orange and red.

visible spectrum.—Light frequencies or wavelengths within the limits of human vision. See *spectrum.*

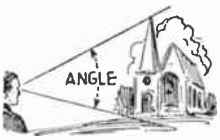
vision.—Sight; the sense which is affected by light, color and form.

visual.—Pertaining to the sense of sight, or to vision.

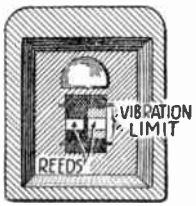
visual angle.—The angle formed by two straight lines drawn from the outer limits of an object or image, and meeting in the eye. *See illustration.*

visual field.—The portion of an image which may be clearly seen without moving the eye.

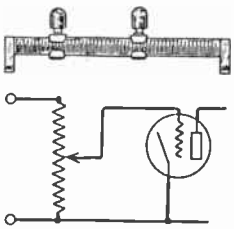
visual persistence.—*Persistence of vision.*



Visual Angle



Visual Reed Indicator



Voltage Divider

visual radio range.—A *radio range* sending signals modulated with low frequencies which operate a *visual reed indicator* or other receiving device producing visible indications.

visual reed indicator.—A device for indicating to an aircraft pilot any deviation from a *radio range* course. Two flexible reeds are caused to vibrate by two differently modulated signals, any difference in vibration amplitude indicating corresponding deviation from the *equisignal zone* of the range signal. *See illustration.*

vitaphone.—A disc record system of sound pictures.

vitreous.—Having the nature of glass.

voice frequency.—*Audio frequency.*

voice modulation.—*Speech modulation.*

volt.—The practical unit of *electromotive force* or electrical potential. The steady electromotive force which causes a current of one *ampere* to flow through a resistance of one *ohm.* Abbreviated *v.* The *international volt.*

Volta effect.—Development of an *electromotive force* at the point of contact when different materials are brought together.

voltage.—*Electromotive force* or *potential.* The number of *volts.*

voltage amplification.—The ratio of the signal voltage appearing between the output terminals of an amplifier to the signal voltage applied to the input terminals. With a vacuum tube, the *amplification coefficient.*

voltage changer.—Any device for raising or lowering a voltage. A *transformer,* a *dynamotor.*

voltage divider.—1—A resistance unit provided with one or more sliding contacts and having impressed across its ends a *potential difference.* Various voltage values may be had between a slider and either end of the resistance, or between two sliders. *See illustration.* 2.—That part of a *power unit* which consists of resistors through which flows all or part of the rectified current and from various points on which are taken potentials suitable for the plate circuits, screen circuits and control grid biases of the connected apparatus.

voltage drop.—*Potential difference.* The difference between the voltages at two points in a circuit.

voltage factor.—The *amplification coefficient.*

voltage feed.—A connection from the closed circuits of a *radio transmitter* to its antenna at a point where the antenna has a high voltage but carries little current.

voltage influence.—The percentage change in reading of an instrument, other than a voltmeter or wattmeter, caused by a deviation of ten per cent from the rated voltage.

voltage multiplier.—A *multiplier.*

voltage operated device.—An electrical part the operation of which depends on changes in applied voltage or potential differences rather than on changes in current. A negatively biased vacuum tube is an example of a voltage operated device since the grid circuit carries little or no current.

voltage ratio.—The ratio of the effective primary voltage to the effective secondary voltage in a transformer.

voltage regulation.—The change in voltage which is brought about by change of load on a generator, a rectifier, a transformer or other unit acting as a power source. The ratio of the drop in output voltage between no load and full load, to the voltage at full load or rated load.

voltage regulator.—A device for maintaining approximately constant voltage with change of load in a circuit. Various methods are employed, as a transformer with variable mutual inductance. See also, *voltage regulator tube.*

voltage regulator tube.—A *two-element gaseous tube* in which a *glow discharge* occurs and in which the voltage drop between elements varies with change in external load to maintain an approximately constant voltage between points to which the tube is connected.

voltage relay.—A relay which operates upon a change of applied voltage.

voltage resonance.—*Series resonance.*

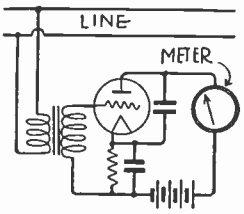
voltage transformer.—A transformer having its primary connected between the two sides of a circuit, primary current then depending on the *potential difference* across the circuit.

voltaic cell.—*A galvanic cell.*

voltaic couple.—Two substances (usually metals) between which there is developed an *electromotive force* when they are placed in an *electrolyte.*

voltaic electricity.—The *electric current.*

voltaic pile.—Alternate discs of two different metals between which



Volume Indicator

are layers of absorbent material carrying *electrolyte,* the combination acting as a number of *primary cells* in series.

voltammeter.—1—An instrument combining two movements, for simultaneous measurement of both voltage and current in a circuit, or containing a single movement with switching arrangements for measuring either voltage or current. 2—A direct current *wattmeter.*

volt-ampere.—A unit of measurement for apparent power in an alternating current circuit as distinguished from real power which is measured in *watts.* The number of volt-amperes is equal to the product of the r-m-s applied volts and the r-m-s current in amperes in a circuit, without reference to the *phase* relation of voltage and current or to the *power factor* of the circuit. In a direct current circuit the number of volt-amperes is the same as the number of watts.

volt-ampere ratio.—The ratio of the *volt-ampere* output to the volt-ampere input of a transformer.

Volta's law.—A law which states that the voltage across the ends of a *series circuit* containing several sources is equal to the sum of all separate e.m.fs. in one direction minus the sum of all separate e.m.fs. acting in the opposite direction.

voltmeter.—An instrument for measuring and indicating *potential difference* in volts.

volts to ground.—In a grounded circuit, the voltage between the specified conductor and the connection of its circuit to ground. In an ungrounded circuit, the greatest voltage between a specified conductor and any other conductor of the circuit.

volume.—1—The space occupied by a body; measured in cubic feet, cubic inches, etc. 2—The intensity of sound produced by a loud speaker.

volume control.—Manual or automatic means for regulating the volume of sound produced by an audio frequency amplifier in its connected *loud speaker.*

volume distortion.—*Amplitude distortion.*

volume indicator.—A device which visually indicates the amount of power, current or voltage being carried by a transmission line. One form consists of a simple *vacuum tube voltmeter,* other types employ direct reading alternating current meters. *See illustration.*

volume leakage.—The *current* which passes through the body of an insulating material.

volume resistance.—*Resistance* to flow of current through the body of a material.

volume resistivity.—The *resistance* in ohms between opposite faces of a centimeter cube of a substance. Sometimes the resistance in ohms of one mil-foot of the substance.

VT.—Abbreviation for *vacuum tube.*

vulcanite.—*Hard rubber.*

vulcanized fibre.—Fibre which has been formed with application of heat.

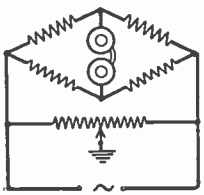
W.—Symbol for *work;* for energy in *joules.*

w.—Abbreviation for *watt.*

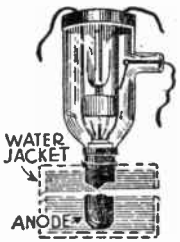
Wagner ground.—Auxiliary variable arms connected to opposite corners of a *Wheatstone bridge* and to ground; allowing elimination of the effects of stray capacities and of leakages. *See illustration.*

wander plug.—A metallic plug attached to a flexible wire, through which connection may be made to any one of several points in a circuit.

watchcase receiver.—A small *telephone receiver.* A *headphone.*



Wagner Ground



Water Cooled Tube

water cooled tube.—A vacuum tube in which water is circulated around portions of the anode or plate to reduce its temperature. *See illustration.*

water rheostat.—A *liquid rheostat.*

watt.—The practical unit of electric *power.* A power of one *joule* per second. The power produced in a direct current circuit by a current of one ampere through a potential drop of one volt, the power in watts being equal to the product of the number of amperes flowing and the voltage drop across the circuit. In an alternating current circuit the (true) power in watts is equal to the number of *volt-amperes* multiplied by the *power factor* of the circuit. Abbreviated *w.*

wattful current or component.—The *active current or component.*

watt-hour.—The amount of power furnished by one *watt* when used for one hour.

watt-hour meter.—An integrating wattmeter; a device for recording the total power in *watt-hours* used in a circuit.

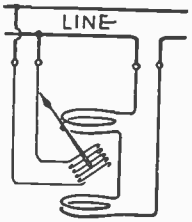
wattless current or component.—The *reactive current or component.*

wattmeter.—An instrument for measuring and indicating in *watts* the rate at which *power* is used in a circuit. In one type the pointer is moved by the reaction between two windings, one in series and the other in shunt with the circuit in which power is being measured. *See illustration.*

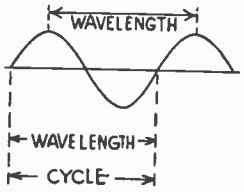
watt-second.—The amount of power furnished by one *watt* during one second. One *joule* of energy.

wave.—A moving disturbance in an elastic body, the disturbance having a regularly recurring period in time. A single cycle of such a disturbance. The representation of such a wave in a graph. A *radio wave, light wave, sound wave,* etc.

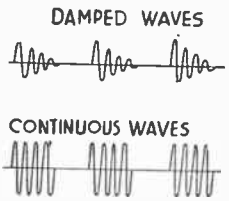
wave antenna.—A directional receiving *antenna* in which the horizontal length of the aerial conductor is a simple multiple of the wavelength of the received carrier. The open end is at a voltage *node* and is connected through a resistance to ground.



Wattmeter



Wavelength



Wave Train

wave band.—The series of wavelengths or frequencies within which the carrier of a transmitter is maintained. A *radio channel.*

wave constant.—The *meters per millimeter* of a piezo-electric resonator.

wave filter.—A *filter.*

wave form.—The shape of a curve indicating the *instantaneous values* in the rise and fall of an alternating quantity during a period of time. The wave form of a signal is not dependent on the amplitude of voltage or current, nor on the scale to which it may be drawn on a graph; remaining the same in form after amplification as before provided there has been no *distortion.*

wave form distortion.—A form of distortion in which the shape of the signal wave is changed, usually by introducing *harmonic frequencies* not present in the original signal.

wave front.—The points in space at which the effects of one particular cycle of a moving disturbance have the same *phase.*

wave front angle.—The angle at which a radio wave deviates from

the perpendicular because of *refraction* in the mediums through which it is traveling.

wavelength.—The distance between successive peaks of the same polarity in a *wave*. The distance traveled by one wave in space before a similar part of the following wave arrives at the same point. The distance spanned by one cycle of radiated energy. Equal to the wave *velocity* divided by the *frequency*. Wavelength usually is measured in *meters* or in *centimeters*, although for very short waves other units, such as the *Angstrom unit*, are employed. The symbol is the Greek letter lambda (λ). *See illustration, page preceding.*

wave meter.—A device which allows measurement of the *wavelength* of an alternating current or of a radio wave. A *frequency meter* calibrated to measure wavelength.

wave motion.—A to and fro motion of an elastic medium as disturbances of any kind travel through it. The motion may be in the form of *longitudinal vibrations* or of *transverse vibrations*.

wave propagation.—The movement of waves through space.

wave reflection.—See *reflection*.

wave selector.—A *wave trap*.

wave shape.—*Wave form*.

wave train.—A series of radio waves preceded and followed by intervals without waves. With *spark transmission*, the number of damped waves between the initial amplitude and a final amplitude having a value equal to one per cent of the initial value. With *interrupted continuous waves*, the waves occurring between successive interruptions. *See illustration, page preceding.*

wave trap.—A device for improving the apparent *selectivity* of a receiver. Usually a tuned circuit associated with the antenna system to attenuate signals at an undesired frequency. An *absorption wave trap* or an *impedance wave trap*.

wax master.—In the disc method of sound recording, the "wax" disc into which is cut the original record of sounds by the cutter. Used for producing the *metal master*.

weak coupling.—*Loose coupling*.

weather-proof slow-burning condenser.—Wire with fire-resisting coating next the conductor and weather-proof coating on the conductor.

weather-proof wire.—Wire covered with fabric treated with asphaltum or similar materials to make it weather-proof. Used for outdoor work.

Wehnelt filament.—An *oxide coated filament*.

Wehnelt interrupter.—An *electrolytic interrupter*, consisting of one lead and one platinum electrode immersed in dilute sulphuric acid.

Wehnelt oscillator.—A generator of high frequency oscillations employing a *Wehnelt interrupter* connected in a circuit containing suitable values of inductance and capacity.

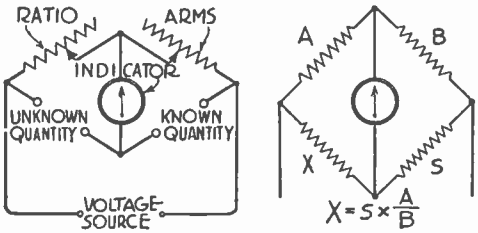
Wein cell.—A *cuprous oxide cell* of the photo-voltaic type.

Western Union joint.—A wire joint made by crossing two wires, then winding the end of each wire around the other one.

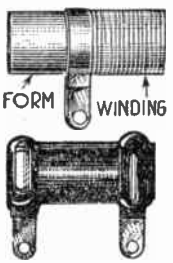
Weston cell.—A *standard cell* having one electrode of mercury, another of cadmium amalgam and an electrolyte of mercurous sulphate and cadmium sulphate. Delivers an electromotive force of 1.01865 volt at a temperature of twenty degrees centigrade.

wet battery.—A *storage battery* or a *primary battery* using a liquid electrolyte.

Wheatstone bridge.—A device for measurement of electrical quantities. Four arms form a parallel circuit across a voltage source, two arms on each side, and a bridging member containing a current indicator joins the points between the two arms on either side. When the ratio between one pair of arms is made equal to the ratio between the other pair, the bridge is balanced and no current flows through the indicator. One ratio then is determined



Wheatstone Bridge



Wire Wound Resistor

from marked calibrations on its two arms; the other ratio is equal and consists of the unknown quantity and a known quantity, therefore the unknown may be determined in terms of the known quantity. *See illustration.*

white level.—The voltage range of the picture signal portions of a television signal. *See black level.*

wind driven generator.—A *fan driven generator.*

winding.—A portion of an electrical circuit formed into a coil.

wipe-out area.—A region in which *blanketing occurs.*

wire.—A slender rod or filament of drawn metal. One or more pieces or strands of metal not insulated from each other.

wire skinner.—A tool having knife edges formed into openings the size of conductors, so that clamping the tool down on an insulated wire allows the insulation to be drawn off without cutting the conductor.

wire wound resistor.—A resistance element consisting of a metallic

wire wound upon a heat resisting, insulating form and usually covered with enamel or other material to prevent oxidation. *See illustration.*

wired radio.—Radio transmission in which the modulated *carrier current* is guided by metallic conductors, these conductors usually being already in use for carrying power, or telephonic or telegraphic messages.

wireless.—A word having the same meaning as "*radio*".

Wollaston wire.—A wire of such small diameter as to be almost invisible to the naked eye.

wood moulding wiring.—Building wiring carried in wooden raceways having grooves to receive the wires and covers to conceal them.

Wood's metal.—An alloy metal of lead, tin, cadmium and bismuth which melts at about 140 degrees Fahrenheit. Used for mounting detector crystals and for making various kinds of joints.

work.—The product of a *force* and the distance through which it moves a certain mass. Units of work are the *erg*, the *joule*, the foot-pound and the centimeter-gram. The symbol is *W*.

work function.—The least amount of energy, expressed in volts, which an *electron* must acquire in order to break away from the surface of a metal into the surrounding space. The potential difference in volts through which an electron must fall to gain velocity sufficient to allow its breaking away from the surface of a *cathode*. Surface tension.

working wave.—In *absorption signalling* or *compensation signalling*, the frequency which is radiated, the frequency which forms the dots and dashes of the code. See *compensation wave*.

X

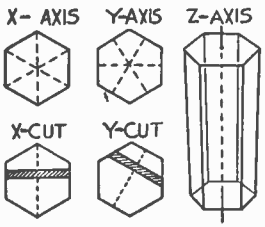
X. or x.—Symbol for *reactance* in ohms.

X_c.—Symbol for *capacitive reactance* in ohms.

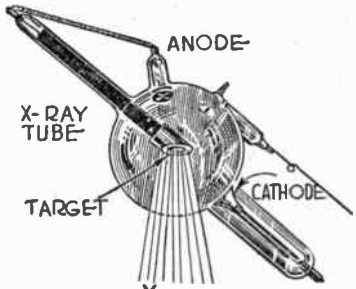
X_l.—Symbol for *inductive reactance* in ohms.

X-axis.—A line joining two diametrically opposite corners of a quartz *piezo-electric crystal,* and lying in a plane at right angles to the *Z-axis.* An electric axis. *See illustration.*

X-cut.—Descriptive of a *piezo-electric crystal* or quartz plate cut in such manner that an *X-axis* is perpendicular to its faces. Also



X-, Y- and Z-axis



X-rays

called a Curie cut, a zero-angle cut or a face-perpendicular cut. *See illustration.*

X-rays.—Rays produced by striking of *cathode rays* on a solid. These rays are capable of penetrating opaque objects and will affect photographic plates or will produce *fluorescence.* Rays having frequencies lying approximately between the higher ultra-violet frequencies and the lower gamma rays. *See illustration.*

X's.—*Static* disturbances.

X-waves.—In a *piezo-electric resonator,* waves whose direction is parallel to an *X-axis.*

Y

Y. or y.—Symbol for *admittance* in mhos.

Y-axis.—A line perpendicular to two diametrically opposite parallel faces of a quartz *piezo-electric crystal,* and lying in a plane at right angles to the *Z-axis.* A mechanical axis. *See illustration for X-axis.*

Y-connection.—A *star connection* in a three-phase circuit.

Y-cut.—Descriptive of a *piezo-electric crystal* or quartz plate cut in such manner that a *Y-axis* is perpendicular to its faces. Also called a thirty-degree cut or a face-parallel cut. *See illustration for X-axis.*

Y-waves.—In a *piezo-electric resonator,* waves whose direction is parallel to a *Y-axis.*

Z.

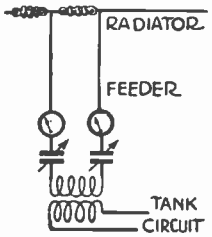
Z. or z.—Symbol for *impedance* in ohms.

Z-axis.—The *optical axis of a piezo-electric crystal. See illustration for X-axis.*

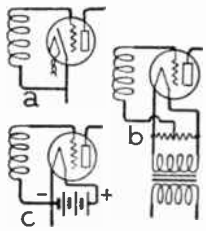
Zeppelin antenna.—A *Hertz antenna* system in which the radiator is connected to the transmitter *tank circuit* through an intermediate tuned circuit which in itself is the equivalent of a second Hertz antenna folded at its center. *See illustration.*

zero-angle cut.—An *X-cut* for a quartz crystal.

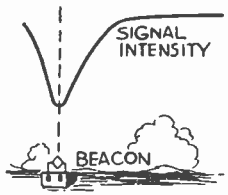
zero-beat.—The condition in which two frequencies are exactly the same so that they produce no beat frequency when working in



Zeppelin Antenna



Zero Bias



Zero-signal Zone

the same circuit.

zero beat reception.—Reception by combining with the *carrier wave* a locally generated current of the same frequency, resulting in a current having average changes at the *modulation frequency. Homodyne reception.*

zero bias.—A control grid potential which is the same as that of *(a)* the tube's cathode, *(b)* the filament center in an A.C. filament tube, or *(c)* the negative end of the filament in a D.C. filament tube. *See illustration.*

zero level.—A *reference level.*

zero method.—A *null method.*

zero potential or voltage.—The voltage of the earth or of a *ground.*

zero-signal zone.—The region above the antenna of a *radio beacon* in which decrease of signal strength shown by receiving instruments advises a pilot that he has reached the beacon. *See illustration.*

zincite detector.—A *crystal detector* employing crystalline zinc oxide as one of its elements.

Z_p.—Symbol for *plate impedance.*

Z-waves.—In a *piezo-electric resonator,* waves whose direction is parallel to a *Z-axis.*