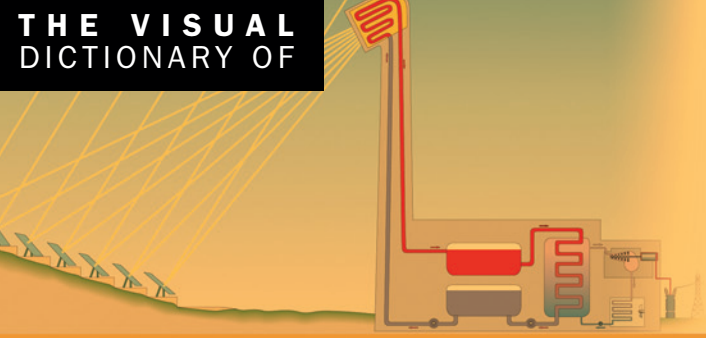
THE VISUAL DICTIONARY OF



SCIENCE & ENERGY

convection
Heat generation in a fluid that is caused by a variation in temperature resulting from the movement of molecules. Here, the heated water expands, rises and releases its heat to the surrounding air.

vapor
Gaseous state of water above its boiling point (water boils and is converted to vapor at 212°F or 100°C).

liquid
Matter having a definite mass and volume but no shape; its atoms are relatively mobile in relation to each other.

radiation
Heat generation in the form of electromagnetic waves emitted by a heated body (solid, liquid or gas).

convection current
Movement of fluid caused by a difference in density, which transfers heat. The heated water rises and is replaced by the cooler water from the surface.

solid
Rigid body possessing mass, volume and a definite form; its atoms are linked to each other and are almost completely at rest.

conduction
Heat generation in a body (usually a solid) or between two bodies in contact; the molecules vibrate but no matter moves.

flame
Incandescent gas resulting from the combustion of a mixture of gas and air; it produces heat and light.

SCIENCE & ENERGY

Jean-Claude **Corbeil**
Ariane **Archambault**

QA INTERNATIONAL

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INTRODUCTION

EDITORIAL POLICY

The Visual Dictionary takes an inventory of the physical environment of a person who is part of today's technological age and who knows and uses a large number of specialized terms in a wide variety of fields.

Designed for the general public, it responds to the needs of anyone seeking the precise, correct terms for a wide range of personal or professional reasons: finding an unknown term, checking the meaning of a word, translation, advertising, teaching material, etc.

The target user has guided the choice of contents for *The Visual Dictionary*, which aims to bring together in 12 thematic books the technical terms required to express the contemporary world, in the specialized fields that shape our daily experience.

STRUCTURE

Each tome has three sections: the preliminary pages, including the table of contents; the body of the text (i.e. the detailed treatment of the theme); the index.

Information is presented moving from the most abstract to the most concrete: sub-theme, title, subtitle, illustration, terminology.

TERMINOLOGY

Each word in *The Visual Dictionary* has been carefully selected following examination of high-quality documentation, at the required level of specialization.

There may be cases where different terms are used to name the same item. In such instances, the word most frequently used by the most highly regarded authors has been chosen.

Words are usually referred to in the singular, even if the illustration shows a number of individual examples. The word designates the concept, not the actual illustration.

DEFINITIONS

Within the hierarchical format of *The Visual Dictionary*'s presentation, the definitions fit together like a Russian doll. For example, the information within the definition for the term *insect* at the top of the page does not have to be repeated for each of the insects illustrated. Instead, the text concentrates on defining the distinguishing characteristics of each insect (the *louse* is a parasite, the female *yellow jacket* stings, and so forth).

Since the definition leaves out what is obvious from the illustration, the illustrations and definitions complement one another.

The vast majority of the terms in the *Visual Dictionary* are defined. Terms are not defined when the illustration makes the meaning absolutely clear, or when the illustration suggests the usual meaning of the word (for example, the numerous *handle*s).

METHODS OF CONSULTATION

Users may gain access to the contents of *The Visual Dictionary* in a variety of ways:

- From the TABLE OF CONTENTS at the end of the preliminary pages, the user can locate by title the section that is of interest.
- With the INDEX, the user can consult *The Visual Dictionary* from a word, so as to see what it corresponds to, or to verify accuracy by examining the illustration that depicts it.
- The most original aspect of *The Visual Dictionary* is the fact that the illustrations enable the user to find a word even if he or she only has a vague idea of what it is. The dictionary is unique in this feature, as consultation of any other dictionary requires the user first to know the word.

TITLE

Its definition is found below. If the title refers to information that continues over several pages, after the first page it is shown in a shaded tone with no definition.

TERM

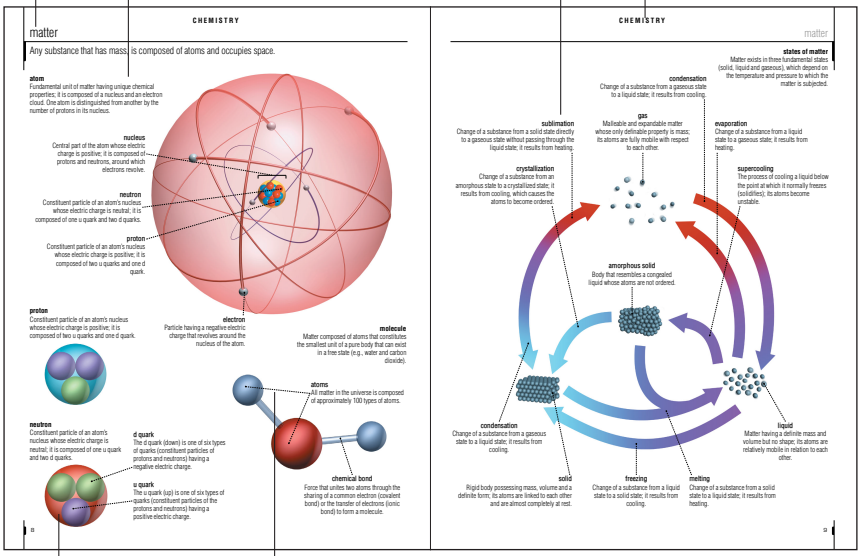
Each term appears in the index with a reference to the pages on which it appears.

DEFINITION

It explains the inherent qualities, function, or characteristics of the element depicted in the illustration.

SUB-THEME

These are shown at the end of the preliminary pages along with their definitions. They are then repeated on each page of a section, but without the definition.



ILLUSTRATION

It is an integral part of the visual definition for each of the terms that refer to it.

NARROW LINES

These link the word to the item indicated. Where too many lines would make reading difficult, they have been replaced by color codes with captions or, in rare cases, by numbers.

CONTENTS

matter

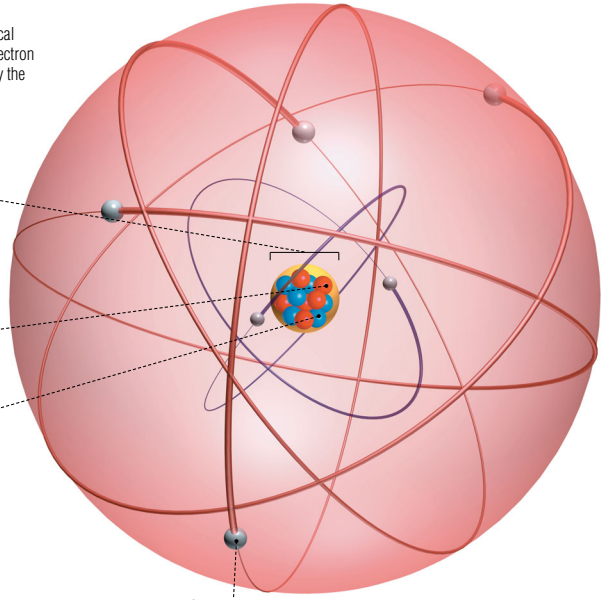
Any substance that has mass, is composed of atoms and occupies space.

atom
Fundamental unit of matter having unique chemical properties; it is composed of a nucleus and an electron cloud. One atom is distinguished from another by the number of protons in its nucleus.

nucleus
Central part of the atom whose electric charge is positive; it is composed of protons and neutrons, around which electrons revolve.

neutron
Constituent particle of an atom's nucleus whose electric charge is neutral; it is composed of one u quark and two d quarks.

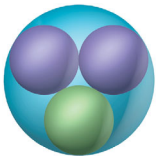
proton
Constituent particle of an atom's nucleus whose electric charge is positive; it is composed of two u quarks and one d quark.



electron
Particle having a negative electric charge that revolves around the nucleus of the atom.

molecule
Matter composed of atoms that constitutes the smallest unit of a pure body that can exist in a free state (e.g., water and carbon dioxide).

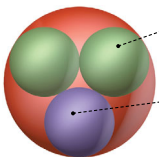
proton
Constituent particle of an atom's nucleus whose electric charge is positive; it is composed of two u quarks and one d quark.

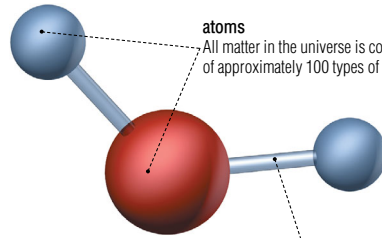


neutron
Constituent particle of an atom's nucleus whose electric charge is neutral; it is composed of one u quark and two d quarks.

d quark
The d quark (down) is one of six types of quarks (constituent particles of protons and neutrons) having a negative electric charge.

u quark
The u quark (up) is one of six types of quarks (constituent particles of the protons and neutrons) having a positive electric charge.





atoms
All matter in the universe is composed of approximately 100 types of atoms.

chemical bond
Force that unites two atoms through the sharing of a common electron (covalent bond) or the transfer of electrons (ionic bond) to form a molecule.

states of matter
Matter exists in three fundamental states (solid, liquid and gaseous), which depend on the temperature and pressure to which the matter is subjected.

condensation
Change of a substance from a gaseous state to a liquid state; it results from cooling.

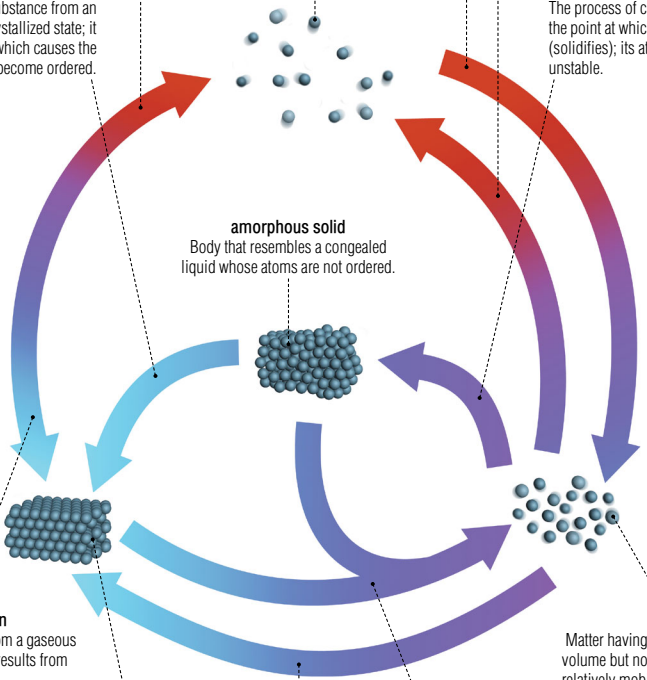
gas
Malleable and expandable matter whose only definable property is mass; its atoms are fully mobile with respect to each other.

sublimation
Change of a substance from a solid state directly to a gaseous state without passing through the liquid state; it results from heating.

evaporation
Change of a substance from a liquid state to a gaseous state; it results from heating.

crystallization
Change of a substance from an amorphous state to a crystallized state; it results from cooling, which causes the atoms to become ordered.

supercooling
The process of cooling a liquid below the point at which it normally freezes (solidifies); its atoms become unstable.



amorphous solid
Body that resembles a congealed liquid whose atoms are not ordered.

condensation
Change of a substance from a gaseous state to a liquid state; it results from cooling.

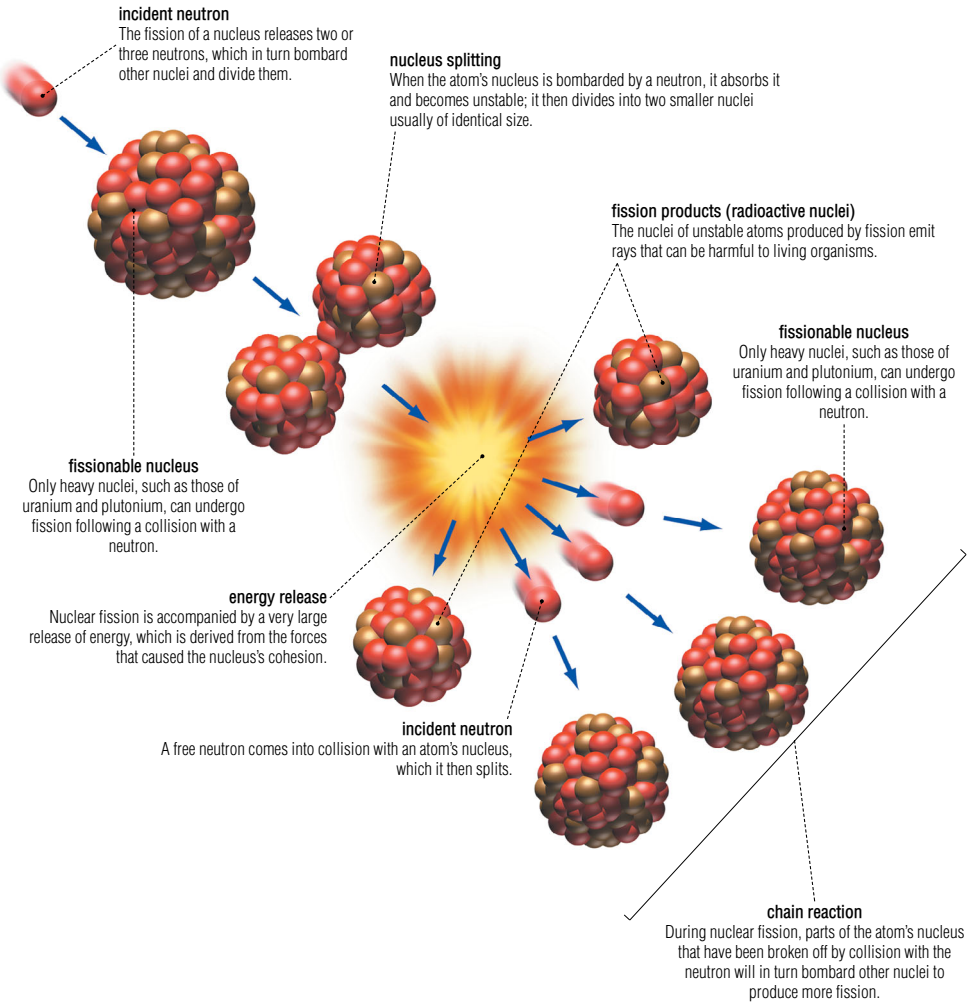
liquid
Matter having a definite mass and volume but no shape; its atoms are relatively mobile in relation to each other.

solid
Rigid body possessing mass, volume and a definite form; its atoms are linked to each other and are almost completely at rest.

freezing
Change of a substance from a liquid state to a solid state; it results from cooling.

melting
Change of a substance from a solid state to a liquid state; it results from heating.

nuclear fission
Process by which the atoms' nuclei become fragmented (e.g., in a nuclear reactor); neutrons are released and energy is produced in the form of heat.

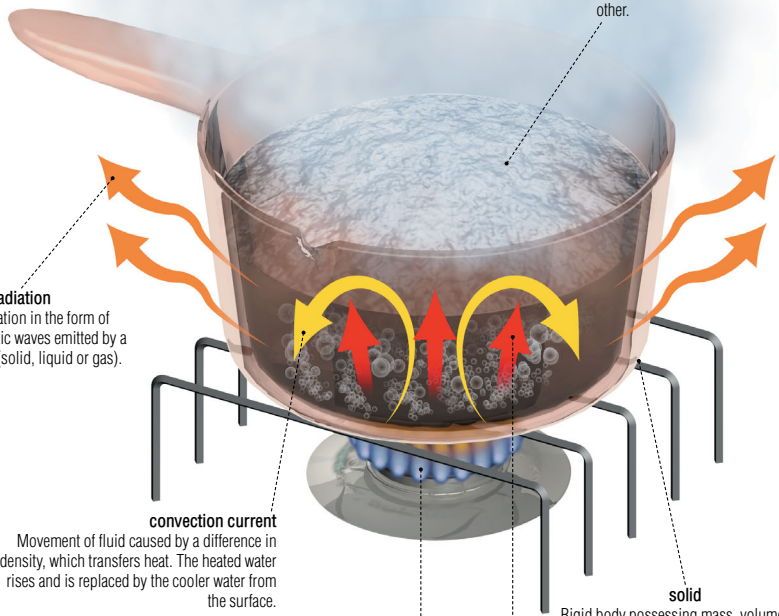


heat transfer
Heat transfer occurs in three ways that are related to molecular movement: conduction, convection and radiation.

convection
Heat generation in a fluid that is caused by a variation in temperature resulting from the movement of molecules. Here, the heated water expands, rises and releases its heat to the surrounding air.

vapor
Gaseous state of water above its boiling point (water boils and is converted to vapor at 212°F or 100°C).

liquid
Matter having a definite mass and volume but no shape; its atoms are relatively mobile in relation to each other.



radiation
Heat generation in the form of electromagnetic waves emitted by a heated body (solid, liquid or gas).

convection current
Movement of fluid caused by a difference in density, which transfers heat. The heated water rises and is replaced by the cooler water from the surface.

flame
Incandescent gas resulting from the combustion of a mixture of gas and air; it produces heat and light.

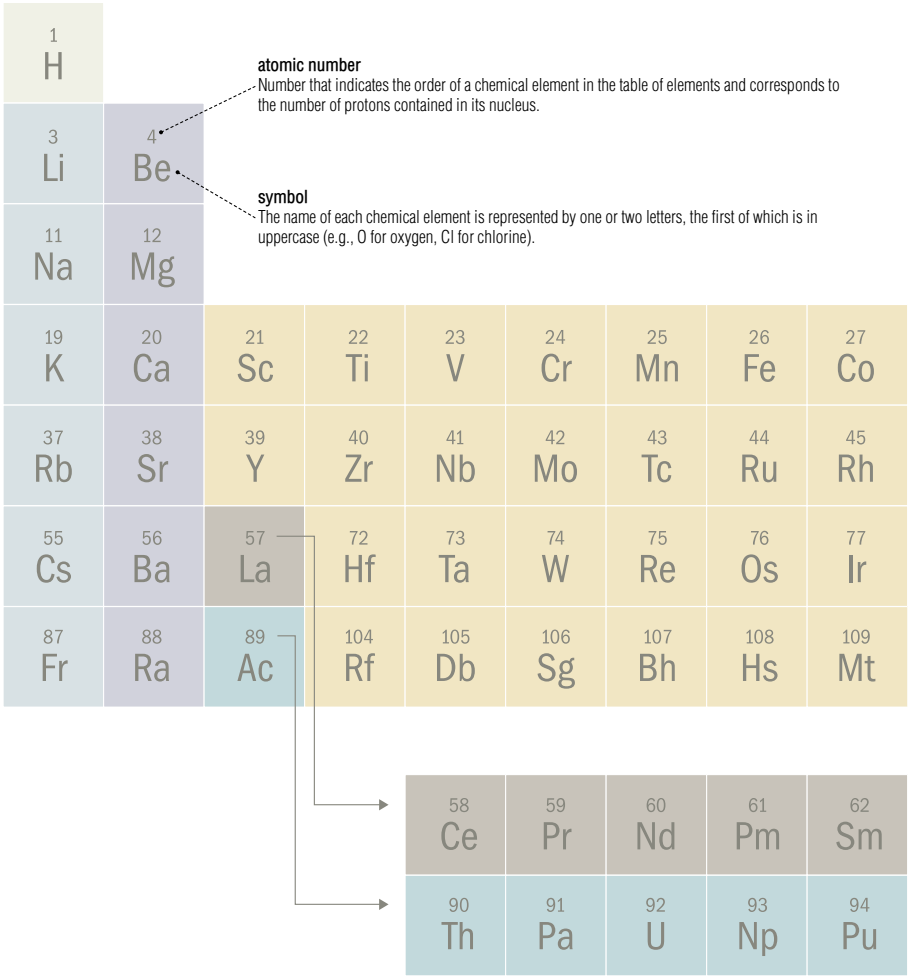
solid
Rigid body possessing mass, volume and a definite form; its atoms are linked to each other and are almost completely at rest.

conduction
Heat generation in a body (usually a solid) or between two bodies in contact; the molecules vibrate but no matter moves.

chemical elements

There are more than 110 chemical elements, most of which are naturally present in the universe. The others are created artificially in the laboratory.

table of elements
Table created by Dmitry Mendeleyev in 1869 that classifies the now approximately 110 known chemical elements such as oxygen, hydrogen, iron and lead. The elements are classified in order of their atomic weight and arranged into groups having similar properties.



1 H **hydrogen**
This gas is the most abundant element in the universe and makes up part of the composition of water. It is used especially in petrochemistry and rocket engines.

								2 He
			5 B	6 C	7 N	8 O	9 F	10 Ne
			13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
110 Ds	111 Rg	112 Uub						

63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

alkali metals

Generally soft and silvery and very good conductors of heat and electricity; they are very reactant with nonmetals and break down in cold water.

3 Li
lithium
The lightest of all the metals is used especially in alloys for the aerospace industry, in household batteries and in medicine.

19 K
potassium
Very reactant light metal that is used especially in fertilizer and matches; its salts are used in medicine.

55 Cs
cesium
Rare metal that is used especially in photoelectric cells, atomic clocks, infrared lamps and treating certain cancers.

11 Na
sodium
Metal that is used especially in streetlights, kitchen salt (sodium chloride) and the manufacture of glass and cosmetic products.

37 Rb
rubidium
Metal similar to potassium but much rarer that is used in the manufacture of photoelectric cells and special kinds of glass and lasers.

87 Fr
francium
The heaviest of the alkali metals is very rare and radioactive and has a very short life span (about 22 minutes).

alkaline earth metals

Generally silvery and malleable and good conductors of heat and electricity; they react easily with nonmetals and water.

4 Be
beryllium
Uncommon metal that is used especially in alloys for the aerospace industry and as a moderator in nuclear reactors.

20 Ca
calcium
Metal that is one of the most essential elements in bones and teeth; it is also a component of cement, plaster and some alloys.

56 Ba
barium
Relatively abundant metal that is used especially in lubricants, pyrotechnics (fireworks), paint and radiology.

12 Mg
magnesium
Metal necessary for the growth and metabolism of most living organisms; it is also a component of aluminum alloys.

38 Sr
strontium
Relatively rare metal that is used especially in pyrotechnics (fireworks), the manufacture of magnets and medicine.

88 Ra
radium
Extremely radioactive metal present in very low quantities in uranium ore; it is used mainly in medicine as a cancer treatment.

semi-metals (metalloids)

Nonmetallic elements that are lusterless and solid; they possess a certain amount of electric and thermal conductivity.

5 B
boron
Semimetal that is used especially as a neutron absorber in nuclear reactors, as a rocket fuel and in detergents.

14 Si
silicon
Most common element on the planet after oxygen; it is used mostly in the manufacture of electronic devices because of its semiconductor properties.

33 As
arsenic
Toxic semimetal that is used especially in very low doses for therapeutic uses and in the manufacture of semiconductors.

51 Sb
antimony
Semimetal that is used in several alloys (mostly with lead) and especially in making metal for printing type and semiconductors.

32 Ge
germanium
Rare semimetal that is used especially in the manufacture of electronic devices and in optical equipment (camera and microscope lenses).

34 Se
selenium
Semimetal that is usually used in photoelectric cells and semiconductors; it is an indispensable trace element for organisms.

52 Te
tellurium
Rare semimetal that is used especially in the manufacture of detonators, electric resistors, rubber, ceramics and glass.

other metals

These elements are not part of any other category of metal; they are sometimes called posttransition metals.

13 Al
aluminum
Light metal that is used especially in aeronautics, cars, buildings, electric cables, kitchen utensils and packaging.

50 Sn
tin
Metal that is used especially as an anticorrosive for copper and steel and as a component in the preparation of bronze, welding and toothpaste.

83 Bi
bismuth
Relatively rare metal that is used especially in alloys and cosmetics and in medicine (treatments for gastric ulcers and diarrhea).

31 Ga
gallium
Rare metal that is used especially in high-temperature thermometers, electroluminescent diodes and television screens (the color green).

81 Tl
thallium
Metal that is used especially in infrared detectors and some kinds of glass.

84 Po
polonium
Very rare radioactive metal that is used as fuel in nuclear reactors; it emits radiation that is much more powerful than that of uranium.

49 In
indium
Very rare metal that is used especially in race car engines and electronic devices, and as a coating for glass.

82 Pb
lead
Heavy toxic metal that is used to prevent corrosion, as a protection against radiation and in accumulator batteries, paint and glass.

non-metals

Nonmetallic elements that are lusterless and nonmalleable; they are mostly gases and solids and are usually poor conductors of heat and electricity.

chlorine
17 Cl
Abundant toxic gas that is used to whiten fabric and paper, disinfect water and manufacture various other products (solvents).

carbon
6 C
Element common in its pure state (diamond, graphite) or found in combination (air, coal, petroleum); it is present in animal and plant tissue.

fluorine
9 F
Gas that is used especially for enriching uranium and manufacturing antistick coatings; it is present in bones and teeth.

bromine
35 Br
Very toxic liquid that is used mainly to manufacture teargas, dyes and disinfectants and in photography and medications.

nitrogen
7 N
Gas that constitutes about 78% of the Earth's atmosphere, present in all animal and vegetable tissue (proteins), and in fertilizer, ammonia and explosives.

phosphorus
15 P
Solid used especially in fertilizer (phosphates), matches and pyrotechnics (fireworks); it is also necessary for human beings.

iodine
53 I
Solid that is used especially in pharmaceuticals (revulsives, antiseptics), in photography and dyes; it is also essential for the human body.

oxygen
8 O
Gas that is the most abundant element on Earth and that comprises about 20% of the atmospheric air; it is used to breathe and in the manufacture of steel.

sulfur
16 S
Solid that is quite common in nature; it is used in car batteries, fertilizer, paint, explosives, pharmaceuticals and rubber.

astatine
85 At
Radioactive element that is extremely rare in nature; it is used in medicine to study the thyroid gland and to detect cancerous tumors.

noble gases

Family of chemical elements also called inert, as they are weakly reactant.

helium
2 He
The lightest of the noble gases is noncombustible and abundant in the stars; it is used especially in inflating aerostats (such as balloons and dirigibles).

argon
18 Ar
Most abundant of the noble gases; it is used especially in incandescent lamps and in welding (protective gas).

xenon
54 Xe
Rarest gas in the atmosphere; it is used mainly in discharge lamps, photoflash bulbs and lasers.

neon
10 Ne
Noble gas that is used mainly in lighting (billboards, television tubes and fog lamps), but also as a liquid coolant.

krypton
36 Kr
Noble gas that is used in some incandescent lamps and in photography.

radon
86 Rn
Highly radioactive noble gas that is used mainly in medicine (destroying cancerous tumors) and in predicting earthquakes.

lanthanides (rare earth)

Very reactant elements found in the lanthanide series (monazite, xenotime); some are relatively abundant in the Earth's crust.

57 La
lanthanum
Metal that reacts with water to yield hydrogen; it is used especially in flint alloys and optical glass.

58 Ce
cerium
The most common metal of the lanthanide group and the main constituent of flint alloys (misch metal).

59 Pr
praseodymium
Metal that is used especially in protective lenses, colorants for glass, flint alloys (misch metal) and permanent magnets.

60 Nd
neodymium
One of the most reactant of rare metals; it is used mainly to manufacture lasers, eyeglasses and permanent-magnet alloys.

61 Pm
promethium
Radioactive metal that is used mainly in specialized batteries and luminescent coatings for watches, and as a source of X-rays in medicine.

62 Sm
samarium
Rare radioactive metal that is used especially in optical glass, lasers, nuclear reactors (absorbing neutrons) and permanent magnets.

63 Eu
europium
The most reactant metal of the lanthanide group; it is used especially in television screens (the color orange) and nuclear reactors (absorbing neutrons).

64 Gd
gadolinium
Metal that is often alloyed with chromed steel; it is used especially in the manufacture of permanent magnets, magnetic heads and electronic components.

65 Tb
terbium
Rare metal that is used especially in lasers and semiconductors.

66 Dy
dysprosium
Very rare metal that is used especially in permanent magnets, lasers and nuclear reactors (absorbing neutrons).

67 Ho
holmium
Very rare metal with limited applications; it is used in lasers and for coloring glass.

68 Er
erbium
Metal that is used mainly in some alloys (especially with vanadium), lasers and infrared-absorbing glass, and as a colorant for glass and enamel.

69 Tm
thulium
The rarest of the lanthanide group; it is used as a source of X-rays in portable radiology equipment and in the manufacture of ferrites (magnetic ceramics).

70 Yb
ytterbium
Metal that is used in the manufacture of stainless steel, in lasers and as a source of X-rays in portable radiology equipment.

71 Lu
lutetium
Very rare metal that is difficult to separate; it has no real industrial applications but can be used as a catalyst (cracking, hydrogenation).

transition metals

Usually less reactant than alkali metals and alkaline earth metals but very good electric and thermal conductors. Many of these metals form vital alloys.

21 Sc
scandium
Rare and very light metal that is employed in aerospace construction because of its high fusion point (about 2,700°F or 1,500°C).

22 Ti
titanium
Metal that is used in several alloys employed in the manufacture of precision items and as a coating for light aerospace parts.

23 V
vanadium
Metal that is used mainly in alloys, to which it provides highly anticorrosive properties.

24 Cr
chromium
Bright metal that is used as an anticorrosive coating and in the manufacture of hard and resistant alloys; it gives emeralds and rubies their color.

25 Mn
manganese
Hard metal that is used mainly in the manufacture of specialty steels and household batteries; it is also an indispensable trace element for humans.

26 Fe
iron
The most used metal in the world due to its variety of alloys (steel, cast iron); it helps move oxygen through the body.

27 Co
cobalt
Strong metal that is used in alloys (cutting tools, magnets) and in radiotherapy; it also yields a blue pigment.

28 Ni
nickel
Hard metal that resists corrosion; it is used in the manufacture of coins and cutlery, and as a protective coating for other metals (iron, copper).

29 Cu
copper
Reddish-brown metal that is a very good conductor of heat and electricity; it is used mainly in the manufacture of electric wire and alloys (brass, bronze).

30 Zn
zinc
Relatively abundant metal that is resistant to corrosion; it is used especially in the manufacture of alloys, tires, paint, ointments and perfume.

39 Y
yttrium
Rare metal used in the manufacture of alloys, electronic components, lasers, television screens and in nuclear reactors.

40 Zr
zirconium
Metal that is used in alloys for the nuclear industry (protective sheathing, fuel rods) and in jewelry (imitation diamonds).

41 Nb
niobium
Rare metal that is used especially in alloys for jet aircraft, missiles, nuclear reactors, ointments and cutting tools.

42 Mo
molybdenum
Hard metal that is used in alloys (aircraft, missiles, nuclear reactors), electric lights and electronic tubes.

43 Tc
technetium
Radioactive metal (first element to have been produced artificially) that makes steel corrosion-free and is used in medical imaging.

44 Ru
ruthenium
Rare metal that hardens platinum and palladium; it is used in the manufacture of electric contacts, spark plugs and jewelry.

45 Rh
rhodium
Rare metal that resists corrosion and hardens platinum and palladium; it is used especially in catalytic converters and jewelry.

46 Pd
palladium
Rare and precious metal that is used especially in dentistry (dental prostheses), jewelry (white gold) and in catalytic converters.

47 Ag
silver
Precious metal that is the best conductor of heat and electricity; it is used especially in the manufacture of mirrors, jewelry and coins.

48 Cd
cadmium
Metal that is used especially as a protective covering for steel, in rechargeable batteries and in nuclear reactors (control rods).

72 Hf
hafnium
Rare metal that is used in the control rods of nuclear reactors, filaments for incandescent lamps and jet engines.

73 Ta
tantalum
Somewhat rare metal that is highly resistant to heat; it is used especially in nuclear reactors, missiles and capacitors.

74 W
tungsten
Metal that is resistant to very high heat; it is used in filaments for incandescent lamps and cutting tools.

75 Re
rhenium
Rare metal that is resistant to wear and corrosion; it is used especially in pen tips and incandescent filaments for ovens.

76 Os
osmium
Rare metal often alloyed with iridium and platinum; it is used in pen tips, bearings, compass needles and jewelry.

77 Ir
iridium
Rare metal that is often alloyed with platinum; it is used especially in electric contacts and jewelry.

78 Pt
platinum
Very rare metal used especially as a catalyst in chemistry (petrochemicals, vitamins), in jewelry and in precision equipment.

79 Au
gold
Precious metal (nuggets, flakes) that is used as currency (ingots) and in jewelry, dentistry and electronics.

80 Hg
mercury
Rare metal that is used in measuring instruments (thermometers, barometers) and in the electricity industry.

104 Rf
rutherfordium
Artificial radioactive element that was first produced in laboratories in the 1960s; it has applications only in scientific research.

105 Db
dubnium
Artificial radioactive element that was first produced in laboratories in the 1960s.

106 Sg
seaborgium
Artificial radioactive element that was first produced in laboratories in 1974; it is based on californium and oxygen.

107 Bh
bohrium
Artificial radioactive element that was first produced in laboratories in 1976; it is based on bismuth and chromium.

108 Hs
hassium
Artificial radioactive element that was first produced in laboratories in 1984; it is based on lead and iron.

109 Mt
meitnerium
Artificial radioactive element that was first produced in laboratories in 1982; it is based on bismuth and iron.

110 Ds
darmstadtium
Artificial radioactive element that was first produced in laboratories in 1994; it is based on nickel and lead.

111 Rg
roentgenium
Artificial radioactive element that was first produced in laboratories in 1994; it is based on bismuth and nickel.

112 Uub
ununbium
Artificial radioactive element that was first produced in laboratories in 1996; it is based on lead and zinc.

actinides

Radioactive elements that are abundant in nature (elements 89 to 92) or made artificially (elements 93 to 103). Most of them have no industrial applications.

89 Ac

actinium
Metal that is present in small quantities in uranium ore; it is used mainly as a source of neutrons in nuclear reactors.

90 Th

thorium
Natural metal that is used especially in alloys, photoelectric cells and uranium production.

91 Pa

protactinium
Very rare metal that is present in uranium ore; it has few applications outside of scientific research.

92 U

uranium
Naturally abundant metal that is used mainly as fuel in nuclear reactors as well as in nuclear weapons.

93 Np

neptunium
Rare metal that is produced from uranium; it is used in neutron-detection instruments.

94 Pu

plutonium
Metal that is produced from uranium; it is used especially as fuel in nuclear reactors as well as in nuclear weapons.

95 Am

americium
Metal that is produced from plutonium; it is used mainly in smoke detectors and in radiology.

96 Cm

curium
Metal that is produced in small amounts from plutonium; it is used especially in thermoelectric generators for spacecraft propulsion.

97 Bk

berkelium
Metal that is produced in small amounts from americium; it is used for scientific research only.

98 Cf

californium
Metal produced from curium that is used especially in the treatment of cancer and in some measuring instruments such as humidistats.

99 Es

einsteinium
Metal that was discovered in 1952 among the debris of the first thermonuclear explosion in the Pacific; it is used for scientific research only.

100 Fm

fermium
Metal that was discovered at the same time as einsteinium; it is used for scientific research only.

101 Md

mendelevium
Metal that is produced from einsteinium; it is named in honor of the chemist Mendeleyev (who classified the elements).

102 No

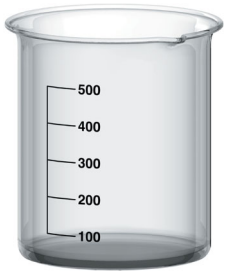
nobelium
Metal that is produced from curium; it is named in honor of Alfred Nobel (inventor of dynamite and founder of the Nobel Prize).

103 Lr

lawrencium
Metal that is produced from californium; it is used for scientific research only.

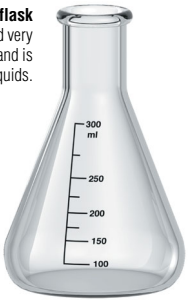
laboratory equipment

These materials are highly varied: measurement instruments, various containers, heat sources, experimentation materials and mounting hardware.



beaker
Graduated container with a spout; it is used to create reactions (precipitation, electrolysis) and to measure approximate amounts of liquid.

Erlenmeyer flask
Graduated cone-shaped container that is used very frequently in laboratories; it can have a stopper and is used especially for mixing and measuring liquids.

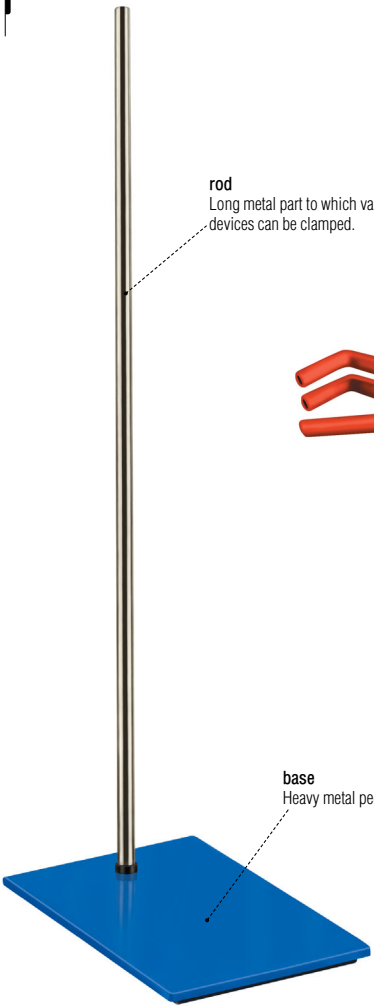


bottle
Container of various sizes and shapes and usually with a straight neck for holding liquids.

wash bottle
Flexible container that is squeezed lightly to squirt a liquid; it is used especially for cleaning equipment (test tubes, pipettes).

round-bottom flask
Spherical container used mainly for boiling liquids.

laboratory equipment



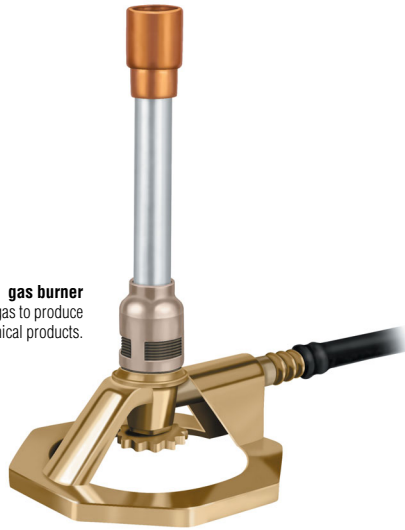
rod
Long metal part to which various laboratory devices can be clamped.

base
Heavy metal pedestal supporting the rod.

stand
Unit consisting of a base and a rod; it supports various laboratory apparatuses such as burettes and flasks.

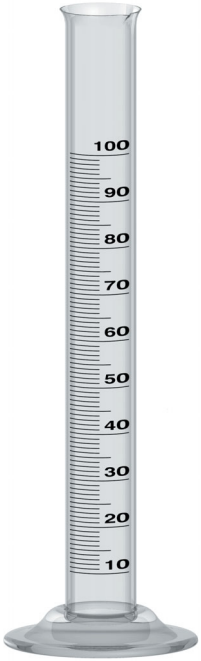
holder
Part with a screw for attaching a clamp onto the stand's rod.

clamp/holder
Part attached to the stand's rod by a holder and having tongs that clamp onto the laboratory equipment to hold it in place.

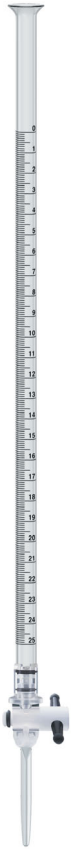


gas burner
Device that is fueled by gas to produce a flame for heating chemical products.

graduated cylinder
Graduated tube with a spout that is used especially for measuring small amounts of liquid with precision.



straight stopcock burette
Long graduated tube for measuring liquids with high precision; it is fitted with a valve for manually regulating the flow.



serological pipette
Fine tube that is open at both ends; it is used to transfer very precise quantities of liquids from one container to another.

Petri dish
Flat transparent box for culturing microorganisms; it has a cover to protect them from contamination.

test tube
Cylindrical tube used to conduct various chemical experiments on small quantities (normally, it is not filled above one-third).

chemistry symbols

Symbols that simplify the writing of the elements, formulas and chemical reactions.

negative charge
Symbol that indicates a surplus of electrons in an atom, which means the atom has a negative electric charge. The chlorine atom, for example, forms a negative ion that is denoted as Cl-.

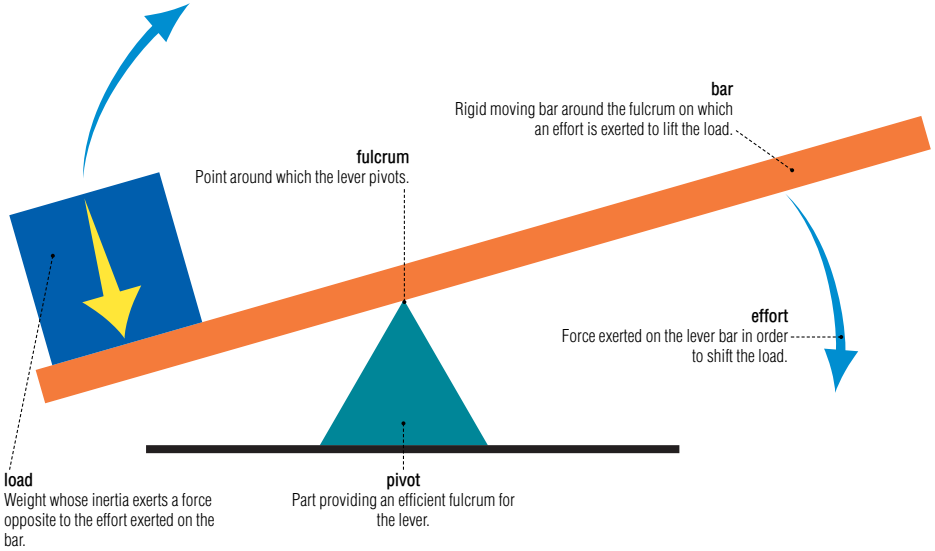
positive charge
Symbol that indicates a loss of electrons in an atom, which means the atom has a positive electric charge. The sodium atom, for example, forms a positive ion that is denoted as Na+.

reversible reaction
Chemical reaction that can occur in both directions; the products obtained (direct reaction) react between them to change back into the original reactants (inverse reaction).

reaction direction
A chemical reaction corresponds to the conversion of reactants in products and is obtained by the loss of one of the reactants. The arrow indicates the direction in which this irreversible reaction occurs.

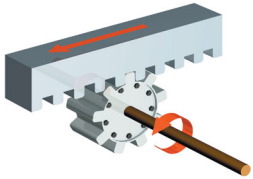
lever

System consisting of a bar pivoting on a fulcrum to lift a load. The amount of effort required is related to the position of the pivot and the length of the bar.

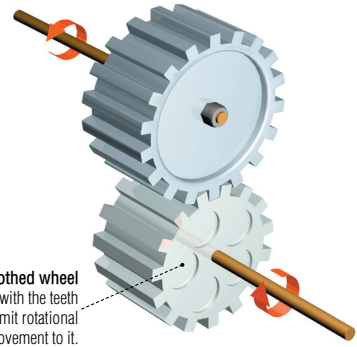


gearing systems

Mechanisms consisting of toothed parts that mesh to transmit the rotational motion of the shafts they are a part of.



rack and pinion gear
Gearing system converting a rotational movement into a horizontal movement (and vice versa); it is often used in the steering systems of automobiles.

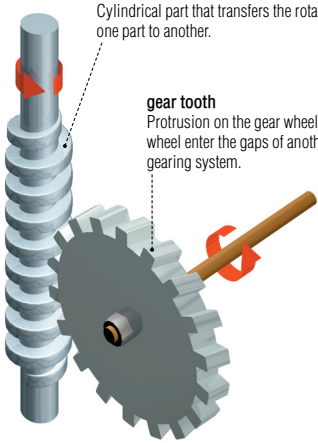


toothed wheel
Wheel with teeth that mesh with the teeth of another wheel to transmit rotational movement to it.

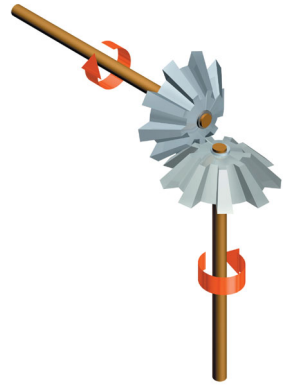
spur gear
Most common gearing system linking two parallel shafts that changes the speed and force of a rotation; it is used especially in automobile transmissions.

shaft
Cylindrical part that transfers the rotational movement of one part to another.

gear tooth
Protrusion on the gear wheel; the teeth of one wheel enter the gaps of another wheel to form a gearing system.



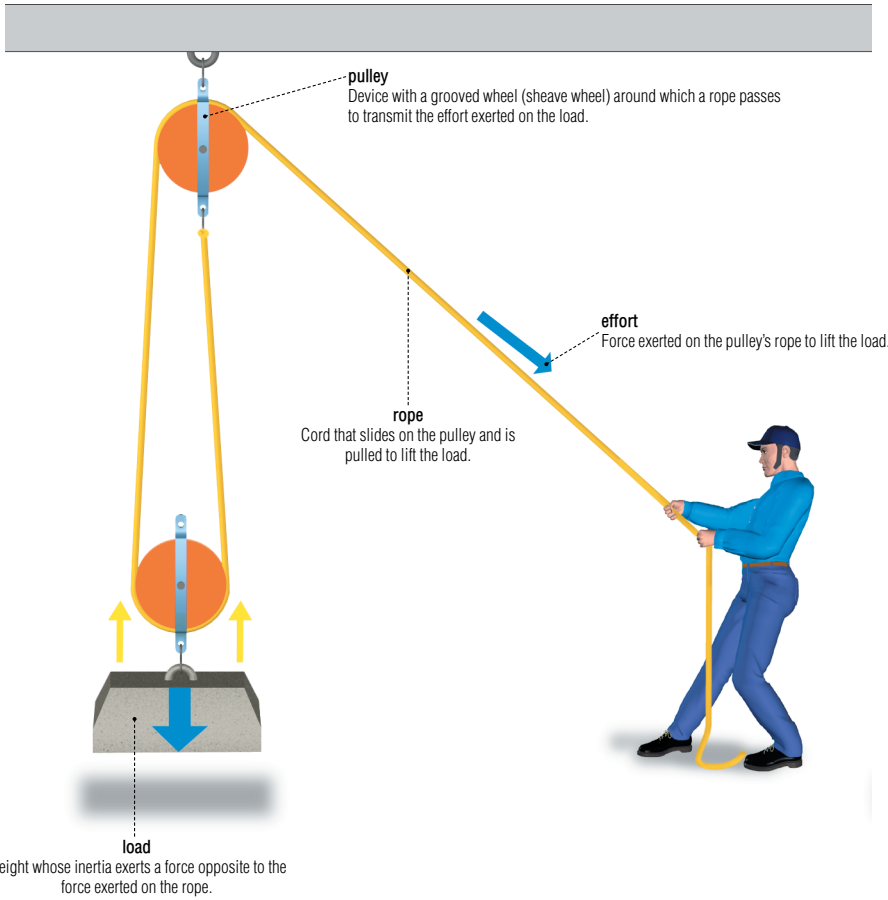
worm gear
One-way gearing system (only the screw can drive the wheel) for slowing down the speed of rotation between two perpendicular axles; it is used especially in the automobile industry (Torsen differential).



bevel gear
Gearing system linking two shafts at right angles that changes the direction of rotation; it is used especially in car jacks.

double pulley system

System consisting of two pulleys with a rope running around them to lift a load. Using two or more pulleys reduces the amount of effort needed.



parallel electrical circuit

It is divided into independent branches, through which the current flows with partial intensity (in a series circuit, all the elements receive the same intensity).

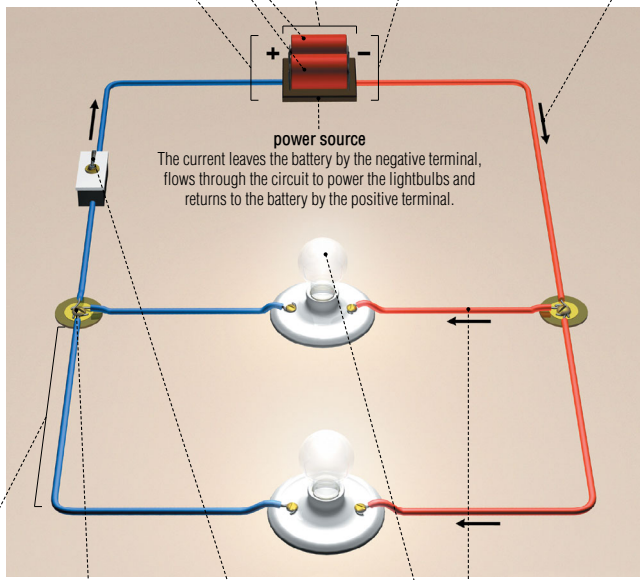
battery
Device composed of one or more interrelated cells; each one accumulates a reserve of electricity whose purpose is to supply electricity to the circuit.

cells
Devices that transform chemical energy into electric energy in order to power electric devices (here, a lightbulb).

negative terminal
Polarity element of the battery from which the current flows through the circuit.

positive terminal
Polarity element of the battery toward which the current flows through the circuit.

direction of electron flow
Electrons move from the negative terminal toward the positive terminal; this is opposite to the conventional direction of the current, which flows from the positive toward the negative.



power source
The current leaves the battery by the negative terminal, flows through the circuit to power the lightbulbs and returns to the battery by the positive terminal.

branch
Part of the circuit between two consecutive nodes; it constitutes an independent electric circuit.

switch
Mechanism allowing the current in an electric circuit to be established or interrupted.

shunt
It enables each device to have its own circuit and to function independently. This way, if one lightbulb does not function, the current continues to flow in the rest of the circuit.

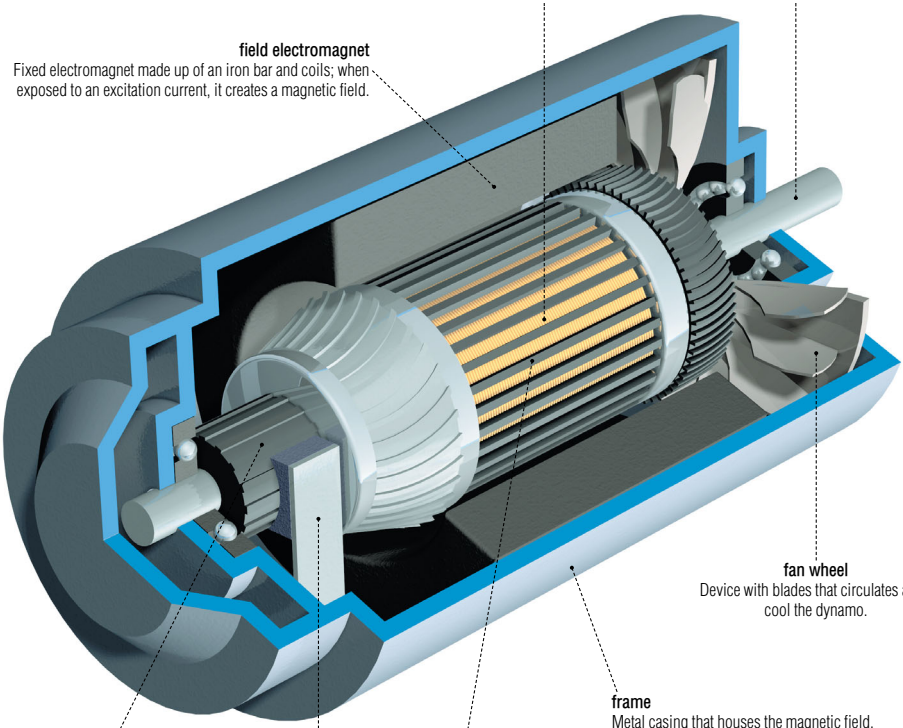
node
Junction point of two or more branches in the electric circuit.

bulb
Gas sealed in a glass envelope into which the luminous body of a lamp is inserted.

generators

Devices that convert mechanical energy (here, a shaft's rotational motion) into electric energy by moving a coil inside a magnet (electromagnetic induction).

dynamo
Continuous generator of electric current; it is used especially on bicycles for lighting.



armature
Moving part of the dynamo that is made up of a coil, which produces an electric current as it rotates inside the field.

shaft
Cylindrical part that transmits a rotational motion to the dynamo's armature.

field electromagnet
Fixed electromagnet made up of an iron bar and coils; when exposed to an excitation current, it creates a magnetic field.

fan wheel
Device with blades that circulates air to cool the dynamo.

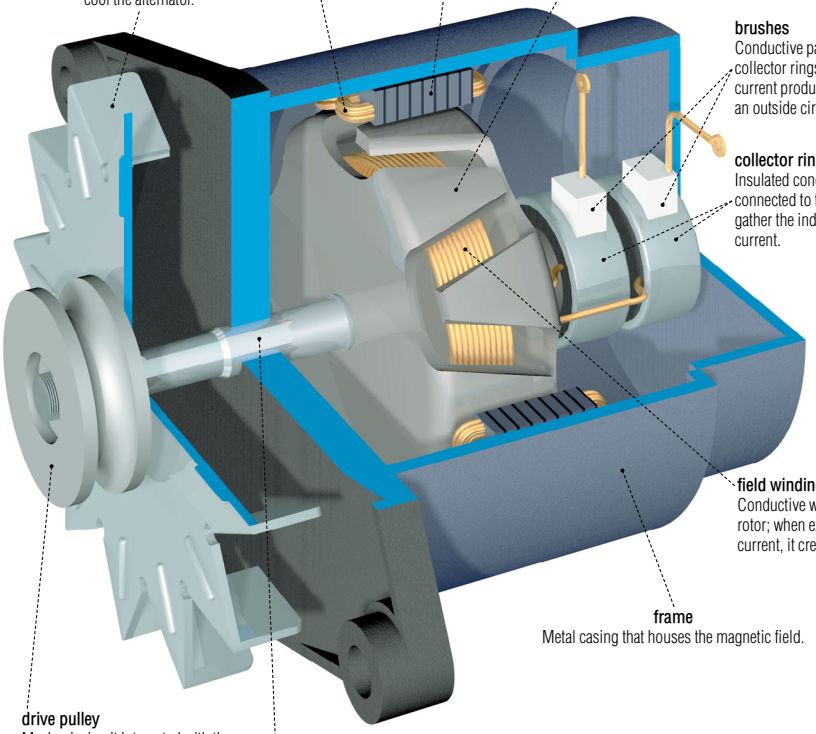
frame
Metal casing that houses the magnetic field.

commutator
Conductive plates that are insulated from each other and connected to the field coil; they collect and rectify the induced alternating current.

coil
Conductive wire that is rolled around the armature cylinder, which rotates in the magnetic field produced by the inductor to create an electric current.

brush
Conductor that rubs against the commutator plates and transmits the continuous current produced by the dynamo to an exterior circuit.

alternator
Generator of alternating current that is used especially in the automobile industry (powering electrical devices) and in power houses.



armature winding
Conductive wire on the armature; the rotor moves in front of it to produce an alternating current.

armature core
Fixed cylinder with a winding; the rotor turns within it to produce the electric current.

claw-pole rotor
Moving cylindrical part made up of a field winding between two pole shoes; it creates the rotating magnetic field required to operate the alternator.

fan wheel
Device with blades that circulates air to cool the alternator.

brushes
Conductive parts that rub against the collector rings and transmit the current produced by the alternator to an outside circuit.

collector rings
Insulated conductor collars that are connected to the coil of the field; they gather the induced alternating electric current.

field winding
Conductive wire on the cylinder rotor; when exposed to an excitation current, it creates a magnetic field.

frame
Metal casing that houses the magnetic field.

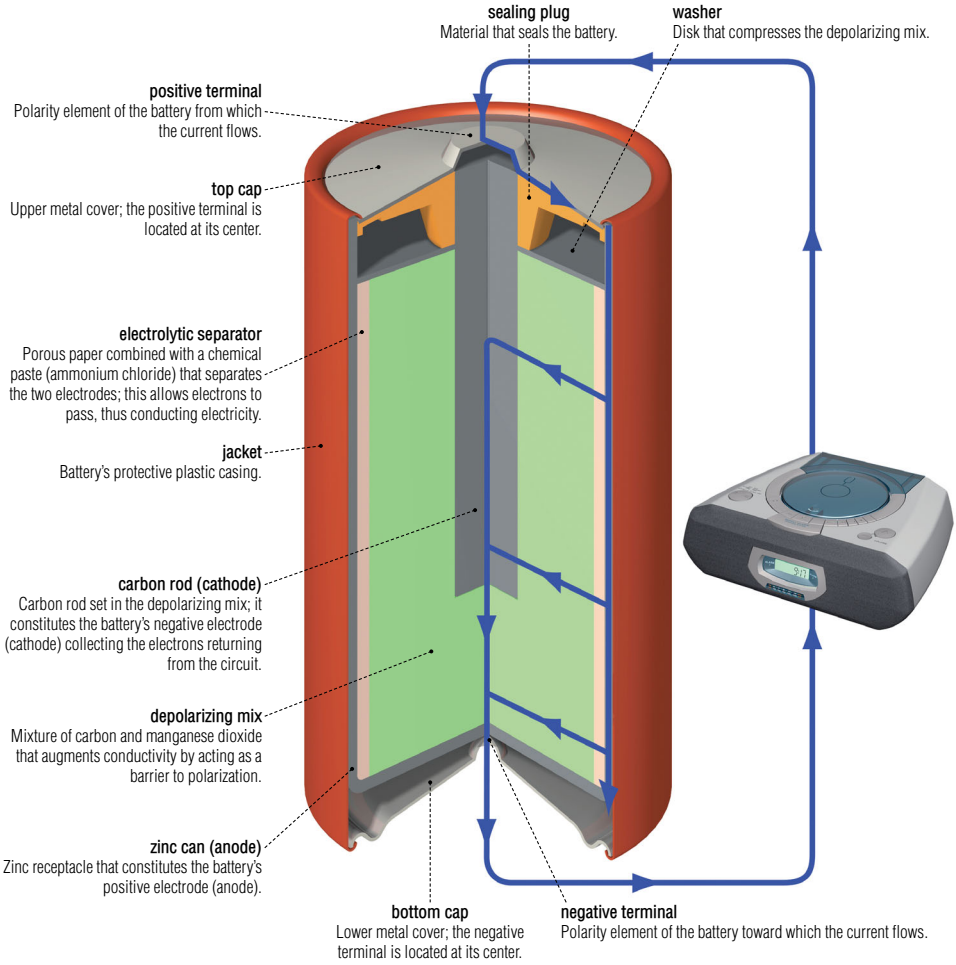
drive pulley
Mechanical unit integrated with the shaft; it is rotated by a belt that is connected to an engine.

shaft
Rod that is rotated by the pulley, which in turn causes the claw-pole rotor to rotate.

dry cells

Devices that transform chemical energy into electric energy (direct current); they usually cannot be recharged and the electrolyte is fixed in place.

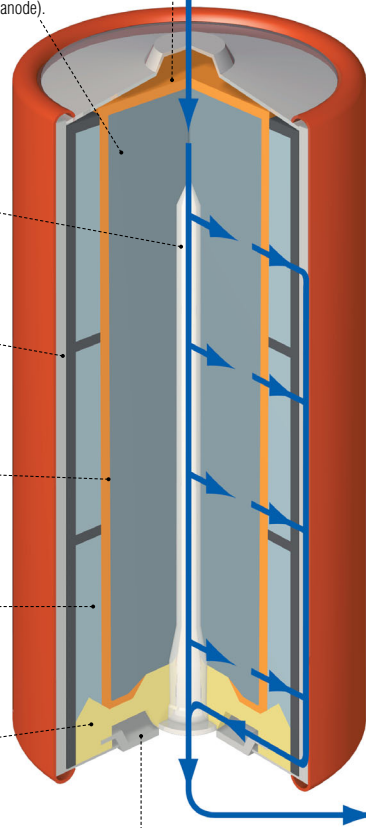
carbon-zinc cell
Battery that produces 1.5 V (also called Leclanché); its use is very widespread (pocket calculators, portable radios, alarm clocks).



alkaline manganese-zinc cell
High-performance battery that produces 1.5 V and has a longer life span than the carbon-zinc cell; it is used in devices such as flashlights, portable CD players and camera flash units.

sealing material
Material (nylon) that seals the battery.

zinc-electrolyte mix (anode)
Substance that is made up of zinc and electrolyte (potassium hydroxide); it constitutes the positive electrode (anode).



electron collector
Zinc rod that is connected to the bottom cap; it collects the electrons from the anode that are attracted to the cathode.

steel casing
Covering that protects the battery.

separator
Porous paper combined with a chemical paste (potassium hydroxide) that separates the two electrodes; this allows electrons to pass, thus conducting electricity.

manganese mix (cathode)
Substance made up of manganese dioxide and carbon; it constitutes the negative electrode (cathode).

sealing plug
Material that seals the battery.

bottom cap
Lower metal cover; the negative terminal is located at its center.

direction of electron flow
When a chemical reaction occurs, the electrons move from the negative terminal toward the positive terminal, thus creating an electric current.

electronics

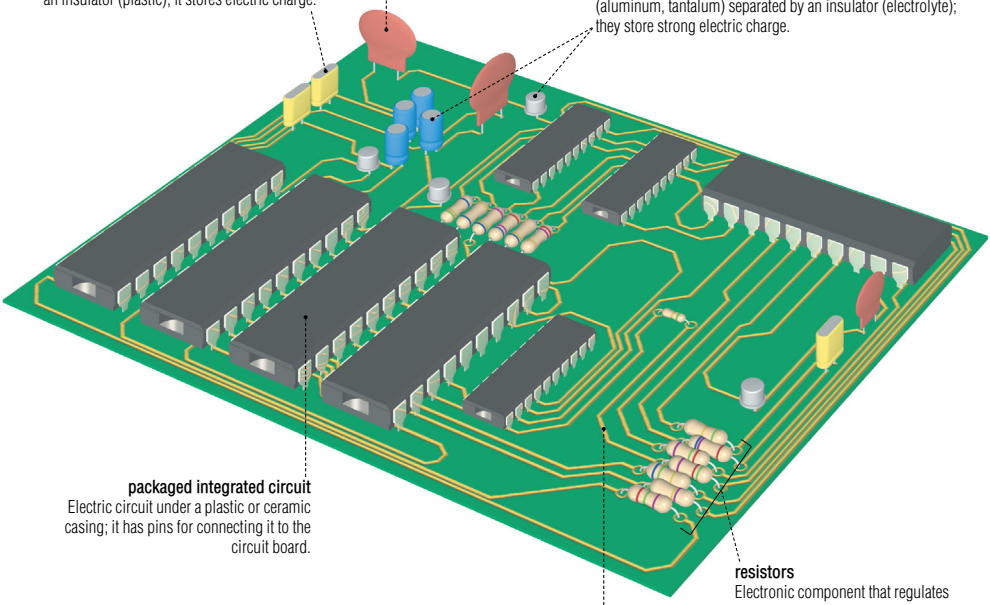
The scientific study of the behavior of the electron and its applications, such as computers, medicine and automation.

printed circuit board
Usually plastic insulated card with holes containing electronic components; the circuit is printed on its surface.

ceramic capacitor
Component with two conductive plates (silver, copper) separated by an insulator (ceramic); it stores weak electric charge.

plastic film capacitor
Commonly used component with two conductive plates (aluminum, tin) separated by an insulator (plastic); it stores electric charge.

electrolytic capacitors
Polarized components with two conductive components (aluminum, tantalum) separated by an insulator (electrolyte); they store strong electric charge.

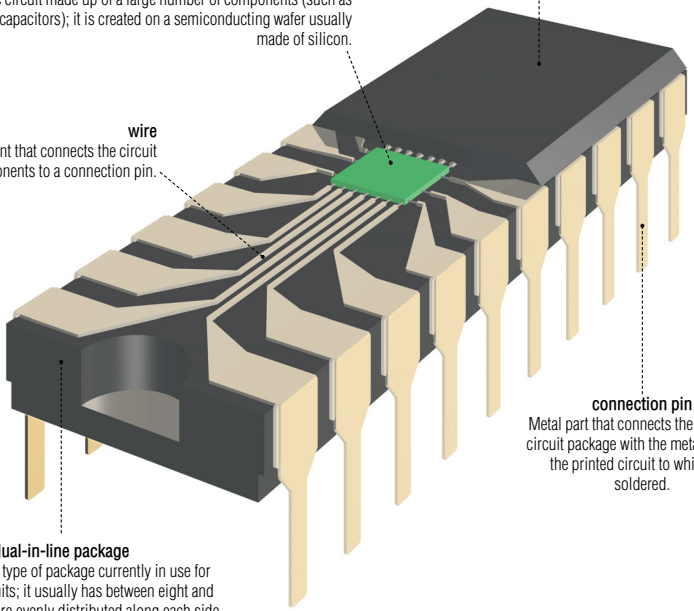


packaged integrated circuit
Electric circuit under a plastic or ceramic casing; it has pins for connecting it to the circuit board.

printed circuit
All of the conductive metal bands on an insulated base (card), which connect a circuit's components and allow a current to flow through it.

resistors
Electronic component that regulates the amount of current flowing in a circuit.

packaged integrated circuit
Integrated circuits are used especially in microprocessors, stereo equipment, calculators, watches and electronic games.



lid
Cover that protects the integrated circuit in its package.

integrated circuit
Miniature electronic circuit made up of a large number of components (such as transistors and capacitors); it is created on a semiconducting wafer usually made of silicon.

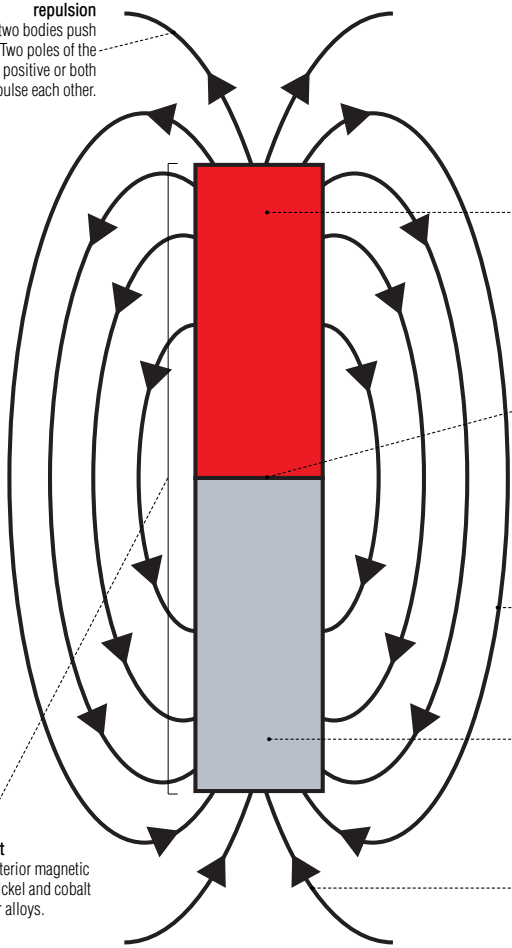
wire
Conductive element that connects the circuit components to a connection pin.

connection pin
Metal part that connects the integrated circuit package with the metal bands of the printed circuit to which it is soldered.

dual-in-line package
Most common type of package currently in use for integrated circuits; it usually has between eight and 48 pins, which are evenly distributed along each side of the package.

magnetism

Action exerted by magnets and magnetic fields and phenomena. Magnetism can be characterized by the forces of attraction and repulsion between two masses.



repulsion
Force by which two bodies push against each other. Two poles of the same orientation (both positive or both negative) repulse each other.

north pole
End of the magnet from which field lines originate and around which the exterior magnetic action is intense.

neutral line
Line separating the north and south lines of the magnet and exhibiting no magnetic phenomena.

magnetic field
Area around the magnet where magnetic forces represented by lines of force are exerted, resulting in electron movement.

field line
Imaginary line representing the direction of the magnetic forces between the north and south poles.

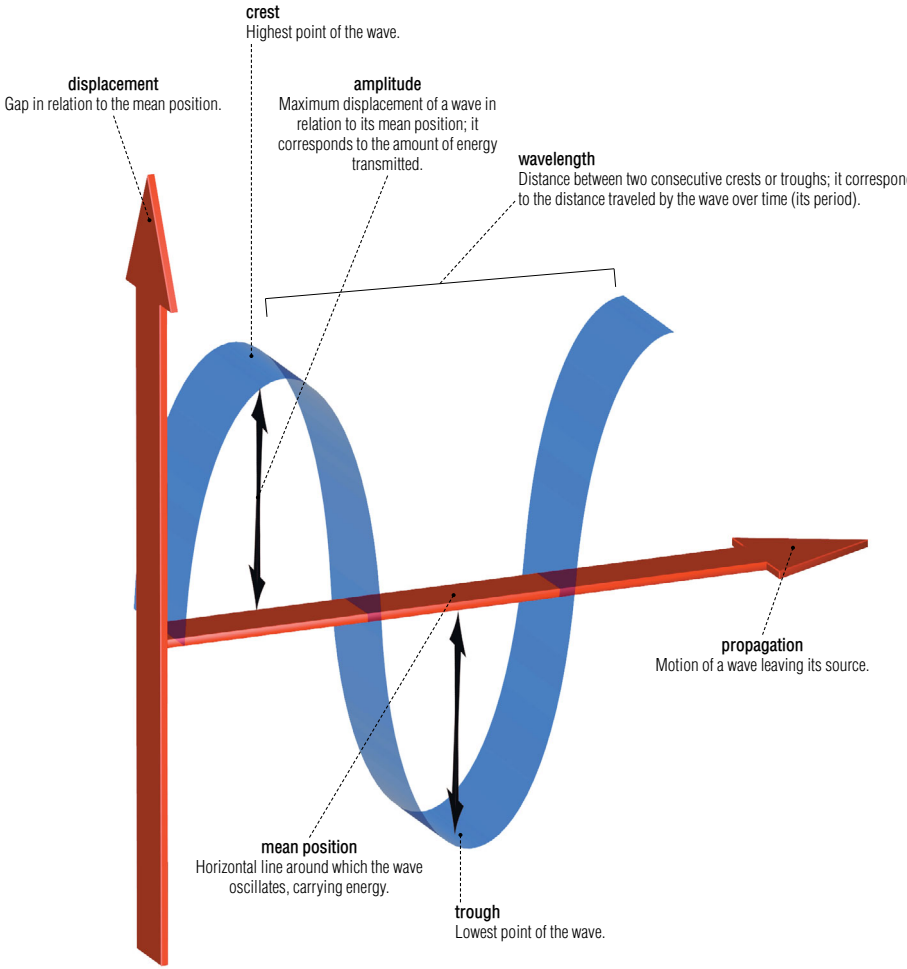
south pole
End of the magnet to which the field lines are directed and around which the exterior magnetic action is intense.

magnet
Body producing an exterior magnetic field; it attracts iron, nickel and cobalt as well as their alloys.

attraction
Force by which two bodies are pulled toward each other; opposite poles attract each other.

wave

Oscillation caused by a disturbance; as it propagates through a medium (mechanical waves) or a vacuum (electromagnetic waves), it carries energy.



electromagnetic spectrum

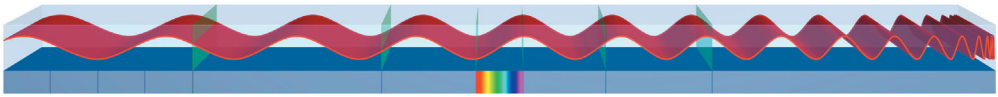
Electromagnetic waves that are classified in ascending order of energy (frequency); they propagate at the speed of light (300,000 km/s).

radio waves
Very long electromagnetic waves (about 1 meter) having low frequency; they are used to transmit information (television, radio).

ultraviolet radiation
Electromagnetic waves used especially to tan skin and in microscopy, medicine and lighting (fluorescent tubes).

infrared radiation
Electromagnetic waves emitted by warm objects; their many uses include heating, medicine, aerial photography and weaponry.

gamma rays
Electromagnetic waves of very high frequency that are emitted by radioactive bodies; they are the most radiant and harmful rays and are used especially in treating cancer.



microwaves
Very short electromagnetic waves; their many applications include radar detection and microwave ovens.

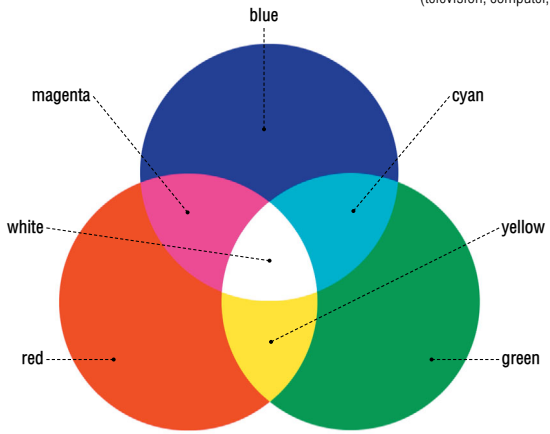
visible light
Electromagnetic radiation that is perceived by the human eye and ranges from red to violet.

X-rays
Electromagnetic waves used especially in radiology; frequent exposure can be harmful.

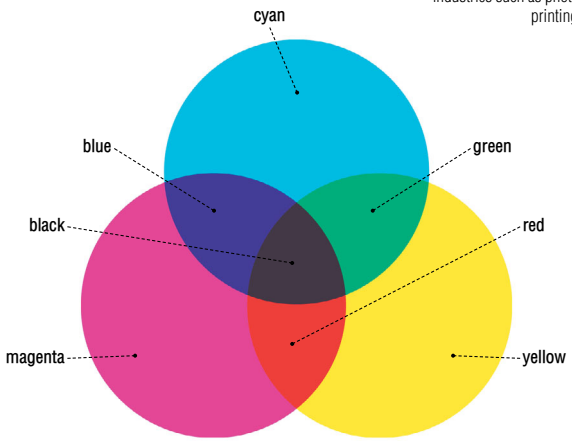
color synthesis

Technique of generating color by combining light rays or subtracting them to obtain a colored image.

additive color synthesis
The superimposition of primary colors (blue, green and red) is used especially in electronic screens (television, computer, video) to obtain intermediate tints.



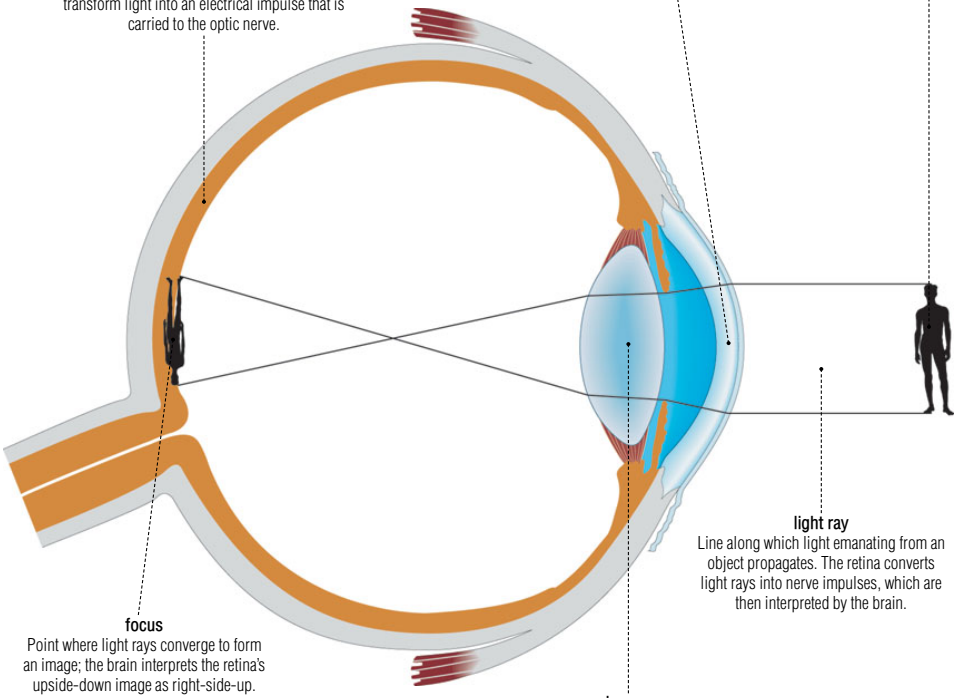
subtractive color synthesis
The absorption of certain light rays (blue, green, red) by colored filters (yellow, magenta, cyan) is used in industries such as photography, film production and printing to obtain intermediate tints.



vision

Ability to perceive shapes, distances, motion and colors; it is related to light rays and varies depending on the degree of sensitivity of the eye.

normal vision
The image of an object is formed on the retina after passing through the lens, which, depending on the distance of the object, expands or contracts to give a sharp image.



retina
Inner membrane at the back of the eye covered in light-sensitive nerve cells (photoreceptors); these transform light into an electrical impulse that is carried to the optic nerve.

cornea
Transparent fibrous membrane extending the sclera and whose curved shape makes light rays converge toward the inside of the eye.

object
Light rays emanating from an object pass through the eye's various media to form an inverted image on the retina.

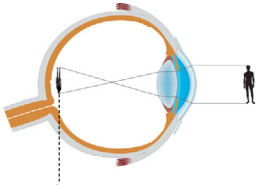
light ray
Line along which light emanating from an object propagates. The retina converts light rays into nerve impulses, which are then interpreted by the brain.

focus
Point where light rays converge to form an image; the brain interprets the retina's upside-down image as right-side-up.

lens
Transparent elastic area of the eye; focuses images on the retina to obtain clear vision.

vision defects

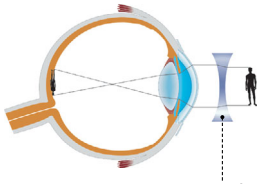
Images do not form on the retina, thus resulting in blurry vision; such defects are corrected by eyeglasses, contact lenses or even surgery.



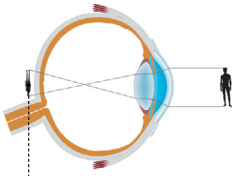
focus
Point where light rays converge to form an image; the brain interprets the retina's upside-down image as right-side-up.

myopia

The image of a distant object is formed in front of the retina due to a defect in the light rays' convergence. This makes distant objects hard to see.



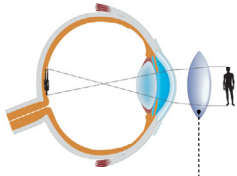
concave lens
Corrects myopia by causing light rays emanating from an object to diverge and project an image onto the focus of the retina.



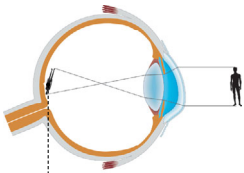
focus
Point where light rays converge to form an image; the brain interprets the retina's upside-down image as right-side-up.

hyperopia

The image of an object is formed behind the retina due to a defect in the light rays' convergence as they pass through the lens. This makes near objects hard to see.



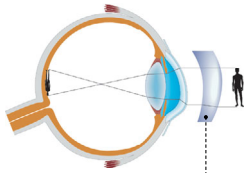
convex lens
Corrects hyperopia by causing light rays emanating from an object to converge and project an image onto the focus of the retina.



focus
Point where light rays converge to form an image; the brain interprets the retina's upside-down image as right-side-up.

astigmatism

Usually caused by a curvature of the cornea, it is manifested by blurred vision when viewing both near and far objects, depending on various axes.

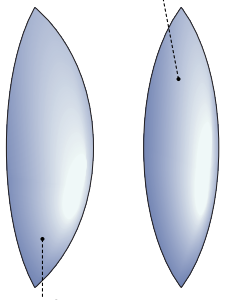


toric lens
Has various powers depending on the rays' axes of convergence; it is used to offset the visual distortion caused by the cornea.

lenses

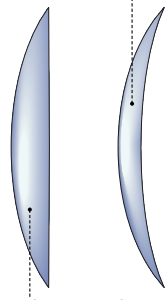
Transparent pieces of material (usually glass) that cause light rays to converge or diverge to form a sharp image (eyeglasses, microscopes, telescopes, cameras).

converging lenses
Thicker in the center than on the edges; they cause parallel light rays emanating from an object to converge onto the same point.



biconvex lens
Lens with both faces bulging outward.

positive meniscus
Lens where the concave side (curving inward) is less pronounced than the convex side (bulging outward).

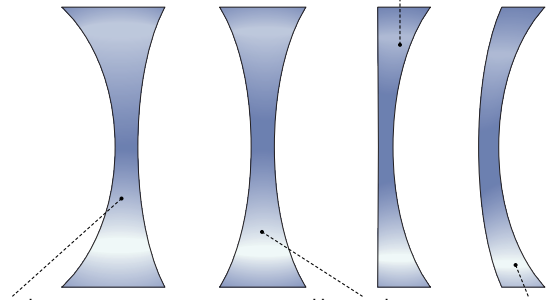


convex lens
Lens with one side bulging outward; the greater the bulge, the more the light rays converge.

plano-convex lens
Lens with one flat side and one convex side (bulging outward).

diverging lenses
Thicker on the edges than in the center; they cause parallel light rays emanating from an object to diverge.

plano-concave lens
Lens with one flat side and one concave side (curving inward).



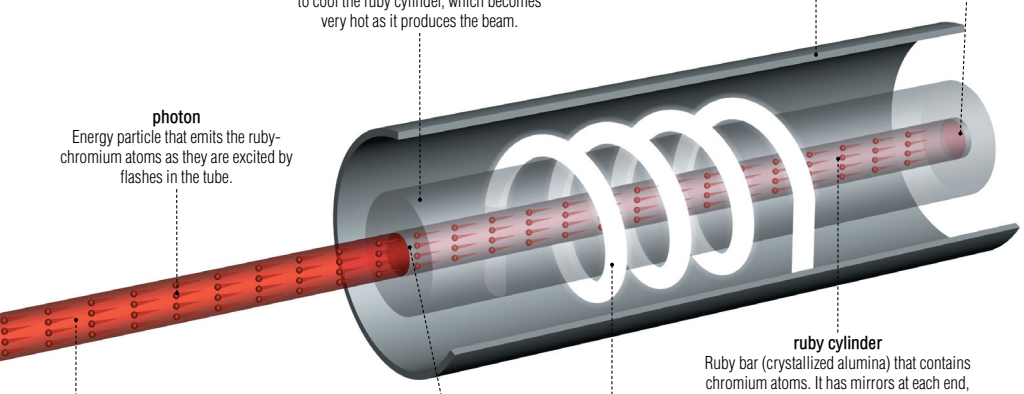
concave lens
Lens with one side curving inward; the greater the curvature, the more the light rays diverge.

biconcave lens
Lens with both sides curving inward.

negative meniscus
Lens where the concave side (curving inward) is more pronounced than the convex side (bulging outward).

pulsed ruby laser

Device that produces a thin and very intense colored light beam; its various applications include fiber optics, manufacturing and surgery.



fully reflecting mirror
Reflects all the light energy toward the partially reflecting mirror. The reflection between the mirrors intensifies the light to form a highly concentrated beam.

reflecting cylinder
Laser's metal casing whose inside is polished so that it reflects the light toward the ruby cylinder.

cooling cylinder
Casing in which water generally circulates to cool the ruby cylinder, which becomes very hot as it produces the beam.

photon
Energy particle that emits the ruby-chromium atoms as they are excited by flashes in the tube.

ruby cylinder
Ruby bar (crystallized alumina) that contains chromium atoms. It has mirrors at each end, which form the amplification medium to produce the laser beam.

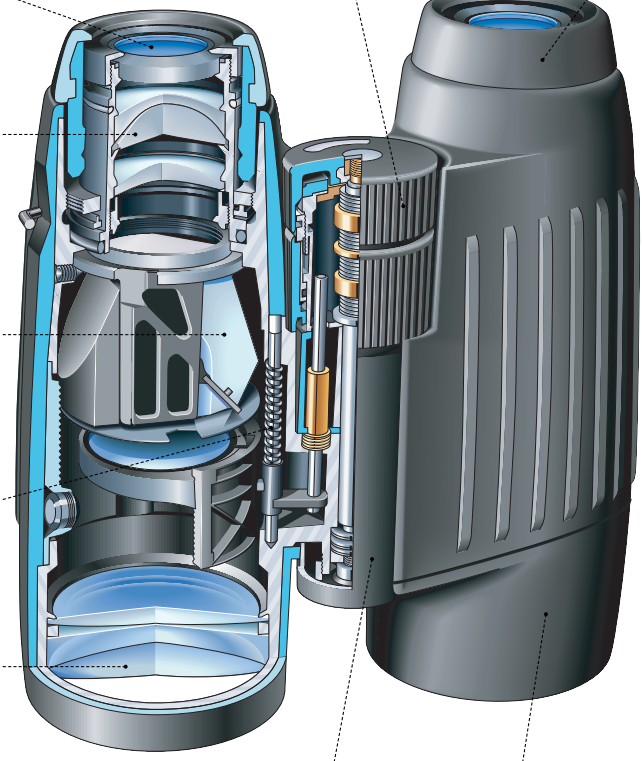
laser beam
Straight and powerful monochrome light beam that is emitted by the device.

partially reflecting mirror
Its partial transparency allows light beams to escape.

flash tube
Lamp that acts as an energy source by emitting a flash of white light, which excites the ruby atoms and causes them to emit photons.

prism binoculars

Optical instrument made up of two identical telescopes, one for each eye; it magnifies both near and distant objects.



central focusing wheel
Focusing ring for both the objective lenses; it is used to manually adjust the sharpness of the image.

focusing ring
Ring on each eyepiece for manually correcting for the difference between the user's eyes.

eyepiece
Optical disk or system of disks through which the eye sees the image produced by the lens.

lens system
Optical system made up of a set of lenses through which light passes to transmit a magnified image of an object to the eye.

Porro prism
Dual-prism system (blocks of glass at right angles) found in most binoculars; it diverts the light rays toward the eyepiece to correct the inverted image formed in the objective lens.

hinge
Mechanism for adjusting the distance between the eyepieces to the user's eyes.

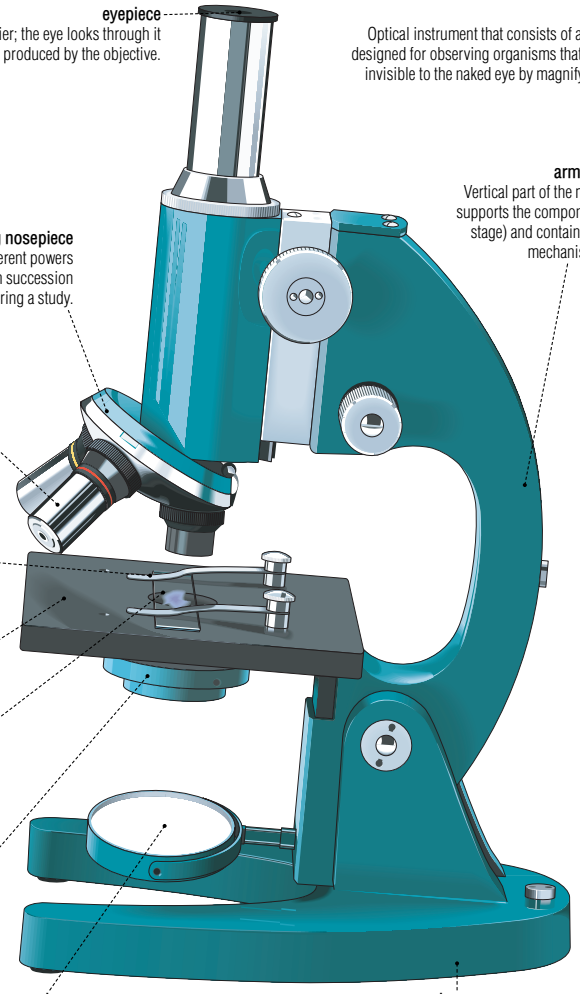
objective lens
Lens that captures the light from the observed object and causes it to converge to form a magnified inverted image.

bridge
Part of the frame joining the two telescopes.

body
Cylindrical body of the binoculars that houses the optical system and through which the light rays pass.

magnifying glass and microscopes

Optical instruments used to magnify the image of a near object; they range in strength from low (magnifying glass) to strong (microscope).



eyepiece
System of lenses that acts as a magnifier; the eye looks through it to see an enlarged image of the image produced by the objective.

microscope
Optical instrument that consists of a system of lenses designed for observing organisms that are very small or invisible to the naked eye by magnifying their images.

arm
Vertical part of the microscope that supports the components (draw tube, stage) and contains the focusing mechanisms.

revolving nosepiece
Rotating plate to which objectives of different powers are fixed to allow them to be used in succession during a study.

objective
Lens system that captures the light from an observed object and makes it converge to form an enlarged inverted image.

stage clip
Springlike metal blade that keeps the glass slide on the stage.

stage
Metal plate with an opening in the middle; the glass slide and the components keeping it in place are placed on it.

glass slide
Fine glass plate on which the object to be studied is placed.

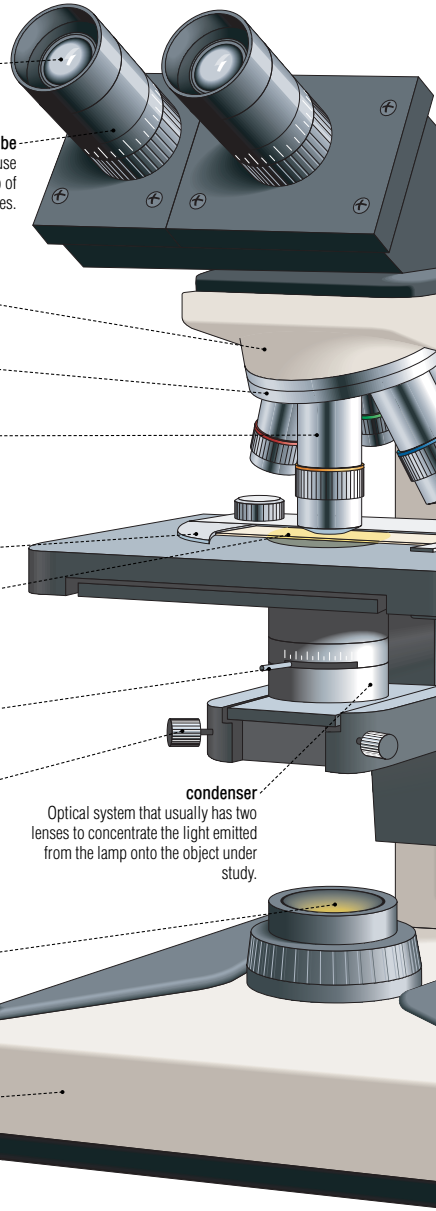
condenser
Optical system that is usually made up of two lenses, which concentrate the light reflected by the mirror onto the object under study.

mirror
Polished glass surface that reflects the surrounding light onto the object under study to illuminate it.

base
Support that stabilizes the microscope.

magnifying glass and microscopes

binocular microscope
Its two eyepieces allow both eyes to be fully applied; this provides a degree of depth to the image and prevents eyestrain.



eyepiece
System of lenses that acts as a magnifier; the eye looks through it to see an enlarged image of the image produced by the objective.

draw tube
One of two cylindrical tubes that house the eyepieces; it is often made up of two converging lenses.

limb top
Upper part of the arm that supports the revolving nosepiece.

revolving nosepiece
Rotating plate to which objectives of different powers are fixed to allow them to be used in succession during a study.

objective
Lens system that captures the light from the observed object and makes it converge to form an enlarged inverted image.

stage clip
Springlike metal blade that keeps the glass slide on the stage.

glass slide
Fine glass plate on which the object to be studied is placed.

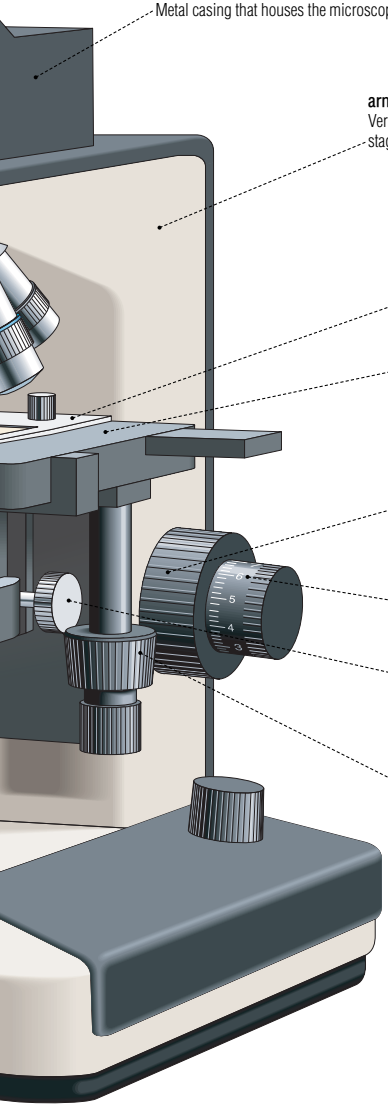
field lens adjustment
Device with a variable-diameter opening that adjusts the amount of light illuminating the object.

condenser adjustment knob
Screw that centers the condenser's light beam in the field of vision by moving it along a horizontal plane.

condenser
Optical system that usually has two lenses to concentrate the light emitted from the lamp onto the object under study.

lamp
Electric device that produces a light beam to illuminate the object under study.

base
Support that stabilizes the microscope.



body tube
Metal casing that houses the microscope's two eyepieces and through which light rays pass.

arm
Vertical part of the microscope that supports the components (draw tube, stage) and contains the focusing mechanisms.

mechanical stage
Adjustable part with two guiding screws that moves an object from right to left and from front to back on the stage.

stage
Metal plate with an opening in the middle; the glass slide and the components keeping it in place are placed on it.

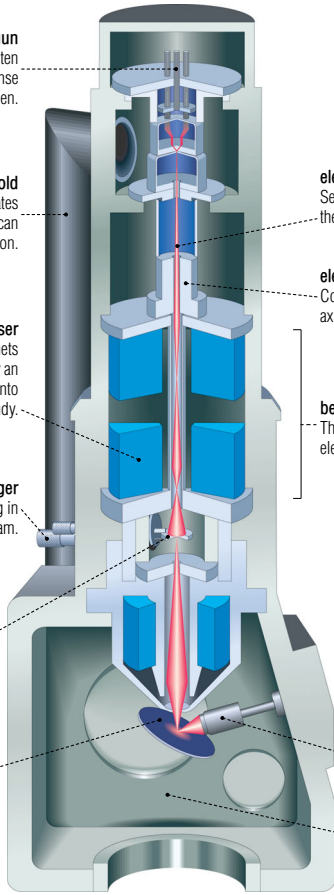
coarse adjustment knob
Medium-precision focusing device for adjusting the distance between the objective and the object under study.

fine adjustment knob
High-precision focusing device for adjusting the distance between the objective and the object under study.

condenser height adjustment
Screw for raising and lowering the condenser.

mechanical stage control
Device for raising and lowering the mechanical stage.

cross section of an electron microscope
Electron microscope: it uses an electron beam (as opposed to light) to provide magnification that is markedly superior to that of an optical microscope.



electron gun
Device that usually consists of a tungsten filament that is heated to produce an intense electron beam, which illuminates the specimen.

vacuum manifold
Conduit connected to a pump that creates enough of a vacuum in the microscope that it can function.

condenser
System of magnetic lenses (electromagnets producing a magnetic field when excited by an electric current) that concentrates the beam onto the specimen under study.

aperture changer
Device that adjusts the diaphragm opening in order to change the diameter of the beam.

aperture diaphragm
Device with an opening whose diameter can be changed to narrow or widen the diameter of the electron beam.

stage
Adjustable metal plate (stage) on which the specimen is mounted in order to study it.

electron beam
Set of negatively charged particles that propagate toward the specimen.

electron beam positioning
Control that positions the electron beam along the optical axis so that it reaches the specimen.

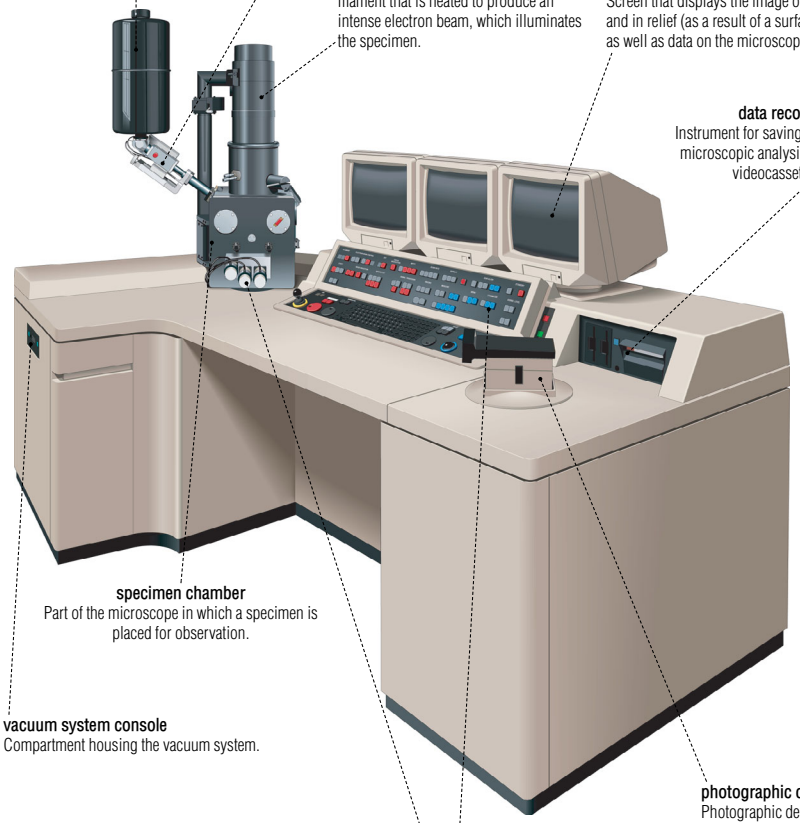
beam diameter reduction
The two lenses of the condenser cause the divergent electron beam emitted by the gun to converge.

focusing lenses
System of magnetic lenses (electromagnets) that concentrate the electron beam on one spot on the specimen.

visual transmission
The electron beam explores the surface of the specimen, which in turn emits electrons to form a point-by-point image on the screen.

vacuum chamber
Part of the microscope in which pressure can be reduced so that the electrons can move.

electron microscope elements



liquid nitrogen tank
Reservoir containing nitrogen to cool the spectrometer.

spectrometer
Instrument for determining the chemical composition of a specimen.

electron gun
Device that usually consists of a tungsten filament that is heated to produce an intense electron beam, which illuminates the specimen.

control visual display
Screen that displays the image of the specimen enlarged and in relief (as a result of a surface scan by the beam), as well as data on the microscope's operations.

data record system
Instrument for saving data pertaining to the microscopic analysis onto media such as videocassette and DVD.

specimen chamber
Part of the microscope in which a specimen is placed for observation.

vacuum system console
Compartment housing the vacuum system.

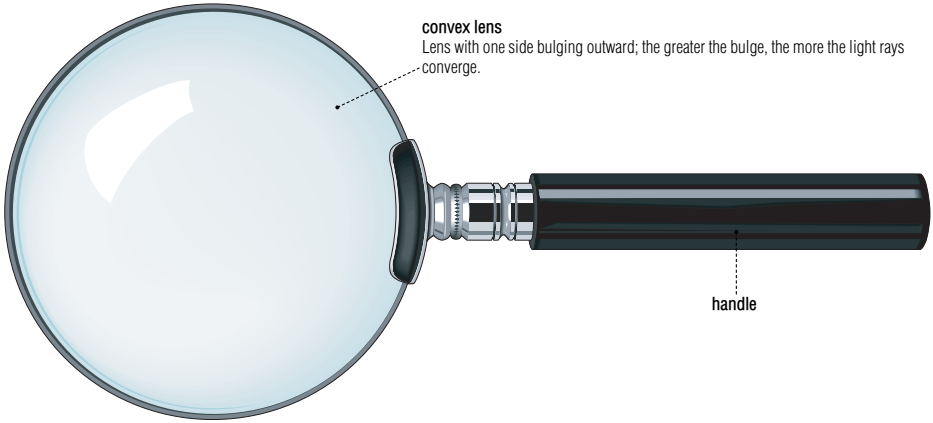
photographic chamber
Photographic device that prints an image of the specimen onto a sensitive surface.

specimen positioning control
Buttons for precisely lining up a specimen in relation to the axis of the electron beam.

control panel
Console containing buttons for operating the microscope.

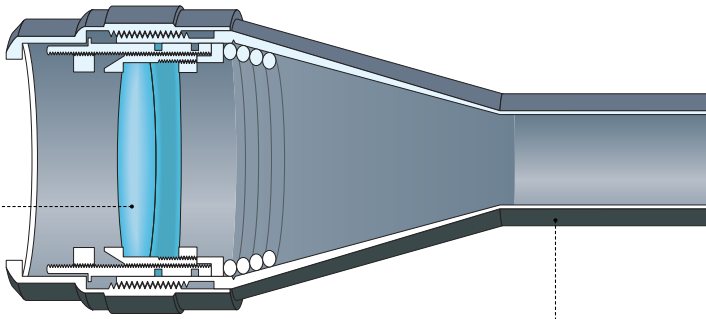
magnifying glass and microscopes

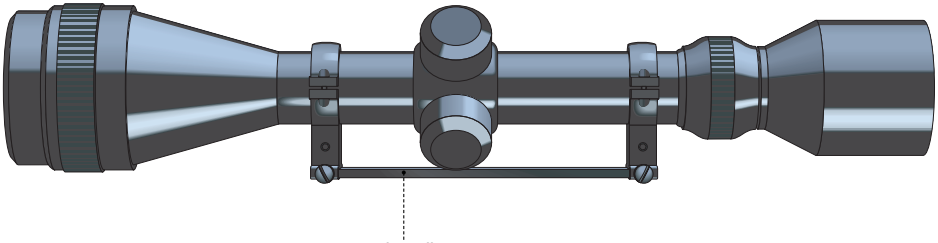
magnifying glass
Converging lens that magnifies the image of an object.



telescopic sight

Optical instrument mounted on a rifle or a measuring device to increase accuracy.





dovetail
Device for mounting the telescopic sight onto a device or firearm.

elevation adjustment
Button for positioning the sight vertically to offset any divergence of the target from the reticle.

erecting lenses
Lens system that returns the inverted image formed on the objective lens.

field lens
Lens placed between the objective and the eyepiece to widen the field of vision.

eyepiece
Optical disk or system of disks through which the eye sees the image produced by the lens.

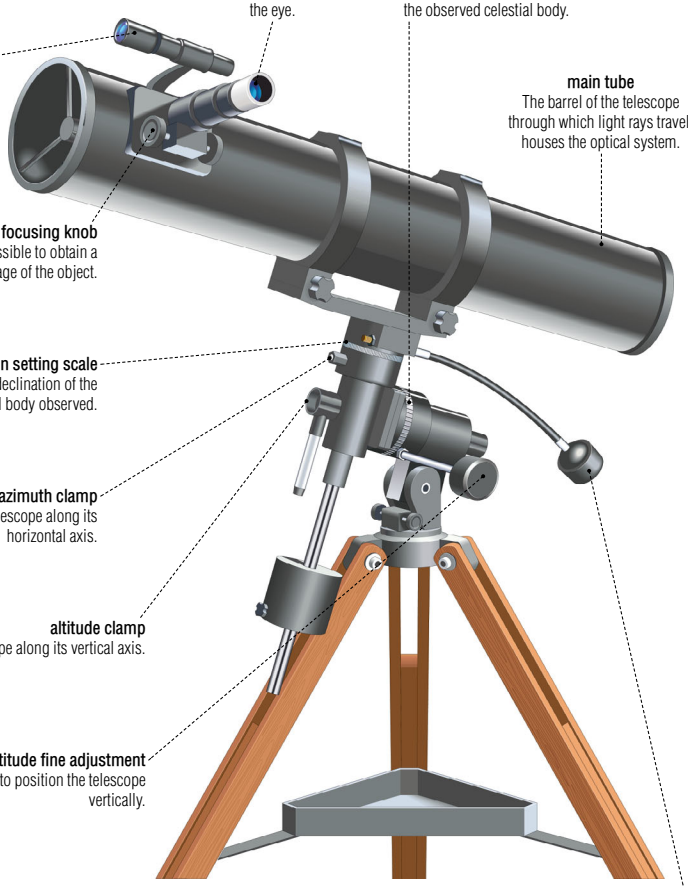
winding adjustment
Button for positioning the sight horizontally to offset any divergence of the target from the reticle.

turret cap
Part covering and protecting an adjustment button.

reticle
Optical system made up of two fine crossed wires to create a precise point as a sighting reference.

reflecting telescope

Optical instrument that uses an objective mirror to observe celestial bodies.



refracting telescope

Optical instrument that uses an objective lens to observe celestial bodies.

focusing knob
Adjusting device that makes it possible to obtain a clear image of the object.

finderscope
Small low-magnification telescope with a wide field of view; serves to locate celestial bodies.

main tube
The barrel of a telescope housing the optical system; light rays travel through the main tube.

eyepiece
Lens or system of lenses meant to magnify the image when placed before the eye.

declination setting scale
Graduated disk indicating the declination of the celestial body observed.

azimuth clamp
Clamp serving to lock the telescope along its horizontal axis.

altitude clamp
Clamp serving to lock the telescope along its vertical axis.

right ascension setting scale
Graduated disk indicating the right ascension of the observed celestial body.

tripod
Stable three-legged stand of variable height.

azimuth fine adjustment
Fine-tuning device serving to position the telescope horizontally.

altitude fine adjustment
Fine-tuning device serving to position the telescope vertically.

measure of temperature

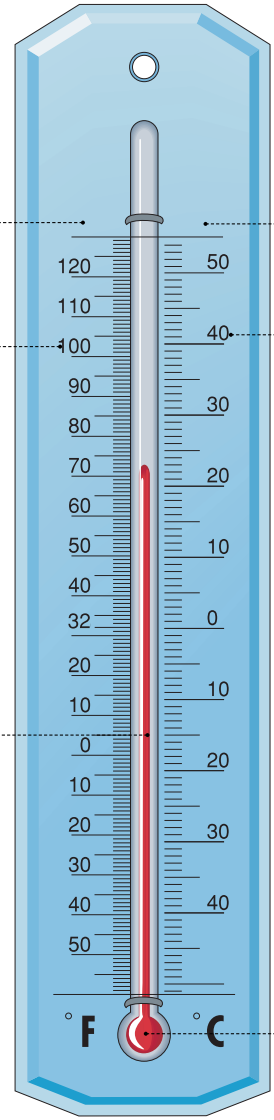
Temperature: physical quantity corresponding to the level of heat or cold, which is measured by means of a thermometer.

thermometer
Instrument for measuring temperature by means of a substance (usually a liquid or a gas) contained in a graduated tube.

Fahrenheit scale
Temperature scale that is used in some English-speaking countries, on which the freezing point of water is at 32 and the boiling point at 212.

F degrees
Symbol representing a unit of measurement on the Fahrenheit scale (Fahrenheit degree).

alcohol column
Quantity of alcohol that is contained in the glass tube; its height varies with the temperature.

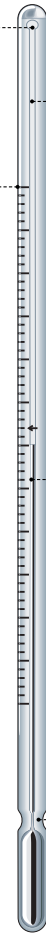


Celsius scale
Temperature scale that is based on a graduation from 0 (freezing point of water) to 100 (boiling point of water); it was formerly called the centigrade scale.

C degrees
Symbol representing a unit of measurement on the Celsius scale (Celsius degree).

alcohol bulb
Glass reservoir containing colored alcohol (methanol, ethanol) that expands and rises in the capillary bore as the temperature rises.

clinical thermometer
More precise than the alcohol thermometer, it is used to take the temperature of the human body; it is graduated from 94°F to 108°F.



expansion chamber
Space that is taken up by the gas in the capillary bore; it is pushed back as the mercury rises into it.

capillary tube
End of the glass tube in which the mercury rises or falls with the temperature; the mercury thermometer tube is filled with gas.

scale
Divisions of equal length (degrees) marked on the thermometer that constitute the units of measurement.

stem
Glass tube containing the capillary bore.

column of mercury
Quantity of mercury that is contained in the capillary bore; its height varies with the temperature.

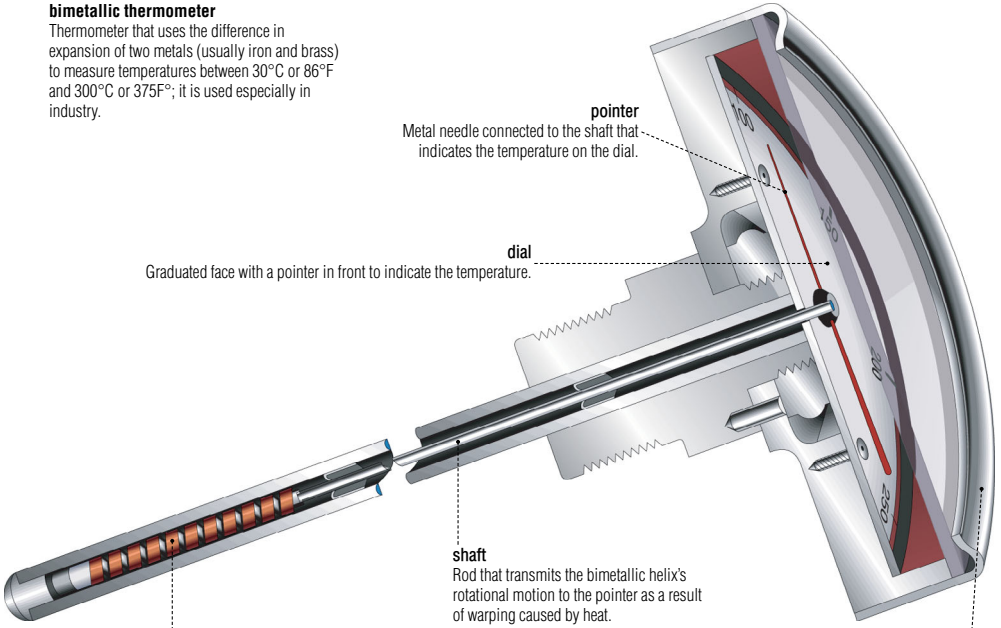
constriction
Narrowing that prevents the mercury from spontaneously dropping into the bulb as the temperature lowers (the thermometer must be shaken to make it go down).

mercury bulb
Glass reservoir containing mercury (a liquid metal) that expands and rises in the capillary tube as the temperature rises.

measure of temperature

digital thermometer
Thermometer that indicates the temperature in digits on a liquid crystal display screen.

bimetallic thermometer
Thermometer that uses the difference in expansion of two metals (usually iron and brass) to measure temperatures between 30°C or 86°F and 300°C or 375F°; it is used especially in industry.



pointer
Metal needle connected to the shaft that indicates the temperature on the dial.

dial
Graduated face with a pointer in front to indicate the temperature.

shaft
Rod that transmits the bimetallic helix's rotational motion to the pointer as a result of warping caused by heat.

bimetallic helix
Band made by welding together two metals with different coefficients of expansion; it curves as the temperature changes.

case
Outer covering that encloses and protects the device's mechanism.

measure of time

Time: physical quantity corresponding to a phenomenon or an event that is measured with devices such as watches and stopwatches.

stopwatch
Instrument that precisely measures time in minutes, seconds and fractions of seconds.

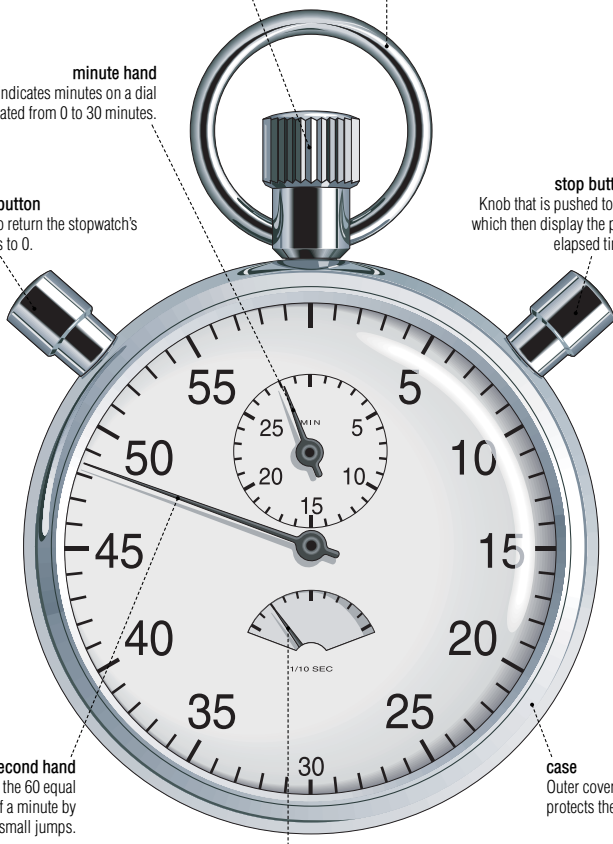
start button
Knob that is pushed to start the stopwatch and measure the duration of a phenomenon or event.

ring
Round part for holding or hanging the stopwatch.

minute hand
Metal needle that indicates minutes on a dial graduated from 0 to 30 minutes.

reset button
Button that is pushed to return the stopwatch's hands to 0.

stop button
Knob that is pushed to stop the hands, which then display the precise amount of elapsed time.



second hand
Metal needle that indicates the 60 equal divisions (seconds) of a minute by moving in small jumps.

case
Outer covering that encloses and protects the device's mechanism.

1/10 second hand
Metal needle that indicates the 10 equal divisions of a second on the dial.

mechanical watch
Set of geared wheels that reduce the force transmitted by a spiral spring to cause the watch's hands to rotate.

fourth wheel
Wheel that transmits energy to the third wheel.

jewel
Very hard stone (formerly a ruby, today a rock crystal) that resists wear; the rotation axle of a wheel rests on it.

third wheel
Wheel that receives energy from the fourth wheel and drives the center wheel.

escape wheel
Last wheel of the gear train with special teeth that causes the watch to operate regularly and continuously; it controls the movement of the other wheels.

winder
Part that rewinds the mechanism, consisting of a series of wheels.

hairspring
Flat spiral spring that causes the wheels of a watch to move over a certain period of time.

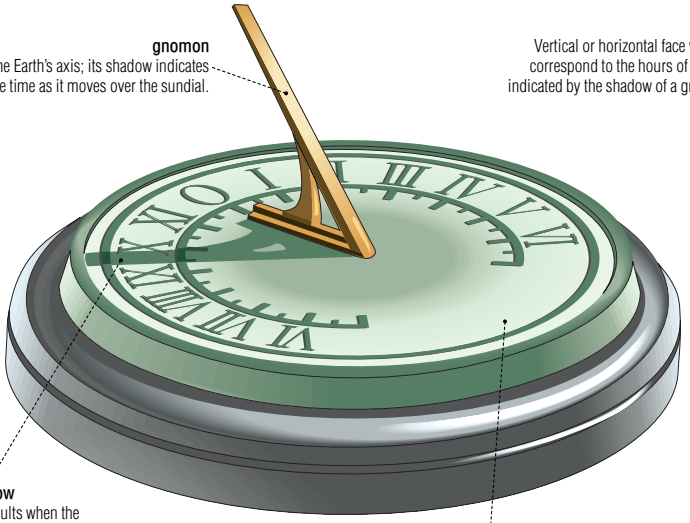
click
Small lever that is engaged between the ratchet-wheel teeth and prevents it from rotating counter to its normal direction.

center wheel
Wheel that is connected to the hands and causes them to rotate on the dial.

ratchet wheel
Toothed wheel having only one direction of rotation; it is kept in place by the click.

gnomon
Part aligned with the Earth's axis; its shadow indicates the time as it moves over the sundial.

sundial
Vertical or horizontal face with divisions that correspond to the hours of the day, which are indicated by the shadow of a gnomon cast by the Sun.



shadow
Dark area that results when the gnomon blocks the sunlight and indicates the time in accordance with the position of the Sun.

dial
Face marked with numbers over which shadows are cast by the gnomon to indicate the approximate time of day.

analog watch
The time is displayed by hands, which move around the dial.

digital watch
The time is read from letters and numbers that appear on a clear background.

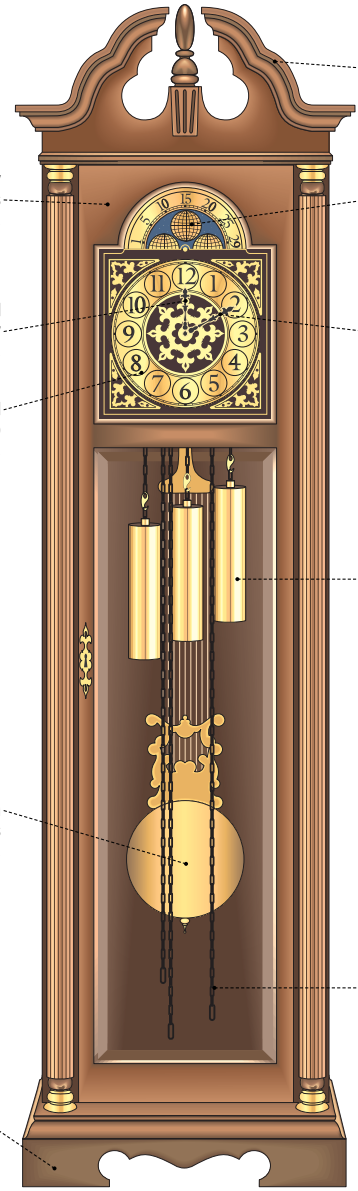
liquid crystal display
Crystal that illuminates when submitted to light and displays the shapes of letters and numbers.

dial
Graduated face over which the hands move to indicate the time.

strap
Leather, fabric, plastic or metal bracelet with a clasp; it is used to hold a watch on the wrist.

crown
Knob with sprockets that is connected to the winder; it is used to manually wind the watch and set its time.

grandfather clock
Clock with a pendulum that is operated by weights and housed in a tall (usually over 2 m high) straight body, which stands upright on the floor.



pediment
Set of decorative moldings that surmount the clock.

body
Usually wooden box that houses and protects the clock's mechanism.

Moon dial
Face divided into 29 1/2 days that is represented by a moon whose movement indicates the phases of the Moon: first quarter, full moon, last quarter, new moon.

hour hand
Metal needle that points at the 24 hours of a day on the dial.

minute hand
Metal needle that points at the 60 minutes of an hour on the dial.

dial
Graduated face over which the hands move to indicate the time.

weight
Heavy body that hangs from the main wheel; its descent provides the necessary energy for the clock's mechanism.

pendulum
Unit whose regular swinging motion controls the workings of the clock's mechanism.

chain
Series of interlaced rings to which weights are attached.

plinth
Base that supports the clock and makes it stable.

weight-driven clock mechanism
This clock is operated by weights that, under gravity, drive the hands of the clock in their rotational movement by means of a gear train.

pinion
Small wheel with teeth that is mounted on a shaft and transmits the rotational movement of one wheel to another.

pallet
Anchor-shaped part that frees and constrains the escape wheel's teeth to maintain the pendulum's back-and-forth movement.

escape wheel
Last wheel of the gear train with special teeth that causes the clock to operate regularly and continuously and controls the movement of the other wheels.

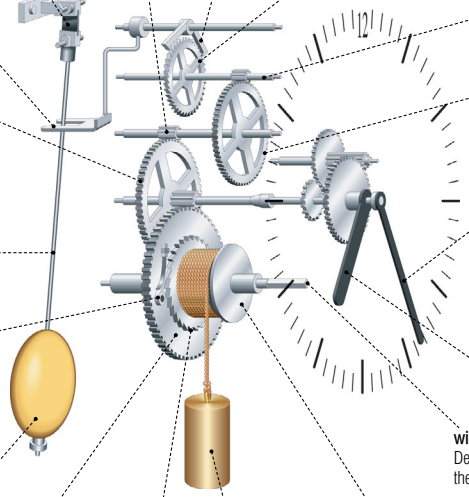
suspension spring
Small rigid plate from which the pendulum hangs.

fork
Part that is operated by the escape wheel to cause the pendulum's movement.

spindle
Cylindrical part that transfers the rotational movement of one part to another.

center wheel
Wheel that is connected to the hands and causes them to rotate on the dial.

third wheel
Wheel that receives energy from the center wheel and drives the escape wheel.



pendulum rod
Rigid bar to which the pendulum bob is attached.

minute hand
Metal needle that points at the 60 minutes of an hour on the dial.

click
Small lever that is engaged between the ratchet-wheel teeth and prevents it from rotating counter to its normal direction.

hour hand
Metal needle that points at the 24 hours of a day on the dial.

pendulum bob
Weight attached to the end of the pendulum rod.

winding mechanism
Device that raises the weights to start anew the cycle of the clock's mechanism.

drum
Cylinder around which the weights' cord or chain winds when the clock is rewound.

main wheel
First wheel in the gear train that transmits the driving force of the weights to the other wheels to turn them.

ratchet wheel
Toothed wheel having only one direction of rotation; it is kept in place by the click.

weight
Heavy body that hangs from the main wheel; its descent provides the necessary energy for the clock's mechanism.

measure of weight

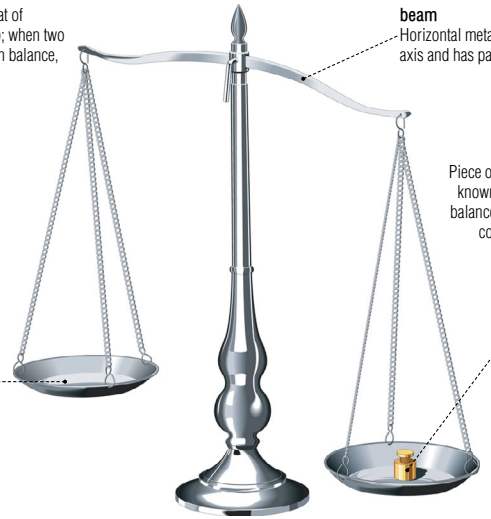
Mass: physical quantity that characterizes an amount of matter (mass) that is measured by means of a scale.

beam balance
Compares the mass of a body with that of another body of known mass (weight); when two pans hanging from a bar (beam) are in balance, the two weights are equal.

beam
Horizontal metal bar that balances on a vertical axis and has pans hanging from each end.

weight
Piece of metal, such as copper or iron, of known mass that is placed on a pan to balance the scale and thereby assess the corresponding mass of a body.

pan
Flat rigid support that holds either the body to be weighed or the weights.



Roberval's balance
Commonly used scale that operates on the same principle as the beam balance; the pans are stabilized by a shank and rest on the beam.

dial
Graduated surface with a pointer in front that indicates the point of equilibrium for the two pans.

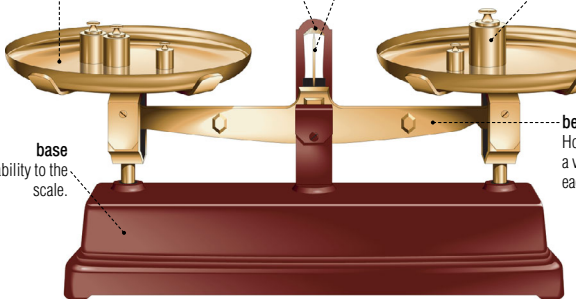
pointer
Metal needle that indicates the point of equilibrium on the dial when the beam is level.

weight
Piece of metal, such as copper or iron, of known mass that is placed on a pan to balance the scale and thereby assess the corresponding mass of a body.

pan
Flat rigid support that holds either the body to be weighed or the weights.

beam
Horizontal metal bar that balances on a vertical axis and supports a pan on each end.

base
Support that provides stability to the scale.



steelyard
Scale used for weighing loads that has a beam with arms of different lengths; the shorter arm supports the pan and the longer arm supports the weights that slide to attain a balance.

notch
Groove in which a sliding weight catches so that a precise reading on the graduated scale can be taken.

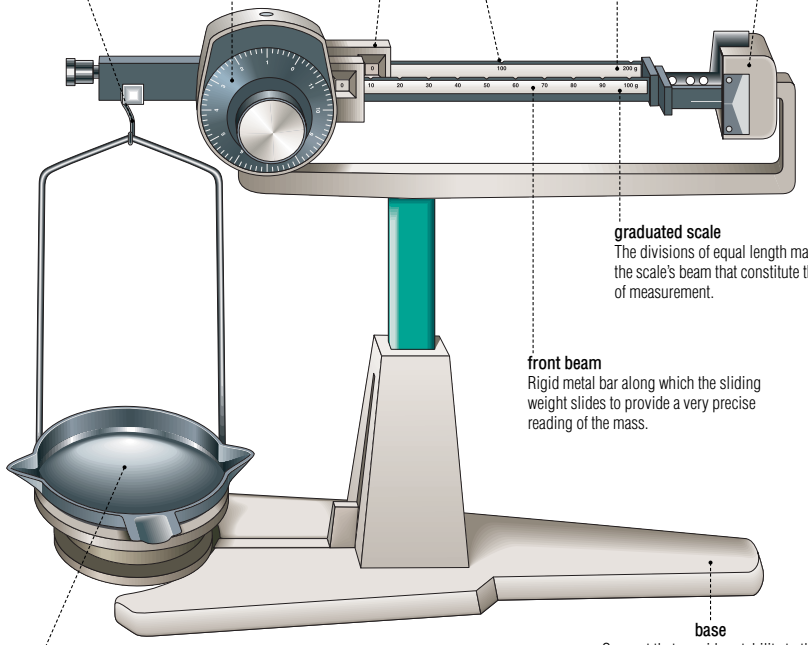
pan hook
Curved part from which the pan is hung by means of rods.

sliding weight
Sliding part that is moved along the beams until a balance between the two masses is attained.

magnetic damping system
Device made up of magnets that reduce the beams' oscillations when the weights are moved to provide a quick reading of the mass.

vernier
Small graduated dial that slides along the beams and provides a very precise reading of the mass.

rear beam
Rigid metal bar along which the sliding weight slides to provide a relatively precise reading of the mass.



graduated scale
The divisions of equal length marked on the scale's beam that constitute the units of measurement.

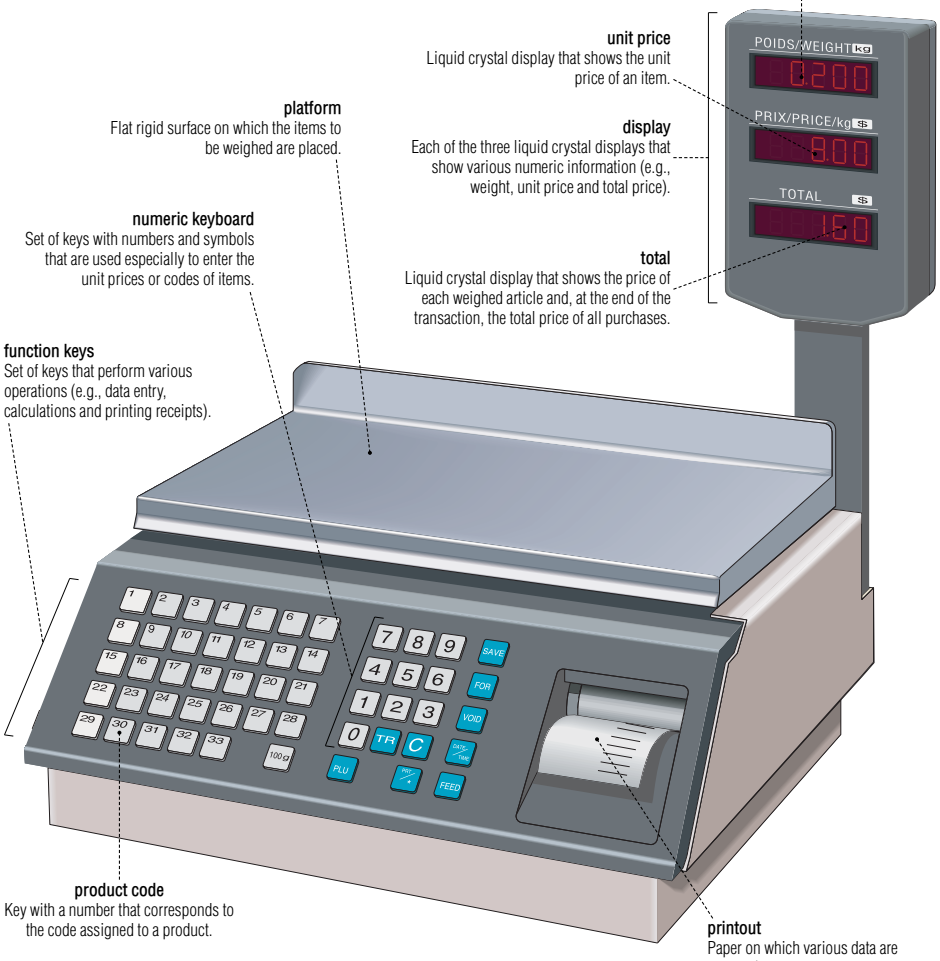
front beam
Rigid metal bar along which the sliding weight slides to provide a very precise reading of the mass.

pan
Flat rigid stand on which the body to be weighed is placed.

base
Support that provides stability to the scale.

measure of weight

electronic scale
Commercial scale that weighs and calculates the price of a quantity of merchandise and displays these elements.



weight
Liquid crystal display that shows the weight of the item.

unit price
Liquid crystal display that shows the unit price of an item.

display
Each of the three liquid crystal displays that show various numeric information (e.g., weight, unit price and total price).

total
Liquid crystal display that shows the price of each weighed article and, at the end of the transaction, the total price of all purchases.

platform
Flat rigid surface on which the items to be weighed are placed.

numeric keyboard
Set of keys with numbers and symbols that are used especially to enter the unit prices or codes of items.

function keys
Set of keys that perform various operations (e.g., data entry, calculations and printing receipts).

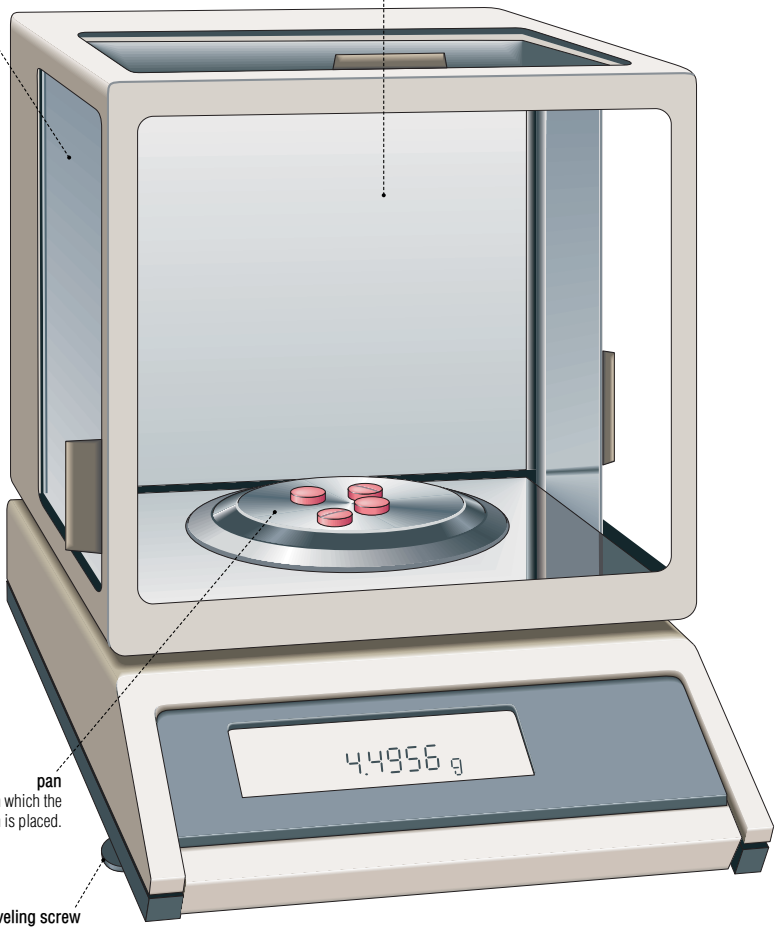
product code
Key with a number that corresponds to the code assigned to a product.

printout
Paper on which various data are printed (e.g., the weight, quantity and price of the items weighed).

analytical balance
Used especially in the laboratory for taking very precise weight measurements.

glass case
Glass box that protects the pan from air currents and dust that might cause a false reading of the weight.

door access
Sliding doors that provide easy access to the inside of the glass case.

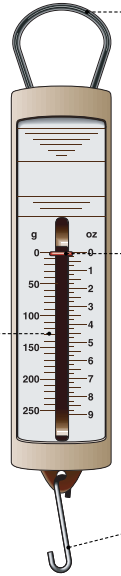


pan
Flat rigid support on which the specimen is placed.

leveling screw
Screw for adjusting the level of the balance's base.

measure of weight

spring balance
Scale made up of a hook attached to a spring that stretches in proportion to the weight of the object being weighed.



ring
Round part for holding or hanging the spring balance.

pointer
Pointer connected to the spring that moves along a graduated scale to indicate the weight of the body being weighed.

graduated scale
The divisions of equal length that are marked on the spring balance and constitute the units of measurement.

hook
Curved part on which the body to be weighed is hung.

bathroom scale
Scale used for weighing a person; it has a spring mechanism that compresses in proportion to the weight.

digital display
Liquid crystal display that indicates the weight in numbers.

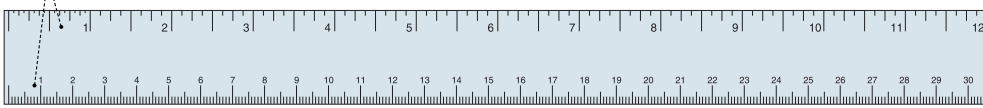
weighing platform
Flat base that a person stands upon to be weighed.

measure of length

Length: the longer dimension of an object as opposed to its width.

ruler
Instrument for measuring length.

scale
The divisions of equal length that are marked on the ruler and constitute the units of measurement.



measure of distance

Distance: interval separating two points in space.

pedometer
Device that counts the number of steps taken by a walker or runner to measure the distance traveled.

reset button
Key used to reset the counter to 0.

distance traveled
Number of steps taken by the walker or runner converted into miles.

clip
Metal fastener for attaching the pedometer to a belt or article of clothing.

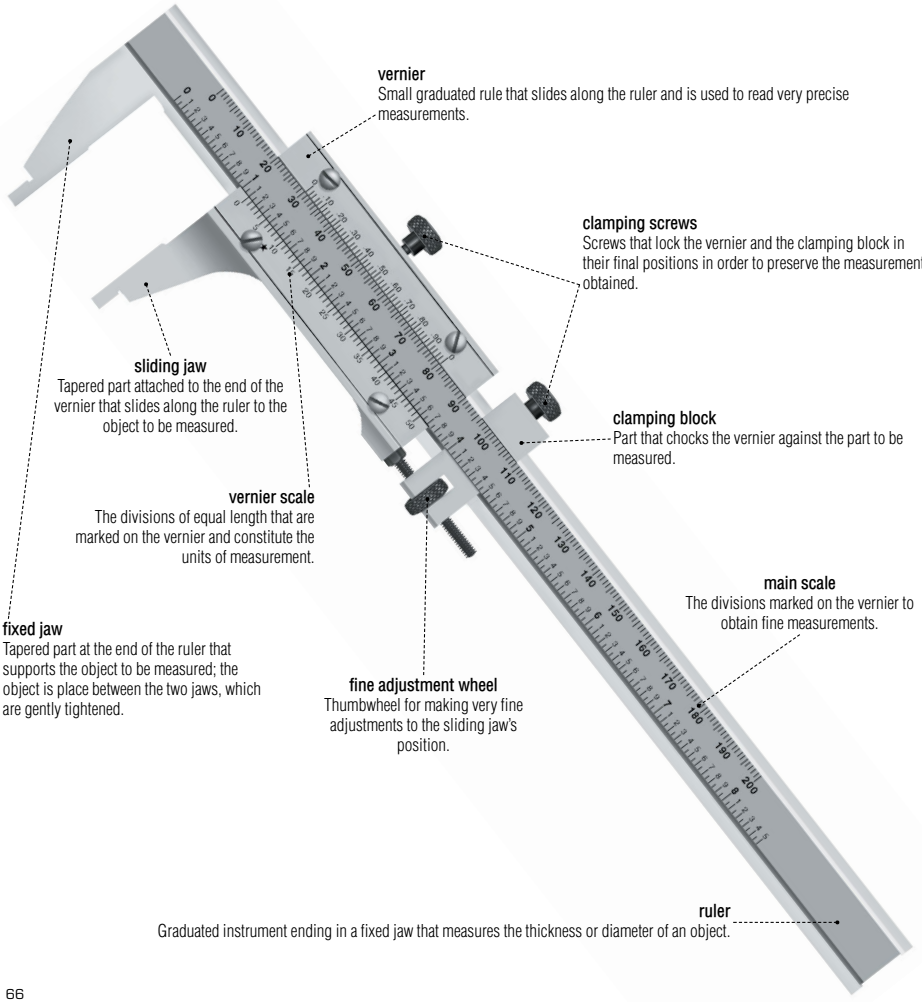
step setting
Button for adjusting the average length of a step in the walk or run.

case
Outer covering that encloses and protects the device's mechanism.

measure of thickness

Thickness: dimension corresponding to the distance between two surfaces of the same body.

vernier caliper
Precision instrument for measuring the thickness and diameter of mechanical parts.



vernier
Small graduated rule that slides along the ruler and is used to read very precise measurements.

clamping screws
Screws that lock the vernier and the clamping block in their final positions in order to preserve the measurement obtained.

sliding jaw
Tapered part attached to the end of the vernier that slides along the ruler to the object to be measured.

clamping block
Part that chocks the vernier against the part to be measured.

vernier scale
The divisions of equal length that are marked on the vernier and constitute the units of measurement.

main scale
The divisions marked on the vernier to obtain fine measurements.

fixed jaw
Tapered part at the end of the ruler that supports the object to be measured; the object is place between the two jaws, which are gently tightened.

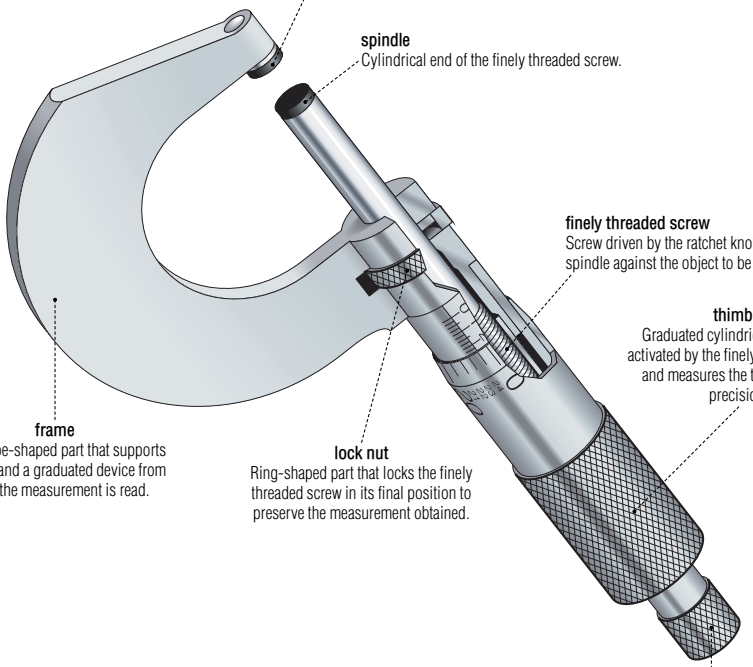
fine adjustment wheel
Thumbwheel for making very fine adjustments to the sliding jaw's position.

ruler
Graduated instrument ending in a fixed jaw that measures the thickness or diameter of an object.

micrometer caliper
Instrument that measures the thickness or the diameter of relatively small parts; it produces finer results than a vernier caliper.

anvil
Cylindrical part that is attached to the frame of the micrometer to support the object to be measured; the object is placed between the anvil and the spindle.

spindle
Cylindrical end of the finely threaded screw.



finely threaded screw
Screw driven by the ratchet knob that moves the spindle against the object to be measured.

thimble
Graduated cylindrical part that is activated by the finely threaded screw and measures the thickness with precision.

frame
Horseshoe-shaped part that supports the anvil and a graduated device from which the measurement is read.

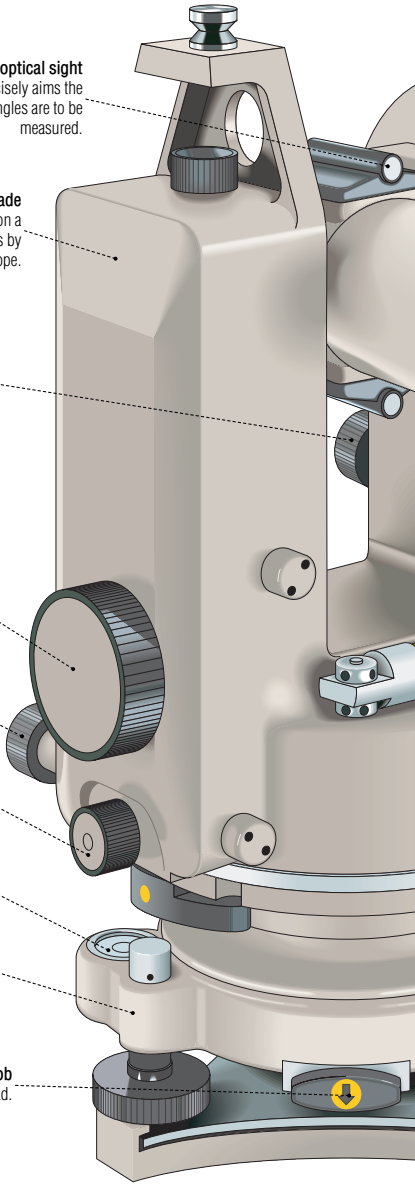
lock nut
Ring-shaped part that locks the finely threaded screw in its final position to preserve the measurement obtained.

ratchet knob
Part that stops the finely threaded screw when the pressure on the object being measured is sufficient.

measure of angles

Angle: figure formed by two intersecting lines or planes; it is measured in degrees.

theodolite
Sighting instrument that is used especially in astronomy, geodesy and navigation for measuring horizontal and vertical angles.



optical sight
Device with an eyepiece that precisely aims the telescope at the target whose angles are to be measured.

alidade
Part of the theodolite that rotates on a vertical axle to measure angles by means of the telescope.

adjustment for vertical-circle image
Knob that adjusts the sharpness of the image of the vertical circle (graduated from 0° to 360°) in order to read the angles on the vertical axis.

micrometer screw
Knob that adjusts the micrometer to give a very precise reading of the circles' measurements.

adjustment for horizontal-circle image
Knob that adjusts the sharpness of the image of the horizontal circle (graduated from 0° to 360°) in order to read the angles on the horizontal axis.

horizontal clamp
Knob that locks the alidade to prevent it from rotating.

leveling head level
Transparent tube that contains liquid and an air bubble; it serves as a guide for positioning the leveling head on the horizontal axis.

leveling head
Platform serving as a support for the theolodite.

leveling head locking knob
Knob that locks the alidade to the leveling head.

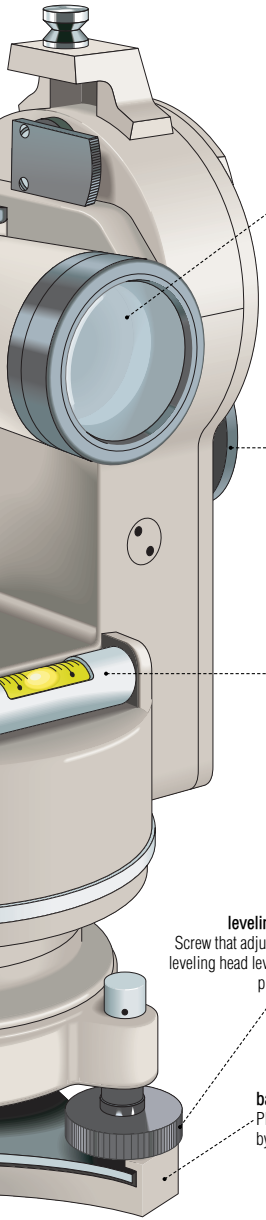
telescope
Optical instrument composed of several lenses; it can be adjusted in the horizontal and vertical planes and is used to observe distant objects.

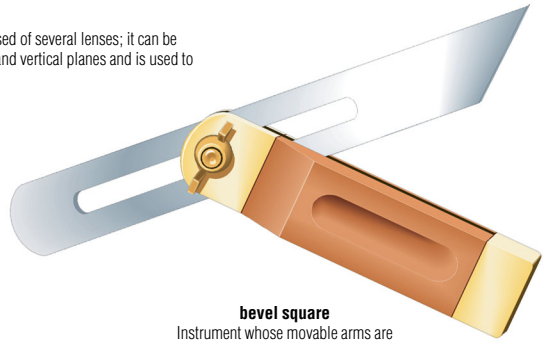
illumination mirror
Adjustable polished glass surface that reflects light onto the circles so that the angles can be read.

alidade level
Transparent tube that contains liquid and an air bubble; it serves as a guide for positioning the alidade on the vertical axis.

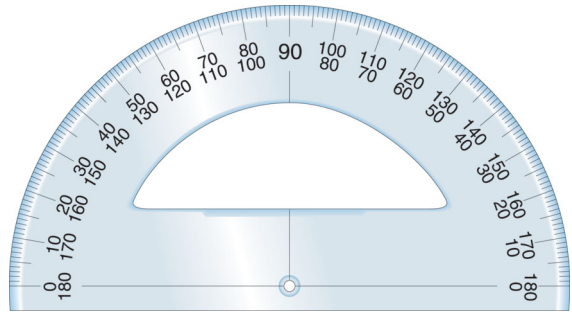
leveling screw
Screw that adjusts the theodolite's leveling head level on the horizontal plane.

base plate
Plate to which the leveling head is attached by means of three leveling screws.





bevel square
Instrument whose movable arms are used for measuring or for marking an angle.



protractor
Graduated semicircular instrument for measuring and drawing angles.

international system of units

Decimal system established by the 11th General Conference on Weights and Measures (GCWM) in 1960 and used by many countries.

measurement of electric potential difference

V

volt
Difference in potential between two points of a conductor carrying a constant current of 1 ampere when the power between these points is 1 watt.

measurement of frequency

Hz

hertz
Frequency of a periodic phenomenon whose period is 1 second.

measurement of electric charge

C

coulomb
Amount of electricity carried in 1 second by a current of 1 ampere.

measurement of energy

J

joule
Amount of energy released by the force of 1 newton acting through a distance of 1 meter.

measurement of power

W

watt
Energy transfer of 1 joule during 1 second.

measurement of force

N

newton
Force required to impart an acceleration of 1 m/s^2 to a body having a mass of 1 kg.

measurement of electric resistance

Ω

ohm
Electrical resistance between two points of a conductor carrying a current of 1 ampere when the difference in potential between them is 1 volt.

measurement of electric current

A

ampere
Constant current of 1 joule per second in a conductor.

measurement of length

m

meter
Distance traveled by light in a vacuum in 1/299,792,458 of a second.

measurement of mass

kg

kilogram
Mass of a platinum prototype that was accepted as the international reference in 1889; it is stored at the International Bureau of Weights and Measures.

measurement of Celsius temperature

°C

degree Celsius
Division into 100 parts of the difference between the freezing point of water (0°C) and its boiling point (100°C) at standard atmospheric pressure.

measurement of thermodynamic temperature

K

kelvin
Zero degrees Kelvin is equal to minus 273.16°C.

measurement of amount of substance

mol

mole
Quantity of matter equal to the number of atoms in 0.012 kg of carbon 12.

measurement of pressure

Pa

pascal
Uniform pressure exerted on a flat surface of 1 m^2 with a force of 1 newton.

measurement of radioactivity

Bq

becquerel
Radioactivity of a substance in which one atom disintegrates per second.

measurement of luminous intensity

cd

candela
Unit of light intensity equivalent to a radiant intensity of 1/683 watts per steradian (solid angle).

mathematics

The science that uses deductive reasoning to study the properties of abstract entities such as numbers, space and functions and the relations between them.

minus/negative
Sign denoting that a number is to be subtracted from another; the result is a difference.

plus/positive
Sign denoting that a number is to be added to another; the result is a sum.

multiplied by
Sign denoting that a number is to be multiplied by another; the result is a product.

divided by
Sign denoting a number (dividend) is to be divided by another (divisor); the result is a quotient.

equals
Sign denoting the result of an operation.

is not equal to
Sign denoting that the result of an operation is not close to the same value as the one on the right.

is approximately equal to
Sign denoting that the result of an operation is close to the same value as the one on the right.

is equivalent to
Sign denoting that the value on the left is the same magnitude as the one on the right.

is identical with
Binary sign denoting that the result of the operation noted on the left has the same value as the operation noted on the right.

is not identical with
Binary sign denoting that the result of the operation noted on the left does not have the same value as the operation noted on the right.

empty set
Sign denoting that a set contains no elements.

union of two sets
Binary sign denoting that a set is composed of the sum of the elements of two sets.

intersection of two sets
Binary sign denoting that two sets M and N have elements in common.

is included in/is a subset of
Binary sign denoting that a set A on the left is part of the set B on the right.

plus or minus
Sign denoting that the number that follows denotes an order of magnitude.

is less than or equal to
Sign denoting that the result of an operation is equal to or of smaller magnitude than the number that follows.

is greater than
Sign denoting that the value on the left is of greater magnitude than the number that follows.

is greater than or equal to
Sign denoting that the result of an operation is equal to or of greater magnitude than the number that follows.

is less than
Sign denoting that the value on the left is of smaller magnitude than the number that follows.

percent
Sign denoting that the number preceding it is a fraction of 100.

is an element of
Binary sign denoting that the element on the left is included in the set on the right.

is not an element of
Binary sign denoting that the element on the left is not included in the set on the right.

sum
Sign indicating that several values are to be added together (their sum).

square root of
Sign denoting that, when a number is multiplied by itself, the result is the number that appears below the bar.

fraction
Sign denoting that the number on the left of the slash (numerator) is one part of the number on the right of the slash (denominator).

infinity
Symbol denoting that a value has no upper limit.

integral
Result of the integral calculation used especially to determine an area and to resolve a differential equation.

factorial
Product of all positive whole numbers less than and equal to a given number. For example, the factorial of 4 is: 4! = 1x2x3x4 = 24.

mathematics

Roman numerals
Uppercase letters that represented numbers in ancient Rome; they are still seen today in uses such as clock and watch dials and pagination.

I

one
Letter whose value is 1 unit.

V

five
Letter whose value is 5 units.

X

ten
Letter whose value is 10 units.

L

fifty
Letter whose value is 50 units.

C

one hundred
Letter whose value is 100 units.

D

five hundred
Letter whose value is 500 units.

M

one thousand
Letter whose value is 1,000 units.

biology

The scientific study of living organisms (humans, animals and plants) from the point of view of their structure and how they function and reproduce.

male
Symbol denoting that a being has male reproductive organs.

female
Symbol denoting that a being has female reproductive organs.

Rh+

blood factor positive
Individuals are Rh positive when their red blood cells carry an Rh molecule (antigen); the Rh factor is positive in about 85% of the population.

Rh-

blood factor negative
Individuals not carrying the Rh molecule (antigen) are Rh negative; the Rh factor plays an important role in pregnancy (the parents' factors must be compatible).

†

death
Symbol placed before a date denoting a person's year of death.

*

birth
Symbol placed before a date denoting a person's year of birth.

geometry

Mathematical discipline that studies the relations between points, straight lines, curves, surfaces and volumes.

°

degree
Symbol placed in superscript after a number to denote the opening of an angle or the length of an arc, or in front of an uppercase letter to identify a scale of measurement.

′

minute
Symbol placed in superscript after a number that denotes degrees in sixtieths of a measure.

″

second
Symbol placed in superscript after a number that denotes degrees in sixtieths of a minute.

π

pi
Constant that represents the ratio of a circle's circumference to its diameter; its value is approximately 3.1416.

perpendicular
Symbol denoting that a straight line meets another at a right angle.

is parallel to
Symbol denoting that two straight lines remain at a constant distance from one another.

is not parallel to
Symbol denoting that two straight lines do not remain at a constant distance from one other.

right angle
Angle formed by two lines or two perpendicular planes that measures 90°.

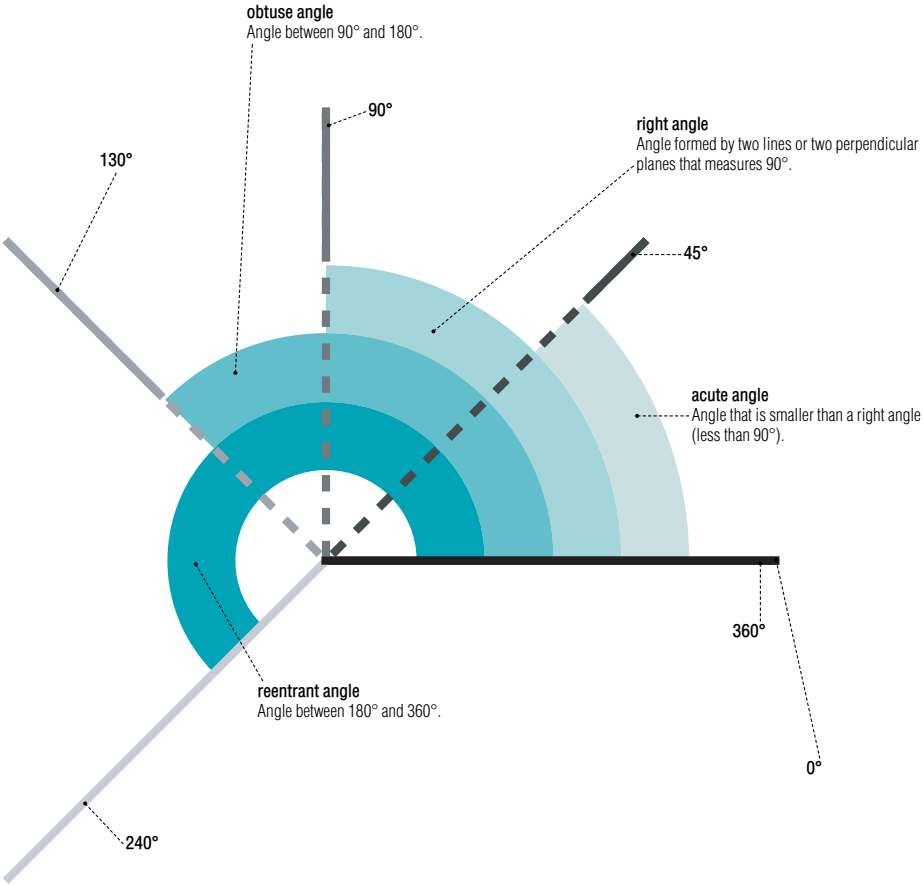
obtuse angle
Angle between 90° and 180°.

acute angle
Angle that is smaller than a right angle (less than 90°).

geometrical shapes

Drawings that represent various geometric forms such as straight lines, circles and polygons.

examples of angles
Angle: figure formed by two intersecting lines or planes; it is measured in degrees.



plane surfaces
Set of points on a plane that describes an area of space.

parts of a circle
Circle: closed plane curve; all its points are the same distance from a fixed point (center).

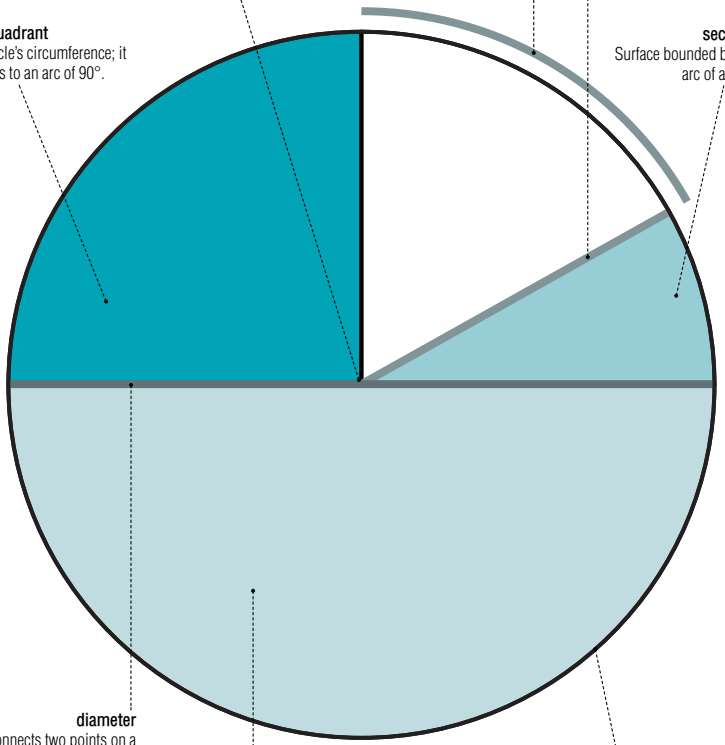
center
Point located at the same distance from every point on the circle's circumference.

radius
Line that joins a point on a circle's circumference to its center; it is one half of the diameter.

arc
Section of a circle between two points on the circle.

quadrant
Quarter of a circle's circumference; it corresponds to an arc of 90°.

sector
Surface bounded by two radii and an arc of a circle.



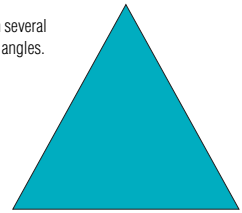
diameter
Line that connects two points on a circle's circumference and passes through its center.

semicircle
A half circle that is delimited by its diameter.

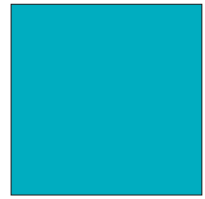
circumference
Length of a circle that corresponds to the product of its diameter and pi.

geometrical shapes

polygons
Geometric plane figures with several sides and a number of equal angles.

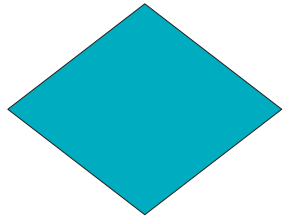


triangle
Three-sided polygon; triangles are scalene (no side is equal to any other) isosceles (two sides equal) or equilateral (all sides equal).



square
Equilateral rectangle with four right angles.

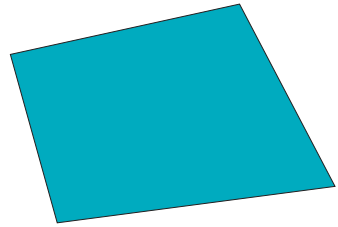
rectangle
Quadrilateral whose opposite sides are equal in length; the sides meet at right angles.



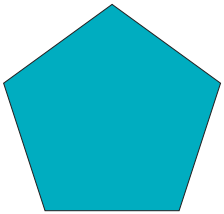
rhombus
Equilateral parallelogram.

trapezoid
Quadrilateral with two sides (bases) that are parallel. It is isosceles when it has two sides that are not parallel and equal, and rectangle when two of its sides form a right angle.

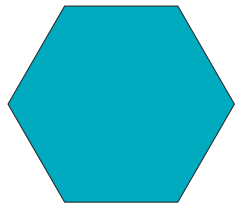
parallelogram
Trapezoid whose opposite sides are parallel and of equal length; the sides do not meet at right angles.



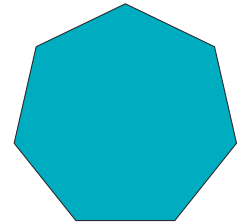
quadrilateral
Any plane figure with four sides and four angles.



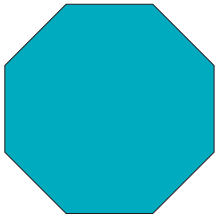
regular pentagon
Polygon with five (penta = five) sides and equal angles.



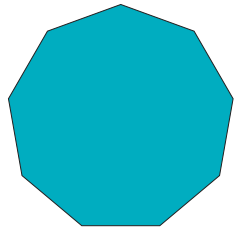
regular hexagon
Polygon with six (hexa = six) sides and equal angles.



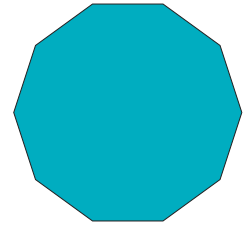
regular heptagon
Polygon with seven (hepta = seven) sides and equal angles.



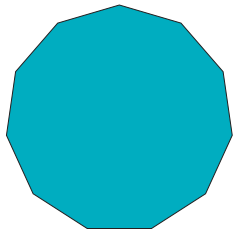
regular octagon
Polygon with eight (octo = eight) sides and equal angles.



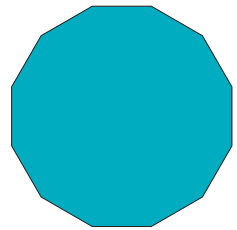
regular nonagon
Polygon with nine (nona = nine) sides and equal angles.



regular decagon
Polygon with 10 (deca = ten) sides and equal angles.



regular hendecagon
Polygon with 11 (hendeca = eleven) sides and equal angles.

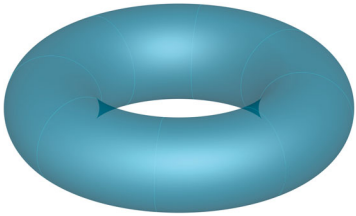


regular dodecagon
Polygon with 12 (dodeca = twelve) sides and equal angles.

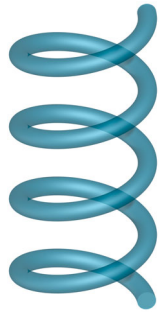
geometrical shapes

solids

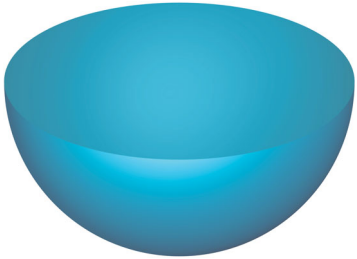
Geometric shapes in three dimensions that are delimited by surfaces.



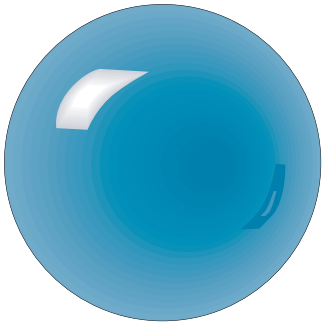
torus
Volume or solid generated by the rotation of a circle at an equal distance from its center of rotation.



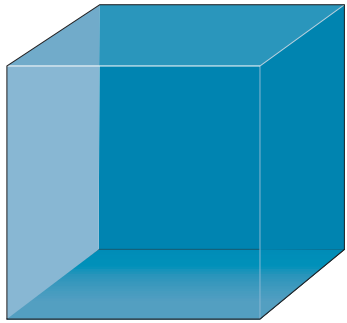
helix
Volume or solid of spiral shape that turns toward the left at a constant angle.



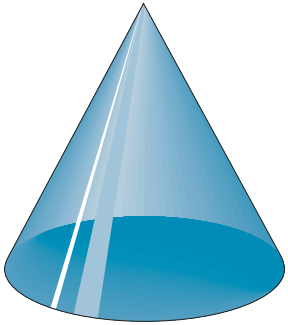
hemisphere
Half sphere cut along its diameter.



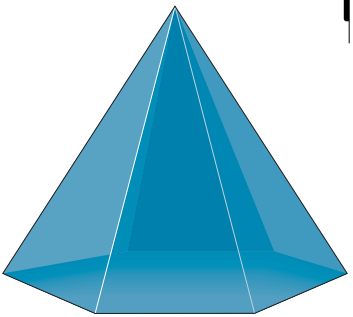
sphere
Volume with all the points on its surface the same distance from its center; the solid thus delimited is a round ball.



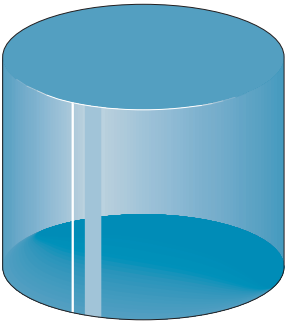
cube
Volume or solid with six square sides of equal area and six equal edges; it has eight vertices.



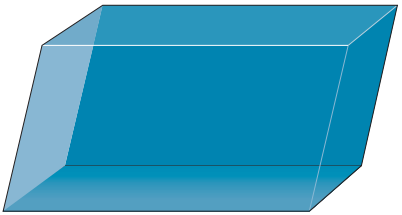
cone
Volume or solid generated by the rotation of a straight line (generatrix) along a circular line (directrix) from a fixed point (vertex).



pyramid
Volume or solid generated by straight lines (edges) connecting the angles of a polygon (base) to the vertex and whose sides form triangles.



cylinder
Volume or solid generated by the rotation of a straight line (generatrix) moving along a curved line (directrix).



parallelepiped
Volume or solid with six sides (parallelograms) that are parallel in pairs.

regular octahedron
Volume or solid with eight triangular sides of equal area; it has six vertices and 12 edges.

production of electricity from geothermal energy

Hot water contained in the ground near a volcano, geyser or thermal source is piped to the surface by drilling to extract steam and produce electricity.

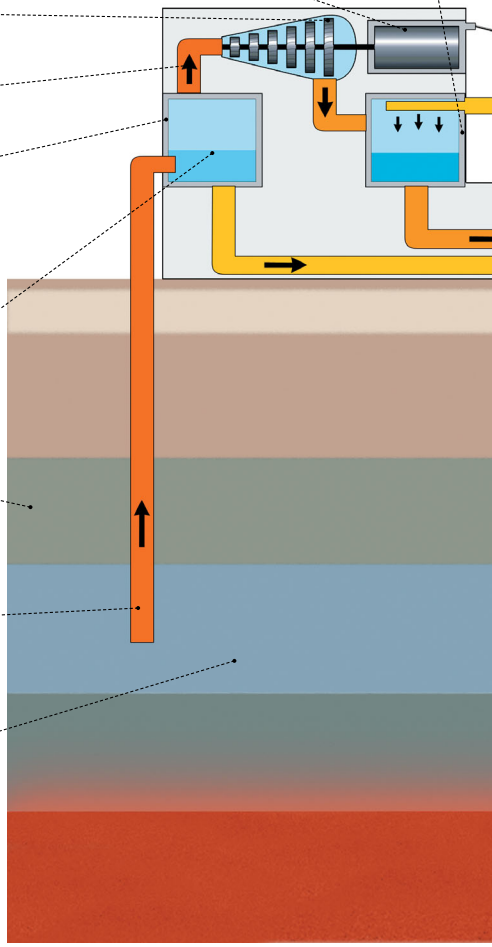
generator
Turbine-powered rotating machine that converts mechanical energy into electric energy to direct it toward a transmission network.

condenser
Circuit that cools the steam from the turbine and condenses it into water.

turbine
Steam-powered machine whose wheel transmits mechanical energy to the generator and causes it to rotate.

steam
Gaseous state of water; steam pressure operates the turbine.

separator
Device that separates water from steam, which it recovers to operate the turbine; the water is reinjected into the aquifer.



water-steam mix
Hot water extracted from the aquifer; as it rises to the surface, it is partially turned into steam.

upper confining bed
Layer of impermeable rock that covers the confined aquifer.

production well
Borehole dug into the ground to allow the hot water contained in the aquifer to be pumped to produce electricity.

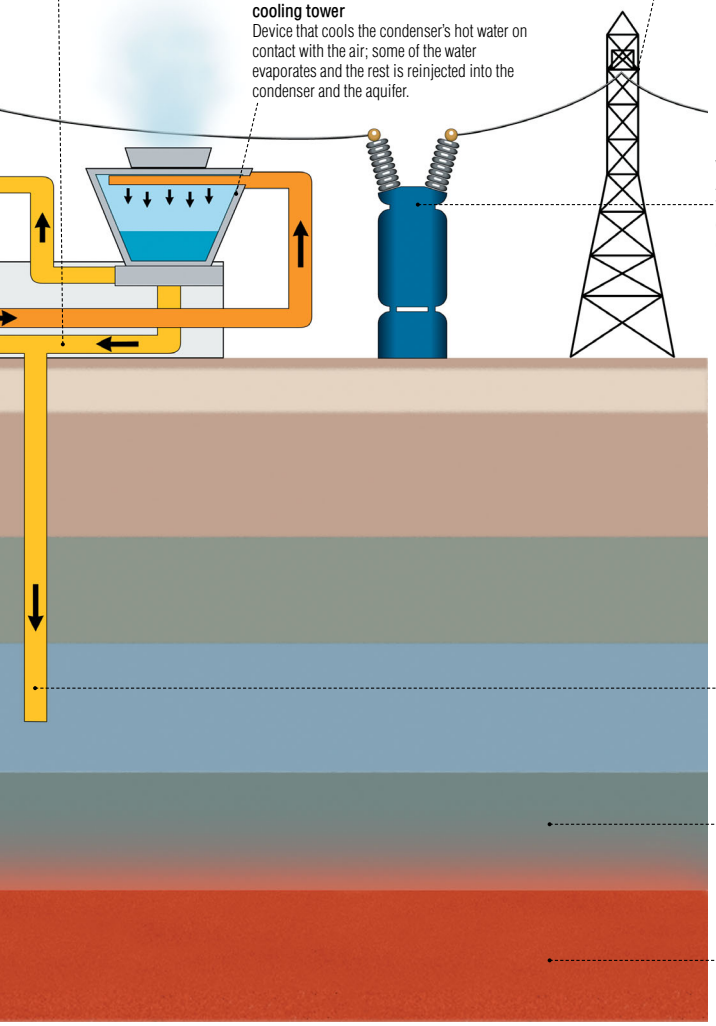
confined aquifer
Layer of porous sedimentary rock between two impermeable layers where water accumulates at a temperature between 300°F and 750°F.

geothermal field
Area of Earth's crust where a pocket of hot confined water is close enough to the surface to be exploited.

water
Liquid made up of hydrogen and oxygen that becomes steam at 212°F; the water transfers Earth's internal heat.

high-tension electricity transmission
Using high-voltage lines to transmit electricity over long distances reduces the strength of the current and, as a result, energy losses.

cooling tower
Device that cools the condenser's hot water on contact with the air; some of the water evaporates and the rest is reinjected into the condenser and the aquifer.



voltage increase
At the outlet end of the power plant, the transformer increases the voltage; this reduces energy losses during transmission over long distances.

injection well
Borehole that is drilled into the ground to return water to the aquifer, where it is reheated after its heat has been extracted.

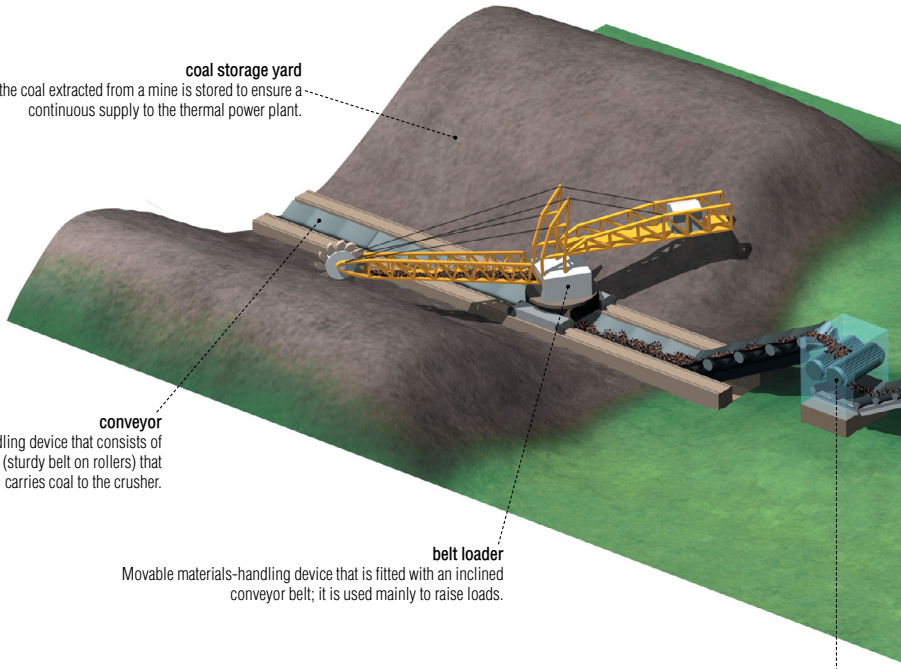
lower confining bed
Layer of impermeable rock that transmits heat from the magma chamber to the aquifer.

magma chamber
Pocket of magma (molten rock emerging from Earth's crust) that constitutes a heat source; it transmits its thermal energy to water.

thermal energy

Energy that is produced by turning water into steam through the burning of fuel (e.g., petroleum and coal) or through nuclear reaction.

production of electricity from thermal energy
The heat that is given off by burning combustible fuels in the thermal power plant converts water into steam; the steam turns a turbo-alternator unit to produce electricity.



coal storage yard
Area where the coal extracted from a mine is stored to ensure a continuous supply to the thermal power plant.

conveyor
Materials-handling device that consists of a conveyor belt (sturdy belt on rollers) that carries coal to the crusher.

belt loader
Movable materials-handling device that is fitted with an inclined conveyor belt; it is used mainly to raise loads.

crusher
Device that pulverizes the coal carried by the conveyor belt into relatively fine fragments.

pulverizer
Device that pulverizes coal into a very fine powder so that it burns more easily in the steam generator.

steam generator
Device that uses the heat produced from burning coal to convert water into steam; the steam powers the turbo-alternator unit.

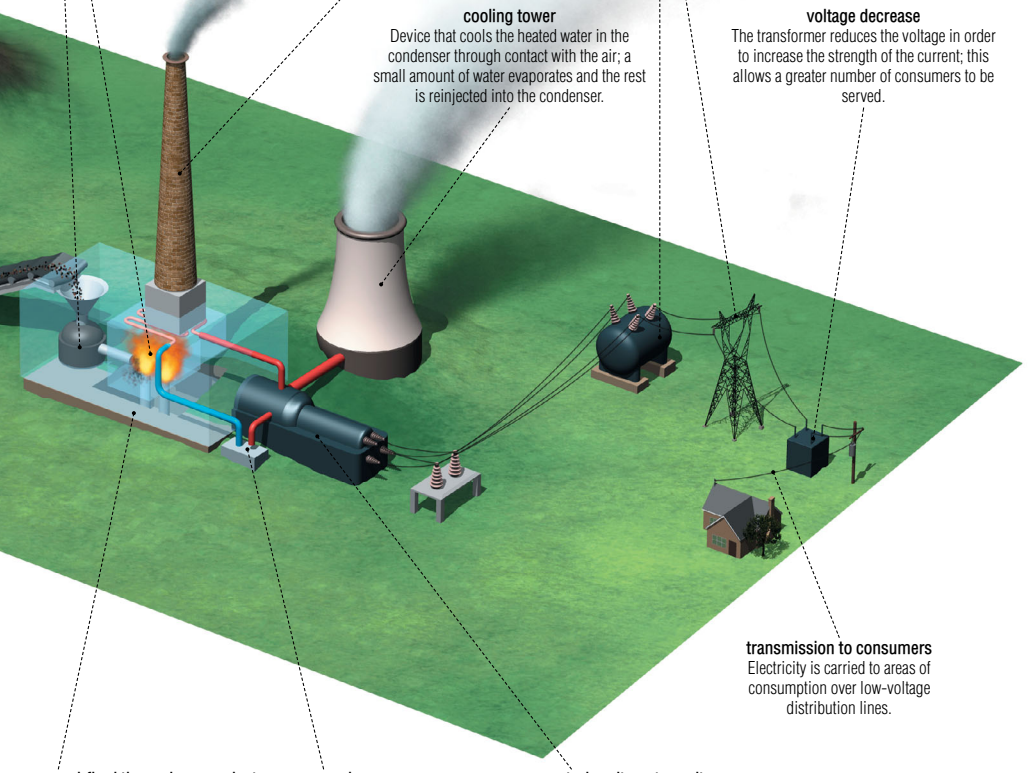
stack
Pipe through which gases produced by burning coal are discharged; these gases are first partially cleaned to reduce pollution.

cooling tower
Device that cools the heated water in the condenser through contact with the air; a small amount of water evaporates and the rest is reinjected into the condenser.

voltage increase
At the outlet end of the power plant, the transformer increases the voltage; this reduces energy losses during transmission over long distances.

high-tension electricity transmission
Using high-voltage lines to transmit electricity over long distances reduces the strength of the current and, as a result, energy losses.

voltage decrease
The transformer reduces the voltage in order to increase the strength of the current; this allows a greater number of consumers to be served.



transmission to consumers
Electricity is carried to areas of consumption over low-voltage distribution lines.

coal-fired thermal power plant
Plant that produces electricity from thermal energy by burning coal.

condenser
Circuit that cools the steam from the turbine and condenses it into water, which is reintroduced into the steam generator.

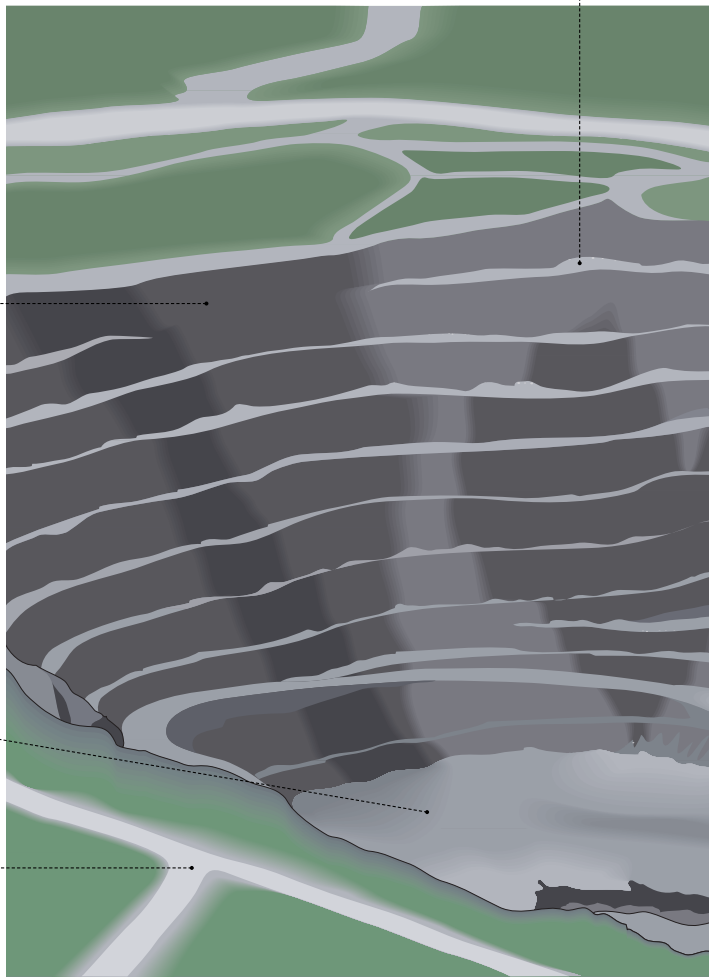
turbo-alternator unit
Device with a turbine that transmits the water's mechanical energy to the alternator's rotor to make it turn to produce electricity.

coal mine

The underground or open-pit facilities that are set up around a coal deposit in order to extract it.

open-pit mine
Type of mining that is used for shallow deposits; coal or ore is extracted by digging a succession of benches from the surface of the ground downward.

bench
The levels of a quarry that are arranged like steps of a staircase and from which coal or ore is extracted.



face
Vertical surface created by dynamiting a deposit to extract its ore.

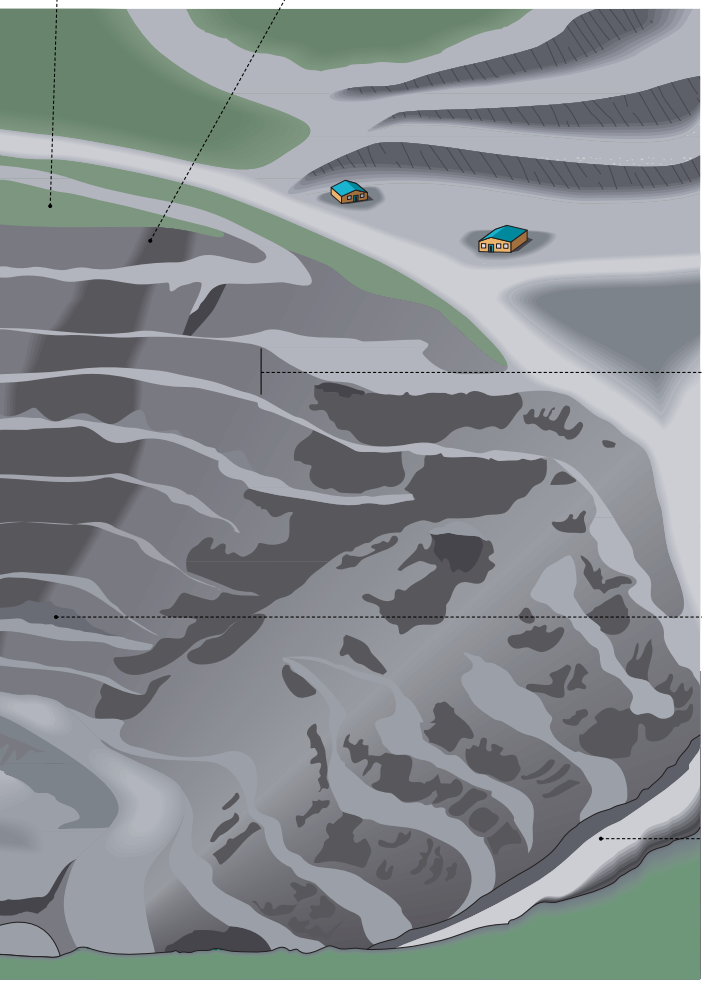
crater
Depression that forms the bottom of the quarry; it is a result of the extraction of deposits.

haulage road
Access road leading to the quarry; it is used to haul coal to the treatment plant.

coal mine

ground surface
The land that covers the deposit.

overburden
Part of the ground that covers the ore beds; it is removed to reach the deposit.



bench height
Vertical distance between the horizontal planes of two benches.

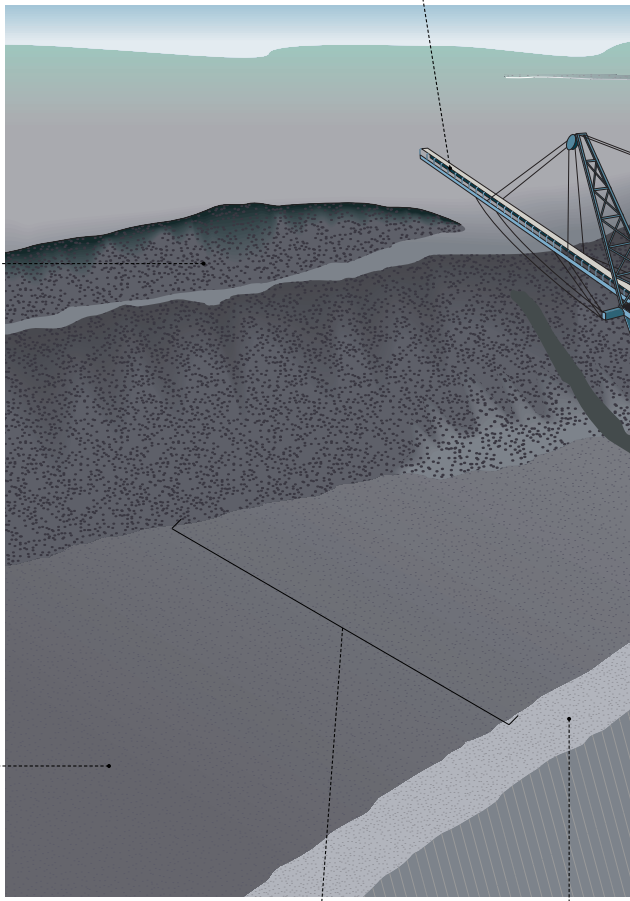
ore
Solid fossil fuel that is black and contains a large amount of carbon.

ramp
Roadway between two benches; it is inclined so that motorized vehicles can remove the ore extracted from the various levels.

coal mine

strip mine
Type of mining that is used especially for large shallow deposits; coal or ore is extracted by digging a trench in the ground surface.

conveyor
Materials-handling device that consists of a conveyor belt (sturdy belt on rollers) that is used to transport coal extracted from the mine.



dump
Pile that is made up of residue from mining operations.

roof
Geologic stratum that covers the ore seam; it is of more recent formation than the ore.

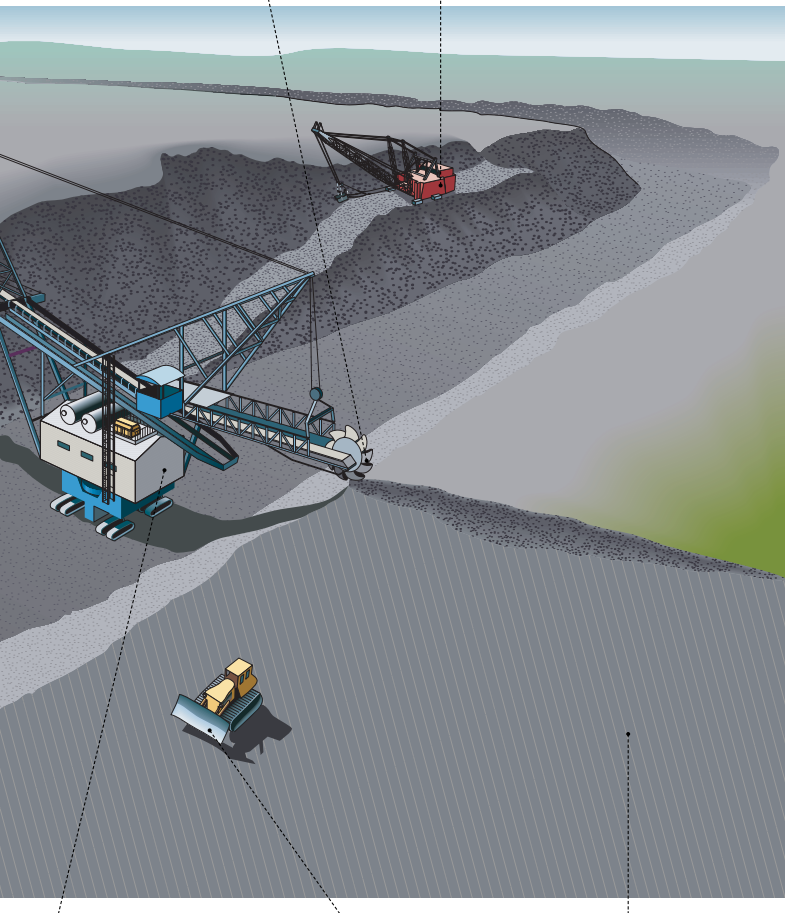
trench
Lengthwise excavation that is made down to the top of the ore layer in order to extract its coal.

face
Part of the quarry that is being excavated and from which ore is progressively extracted.

coal mine

bucket wheel excavator
Earthmover that consists of a wheel fitted with buckets (scoops); it is used to dig into rock to extract materials, which are then dumped onto a conveyor.

mechanical shovel
Earthmover that consists of a movable cab with an articulated arm fitted with a bucket (scoop); it is used for digging and handling loads.



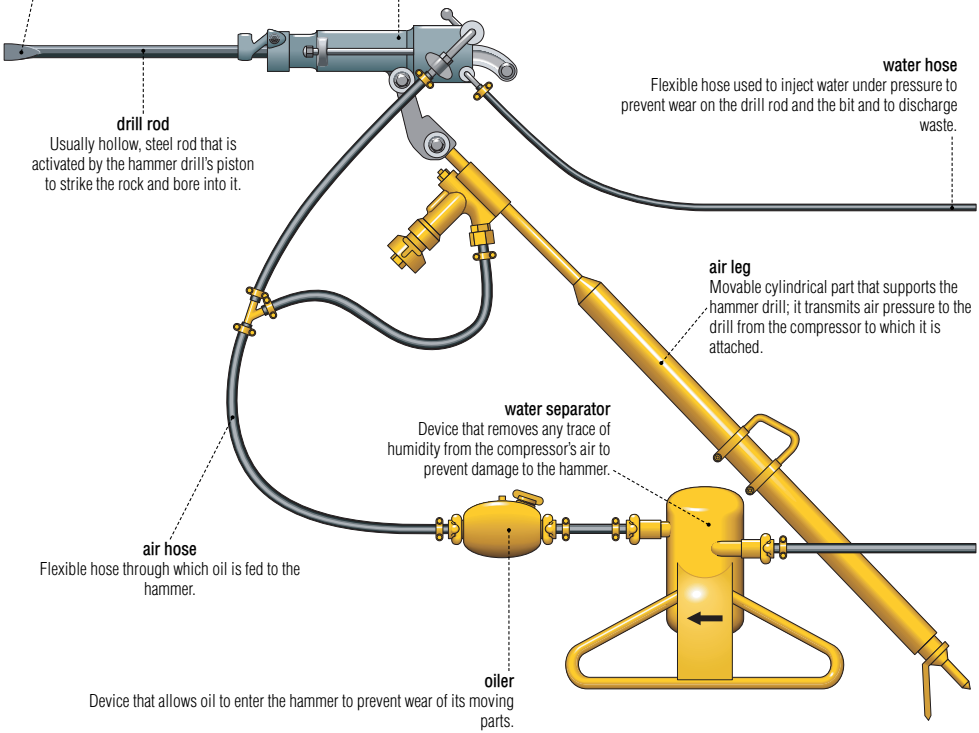
belt loader
Movable materials-handling device that is fitted with an inclined conveyor belt; it is used mainly to raise loads.

bulldozer
Excavation machine for pushing materials; it is made up of a crawler tractor, a blade and often a ripper.

overburden
Part of the ground that covers the ore beds; it is removed to reach the deposit.

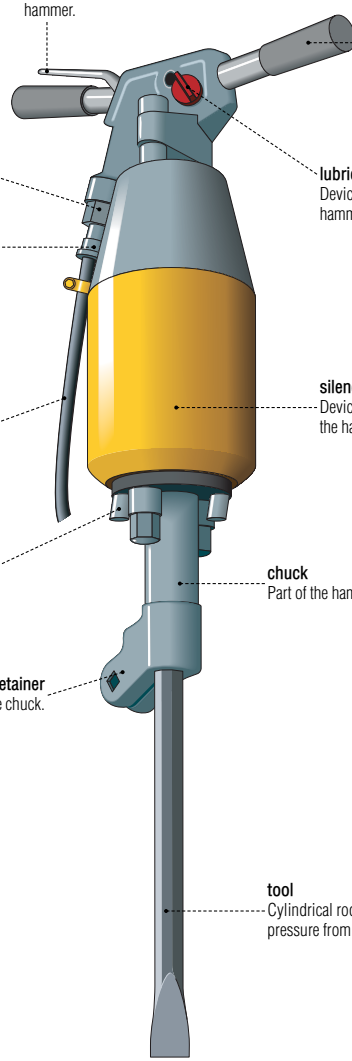
coal mine

jackleg drill
Percussive tool that is powered by compressed air; it is used to bore holes into hard rock. The air leg makes the job easier for the drill operator.



pneumatic hammer
Percussive tool that is powered by compressed air; with the help of a piston, it activates a tool, which breaks through very hard matter such as rock and concrete.

control lever
Grip used to operate the hammer; the lever opens the throttle valve so that air can enter the hammer.



handle
The two elements that allow a worker to manipulate the hammer.

throttle valve
Movable part that is opened by the control lever to let compressed air into the hammer.

lubricator
Device that automatically oils the various parts of the hammer to prevent wear.

flexible hose connection
Fastening device with a metal part that accepts the flexible hose so that compressed air can enter the hammer.

silencer
Device that lessens the noise caused when air exits the hammer.

flexible hose
Flexible hose through which compressed air from the compressor it is attached to enters the hammer.

exhaust port
Opening through which compressed air is expelled from the pneumatic hammer.

chuck
Part of the hammer to which the tool is fastened.

retainer
Device that holds the tool in place in the chuck.

tool
Cylindrical rod that is set in motion by compressed air pressure from the hammer; it is used to break hard surfaces.

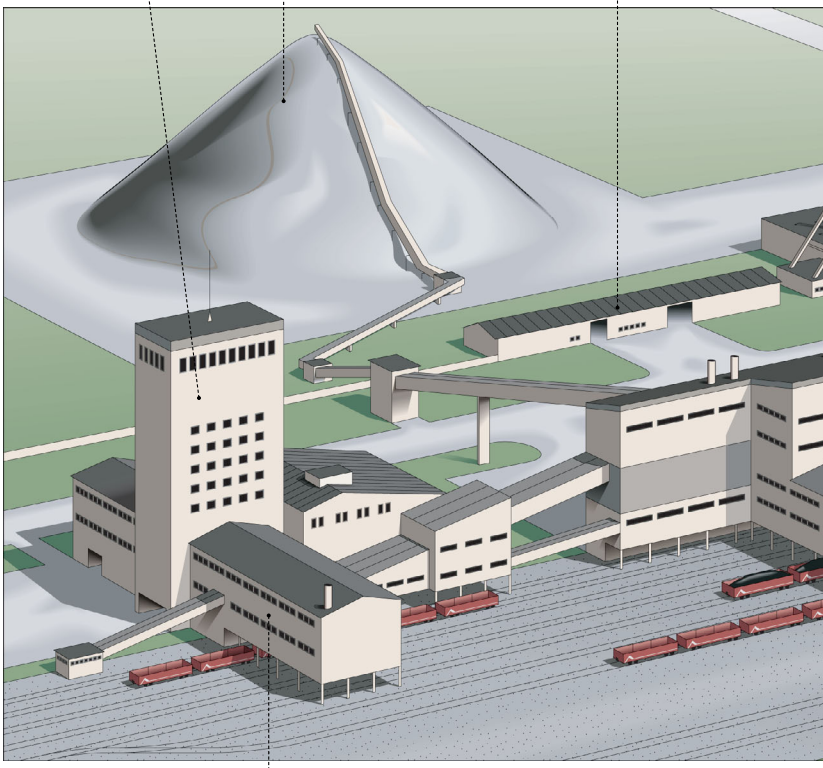
coal mine

pithead
The surface facilities needed for underground mining (including extraction machinery, storage areas and offices).

main fan
Device that ensures air exchange in the mine; air is drawn through one shaft and exits through another.

dump
Pile that is made up of residue from mining operations.

maintenance shop
Work area where machinery is maintained and repaired.



loading bunker
Reservoir where processed coal is stored before being loaded onto freight cars to be transported by rail to the power plant.

coal mine

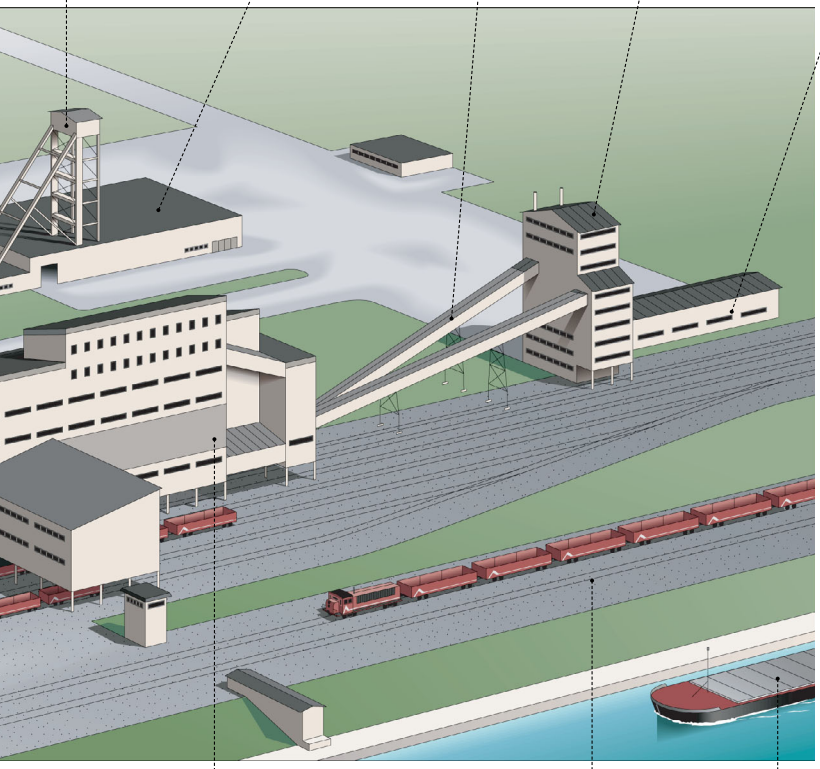
headframe
Opening at the top of the shaft that connects the aboveground facilities (including ventilation fans and hoists) to the underground areas being mined.

miners' changing-room
Area with sanitary facilities (showers, toilets) where miners can go mainly to change their clothes.

winding tower
Building that houses the shaft's hoisting equipment (including motors and hoisting cables); it provides communication between the surface and the mine galleries.

conveyor
Materials-handling device that consists of a conveyor belt (sturdy belt on rollers); it is used to carry coal to the treatment plant.

hoist room
Area that houses the hoist (cylinder) on which the hoisting cables are wound; it controls movement of the elevators and skip hoists in the shaft.



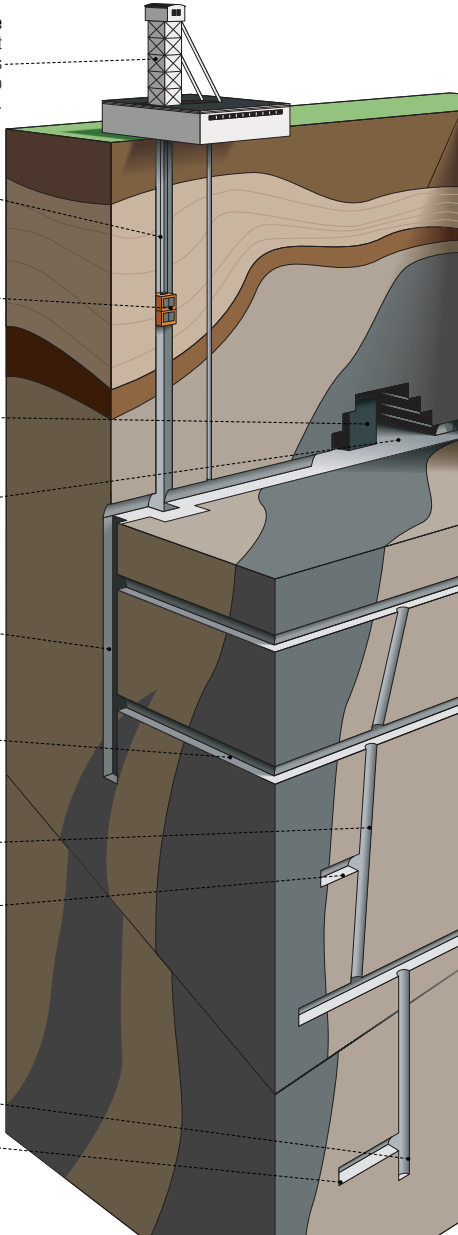
treatment plant
Place where all processing activities (including crushing and washing) are carried out to prepare the coal for market.

rail track
The tracks formed of two parallel rails on which trains travel to transport coal.

maritime transport
Means of transport that uses barges to transport coal over water.

coal mine

underground mine
Property in which excavations are carried out to extract deeply embedded (between 30 and 11,500 ft) coal for industrial mining.



headframe
Opening at the top of the shaft that connects the aboveground facilities (including ventilation fans and hoists) to the underground areas being mined.

vertical shaft
Shaft that is dug perpendicular to the surface; it serves various levels and is used mainly to transport personnel, equipment and ore.

elevator
Power lift fitted with a cab that transports coal or miners between the various levels.

pillar
Mass of ore that is left unmined at regular intervals in an excavation (chamber); it provides stability for the upper layers.

room
Cavity that remains after the ore is extracted; pillars support its roof.

chute
Vertical or inclined passageway through which ore, equipment, personnel and air move from one level of the mine to the other.

cross cut
Horizontal passageway that cuts through the ore bed perpendicularly; it provides communication between the passageways and helps to ventilate the mine.

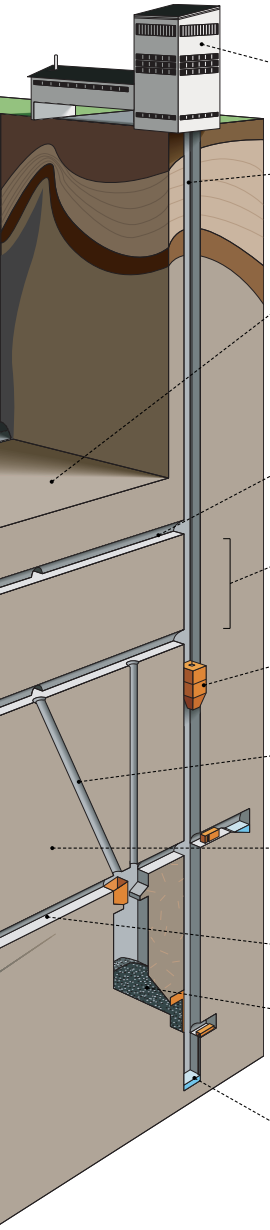
manway
Passageway allowing workers to move around in the mine.

drift
Passageway dug horizontally along the grade line of the ore seam; it can also be dug into the ore vertically.

winze
Vertical or inclined passageway that connects two levels; it is dug downward from inside the mine and not from the surface.

face
Opening that is dug laterally into the rock as coal is extracted.

coal mine



winding tower
Building that houses the shaft's hoisting equipment (including motors and hoisting cables); it provides communication between the surface and the mine galleries.

winding shaft
Shaft that is dug vertically into the ground; coal is removed from the mine through it using hoisting machinery.

level
The horizontal passageways that branch off from the shaft at the same depth; they are usually at regular intervals.

top road
Horizontal passageway that serves the highest level of a panel.

deck
Extraction layer between two levels; mining is usually done in stages and in descending order.

skip
Elevator consisting of a skip bucket that is activated by a hoist; it is used to bring coal and people to the surface.

ore pass
Inclined route that takes coal to a lower level; coal that falls on the mine floor is usually crushed before being brought to the surface.

panel
Unit of rock that is being mined; it is contained between vertical and horizontal planes and is demarcated by various passageways.

bottom road
Horizontal passageway that serves the base of a panel.

landing
Landing located around a shaft on each level; coal is collected here before being moved to the surface.

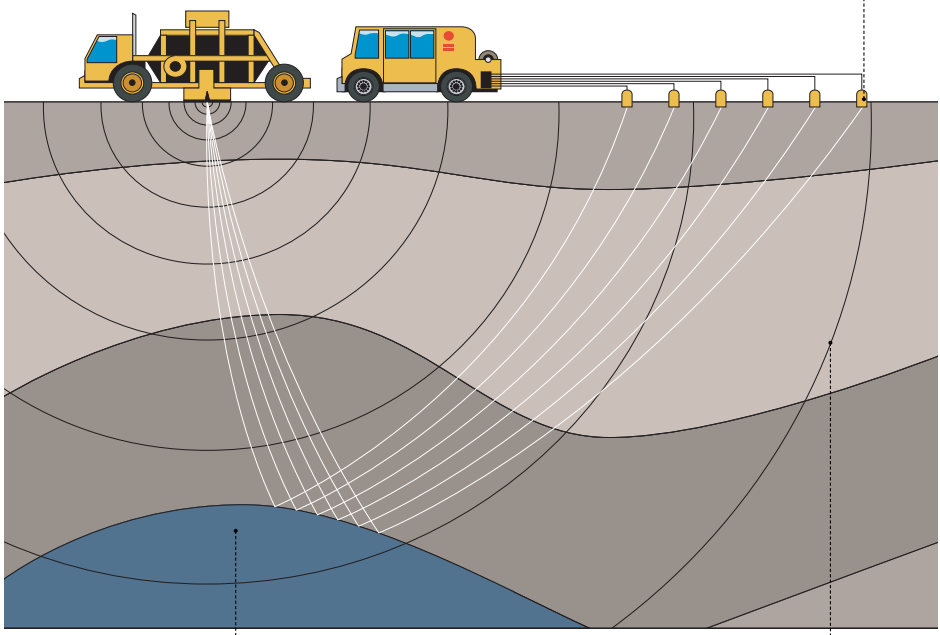
sump
Bottom of the shaft in which water runoff accumulates inside the mine before being pumped to the surface.

oil

Flammable, relatively viscous oily liquid that is used as an energy source; it is made up of various hydrocarbons resulting from the decomposition of plant life over millions of year.

surface prospecting
Searching for potential oil deposits by studying the structure of the subsoil using a seismograph.

seismographic recording
A recording made using an apparatus called a seismograph; the analysis of its shock wave echoes detects the presence of rock layers that might contain pockets of petroleum or gas.

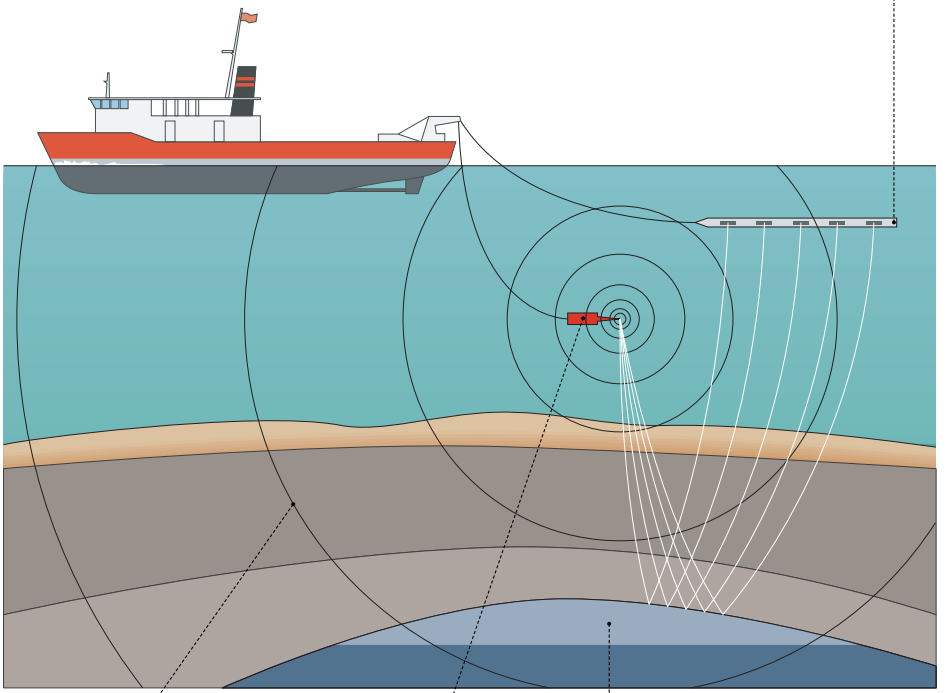


petroleum trap
Assemblage of porous rocks that contain recoverable oil reserves, which are produced from marine or land deposits.

shock wave
The shock wave spreads and sends back an echo, which varies with the density and depth of the layers of subsoil; with this information, the composition of the subsoil can be determined.

offshore prospecting
Vibrations from an exploding charge in the sea are used to locate oil deposits; prospecting offshore is more difficult than on land.

seismographic recording
A recording made using an apparatus called a seismograph; the analysis of its shock wave echoes detects the presence of rock layers that might contain pockets of petroleum or gas.

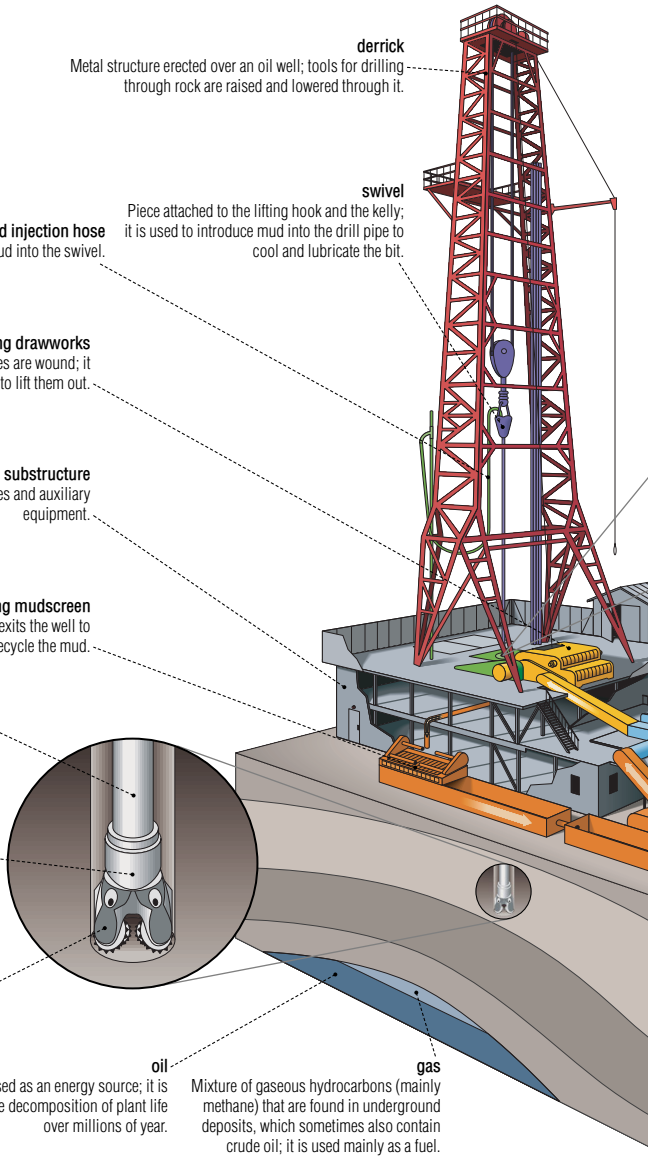


shock wave
The shock wave spreads and sends back an echo, which varies with the density and depth of the layers of subsoil; with this information, the composition of the subsoil can be determined.

blasting charge
Quantity of explosives (substances capable of discharging high-temperature gases over a very short time period) that produce shock waves when detonated.

petroleum trap
Assemblage of porous rocks that contain recoverable oil reserves, which are produced from marine or land deposits.

drilling rig
All the drilling machinery and devices that are used to excavate and extract oil from the ground.



derrick
Metal structure erected over an oil well; tools for drilling through rock are raised and lowered through it.

swivel
Piece attached to the lifting hook and the kelly; it is used to introduce mud into the drill pipe to cool and lubricate the bit.

mud injection hose
Flexible hose that introduces the drilling mud into the swivel.

drilling drawworks
Device that consists of a cylinder on which hoisting cables are wound; it is used to lower the drill pipes and bit into the well and to lift them out.

substructure
Metal infrastructure that supports the derrick, engines and auxiliary equipment.

vibrating mudscreen
Perforated vibrating tray that is used to filter mud as it exits the well to remove debris and recycle the mud.

drill pipe
Hollow steel rods that are joined together according to the depth of the excavation; their rotation activates the bit.

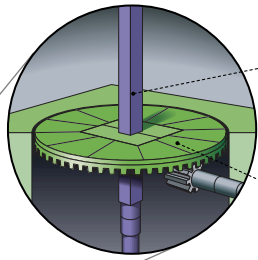
drill collar
Heavy steel tube immediately above the bit that applies a certain weight to the bit to help it cut into the rock.

bit
Rotating drill bit with toothed steel or diamond wheels; it bores into rock to break it up and drill a hole.

oil
Flammable, relatively viscous oily liquid that is used as an energy source; it is made up of various hydrocarbons resulting from the decomposition of plant life over millions of year.

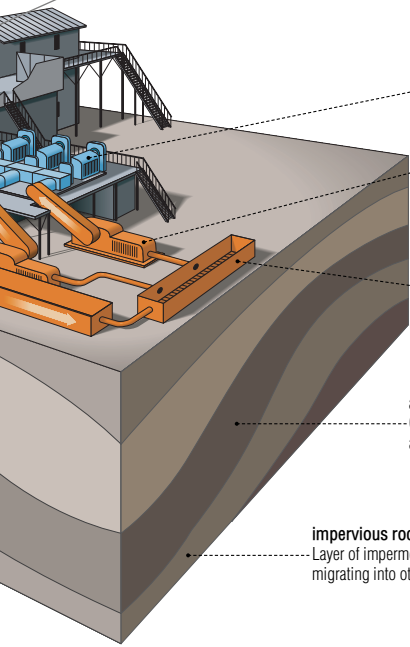
gas
Mixture of gaseous hydrocarbons (mainly methane) that are found in underground deposits, which sometimes also contain crude oil; it is used mainly as a fuel.

rotary system
Drilling device in which a kelly is attached to a rotary table; with the help of powerful motors, it transmits the rotative movement to the kellys.



kelly
Special square rod that is screwed to the top of the drill pipes and driven by the rotary table.

rotary table
Circular table that is moved by powerful motors; it transmits its rotative movement to the drill pipes by means of the kelly.



engine
Device converting the combustion of fuel and air into mechanical energy.

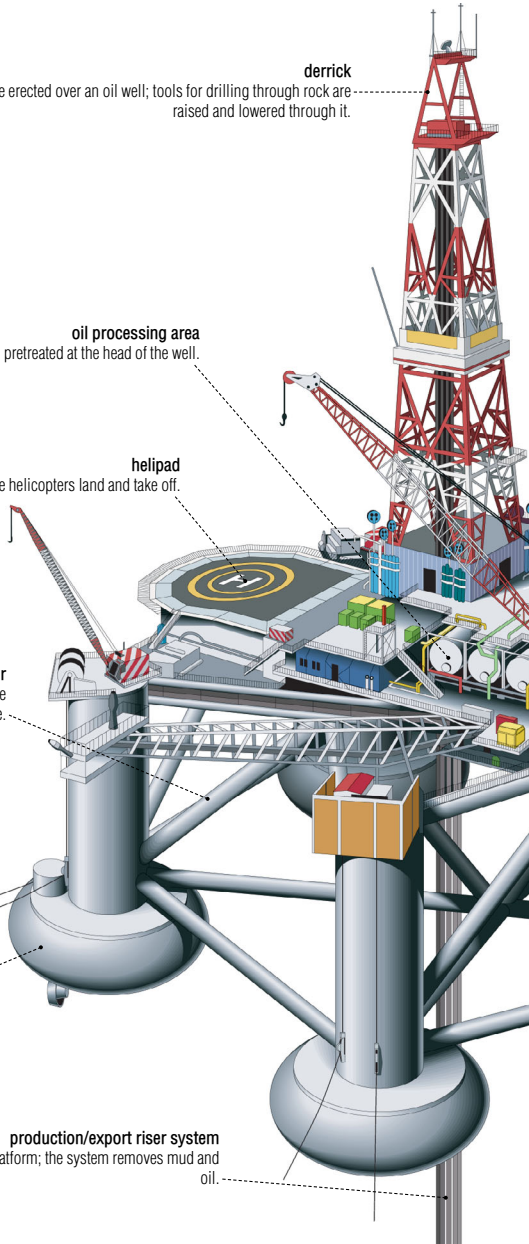
mud pump
Device that circulates the mud in the drilling rig.

mud pit
Basin that contains mud (a mixture of water, clay and chemical products) used mainly to cool and lubricate the bit and to remove debris.

anticline
Geologic stratum that results from the convex folding of rock formations; large pools of oil often accumulate in it.

impervious rock
Layer of impermeable rock that covers and protects the oil deposit; it prevents hydrocarbons from migrating into other rocks.

production platform
Facility used to extract underwater oil deposits; the separation and treatment of hydrocarbons are mainly done here.



derrick
Metal structure erected over an oil well; tools for drilling through rock are raised and lowered through it.

oil processing area
Area where crude oil is pretreated at the head of the well.

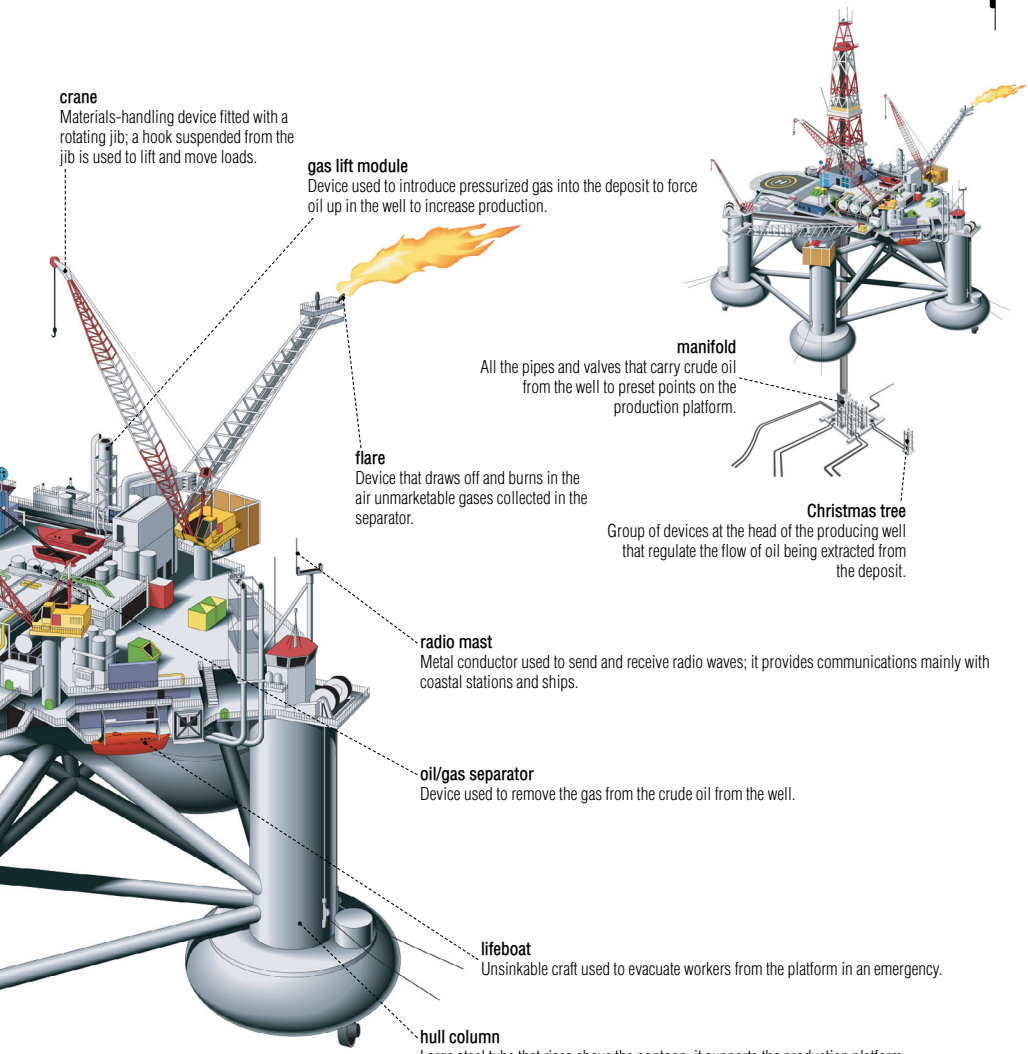
helipad
Site where helicopters land and take off.

tubular member
Steel tube that connects the platform's various hull columns to reinforce the structure.

anchor wires
They anchor the pontoon securely to the ocean floor to ensure the stability of the platform.

pontoon
Submerged floating caisson at the base of the hull column; seawater or oil are stored here to stabilize the platform.

production/export riser system
Vertical steel tubes that link the wellhead and the drilling platform; the system removes mud and oil.



crane
Materials-handling device fitted with a rotating jib; a hook suspended from the jib is used to lift and move loads.

gas lift module
Device used to introduce pressurized gas into the deposit to force oil up in the well to increase production.

flare
Device that draws off and burns in the air unmarketable gases collected in the separator.

manifold
All the pipes and valves that carry crude oil from the well to preset points on the production platform.

Christmas tree
Group of devices at the head of the producing well that regulate the flow of oil being extracted from the deposit.

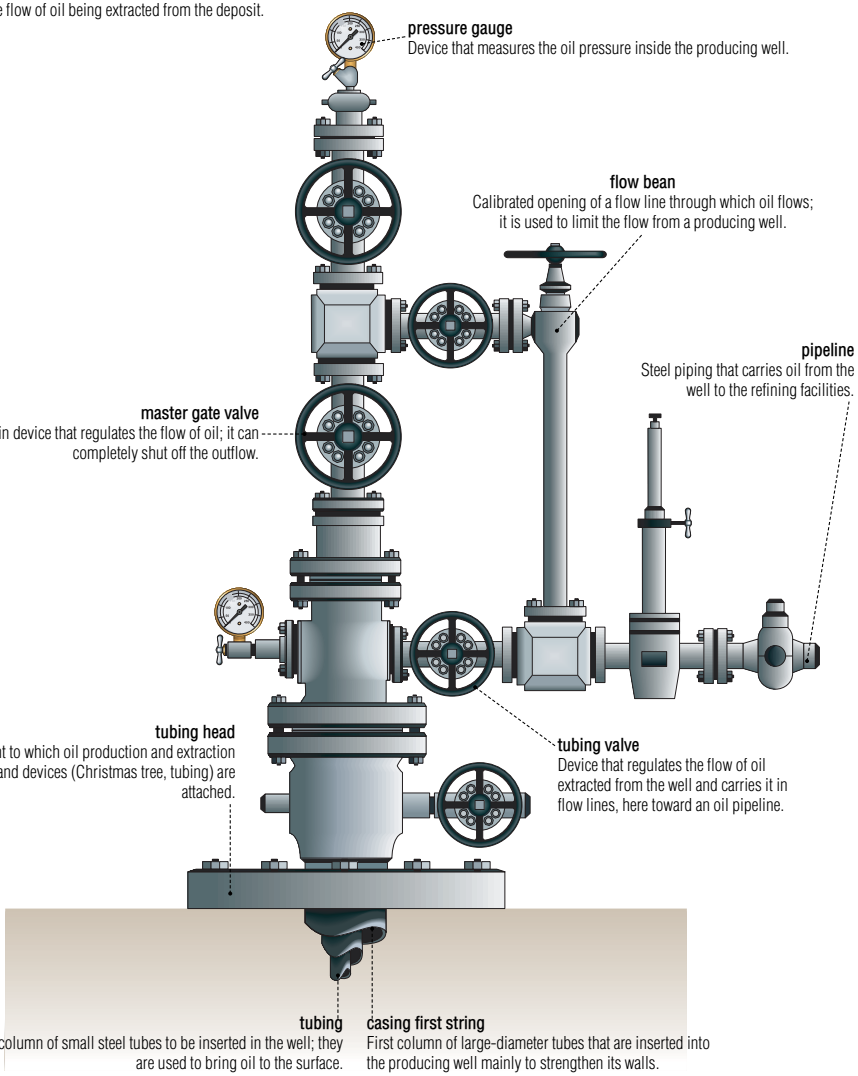
radio mast
Metal conductor used to send and receive radio waves; it provides communications mainly with coastal stations and ships.

oil/gas separator
Device used to remove the gas from the crude oil from the well.

lifeboat
Unsinkable craft used to evacuate workers from the platform in an emergency.

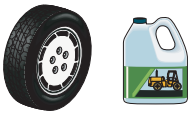
hull column
Large steel tube that rises above the pontoon; it supports the production platform above the surface of the water.

Christmas tree
Group of devices at the head of the producing well that regulate the flow of oil being extracted from the deposit.

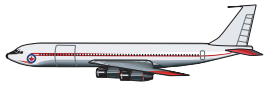


refinery products

Refining of crude oil yields hundreds of useful products.



petrochemicals
Chemical products derived from petroleum-based products; they are found in fertilizers, detergents, plastics and other products.



jet fuel
Aviation fuel used to power jet engines.

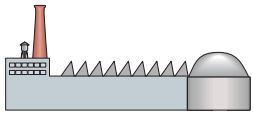
gasoline
Motor fuel that is used mainly by the automotive industry to power internal combustion engines.

kerosene
Fuel used for lighting and heating.

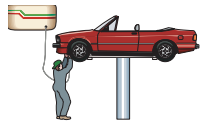
stove oil
Fuel used mainly in home furnaces.

diesel oil
Fuel used mainly by the transportation industry to power diesel engines.

heating oil
Fuel used in home heating systems and industrial installations requiring little energy.



bunker oil
Fuel used in high-powered heating systems and electric power plants; it is also used to power large diesel engines.



greases
Pasty substances made of mineral oil and soap; they are used by industry to lubricate mechanical parts.

lubricating oils
Viscous substances that are used mainly to reduce friction between two moving surfaces.

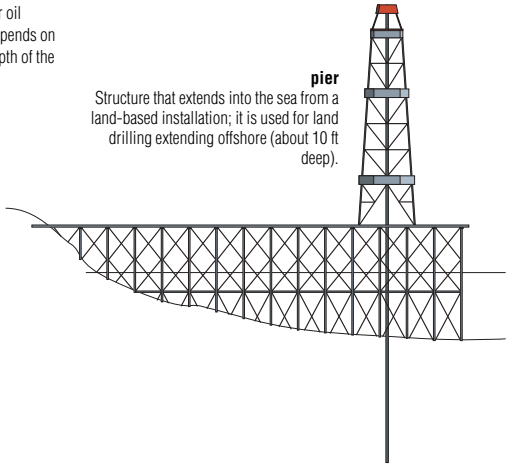
paraffins
Water-insoluble substances that have various uses; these include candle making, packaging and pharmaceutical products.

asphalt
Mixture of bitumen and other substances that is used mainly to pave roads.

offshore drilling

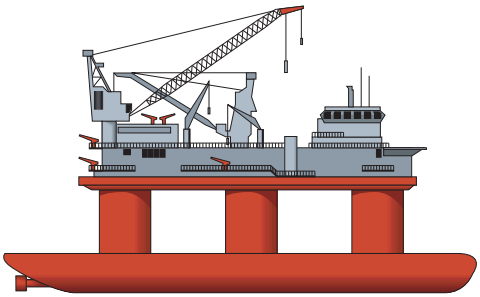
There are various types of underwater oil drilling installations; the one used depends on the location of the deposit and the depth of the water.

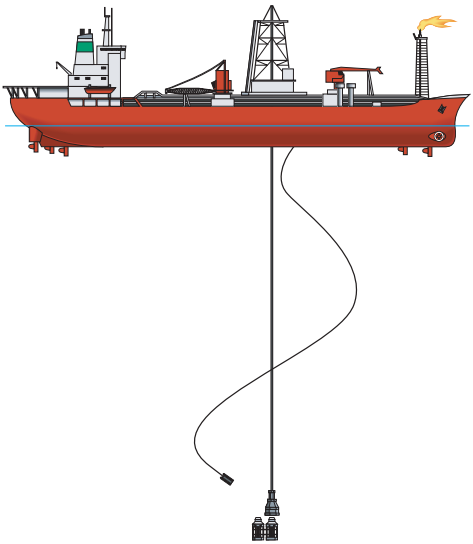
pier
Structure that extends into the sea from a land-based installation; it is used for land drilling extending offshore (about 10 ft deep).



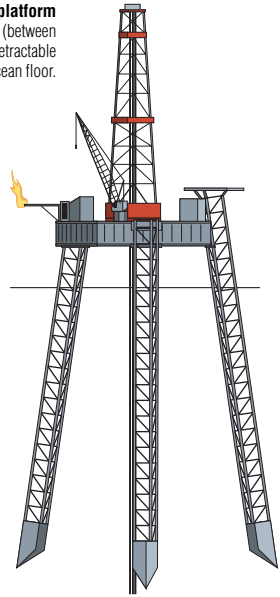
drill ship
Ship for drilling for oil in deep water (3,300 ft and more); it is more mobile but less stable than a semisubmersible or jack-up platform.

emergency support vessel
Floating structure equipped with specialized equipment; it is used for rescue operations on drilling rigs.

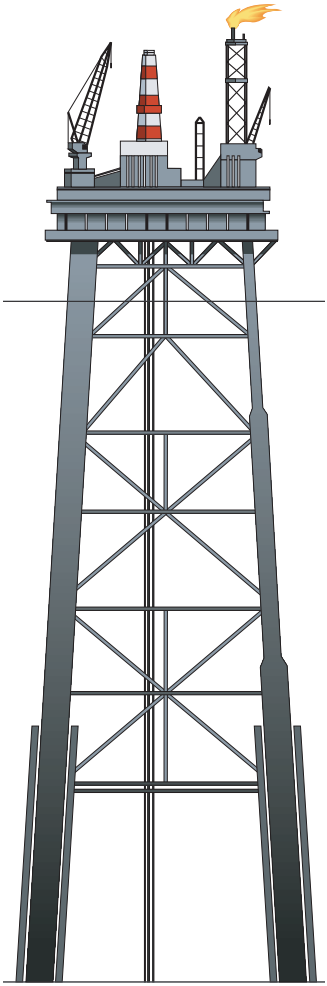




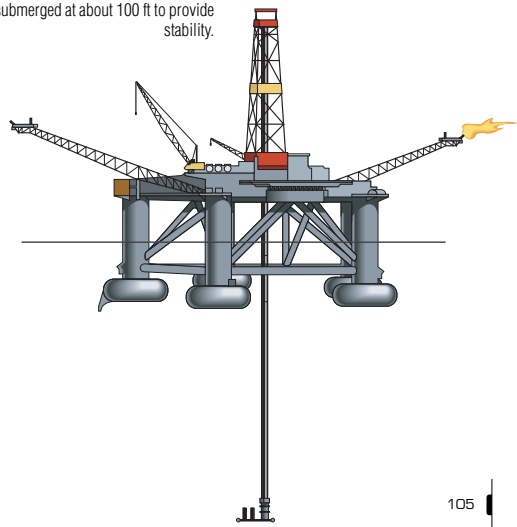
jack-up platform
Movable structure that is used in shallow water (between 65 and 330 ft); it is raised above sea level on retractable pillars resting on the ocean floor.



fixed platform
Structure that is mainly used at moderate depths (up to 1,300 ft); it rests on the seabed on pillars buried deep in the sea floor.



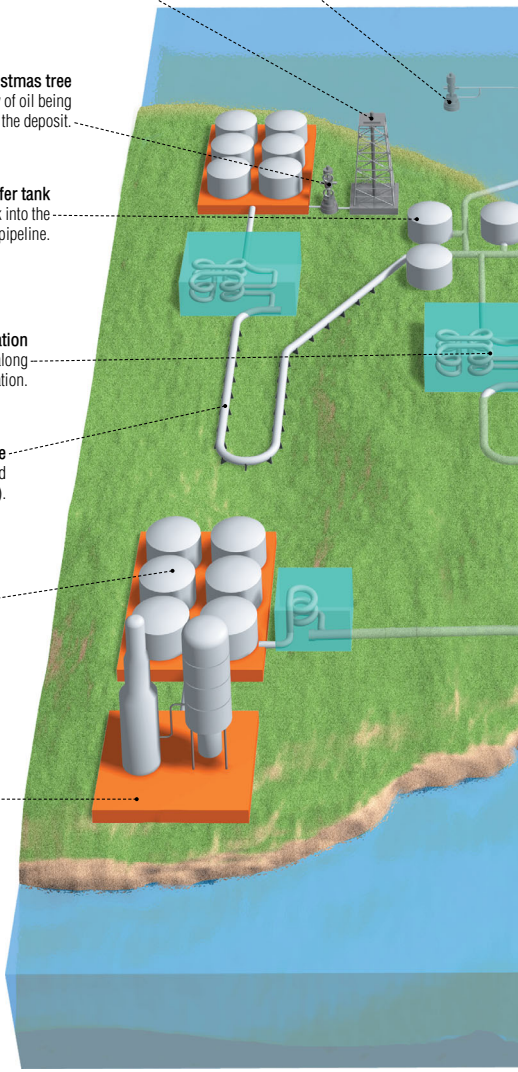
semisubmersible platform
Movable structure that is anchored to the seabed and used at depths of 350 to 1,650 ft; it is mounted on pontoons submerged at about 100 ft to provide stability.



crude-oil pipeline
Continuous underground, aboveground or underwater oil pipeline that can be thousands of miles long (the Trans-Siberian pipeline is 3,800 mi long).

derrick
Metal structure erected over an oil well; tools for drilling through rock are raised and lowered through it.

offshore well
Hole dug in the sea floor to extract oil deposits; equipment such as the Christmas tree rests on the seabed.



Christmas tree
Group of devices at the head of the producing well that regulate the flow of oil being extracted from the deposit.

buffer tank
Large container that stores crude oil temporarily before it is pumped back into the pipeline.

central pumping station
Powerful pumping station that maintains the pressure required to move the oil along the pipeline to the next pumping station.

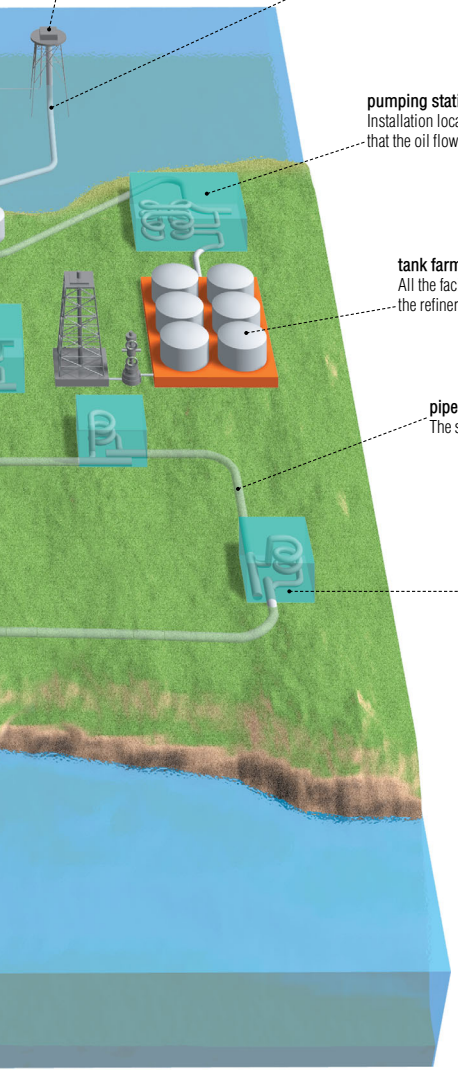
aboveground pipeline
Oil pipeline that rests on aboveground supports to protect it from frozen ground (e.g., the Alaska pipeline).

terminal
Facility located at the end of the pipeline that includes equipment such as tanks and pumps; it receives the crude oil before it is refined.

refinery
Plant in which crude oil is refined (separated and scrubbed) to obtain a broad range of finished products (including motor fuel and oils).

production platform
Facility used to extract underwater oil deposits; the separation and treatment of hydrocarbons are mainly done here.

submarine pipeline
Pipeline installed on the seabed that carries oil extracted from an underwater deposit to shore.



pumping station
Installation located at regular intervals along the pipeline that is fitted with motorized pumps; it ensures that the oil flows inside the pipeline.

tank farm
All the facilities (such as tanks and pumps) that store large quantities of crude oil to be sent later to the refinery.

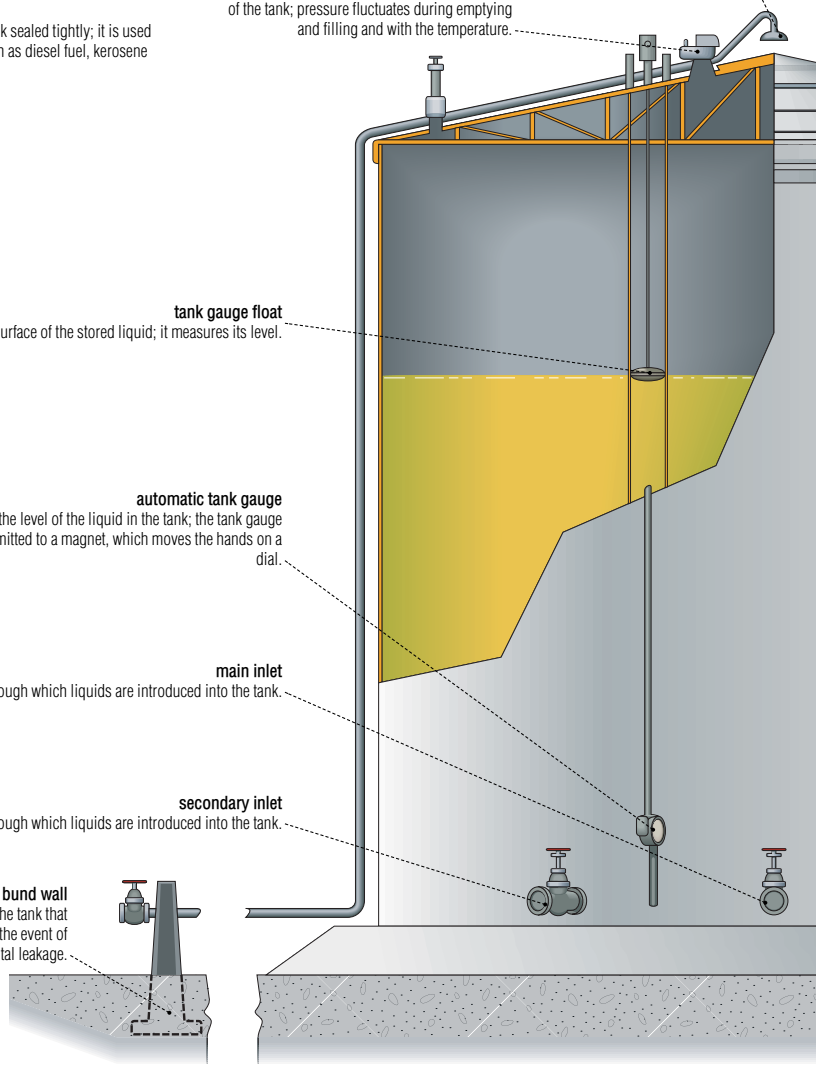
pipeline
The steel piping that carries oil from one treatment facility to another.

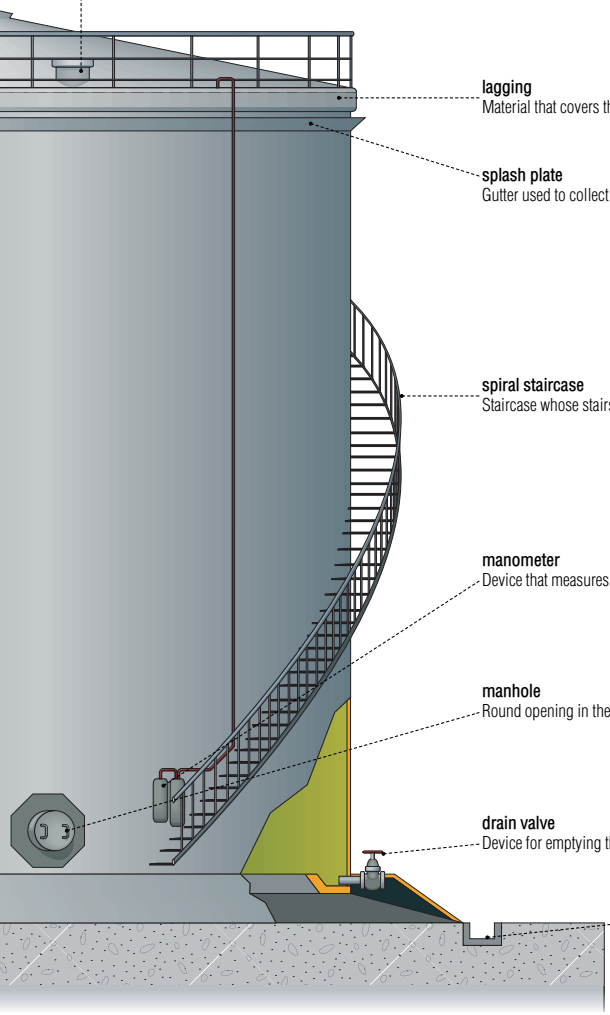
intermediate booster station
Booster station that reinforces the action of the central station and maintains the flow of oil in the pipeline network.

tanks

Large covered cylindrical containers that are usually made of steel; liquid or gaseous oil products are stored here between the time they are refined and sold.

fixed-roof tank
Fixed roof that keeps the tank sealed tightly; it is used to store heavy products such as diesel fuel, kerosene and asphalt.





manhole
Round opening in the tank that is covered with a plate; workers can pass through it.

lagging
Material that covers the wall of the tank to keep it watertight and prevent corrosion.

splash plate
Gutter used to collect water draining from the roof.

spiral staircase
Staircase whose stairs wind around the wall of the tank to the roof.

manometer
Device that measures the pressure of the product inside the tank.

manhole
Round opening in the tank that is covered with a plate; workers can pass through it.

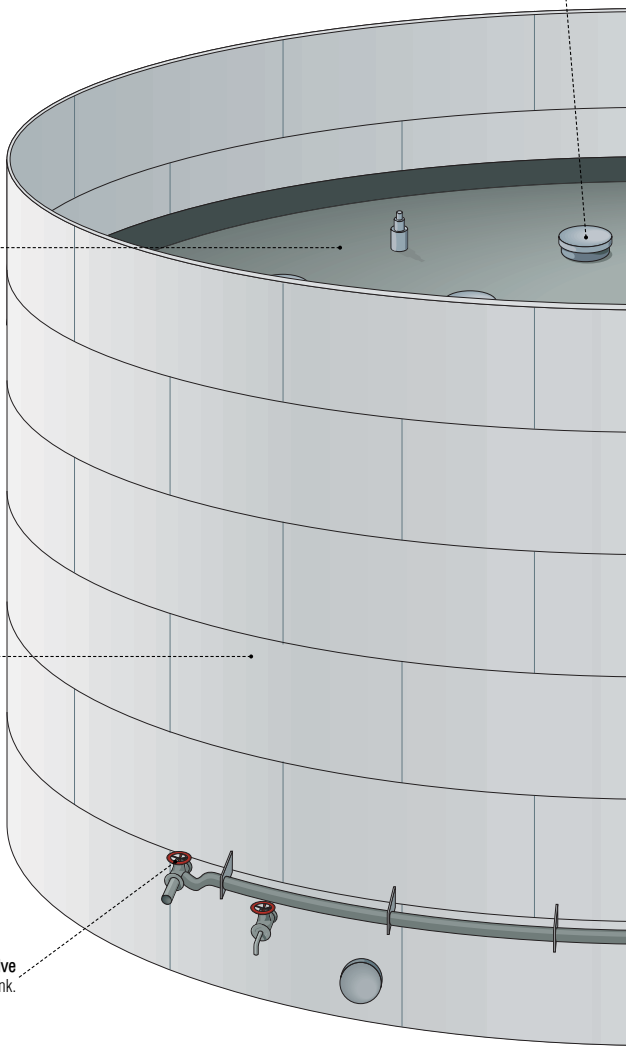
drain valve
Device for emptying the liquid from the tank.

concrete drain
Small concrete trench used to drain off the product in the event of a spill or when the tank is emptied.

floating-roof tank
Tank whose floating roof rests directly on the surface of the liquid to minimize the evaporation of hydrocarbons; it is used to store the most volatile products.

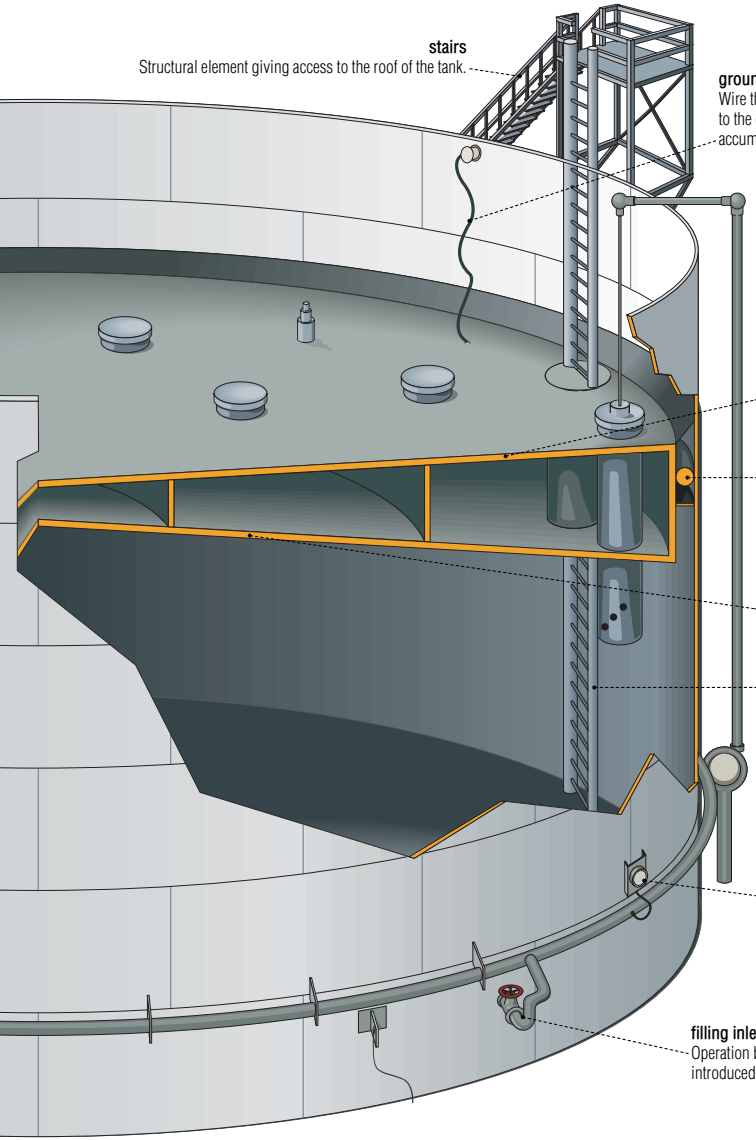
manhole
Round opening in the tank that is covered with a plate; workers can pass through it.

floating roof
Metal cover that rests on the surface of the stored liquid; it fluctuates with the level of the fluid and slides vertically inside the shell.



shell
Vertical cylindrical wall of the tank.

drain valve
Device for emptying the liquid from the tank.



stairs
Structural element giving access to the roof of the tank.

ground
Wire that connects the tank and its contents to the ground to prevent static electricity from accumulating and avoid the risk of fire.

top deck
Upper part of the roof; the space between the top and bottom decks is used to contain evaporated hydrocarbons.

sealing ring
Part that fills the space between the roof and the shell to prevent any hydrocarbons from evaporating and polluting the atmosphere.

bottom deck
Lower part of the roof; it rests directly on the surface of the stored liquid.

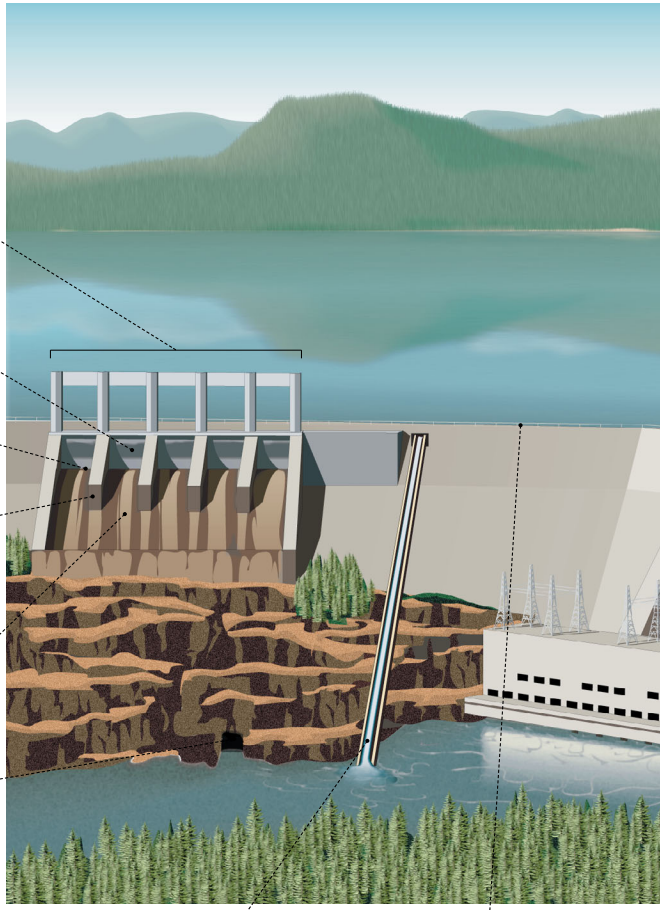
ladder
Movable device that consists of rungs (crossbars); it is used to climb up and down.

thermometer
Device that sets and controls the temperature of the product inside the tank.

filling inlet
Operation by which a liquid product is introduced into the tank.

hydroelectric complex

The reservoir structures and installations that use water power to produce electricity.



spillway
Channel that discharges excess water from the reservoir during flooding to avoid submerging the dam.

spillway gate
Movable vertical panel; it is opened to allow the reservoir's overflow to pass through.

crest of spillway
Cement crest over which the reservoir's overflow discharges when the spillway gates are opened.

training wall
Wall that separates the spillway chutes; it is used to direct the water flow.

spillway chute
Inclined surface along which discharged water flows out.

diversion tunnel
Underground conduit that diverts water during construction.

log chute
Structure that allows floating wood to travel from upstream to downstream of the dam.

top of dam
Upper part of the dam; it rises above the water level of the reservoir by several yards.

hydroelectric complex

reservoir
Basin formed by the construction of a dam; it holds back a very large volume of water so that the flow rate can be controlled.

headbay
Part of the reservoir immediately in front of the dam where the current originates.

gantry crane
Hoisting device in the form of a bridge; it moves along rails.

dam
Barrier built across a watercourse in order to build up a supply of water for use as an energy source.

penstock
Channel that carries water under pressure to the power plant's turbines.

bushing
Device that allows the conductor to pass through the wall of the transformer and separates it from the latter.

control room
Area that contains the various control and monitoring devices required for the production of electricity.

afterbay
Area of the watercourse where water is discharged after passing through the turbines.

power plant
Plant that uses an energy source, here water, and converts it into electricity.

machine hall
Area that houses the generator units used to produce electricity.

hydroelectric complex

cross section of a hydroelectric power plant
Hydroelectric power plant: plant that produces electricity from energy generated by flowing water.

gantry crane
Hoisting device in the form of a bridge; it moves along rails.

transformer
Device used to alter the electric voltage; voltage is increased as the current leaves the power plant so that it can be carried over long distances.

circuit breaker
Mechanism automatically cutting off the power supply in the event of overload.

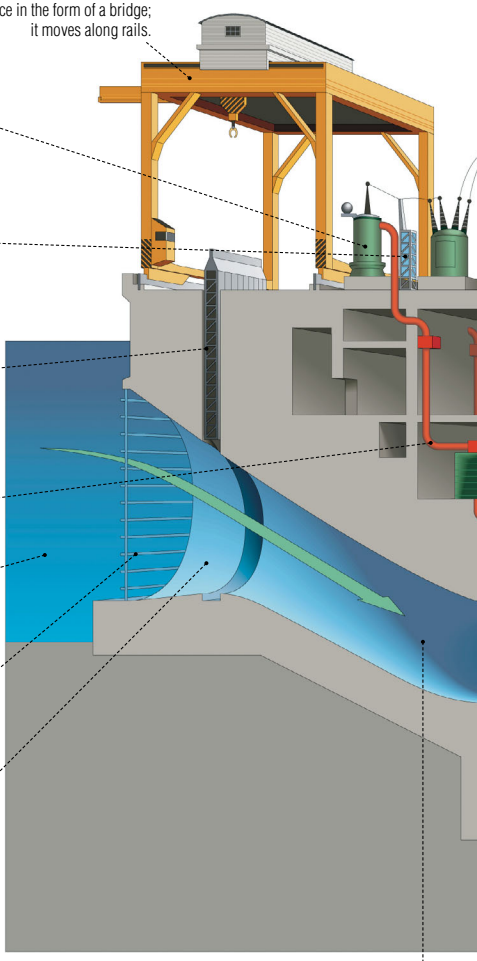
gate
Movable vertical panel that controls the volume of water in the penstock.

busbar
Large aluminum conductor that transmits electric current from the alternator to the transformer.

reservoir
Basin formed by the construction of a dam; it holds back a very large volume of water so that the flow rate can be controlled.

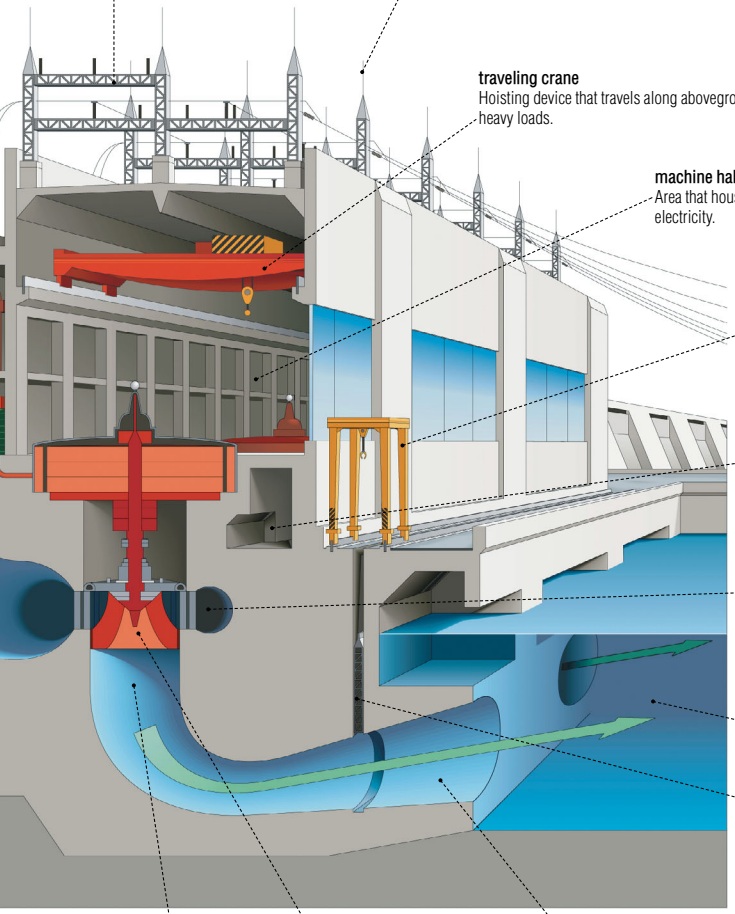
screen
Assembly of bars placed in front of the water intake to hold back anything that could hinder the operation of the turbine.

water intake
Structure that directs water from the headbay to the penstock to power the plant.



penstock
Channel that carries water under pressure to the power plant's turbines.

hydroelectric complex



bushing
Device that allows the conductor to pass through the wall of the transformer and separates it from the latter.

lightning arrester
Device that protects the electric facilities from power surges caused by lightning.

traveling crane
Hoisting device that travels along aboveground parallel rails; it is used to lift and carry heavy loads.

machine hall
Area that houses the generator units used to produce electricity.

gantry crane
Hoisting device in the form of a bridge; it moves along rails.

access gallery
Underground passageway that provides access to various parts of the dam so that it can be inspected and maintained.

scroll case
Duct shaped like a spiral staircase that is used to distribute water uniformly around the turbine to make it turn smoothly.

afterbay
Area of the watercourse where water is discharged after passing through the turbines.

gate
Movable vertical panel that controls the discharge of water to the tailrace.

draft tube
Conduit at the base of the turbine that increases the runner's output by reducing the pressure of the water as it exits.

generator unit
Device with a turbine that transmits the water's mechanical energy to the generator's rotor to make it turn to produce electricity.

tailrace
Channel that discharges water toward the afterbay in order to return it to the watercourse.

generator unit

Device with a turbine that transmits the water's mechanical energy to the generator's rotor to make it turn to produce electricity.

rotor
Movable part of the generator that is made up of electromagnets; its rotation induces an electric current in the stator.

thrust bearing
Unit that bears the thrust of the turbine and the weight of the rotating parts of the generator unit.

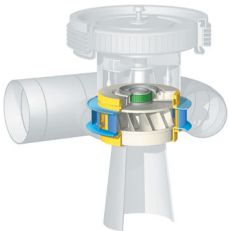
turbine headcover
Structure that covers the upper part of the turbine's runner.

spiral case
Duct shaped like a spiral staircase that is used to distribute water uniformly around the turbine to make it turn smoothly.

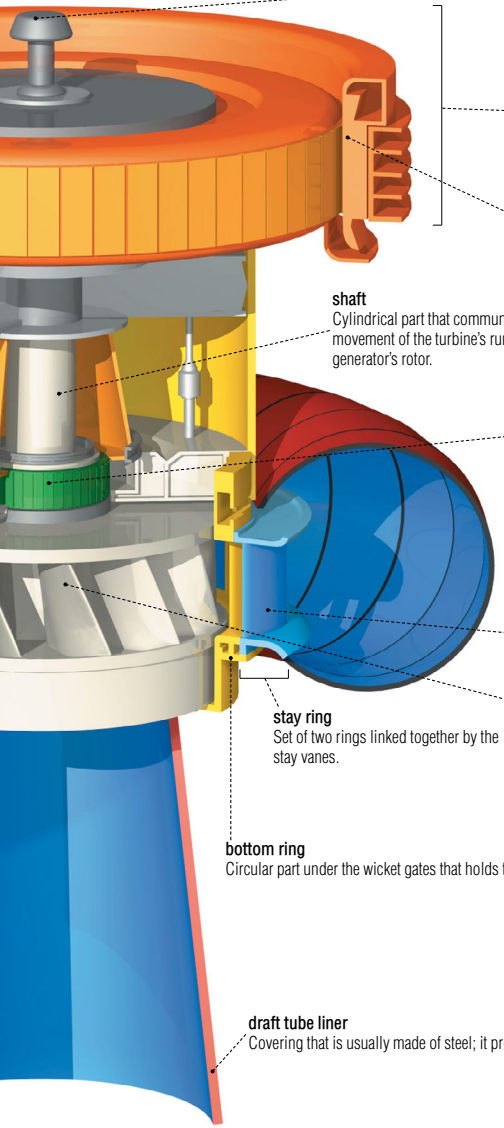
wicket gate
Movable panel that regulates the flow of water entering the turbine to ensure a constant rotational speed of the runner.

runner
Movable part of the turbine that transmits the movement of the water to the shaft to which it is attached to turn the rotor.

draft tube
Conduit at the base of the turbine that increases the runner's output by reducing the pressure of the water as it exits.



hydraulic turbine
Machine whose runner is powered by water; it transmits mechanical energy to the rotor to make it turn.



exciter
Device that supplies electric current to the rotor's electromagnets.

generator
Machine that consists of a rotor and a stator; it produces an electric current.

stator
Stationary part of the generator that consists of a coil of copper conductors, which collects the electric current produced by the rotor.

shaft
Cylindrical part that communicates the movement of the turbine's runner to the generator's rotor.

gate operating ring
Movable device that controls the opening and closing of the wicket gates.

stay vane blade
Fixed panel that receives pressurized water from the spiral case and directs it over the wicket gates.

stay ring
Set of two rings linked together by the stay vanes.

runner blade
Stationary curved plate on the turbine's runner; it receives the thrust of the water to turn the runner.

bottom ring
Circular part under the wicket gates that holds them in place.

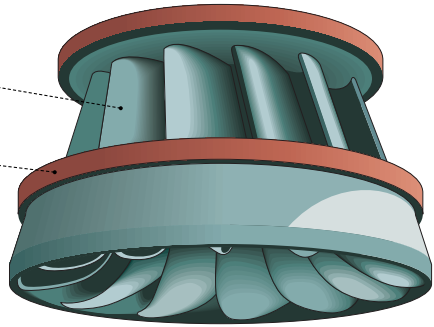
draft tube liner
Covering that is usually made of steel; it protects the draft tube from erosion.

runners
Movable parts of the turbine that transmit the movement of the water to the shaft to which they are attached to turn the rotor.

Francis runner
Most common type of runner that is suited to average heights of water (usually between 100 and 1,000 ft).

blade
Stationary curved plate on the turbine's runner; it receives the thrust of the water to turn the runner.

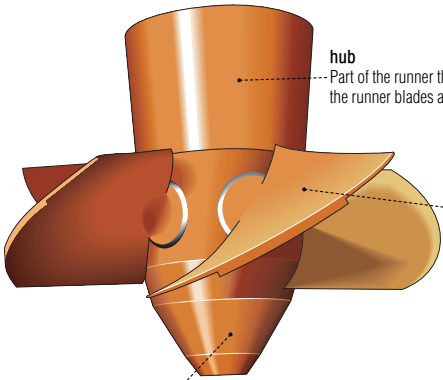
ring
Circular part that supports the wicket gates.



Kaplan runner
Type of runner that is suited to low heights of water (usually between 30 and 200 ft) and variable flow rates.

hub
Part of the runner that holds the shaft; the runner blades are attached to it.

runner blade
Movable part that is fixed to the hub of the runner; it turns through the action of water power on it.

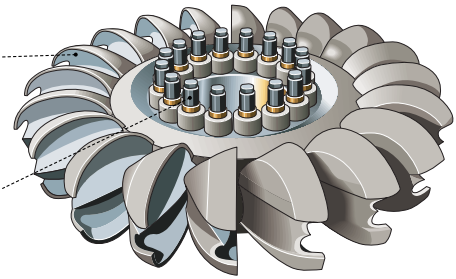


hub cover
Cover for the lower cone-shaped part of the hub.

Pelton runner
Type of runner that is suited to high water sources (usually over 1,000 ft) and low flow rates.

bucket
Small bucket that is attached to the turbine's runner; water enters it to turn the wheel.

coupling bolt
Element made up of a nut and a bolt that attaches the runner to the shaft plate to transmit its movement to the runner.



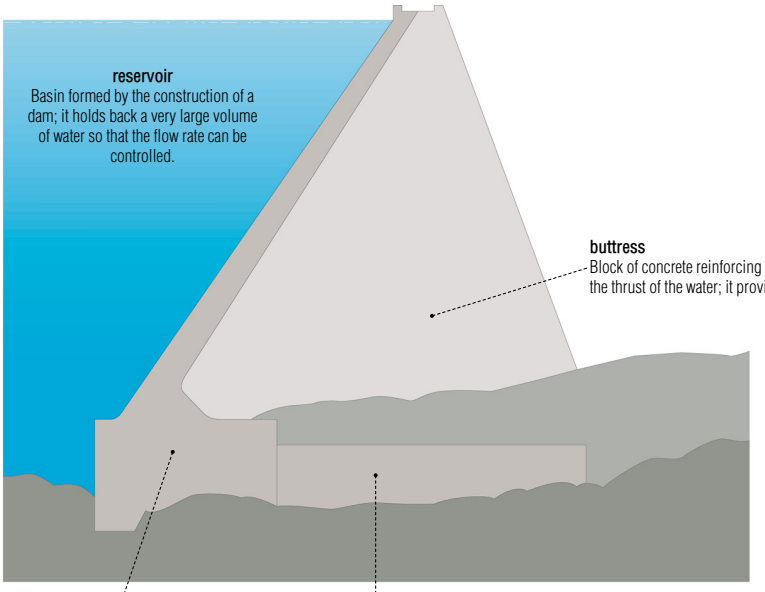
bucket ring
Disk housing all the turbine buckets that activates the runner.

examples of dams

There are masonry dams, concrete dams and embankment dams; the choice depends on criteria such as the nature of the ground, the shape of the valley and the materials available.

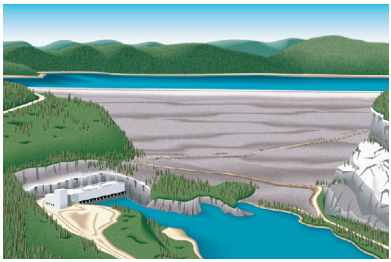
buttress dam
Used mainly in wide valleys, it consists of an impermeable wall, which is shored up by a series of buttresses to transmit the thrust of the water to the foundation.

cross section of a buttress dam



examples of dams

embankment dam
Formed of mounds of earth or rocks, it is used mainly when the subsoil does not allow for construction of a concrete dam.



cross section of an embankment dam

clay core
Central portion of the dam that is usually made of compact clay to make it watertight.

top of dam
Upper part of the dam; it rises above the water level of the reservoir by several yards.

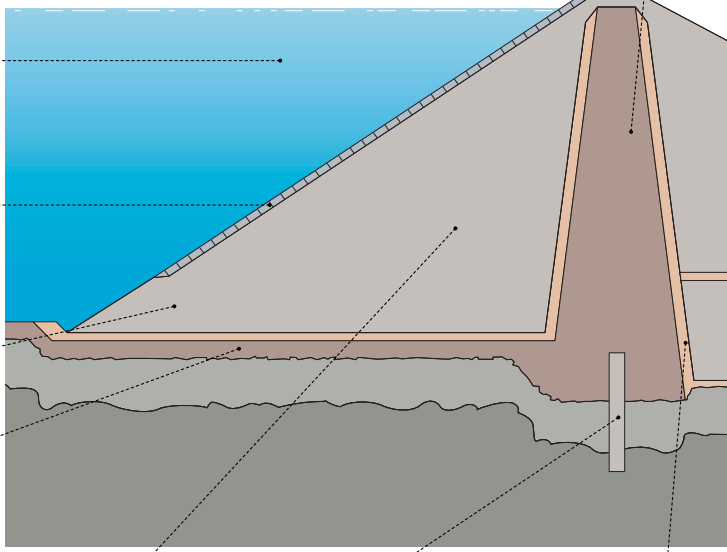
wave wall
Small wall located at the top of the upstream shoulder that protects the dam against waves.

reservoir
Basin formed by the construction of a dam; it holds back a very large volume of water so that the flow rate can be controlled.

pitching
Layer of rock or concrete blocks that covers the upstream shoulder to prevent erosion.

upstream toe
Area where the upstream shoulder and the foundation of the dam meet.

upstream blanket
Impermeable layer that consists of compact clay; it rests on the bottom of the dam to prevent infiltration.



upstream shoulder
Soil embankment located on the reservoir side; its mass provides stability to the dam.

cut-off trench
Area of the foundation of the dam that is connected to the core; it contains impermeable materials to limit leakage and infiltration under the dam.

sand
Granular material that is inserted between the core and the shoulder; it filters particles carried by the water flow to prevent erosion.

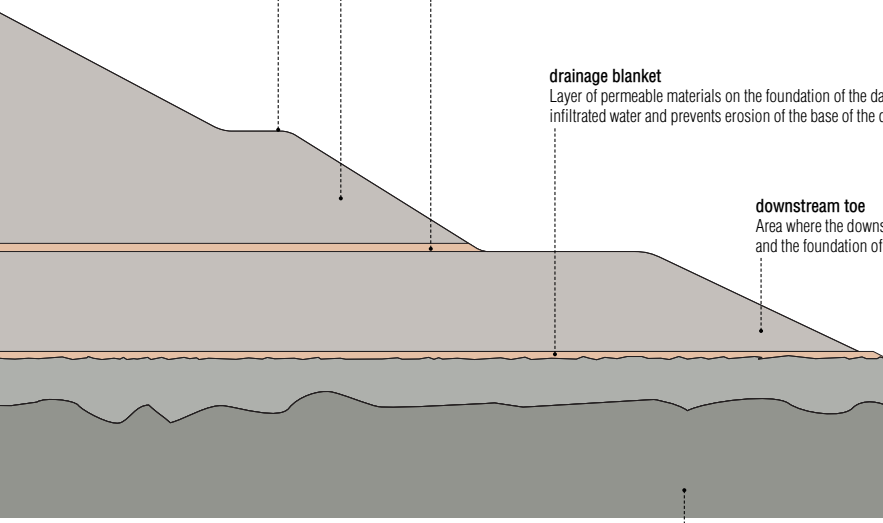
berm
Horizontal ledge that stabilizes the upstream or downstream shoulder.

downstream shoulder
Soil embankment that, together with the upstream shoulder, provides stability to the structure.

drainage layer
Layer of permeable materials that is inserted into large-scale dams to collect infiltrated water.

drainage blanket
Layer of permeable materials on the foundation of the dam; it collects infiltrated water and prevents erosion of the base of the dam.

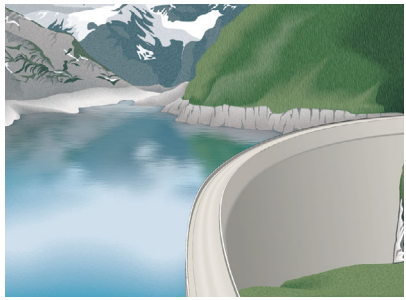
downstream toe
Area where the downstream shoulder and the foundation of the dam meet.



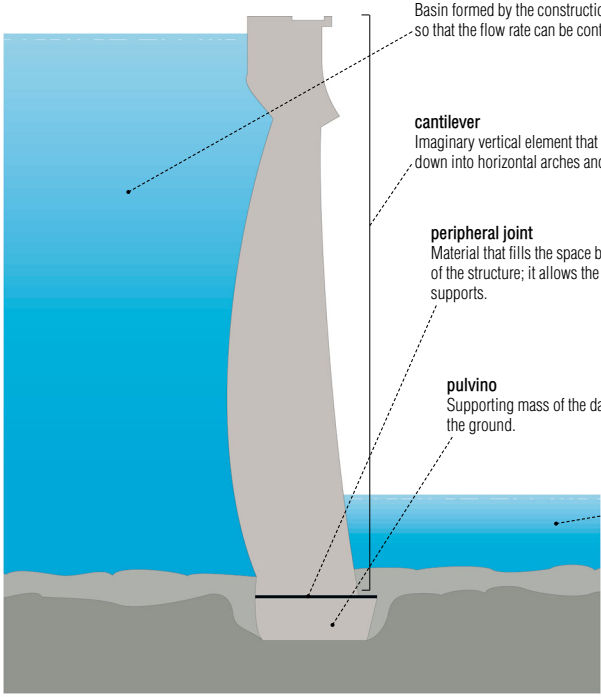
foundation of dam
Natural terrain (such as rock, sand or clay) on which the dam is built.

examples of dams

arch dam
Its curvature allows most of the water's thrust to be transmitted to the usually narrow valley slopes supporting it.



cross section of an arch dam



reservoir
Basin formed by the construction of a dam; it holds back a very large volume of water so that the flow rate can be controlled.

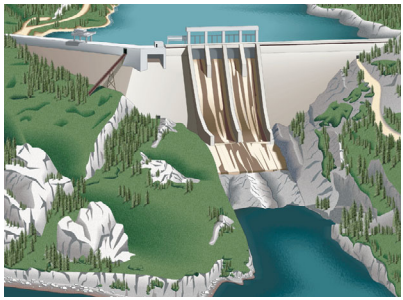
cantilever
Imaginary vertical element that is used to calculate the arch dam (usually by breaking it down into horizontal arches and vertical cantilever elements).

peripheral joint
Material that fills the space between the dam and the pulvino over the entire length of the structure; it allows the structure to transmit the thrust of the water to its lateral supports.

pulvino
Supporting mass of the dam foundation that bears its weight and transmits it to the ground.

afterbay
Area of the watercourse where water is discharged after passing through the turbines.

soil
Natural rocky ground in which the dam is anchored.

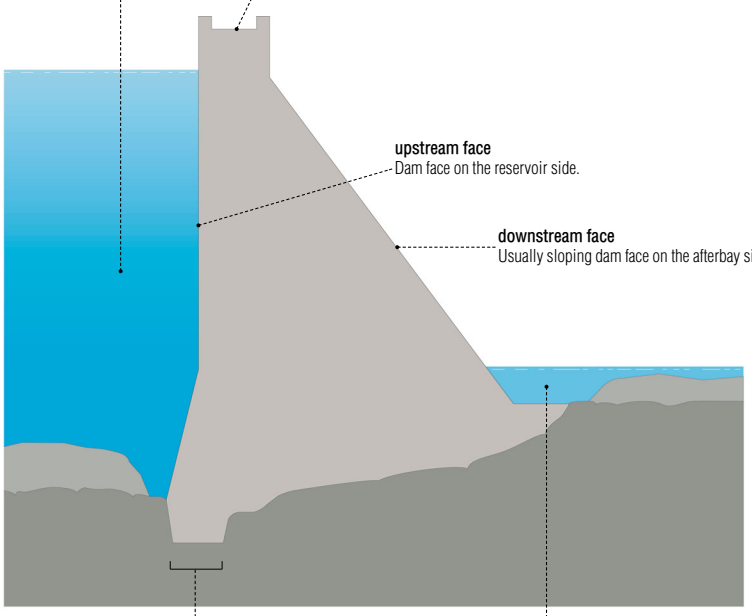


gravity dam
Its huge mass resists the thrust of the water to prevent it from overturning or sliding; this type of dam is usually used to hold back large volumes of water.

reservoir
Basin formed by the construction of a dam; it holds back a very large volume of water so that the flow rate can be controlled.

top of dam
Upper part of the dam that usually contains a roadway.

cross section of a gravity dam



upstream face
Dam face on the reservoir side.

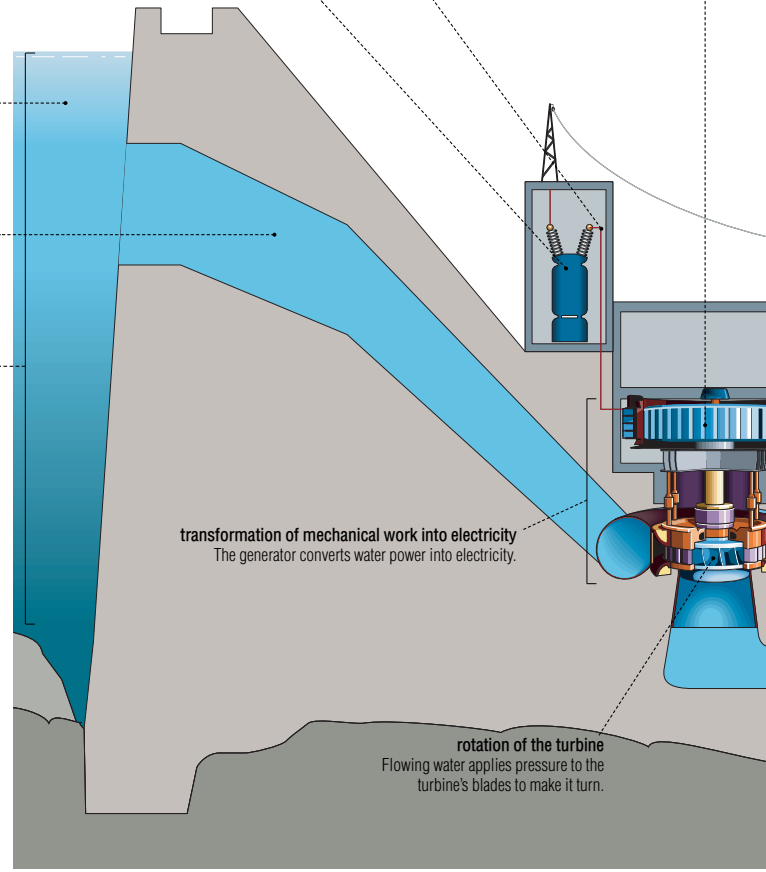
downstream face
Usually sloping dam face on the afterbay side.

cut-off trench
Watertight structure that extends the foundations of the dam into the ground; it limits leakage and infiltration under the dam.

afterbay
Area of the watercourse where water is discharged after passing through the turbines.

steps in production of electricity

In a hydroelectric power plant, water is turned into electricity, which is carried to consumers along a transportation and distribution network.



energy transmission at the generator voltage
Electric power produced by the generator is transmitted to a transformer at the power plant outlet.

production of electricity by the generator
The generator produces electricity through the movement of the rotor in the stator.

voltage increase
At the outlet end of the power plant, the transformer increases the voltage; this reduces energy losses during transmission over long distances.

supply of water
Basin created by building a dam, which holds back a large volume of water.

water under pressure
The water takes on energy as it flows down the penstock and is carried with force to the turbine.

head of water
The dam raises the water level to create a vertical drop along the length of the penstock.

transformation of mechanical work into electricity
The generator converts water power into electricity.

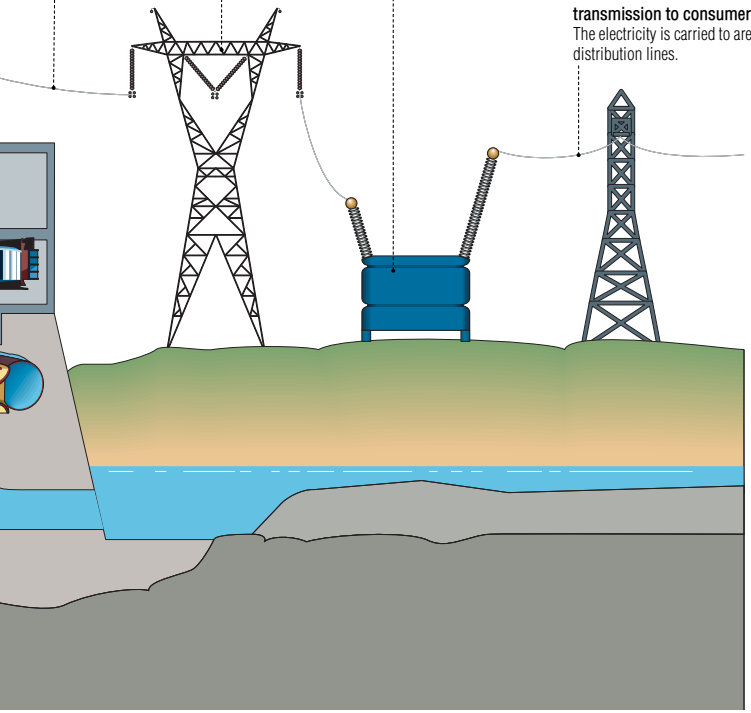
rotation of the turbine
Flowing water applies pressure to the turbine's blades to make it turn.

energy integration to the transmission network
The electricity produced is integrated into the network.

high-tension electricity transmission
Using high-voltage lines to transmit electricity over long distances reduces the strength of the current and, as a result, energy losses.

voltage decrease
Before integrating the electricity into the distribution network, the voltage is progressively decreased to 240 V.

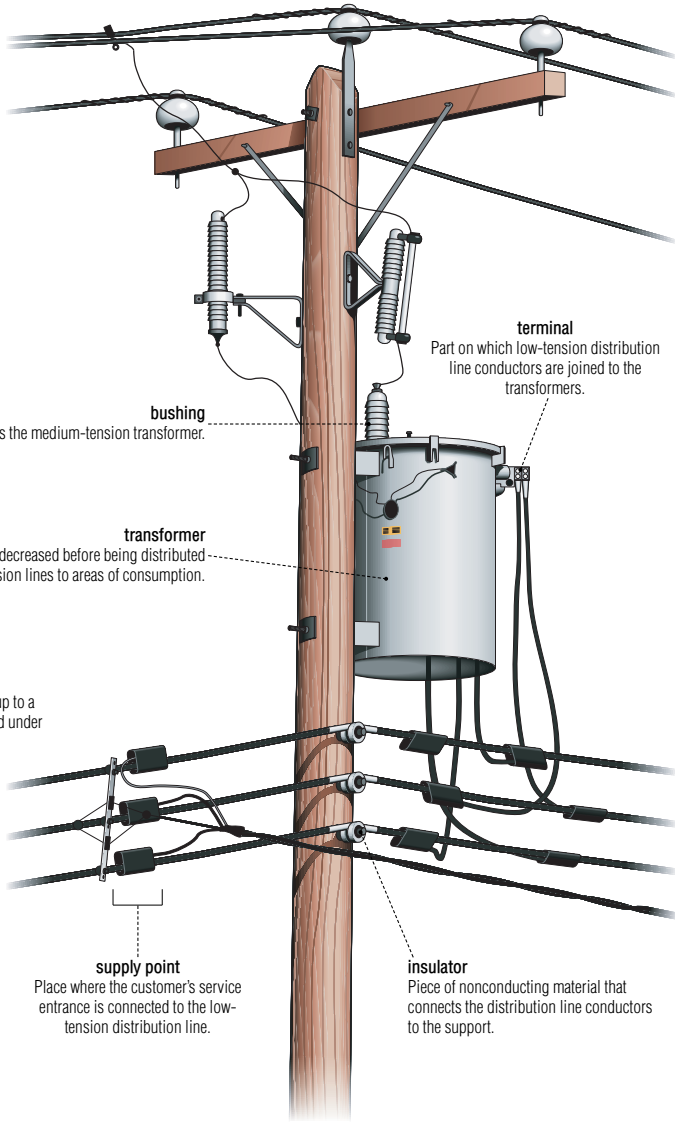
transmission to consumers
The electricity is carried to areas of consumption by low-voltage distribution lines.



electricity transmission

Electricity is carried by overhead and underground lines; due to high cost, underground lines are used mainly in cities.

overhead connection
The equipment and overhead conductors that connect a subscriber's electric system to the public distribution network.



terminal
Part on which low-tension distribution line conductors are joined to the transformers.

bushing
Insulator and point where the current enters the medium-tension transformer.

transformer
Device that alters electric voltage; voltage is decreased before being distributed by low-tension lines to areas of consumption.

low-tension distribution line
Overhead line that distributes electricity up to a voltage of 750 V; its conductors are located under the transformer.

supply point
Place where the customer's service entrance is connected to the low-tension distribution line.

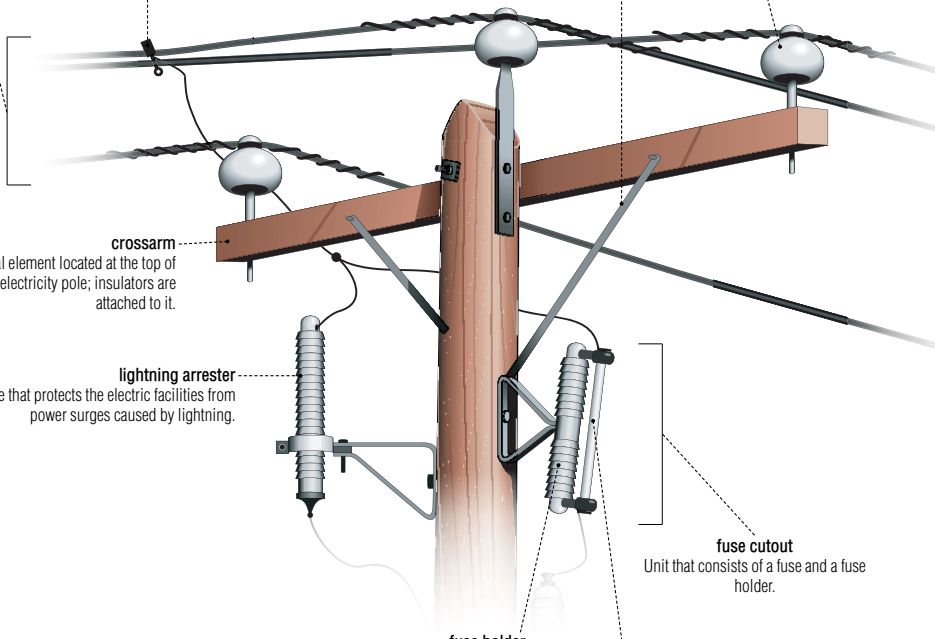
insulator
Piece of nonconducting material that connects the distribution line conductors to the support.

medium-tension distribution line
Overhead line that distributes electricity at a voltage between 750 and 50,000 V; its conductors are located at the top of electricity poles.

brace
Slanted part that connects the pole to the crossarm to hold it in place horizontally.

hot line connector
Linking piece with a bolt, which is tightened to bring together two conductors to establish an electric connection between them.

insulator
Piece of nonconducting material that connects the distribution line conductors to the support.



crossarm
Horizontal element located at the top of an electricity pole; insulators are attached to it.

lightning arrester
Device that protects the electric facilities from power surges caused by lightning.

fuse cutout
Unit that consists of a fuse and a fuse holder.

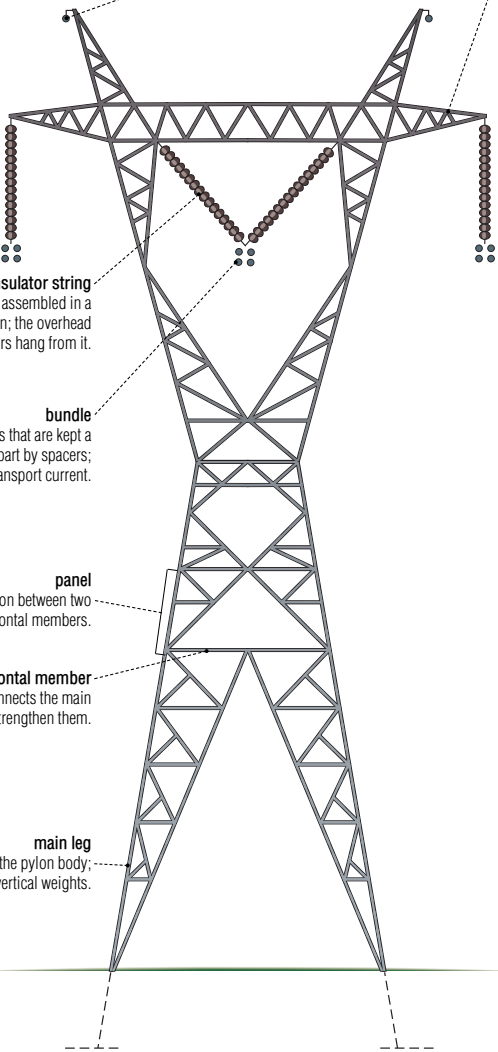
fuse holder
Electric junction point where the fuse is attached and on which it articulates so the fuse can fall over.

fuse
Protection device for the electric circuit; it falls from the fuse holder to cut the current in the event of a surge.

pylon
Metal beam that supports the electric conductors along the overhead transportation lines.

overhead ground wire
Conductor that is connected to the ground and attached above the bundles of the overhead lines to protect them from lightning.

crossarm
Horizontal element that protrudes on each side of the pylon; it supports the bundles by means of suspension insulator strings.



pylon top
Upper portion of the pylon where the insulator strings and bundles are attached.

suspension insulator string
Insulators that are assembled in a vertical or oblique chain; the overhead line conductors hang from it.

bundle
Conductor cables that are kept a constant distance apart by spacers; they are used to transport current.

panel
Part of the pylon between two horizontal members.

horizontal member
Horizontal bar that connects the main legs to strengthen them.

pylon body
Part of the pylon support between the top and the foot.

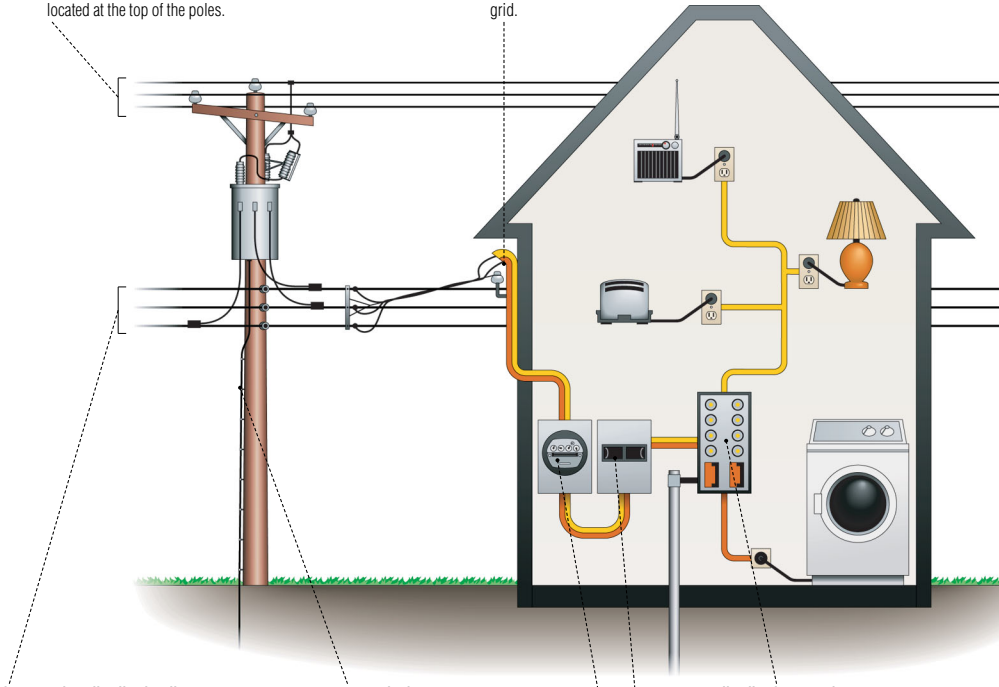
main leg
The main tower legs of the pylon body; they support mainly vertical weights.

pylon foot
Lower part of the pylon that is usually underground; the legs are anchored to it.

network connection
Set of equipment and conductors allowing a customer's electric installation to be connected to the public grid.

medium-tension distribution line
Overhead electricity-distribution lines with tension between 750 and 50,000 volts; its conductors are located at the top of the poles.

connection point
Place where the customer's electric hookup is connected to the electric grid.



low-tension distribution line
Overhead electricity-distribution line with a maximum tension of 750 volts; its conductors are located under the transformer.

ground wire
Metal conductor inserted into the ground ensuring that accidental electric leakages are conducted to the earth.

distribution panel
Set of devices forming the junction of the public electricity grid and the electric circuits of a dwelling.

electricity meter
Device measuring the consumption of electricity by a dwelling.

main switch
Mechanism allowing a dwelling's current to be cut off.

tidal power plant

Plant that harnesses tidal power (the motion of the rising and falling tides) to produce electric power.

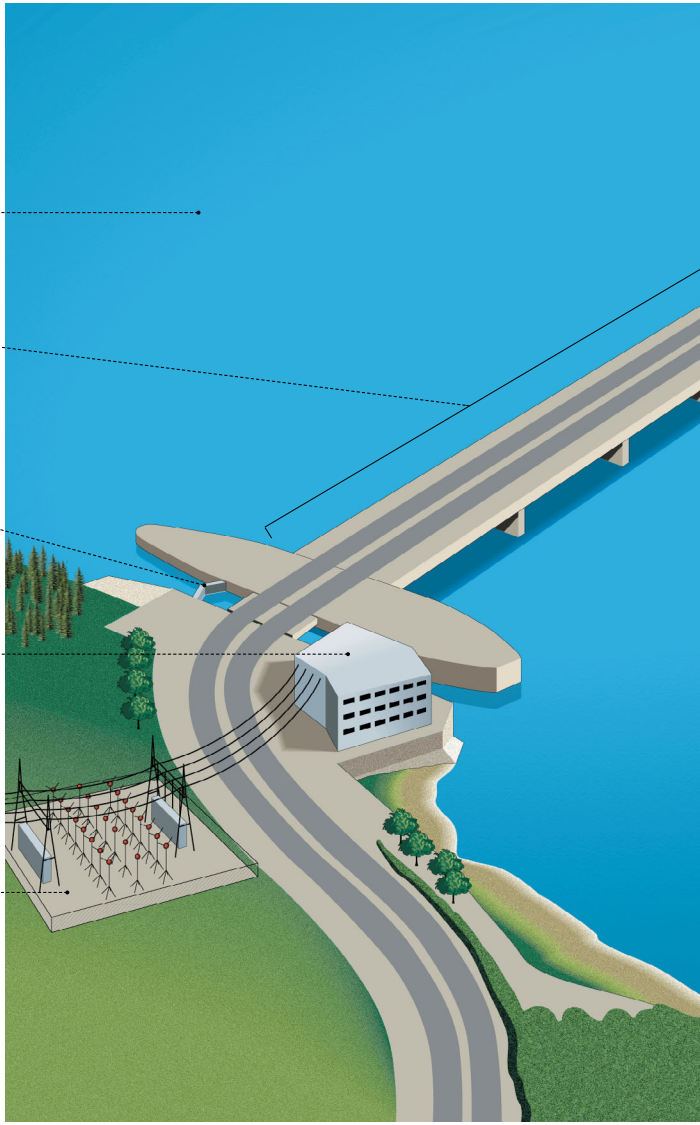
sea
Vast body of saltwater at some distance inland; it is not as deep as an ocean.

power plant
Part of the dam housing bulb units that are powered by the rise and fall of the sea to produce electricity.

lock
Structure with doors and gates that is built between the sea and the basin; it allows boats to pass from one level to the other.

administrative building

substation
The devices (such as transformers and changeover switches) that increase the voltage of the electricity and carry it to the network.



tidal power plant

bank
Strip of land bordering the sea.

gate
Movable vertical panel that controls the rate of flow of the water between the sea and the basin.

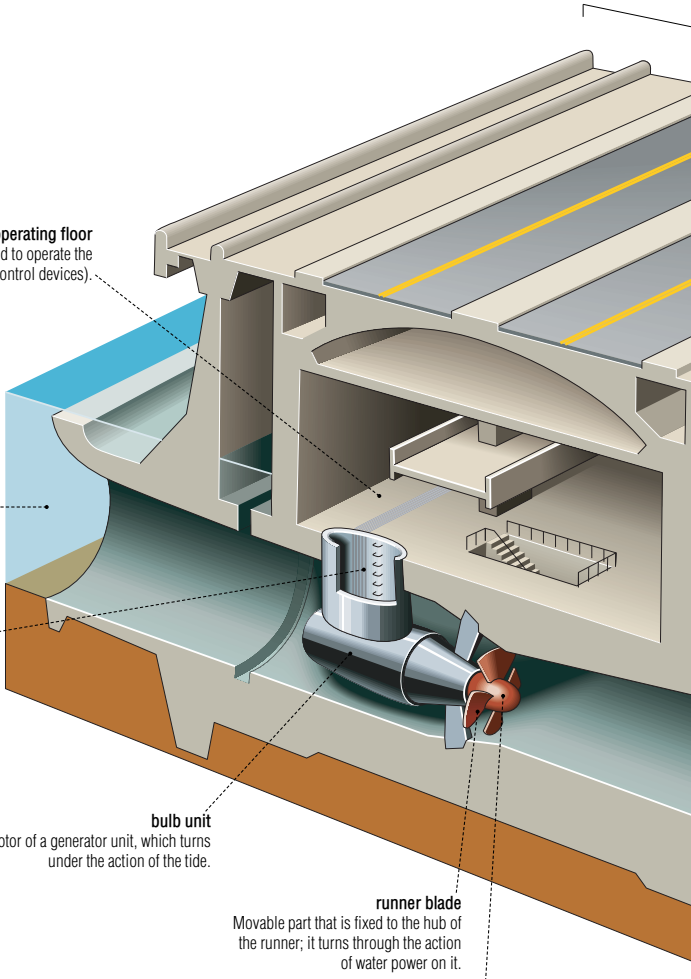
operating dam
Structure with gates that control the basin level in relation to the level of the sea.

inactive dike
Part of the dam made up mainly of rocky material; it is built between the plant and the operating dam to separate the basin from the sea.

basin
Area in which water is stored at high tide; the basin empties out through the penstocks at low tide.

tidal power plant

cross section of a power plant



operating floor
Part of the plant that houses the equipment needed to operate the bulb units (including maintenance and control devices).

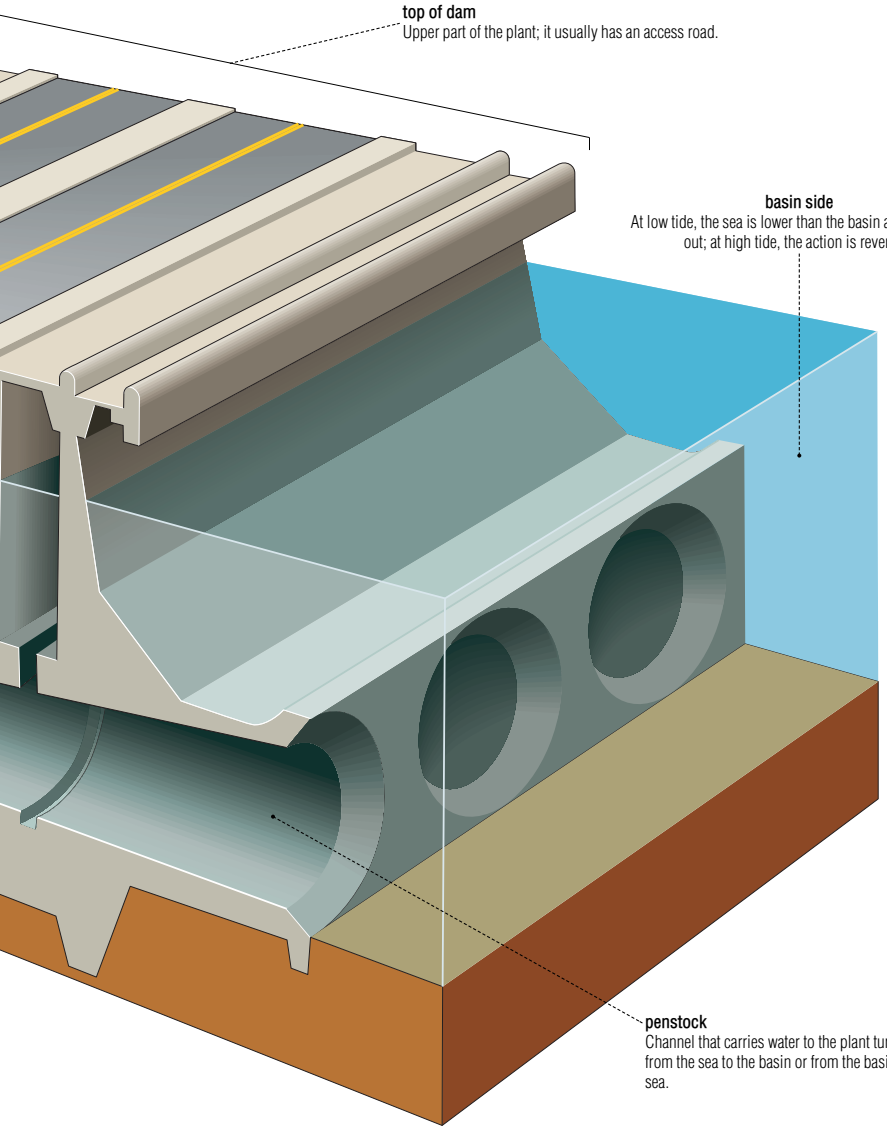
sea side
At high tide, the sea is higher than the basin and it fills up; at low tide, the action is reversed.

access shaft
Vertical shaft connecting the operating floor to the generator so that inspection and maintenance can be carried out.

bulb unit
A turbine is connected by a horizontal axis to the rotor of a generator unit, which turns under the action of the tide.

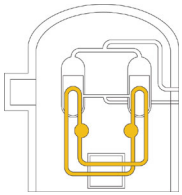
runner blade
Movable part that is fixed to the hub of the runner; it turns through the action of water power on it.

turbine runner
Movable part of the turbine that converts energy from the water it receives into mechanical energy, which is transmitted to the generator's rotor.

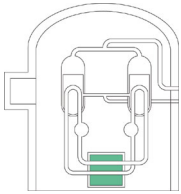

top of dam
Upper part of the plant; it usually has an access road.
basin side
At low tide, the sea is lower than the basin and it empties out; at high tide, the action is reversed.
penstock
Channel that carries water to the plant turbines, from the sea to the basin or from the basin to the sea.

production of electricity from nuclear energy

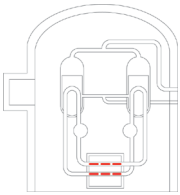
A nuclear fission chain reaction is started and controlled inside the reactor to produce electricity.



coolant
Liquid or gas (including heavy water and carbon dioxide) that circulates inside the reactor; it harnesses and transports the heat released during fission of the fuel.



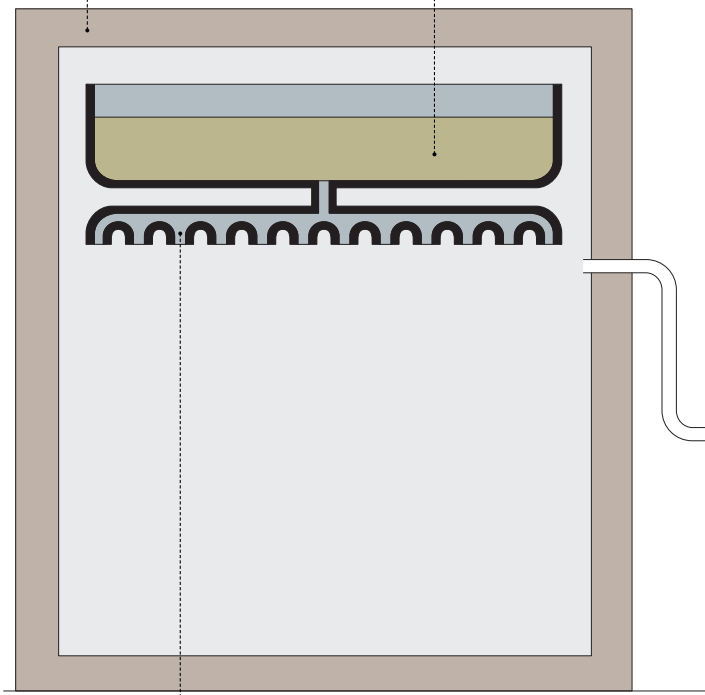
moderator
Substance (ordinary water, heavy water, graphite) that slows the fast-moving neutrons emitted during fission to increase the probability of new collisions.



fuel
Matter placed in the core of the reactor that contains heavy atoms (uranium, plutonium); energy is extracted from it by fission.

containment building
Concrete building used to collect the radioactive steam from the reactor in the event of an accident.

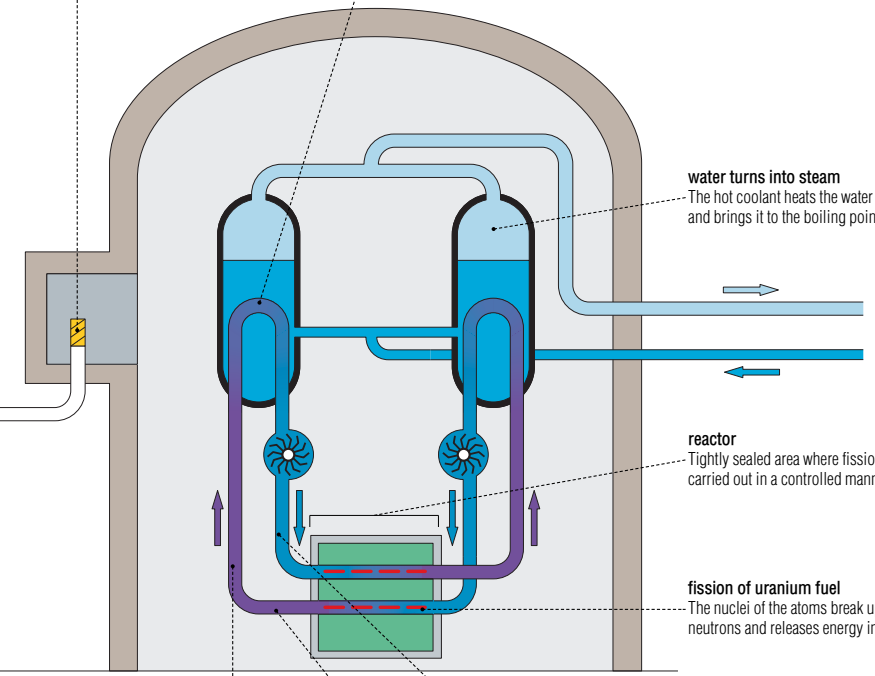
dousing water tank
Vat that contains water to cool the radioactive steam in the reactor in the event of an accident; this prevents a rise in pressure.



sprinklers
Devices that release water to condense radioactive steam.

safety valve
Device that lowers the pressure inside the reactor by discharging the radioactive steam to the containment building.

transfer of heat to water
The coolant releases the heat given off by the fission of uranium to the steam generator.



water turns into steam
The hot coolant heats the water of the generator and brings it to the boiling point.

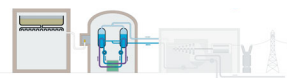
reactor
Tightly sealed area where fission of the fuel is carried out in a controlled manner to release heat.

fission of uranium fuel
The nuclei of the atoms break up; this frees neutrons and releases energy in the form of heat.

cold coolant
After releasing its heat to the steam generator, the cold coolant returns to the reactor.

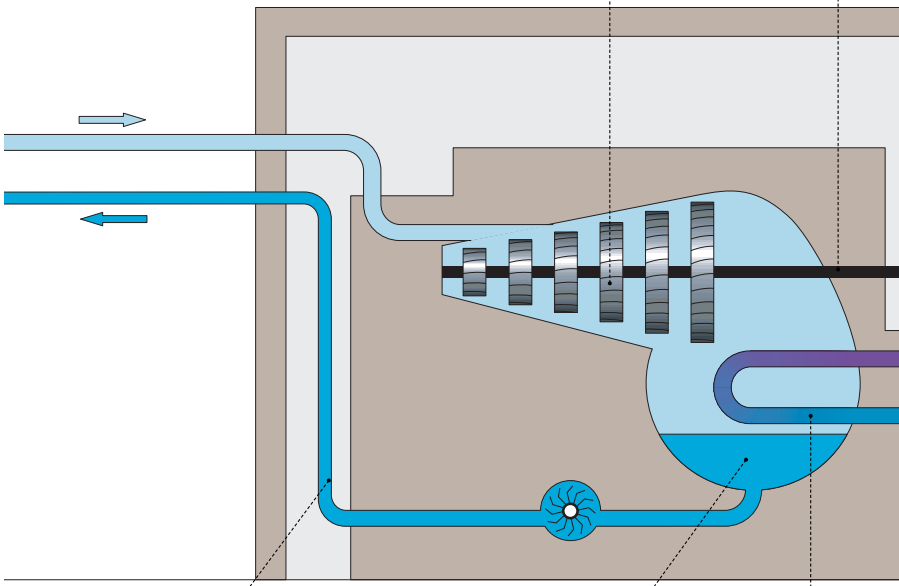
hot coolant
The coolant extracts heat from the fuel and carries it toward the steam generator.

heat production
The fission of atoms releases intense heat (between 575°F and 925°F), which is transmitted to the coolant.



turbine shaft turns generator
The rotational movement of the turbine is transmitted to the generator's rotor.

steam pressure drives turbine
Steam from the steam generator turns the turbine runner, which is connected to the generator.



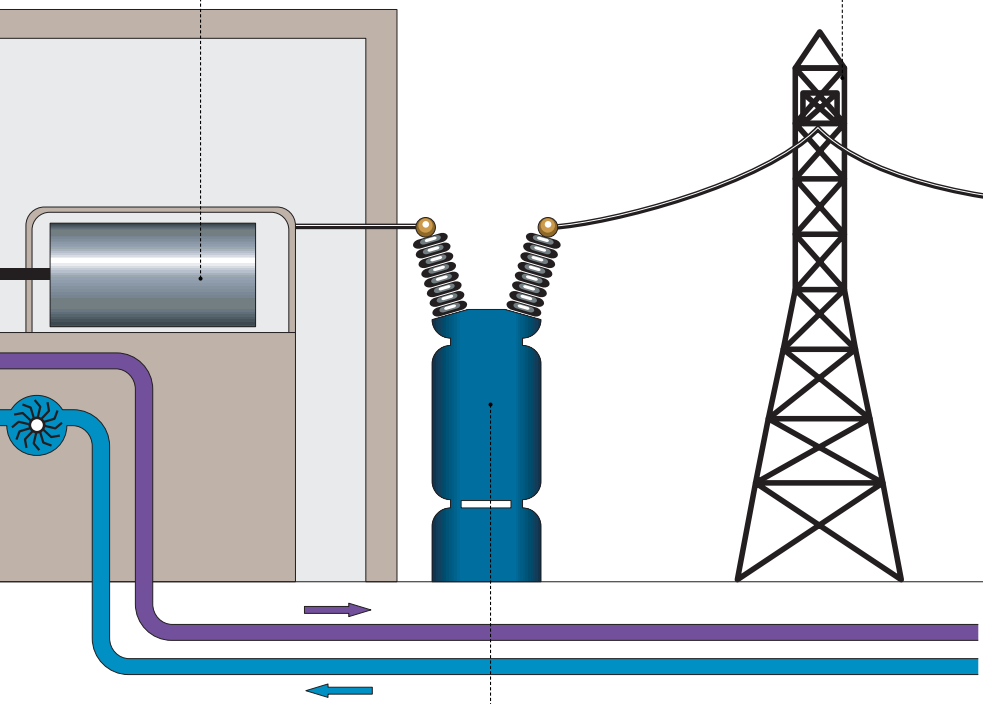
water is pumped back into the steam generator
After passing through the turbine, water produced by the condensation of the steam returns to the steam generator.

condensation of steam into water
At the turbine outlet, the steam cools and condenses into water.

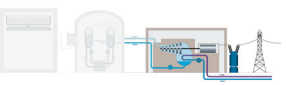
water cools the used steam
Cooling of the steam from the turbine is done with river or lake water.

production of electricity by the generator
The generator produces electricity through the movement of the rotor in the stator.

electricity transmission
Using high-voltage lines to transmit electricity over long distances reduces the strength of the current and, as a result, energy losses.

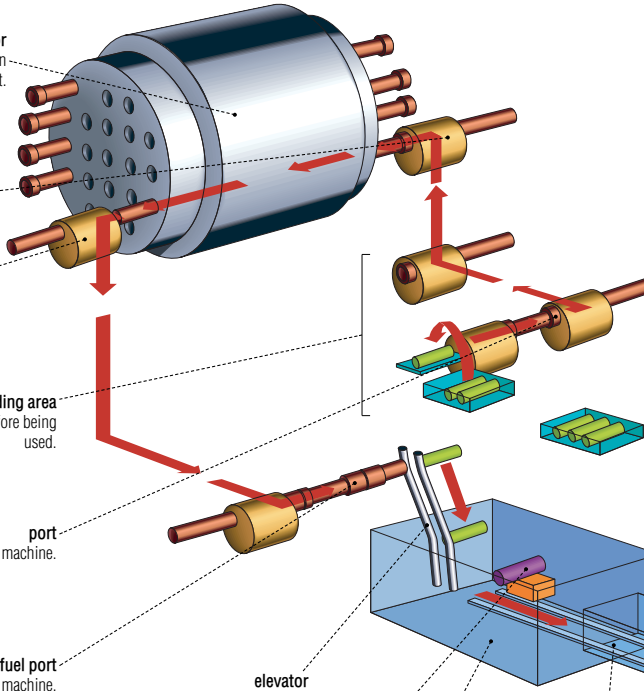


voltage increase
At the outlet end of the power plant, the transformer increases the voltage; this reduces energy losses during transmission over long distances.



fuel handling sequence

Uranium is made into pellets, which are pressed into fuel bundles to be used in the reactor and then stored in cooling bays.



reactor
Tightly sealed area where fission of the fuel is carried out in a controlled manner to release heat.

fueling machine
Remote-controlled device that inserts new fuel into the reactor.

accept machine
Remote-controlled cylinder that removes the spent fuel from the reactor and carries it to the discharge bay.

loading area
Area of the reactor building where new fuel is stored before being used.

port
Tube used to insert fuel into the fueling machine.

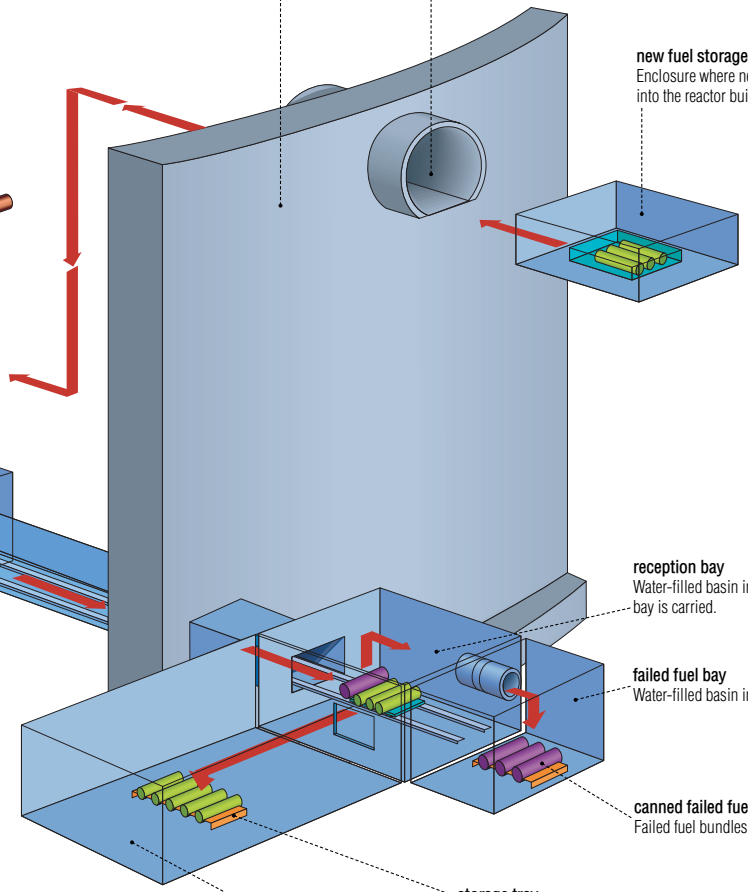
spent fuel port
Tube used to reclaim spent fuel from the accept machine.

elevator
Mechanical device used to put spent fuel into the discharge bay.

failed fuel canning
Failed fuel bundles are covered with a watertight casing.

discharge bay
Water-filled basin that receives spent fuel as it exits the accept machine; the water acts as a protective barrier against the radiation emitted by the fuel.

transfer canal
Water-filled channel used to transfer the spent fuel mechanically from the reactor building to the service building for storage.



service building
Enclosure that contains the plant's auxiliary systems such as storage and fuel decontamination equipment.

equipment lock
Area through which equipment and fuel pass between the service building and the reactor building.

new fuel storage room
Enclosure where new fuel is stored before being introduced into the reactor building.

reception bay
Water-filled basin into which spent fuel from the discharge bay is carried.

failed fuel bay
Water-filled basin in which failed fuel is stored.

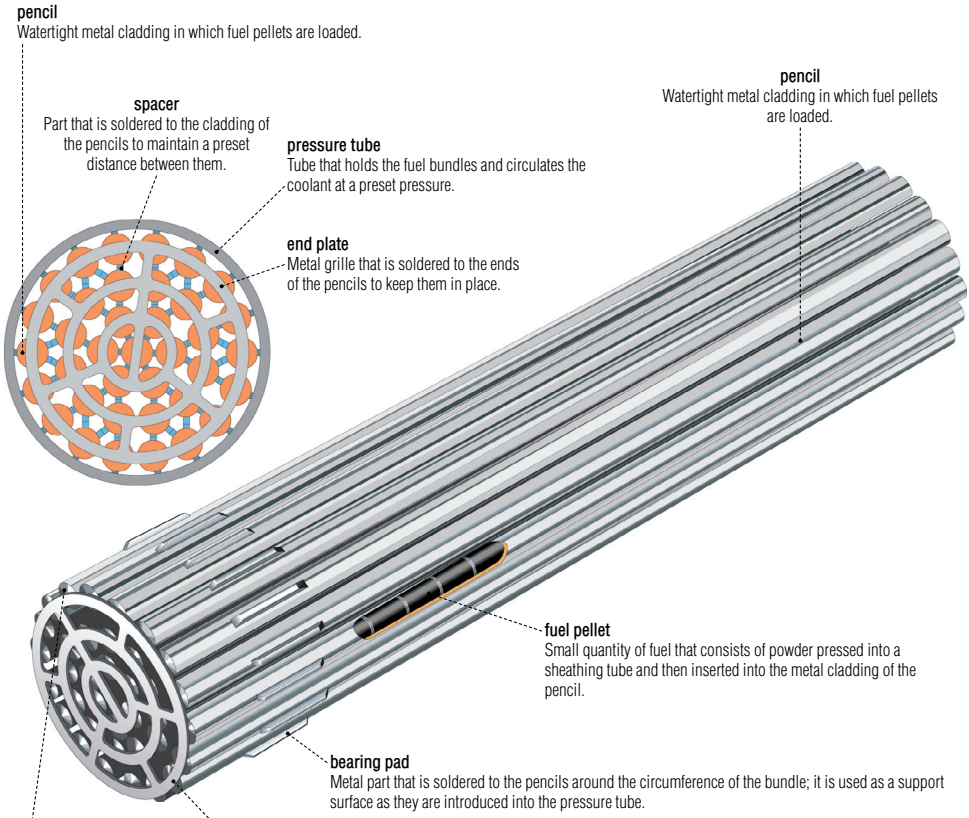
canned failed fuel
Failed fuel bundles are stored in a water-filled basin.

storage tray
Tray on which spent fuel is stacked.

spent fuel storage bay
Water-filled basin where the spent fuel is stored for several years before it can be disposed of safely.

fuel bundle

Fuel pencils that are grouped in parallel for introduction into the reactor.



nuclear reactor

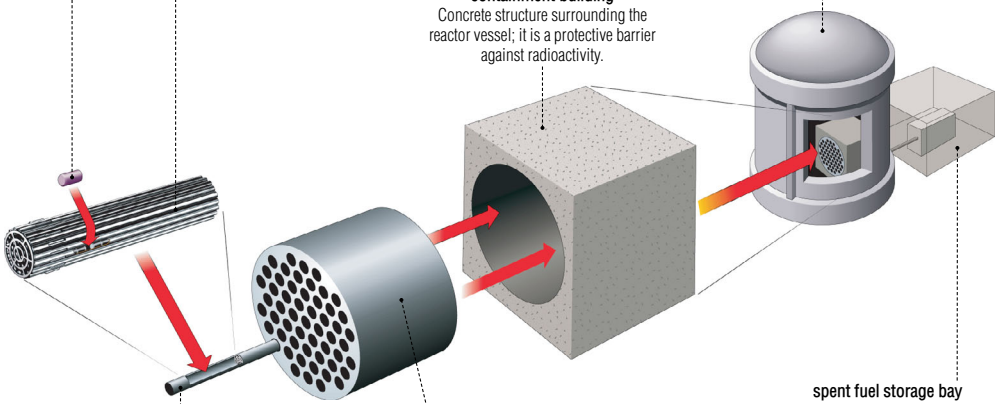
Tightly sealed area where fission of the fuel is carried out in a controlled manner to release heat.

fuel pellet
Small quantity of fuel that consists of powder pressed into a sheathing tube and then inserted into the metal cladding of the pencil.

fuel bundle
Fuel pencils that are grouped in parallel for introduction into the reactor.

reactor building
Concrete structure surrounding the reactor vessel; it is a protective barrier against radioactivity.

containment building
Concrete structure surrounding the reactor vessel; it is a protective barrier against radioactivity.



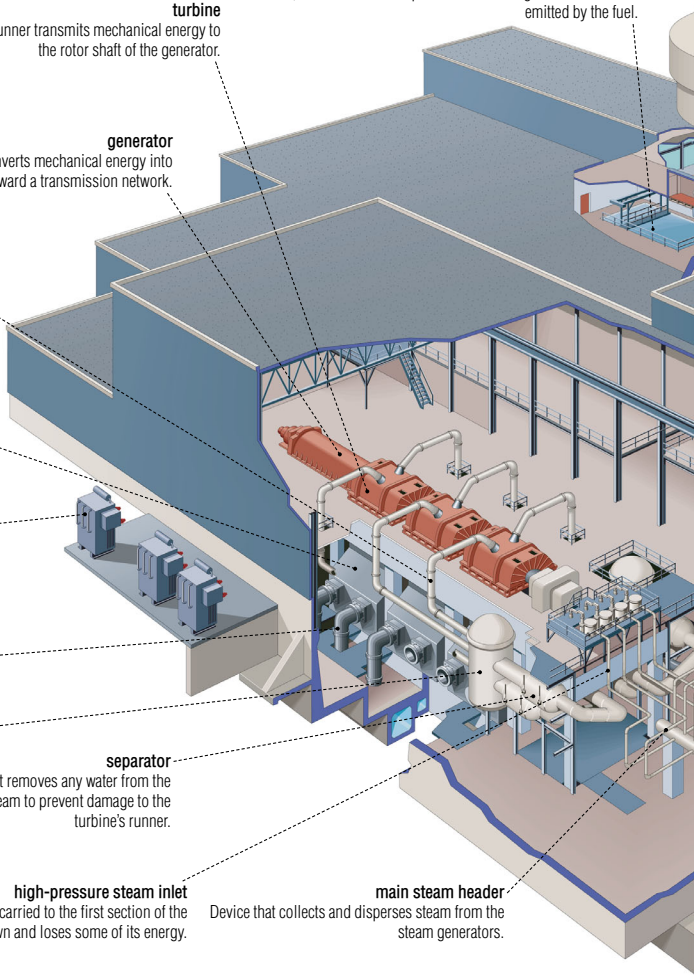
spent fuel storage bay
Water-filled basin where the spent fuel is stored for several years before it can be disposed of safely.

pressure tube
Tube that holds the fuel bundles and circulates the coolant at a preset pressure.

reactor vessel
The core of the nuclear reactor consists of tubular spaces where fission is produced and the coolant and moderator circulate.

nuclear generating station

Plant that produces electricity from thermal energy generated by the fission of fuel atoms in a reactor.



spent fuel discharge bay
Water-filled basin that receives spent fuel as it exits the accept machine; the water acts as a protective barrier against the radiation emitted by the fuel.

turbine
Machine in two sections whose steam-activated runner transmits mechanical energy to the rotor shaft of the generator.

generator
Turbine-powered rotating machine that converts mechanical energy into electric energy to direct it toward a transmission network.

low-pressure steam inlet
Heated steam is reinjected into the turbine, where it releases its remaining energy.

condenser
Water collected from the water table flows in a circuit to cool the steam from the turbine and condense it into water.

transformer
Device used to alter the electric voltage; the voltage is increased at the station outlet in order to carry the current over long distances.

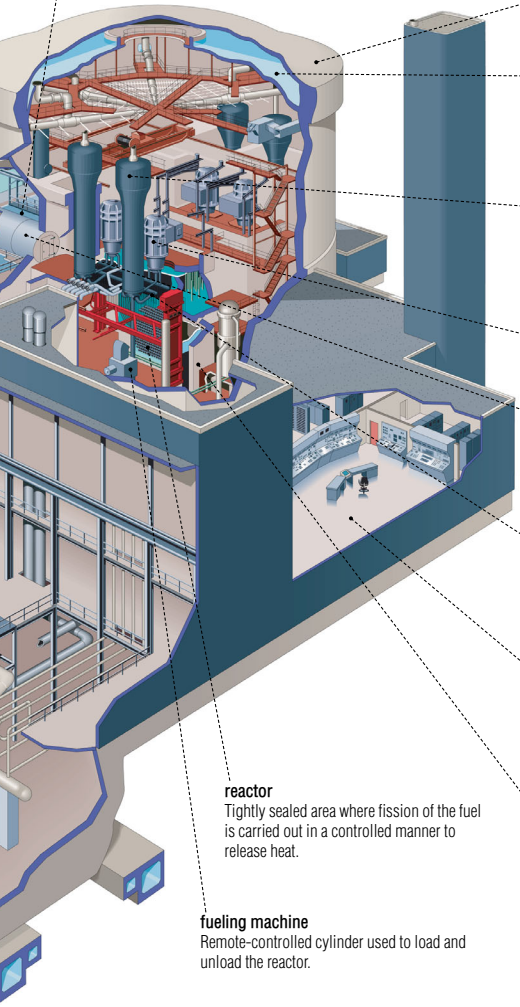
condenser water outlet
Water in the condenser returns to its original source.

reheater
Device used to increase the temperature of the steam from the first section of the turbine to reinject it into the second section.

separator
Device that removes any water from the steam to prevent damage to the turbine's runner.

high-pressure steam inlet
Steam from the steam generators is carried to the first section of the turbine; here, it cools down and loses some of its energy.

main steam header
Device that collects and disperses steam from the steam generators.



spent fuel storage bay
Water-filled basin where the spent fuel is stored for several years before it can be disposed of safely.

reactor building
Concrete structure surrounding the reactor vessel; it is a protective barrier against radioactivity.

dousing water tank
Vat that contains water to cool the radioactive steam in the reactor in the event of an accident; this prevents a rise in pressure.

steam generator
Apparatus that turns water into steam, which in turn activates the turbine.

heat transport pump
Apparatus that circulates the coolant fluid between the reactor and the steam generator.

reactor building airlock
Secure area where equipment and personnel can pass safely through the reactor building.

feeder header
Large-diameter pipe that collects the coolant fluid at the reactor inlet and outlet.

control room
Area that houses the personnel and equipment used to operate and monitor the power station.

reactor
Tightly sealed area where fission of the fuel is carried out in a controlled manner to release heat.

calandria
Safety containment wall that separates the reactor from the rest of the building.

fueling machine
Remote-controlled cylinder used to load and unload the reactor.

carbon dioxide reactor

Developed for the most part in Great Britain and France, it was replaced by the pressurized water reactor, which performs better and is less expensive.

fueling machine
Remote-controlled device that inserts new fuel into the reactor.

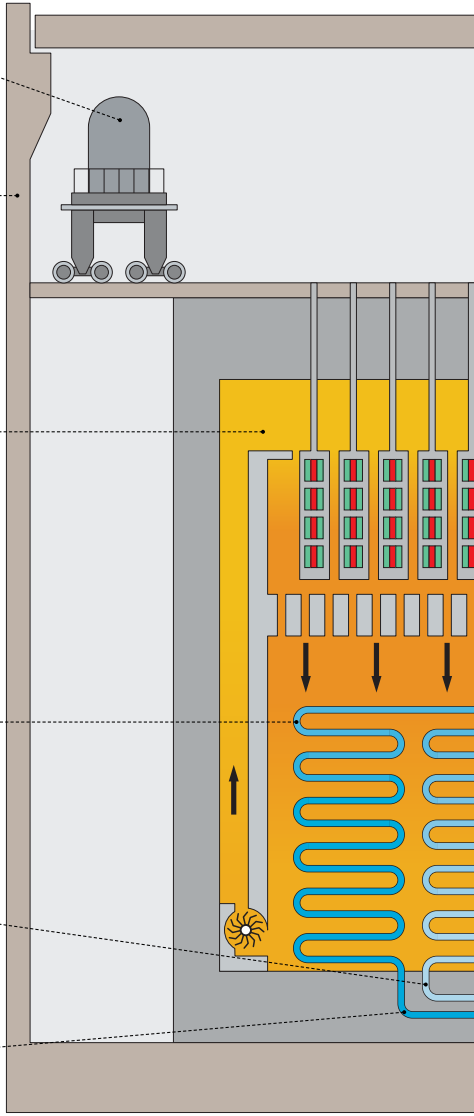
concrete shielding
Concrete structure that holds back radioactive products in the event of an accident.

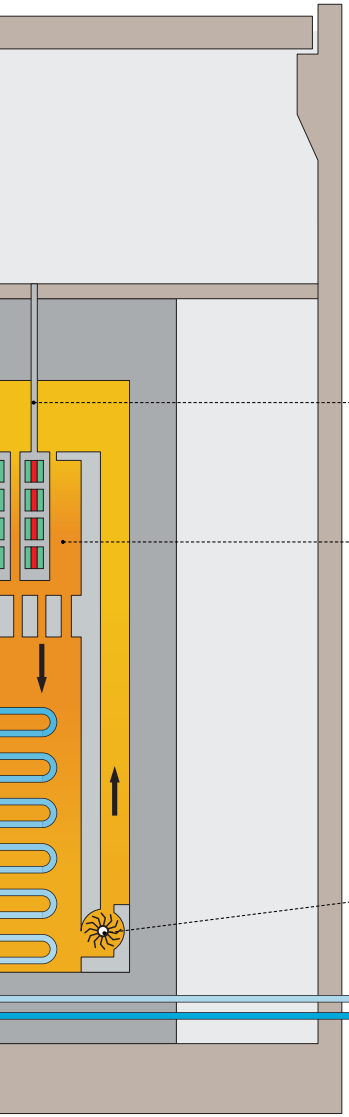
carbon dioxide gas coolant
Carbon dioxide that recovers the heat from the reactor core and transfers it to the heat exchanger.

heat exchanger
Tubing system that is submerged in the hot carbon dioxide; here, water is turned into steam to power the turbine.

steam outlet
Water that has been vaporized in the carbon dioxide is carried to the turbine to produce electricity.

feedwater
Piping carries water from the condenser to the heat exchanger, where it is turned into steam.

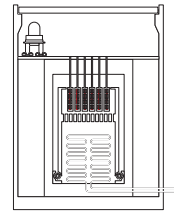




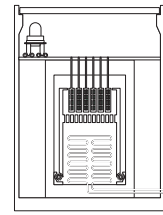
control rod
Tube that contains a neutron-absorbing material (boron, cadmium) that is introduced into the reactor core to control its power.

reactor core
Center section of the nuclear reactor where fission reactions take place.

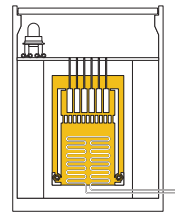
blower
Device that circulates carbon dioxide in the reactor core.



fuel: natural uranium
Natural uranium: fuel extracted from mines; it consists of a mixture of three uranium isotopes (uranium-234, -235 and -238).



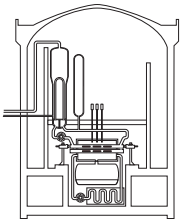
moderator: graphite
Moderator: medium that slows the speed of the neutrons to maintain a continuous chain reaction.



coolant: carbon dioxide
Carbon dioxide: gas that is heavier than air and is produced by burning graphite.

heavy-water reactor

The advantage of this type of reactor is that it does not require fuel enrichment; it is used mainly in Canada, Argentina and India.



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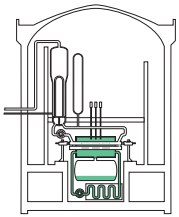
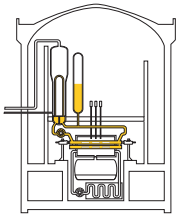


moderator: heavy water
Heavy water: water consisting of heavy hydrogen (deuterium) and oxygen; it can slow down neutrons.

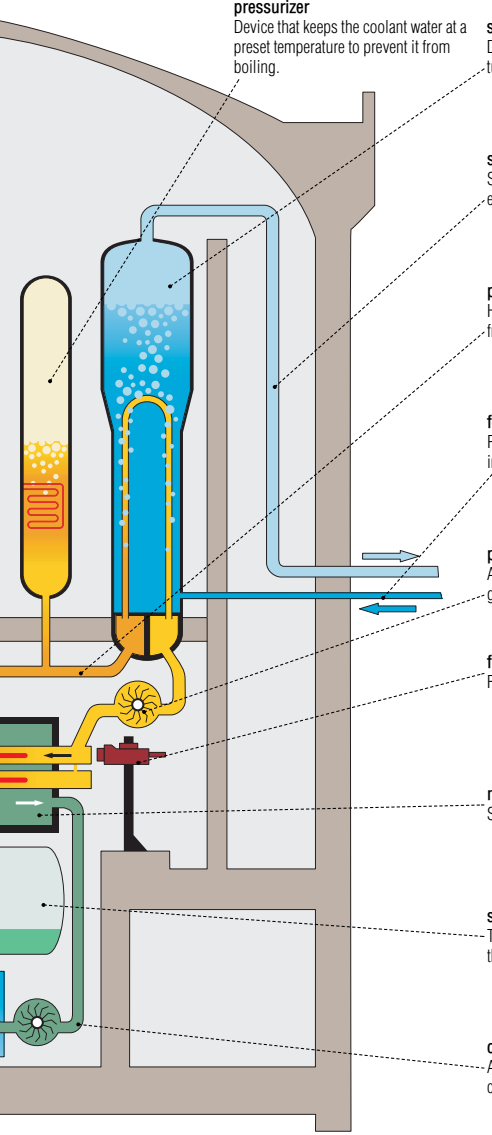


coolant: pressurized heavy water
Heavy water is kept at a set pressure to prevent it from boiling.

concrete shielding
Concrete structure that holds back radioactive products in the event of an accident.

control rod
Tube that contains a neutron-absorbing material (boron, cadmium) that is introduced into the reactor core to control its power.

fuel
Matter that is placed in the reactor core; it contains heavy atoms (uranium, plutonium) from which power is extracted by fission.



pressurizer
Device that keeps the coolant water at a preset temperature to prevent it from boiling.

steam generator
Device that uses heat from the coolant to turn water into steam to activate the turbine.

steam outlet
Steam from the generator is carried to the turbine and generator to produce electricity.

pressurized heavy water
Heavy water that is heated in the reactor core is kept under pressure to prevent it from boiling.

feedwater
Piping carries water from the condenser to the steam generator, where it is turned into steam.

pump
Apparatus that circulates the coolant fluid between the reactor and the steam generator.

fueling machine
Remote-controlled device that inserts new fuel into the reactor.

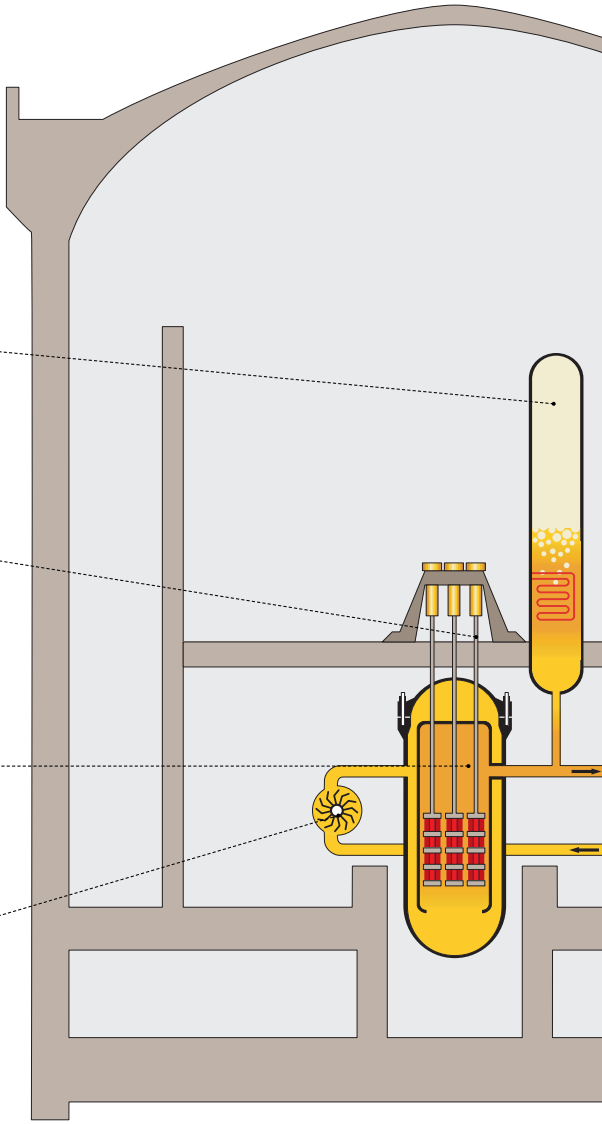
moderator tank
Steel tank that contains cold heavy water from the moderator.

safety tank
Tank where cold heavy water from the moderator flows to stop fission reactions in the event of an emergency.

cold heavy water
A pumping system ensures that heavy water around the moderator tank circulates, cools and is purified.

pressurized-water reactor

The most common type of reactor in the world; water from the coolant is kept under heavy pressure to prevent it from vaporizing.

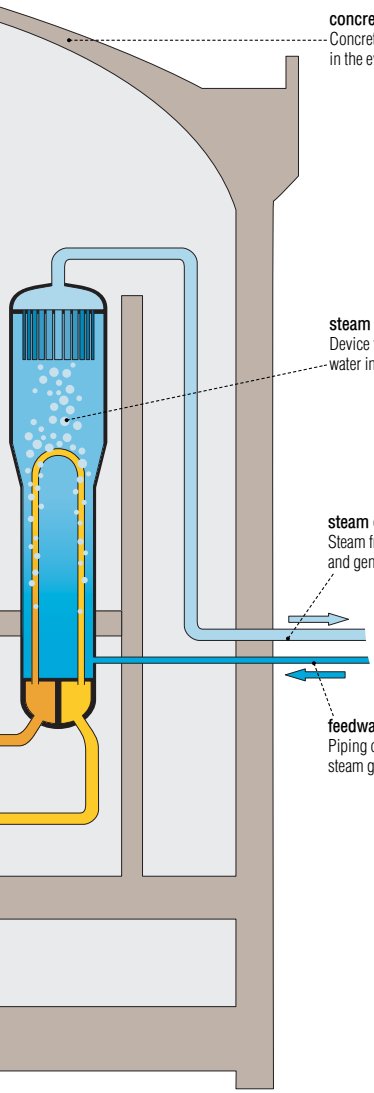


pressurizer
Device that keeps the coolant water at a preset temperature to prevent it from boiling.

control rod
Tube that contains a neutron-absorbing material (boron, cadmium) that is introduced into the reactor core to control its power.

reactor core
Center section of the nuclear reactor where fission reactions take place.

pump
Apparatus that circulates the coolant fluid between the reactor and the steam generator.

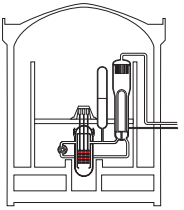


concrete shielding
Concrete structure that holds back radioactive products in the event of an accident.

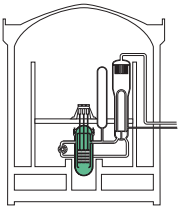
steam generator
Device that uses heat from the coolant to turn water into steam to activate the turbine.

steam outlet
Steam from the generator is carried to the turbine and generator to produce electricity.

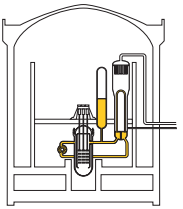
feedwater
Piping carries water from the condenser to the steam generator, where it is turned into steam.



fuel: enriched uranium
Enriched uranium: uranium produced by treating natural uranium to increase the quantity of fissionable isotopes (uranium-253) contained in it.



moderator: natural water
Natural water: water found in its natural state.



coolant: pressurized water
Pressurized water: natural water kept under a preset pressure to prevent it from boiling.

boiling-water reactor

In this second most common reactor, boiling occurs directly in the reactor core; it is used mainly in the United States, Sweden and Japan.

reactor tank
Safety containment wall that separates the reactor from the rest of the building.

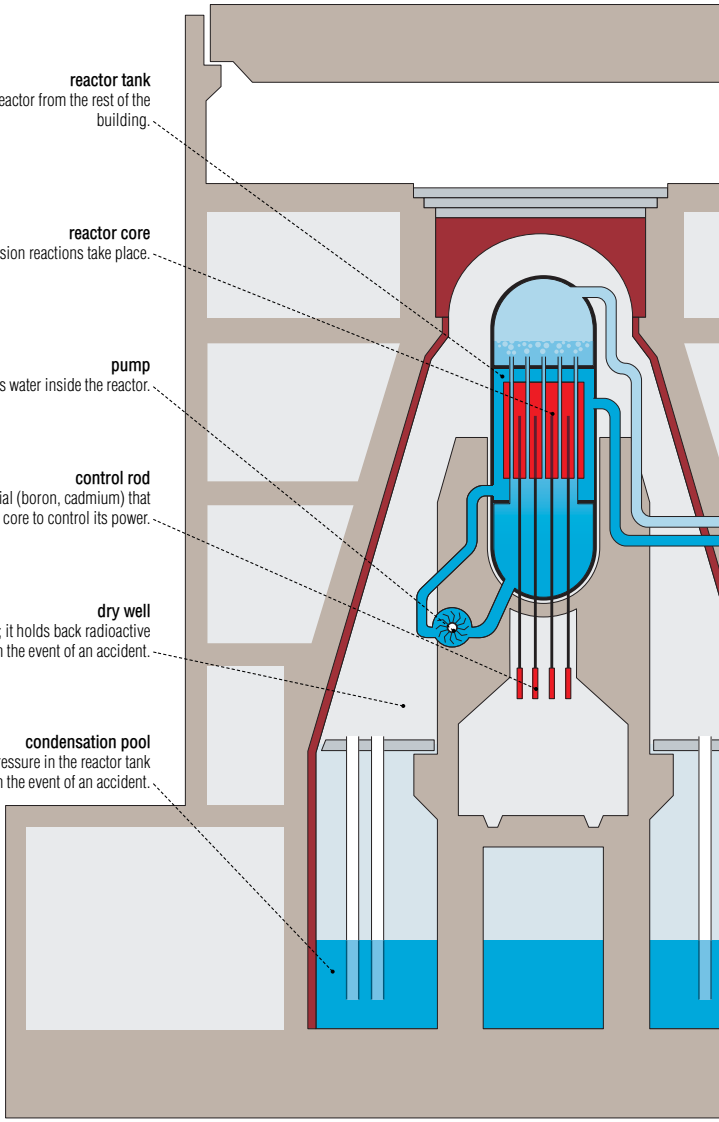
reactor core
Center section of the nuclear reactor where fission reactions take place.

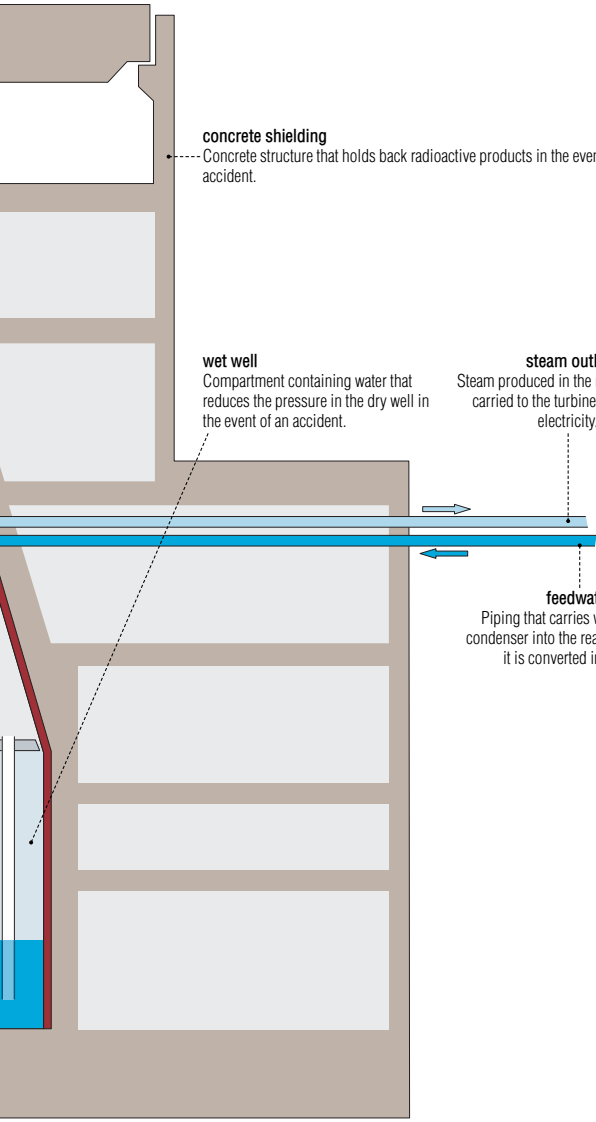
pump
Device that continuously circulates water inside the reactor.

control rod
Tube that contains a neutron-absorbing material (boron, cadmium) that is introduced into the reactor core to control its power.

dry well
Compartment around the reactor tank; it holds back radioactive products in the event of an accident.

condensation pool
Water-filled basin that is used to lower the pressure in the reactor tank in the event of an accident.



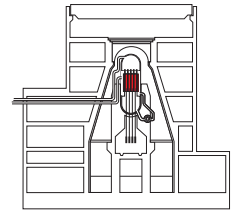


concrete shielding
Concrete structure that holds back radioactive products in the event of an accident.

wet well
Compartment containing water that reduces the pressure in the dry well in the event of an accident.

steam outlet
Steam produced in the reactor tank is carried to the turbine to produce electricity.

feedwater
Piping that carries water from the condenser into the reactor tank, where it is converted into steam.



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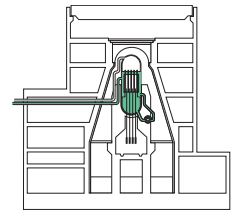
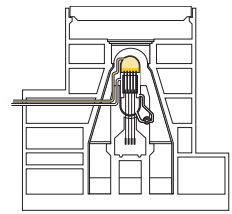


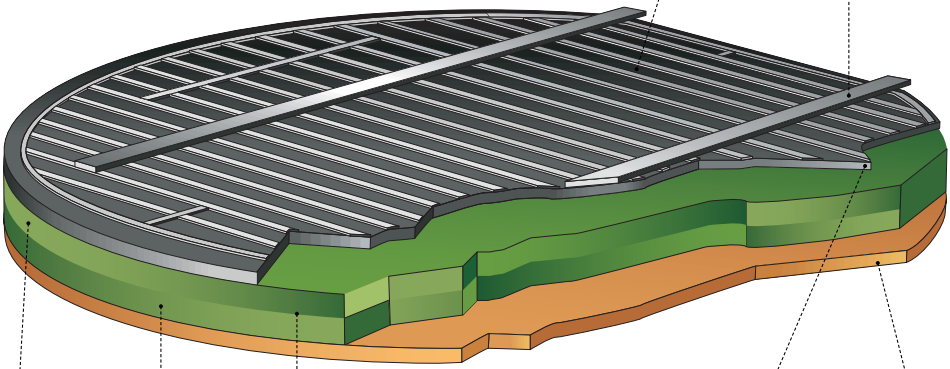
moderator: natural water
Natural water: water found in its natural state.



coolant: boiling water
Boiling water: natural water that boils and vaporizes on contact with the heat released by the fuel.

solar cell

Device used to convert solar energy directly into electric energy (photovoltaic effect).



solar radiation
All the electromagnetic waves emitted by the Sun.

metallic contact grid
Metal grille that collects the electric current being generated.

antireflection coating
Coating product that is deposited on the negative region to reduce light reflection and optimize solar radiation absorption.

negative contact
Metal element that ensures that the electric current flows through the circuit to which it is attached.

positive region
Layer of semiconductive material (silicon) to which boron is added to produce a layer with insufficient electrons.

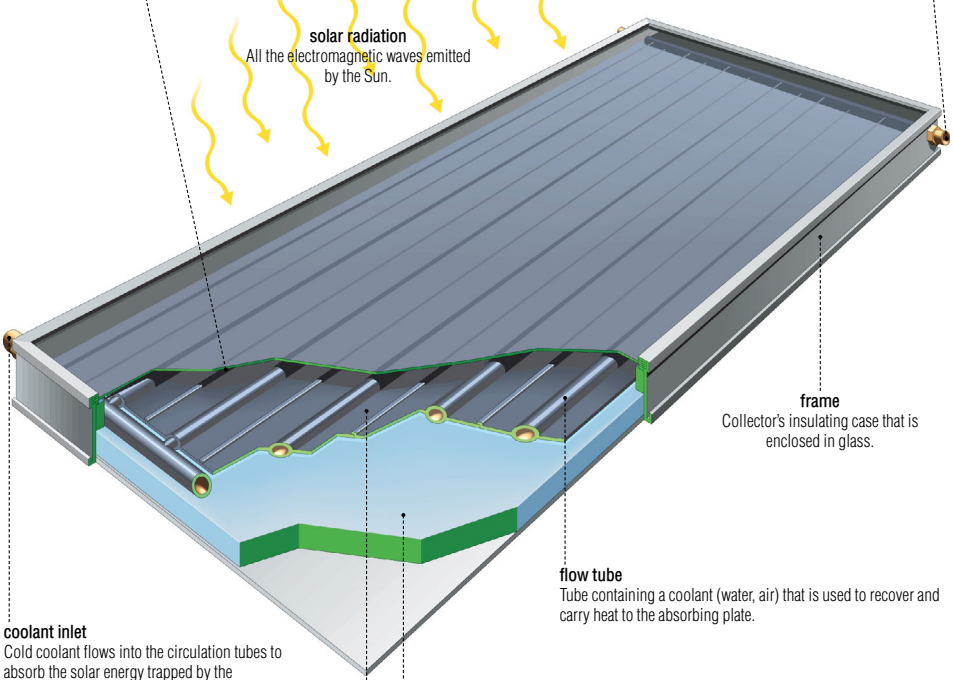
positive/negative junction
Contact area in which electrons are exchanged between two layers to create an electric current; radiation moves the charges between these regions to create voltage.

positive contact
Metal element that ensures that the electric current flows through the circuit to which it is attached.

negative region
Layer of semiconductive material (silicon) to which phosphorous is added to release electrons.

flat-plate solar collector

Device that collects solar radiation and heats a coolant, which in turn will be used in residential settings to heat water or the home.



glass
Translucent covering (glass, fiberglass, polycarbonate) that allows solar radiation to pass through; the heat produced is trapped in the collector.

coolant outlet
The coolant exits the collector at high temperature (up to about 175°F) and is stored or used immediately.

solar radiation
All the electromagnetic waves emitted by the Sun.

frame
Collector's insulating case that is enclosed in glass.

flow tube
Tube containing a coolant (water, air) that is used to recover and carry heat to the absorbing plate.

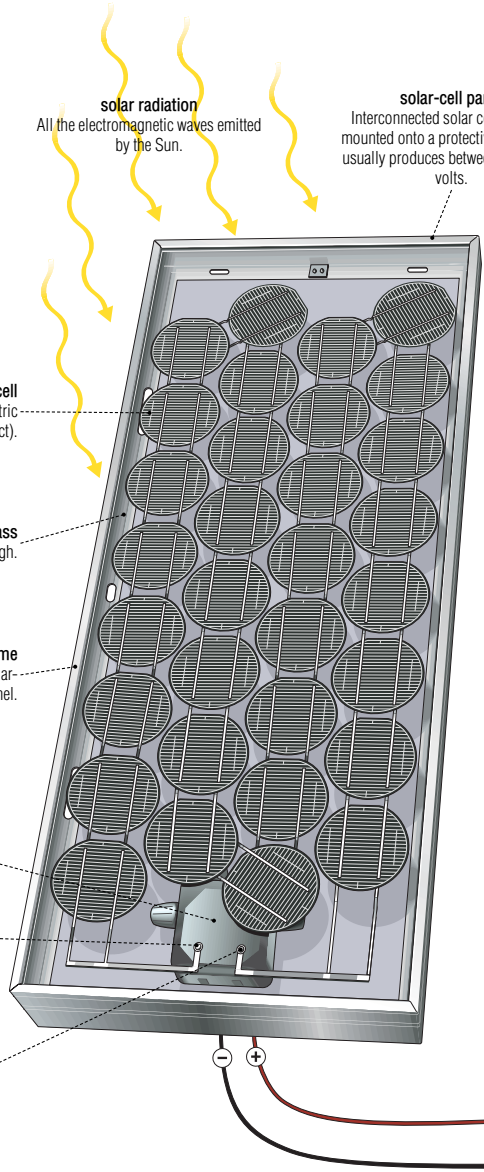
coolant inlet
Cold coolant flows into the circulation tubes to absorb the solar energy trapped by the collector.

absorbing plate
Black metallic sheet that harnesses heat from solar radiation and transfers it to the coolant fluid.

insulation
Material placed on the back side of the collector to reduce heat loss.

solar-cell system

Unit that is usually made up of 36 solar cells, each of which produces a voltage of 0.5 V; it is used to power low-voltage devices.



solar radiation
All the electromagnetic waves emitted by the Sun.

solar-cell panel
Interconnected solar cells that are mounted onto a protective support; it usually produces between 15 and 20 volts.

solar cell
Device used to convert solar energy directly into electric energy (photovoltaic effect).

glass
Glass covering that allows solar radiation to pass through.

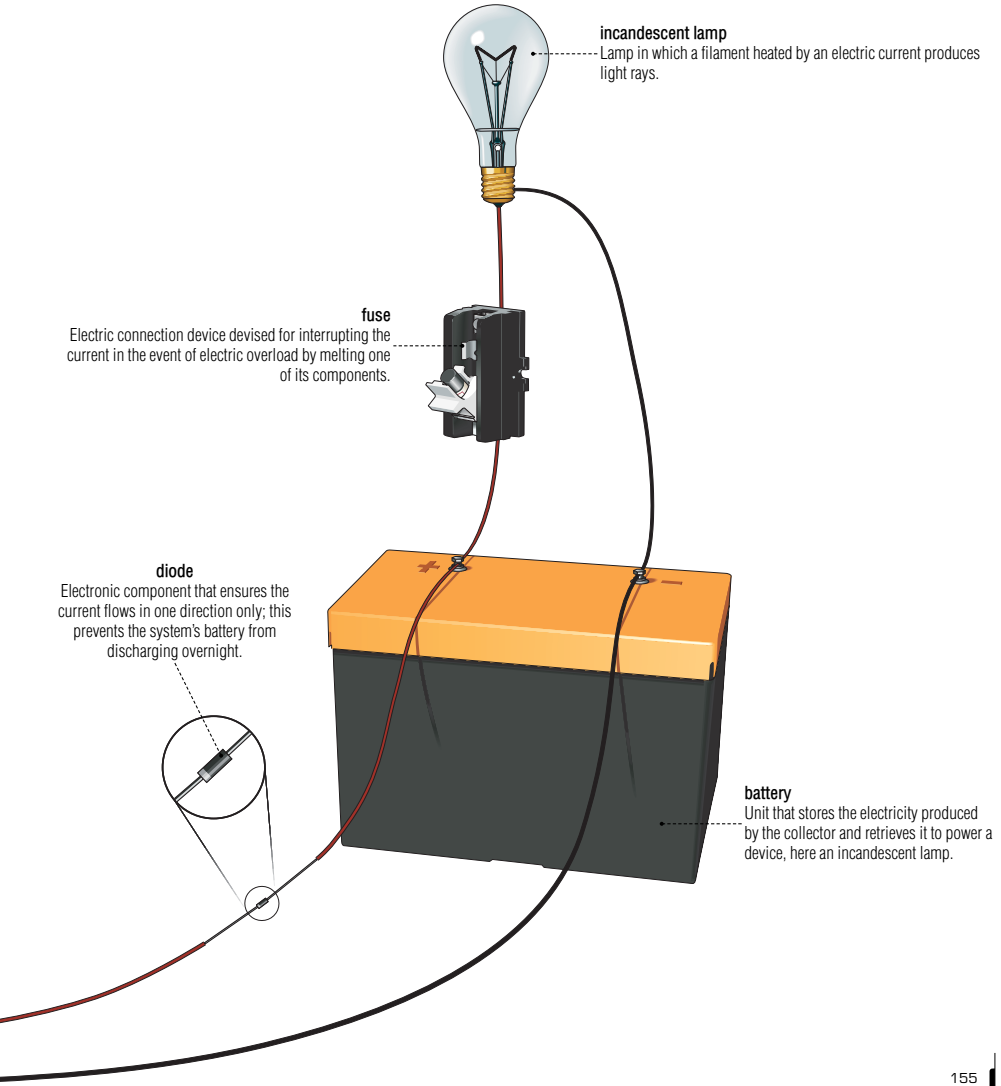
frame
Sealed box that is encased in glass and contains the solar-cell panel.

terminal box
Box in which the electric cables powering the battery are connected to the collector's positive and negative contacts.

negative contact
Metal element that ensures that the electric current flows through the circuit to which it is attached.

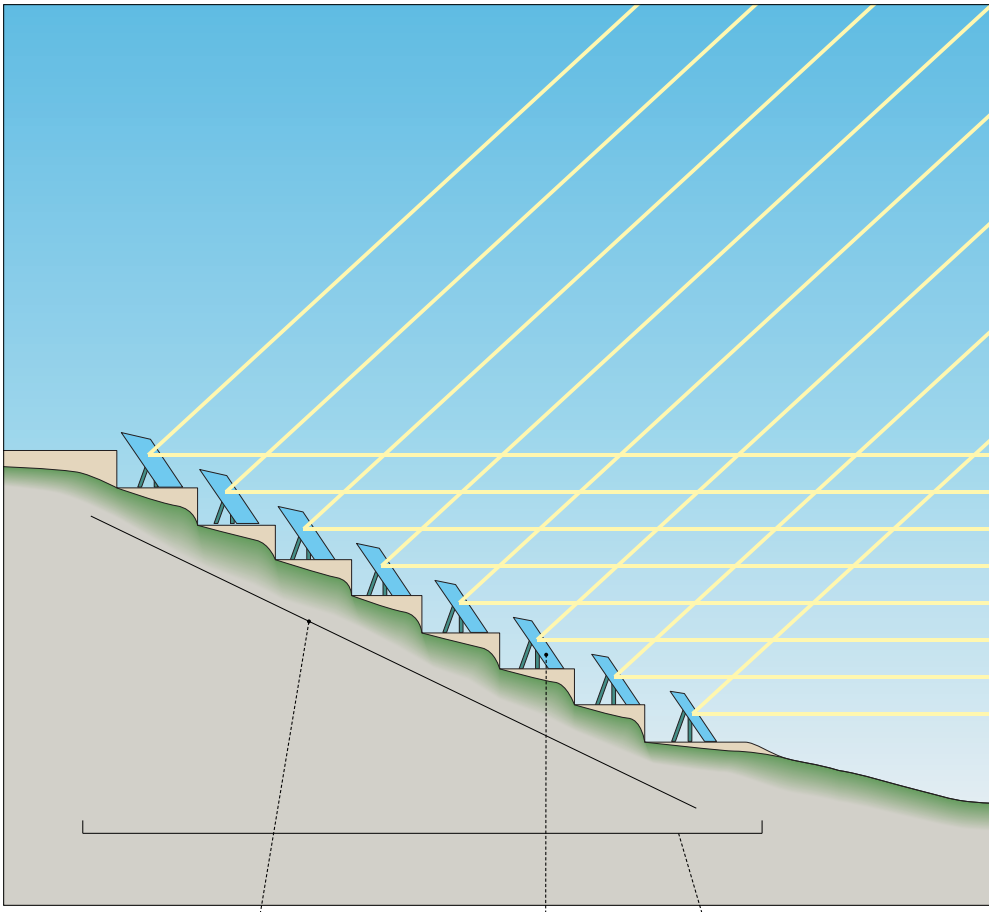
positive contact
Metal element that ensures that the electric current flows through the circuit to which it is attached.

solar-cell system



solar furnace

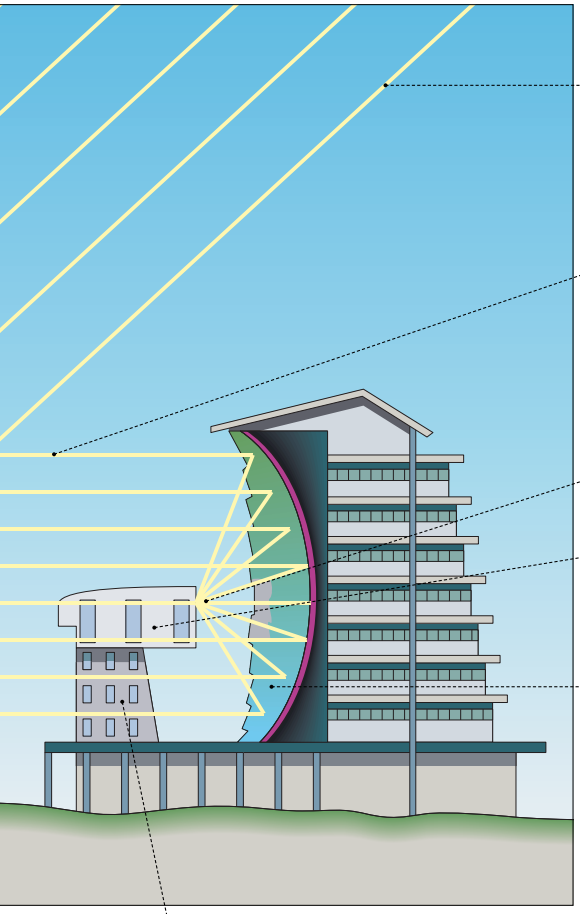
Plant that concentrates solar radiation to reach very high temperatures (over 5,400°F) as part of a research effort to develop experimental materials (including astronautic materials and ceramics).



hill
Heliostats are placed on slopes to prevent energy loss due to shade or the interception of reflected rays by neighboring mirrors.

reflecting surface
Polished metallized glass that receives solar radiation and direct it to the parabolic mirror.

bank of heliostats
Heliostats: remote-controlled adjustable mirrors that follow the Sun's trajectory and concentrate solar radiation toward the boiler at the top of the tower.



solar radiation
All the electromagnetic waves emitted by the Sun.

solar ray reflected
Solar rays that reach the heliostats are sent to the parabolic mirror.

target area
Point where solar rays reflected by the parabolic mirror converge.

furnace
Reaching temperatures of over 5,400°F, it is mainly used to process and develop materials.

parabolic mirror
Curved mirror that concentrates the Sun's rays toward one point in the furnace (the target area).

tower
Structure atop which the furnace is placed to collect luminous energy; it usually reaches a height of 65 ft.

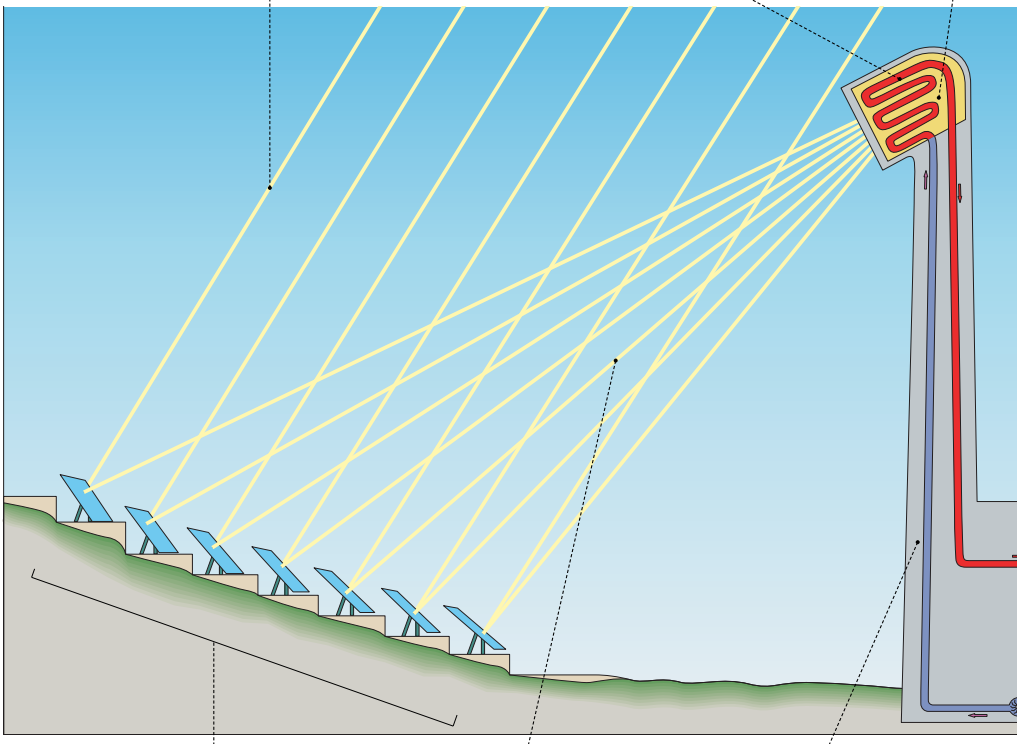
production of electricity from solar energy

Heating the coolant directly with solar rays turns water into steam, which then turns the turbo-alternator to produce electricity.

solar radiation
The Sun emits waves in the form of luminous radiation (41% visible light, 52% infrared light and 7% ultraviolet light).

coolant
Fluid (e.g., a mixture of melted salts) that traps the heat from concentrated solar radiation and carries it to the turbine.

boiler
Enclosure in which the concentrated heat from the Sun's rays raises the temperature of the coolant.



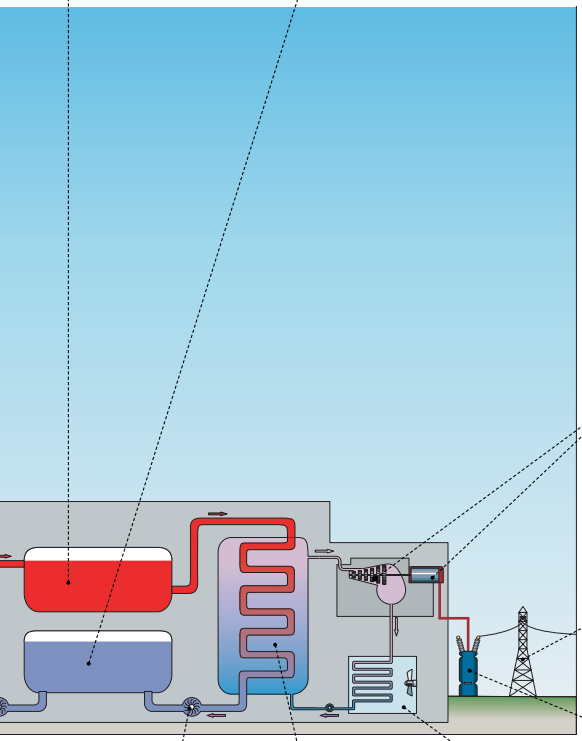
bank of heliostats
Heliostats: remote-controlled adjustable mirrors that follow the Sun's trajectory and concentrate solar radiation toward the boiler at the top of the tower.

solar ray reflected
Solar rays trapped by heliostats are sent to the boiler.

tower
Structure atop which the boiler sits and collects luminous energy; it can reach 325 ft in height.

hot coolant
The coolant extracts heat from the boiler and carries it to the steam generator and turbine.

cold coolant
After releasing its heat to the steam generator, the cold coolant returns to the boiler.



turbo-alternator
Device that uses steam to convert the mechanical force generated by the rotation of the turbine into electricity.

electricity transmission network
Electricity is carried over vast distances by a network of cables that extends from the power plant to consumers.

transformer
Device used to alter the electric voltage; the voltage is increased at the plant outlet in order to carry the current over long distances.

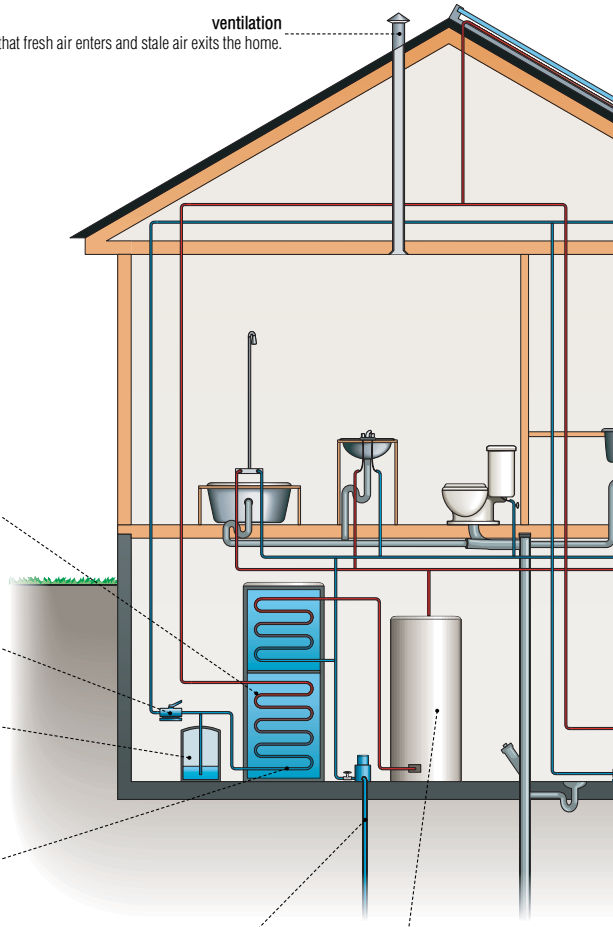
pump
Device that ensures that the cold coolant liquid flows to the boiler.

steam generator
Device that uses heat to convert water into steam to activate the turbo-alternator.

condenser
Circuit that cools the steam from the turbine and condenses it into water, which is reintroduced into the steam generator.

solar house

Solar energy can be used to heat and supply hot water to a home.



ventilation
Piping that ensures that fresh air enters and stale air exits the home.

storage tank
Insulated metal tank that contains clean hot water to be distributed in the home.

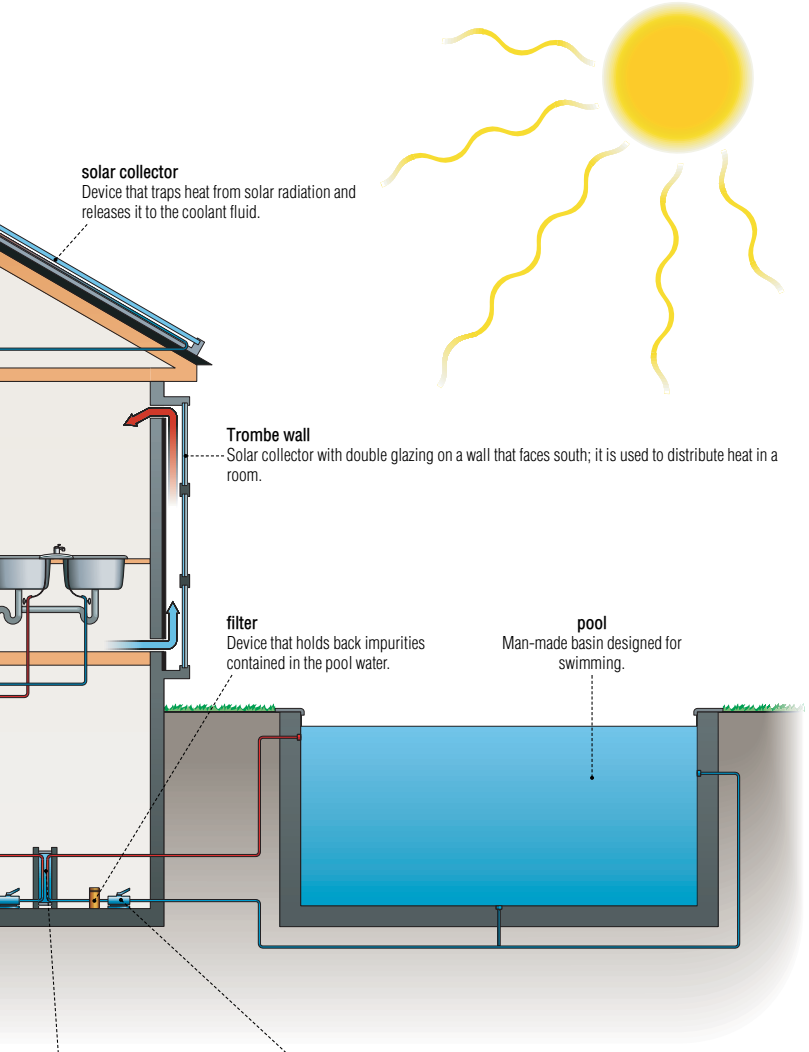
circulating pump
Apparatus that circulates the cooled coolant from the heat exchanger to the solar collector.

expansion tank
Reservoir for absorbing water expansion; it keeps the water pressure in the system steady.

heat exchanger
Apparatus used to release the heat of the coolant liquid generated by the collector to the home's water system.

service pipe
Pipe connecting a public water supply to the house.

water-heater tank
Apparatus that produces clean hot water by gas or electric heating; this auxiliary system is used when there is insufficient sunlight, mainly in winter.



solar collector
Device that traps heat from solar radiation and releases it to the coolant fluid.

Trombe wall
Solar collector with double glazing on a wall that faces south; it is used to distribute heat in a room.

filter
Device that holds back impurities contained in the pool water.

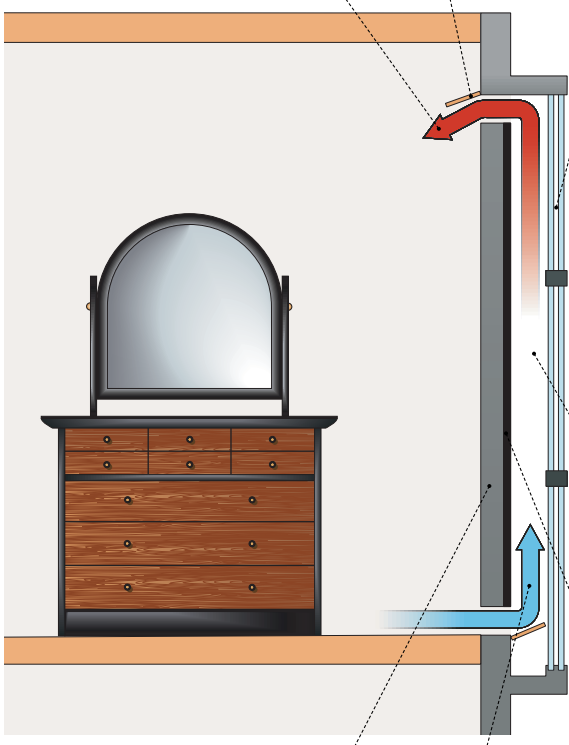
pool
Man-made basin designed for swimming.

heat exchanger
Device that transfers the heat produced by the collector to the home's hot water system.

circulating pump
Apparatus that ensures that the cooled water flows from the pool to the solar collector.

solar house

Trombe wall
Solar collector with double glazing on a wall that faces south; it is used to distribute heat in a room.



shutter
Flap gate used to control the entry of heat into the home.

double glazing
Each of two glass plates placed in front of the concrete wall; they allow solar radiation to penetrate and retain the heat.

warm air
Air heated by solar radiation is introduced into the room by convection.

solar radiation
All the electromagnetic waves emitted by the Sun.

air gap
Space between the wall and the glazing in which air flows; as air heats up on contact with the wall, it rises naturally in this space.

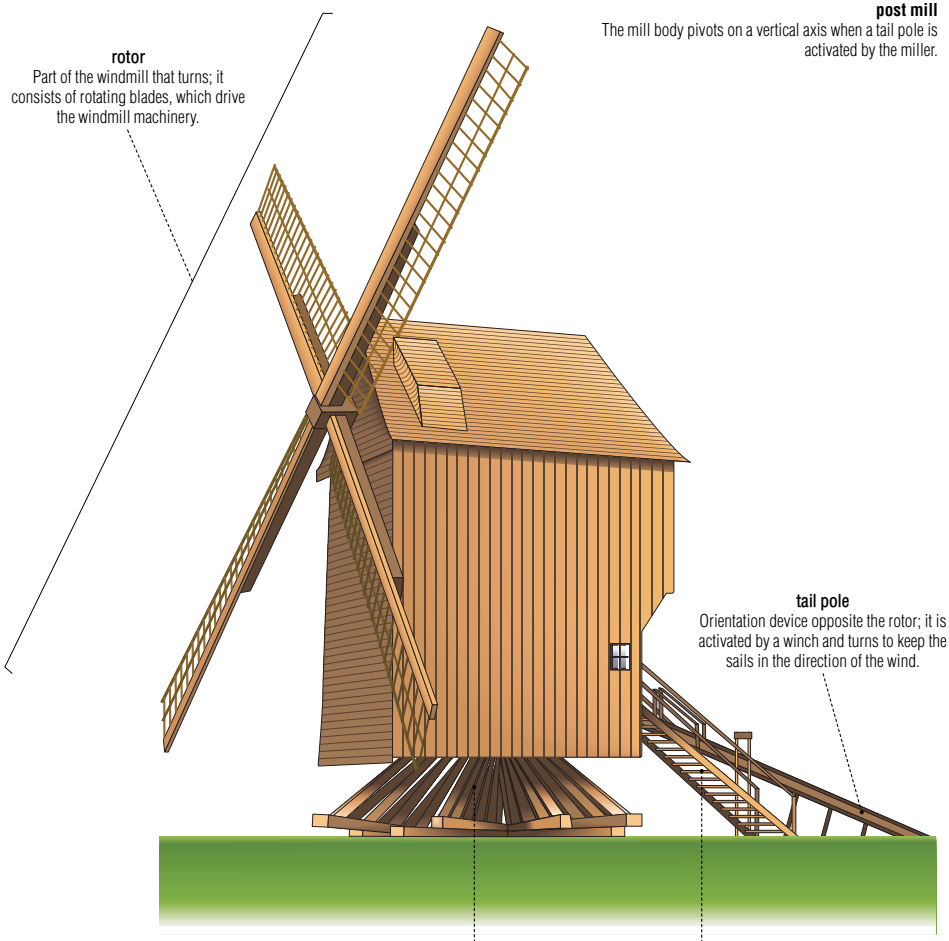
absorbing surface
Black wall that catches solar radiation and converts it into heat.

concrete wall
Masonry structure that is about 15 in thick; it has a black surface to absorb heat from the Sun to heat the air.

cold air
Fresh air enters the home at the base of the air gap and is heated on contact with the wall.

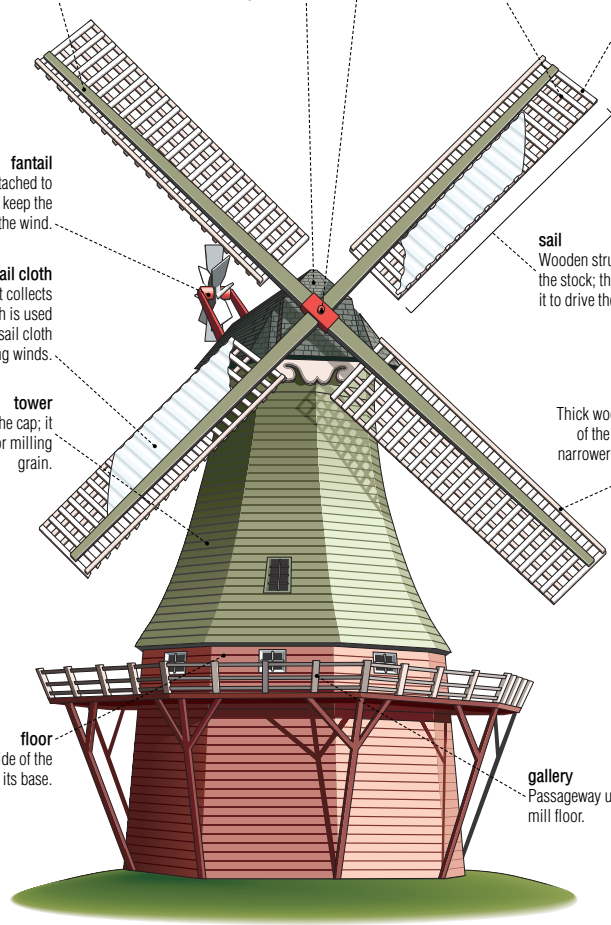
windmill

Machine that converts wind energy into mechanical energy; it was used in the past to mill grain and pump water.



windmill

tower mill
The tower mill appeared later than the post mill; it consists of a usually circular, stationary body and a roof that rotates with the help of a fantail.



windshaft
Cylindrical part on which the sails turn; it transmits the movement of the rotor to the windmill machinery.

frame
All the sailbars forming the outline of the sail.

cap
Movable upper part of the tower that contains the rotor; it turns to position the sails facing the wind.

stock
Wooden arm to which the sail frame is attached.

sailbar
Elongated piece of wood that forms a sail.

fantail
Orientation device that is attached to the cap, allowing it to rotate to keep the sails in the direction of the wind.

sail
Wooden structure that is attached to the stock; the force of the wind turns it to drive the rotor.

sail cloth
Cloth attached to a sail that collects wind energy; a large sail cloth is used for weak winds and a small sail cloth for strong winds.

hemlath
Thick wooden sailbar on the side of the frame that keeps the narrower sailbars inside the sail.

tower
Structure that supports the cap; it houses all the machinery for milling grain.

floor
Level for accessing the inside of the mill; grain is usually stored at its base.

gallery
Passageway used to move around the mill floor.

wind turbines and electricity production

Wind turbine: machine that harnesses energy from the wind and converts it into mechanical energy to activate the alternator.

vertical-axis wind turbine
Wind turbine whose axis is perpendicular to the wind.

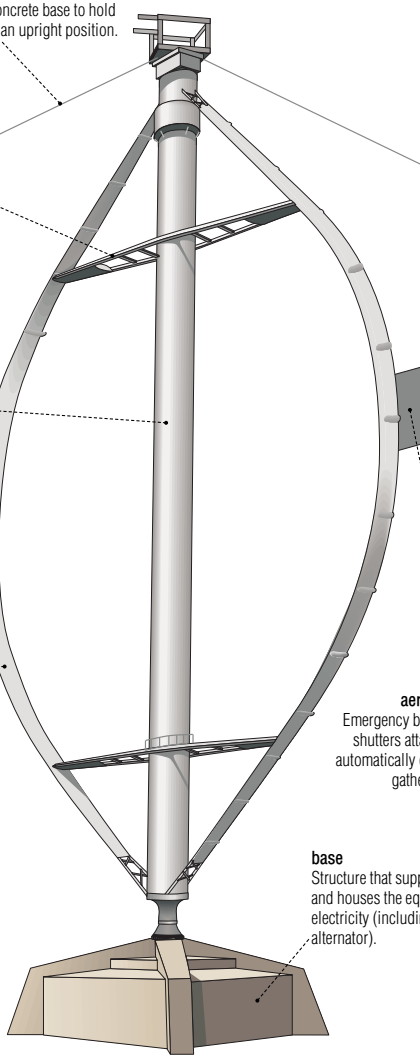
guy wire
Cable that connects the top of the vertical axis to a concrete base to hold the wind turbine in an upright position.

strut
Horizontal piece that connects the blades to the central column to strengthen them.

central column
Vertical cylindrical part to which the blades are attached; the force of the wind on the blades causes it to rotate.

rotor
Rotating part of the wind turbine that is usually made up of two or three blades; its rotation drives the alternator to produce electricity.

blade
Aerodynamic part that is attached to the central column; the force of the wind turns it to drive the rotor.



aerodynamic brake
Emergency braking system; it consists of shutters attached to the blades, which automatically deploy when the wind turbine gathers too much speed.

base
Structure that supports the wind turbine's rotor and houses the equipment used to produce electricity (including the gearbox and the alternator).

wind turbines and electricity production

horizontal-axis wind turbine
The most common type of wind turbine; its axis positions itself in the direction of the wind.

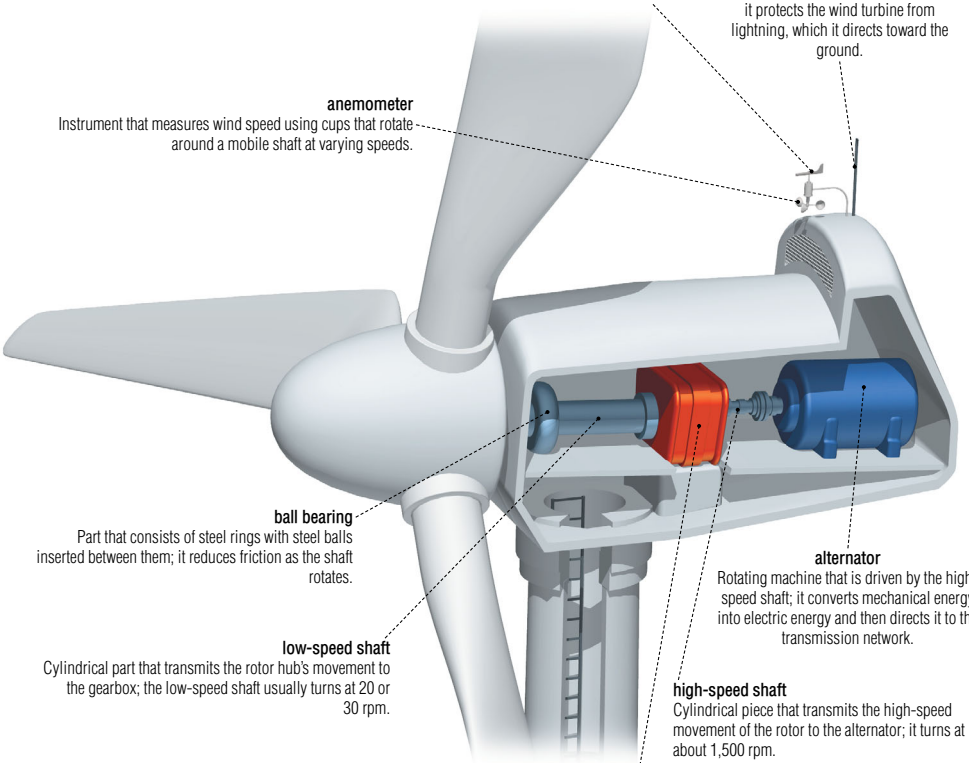
blade
Aerodynamic part that is attached to the hub; the force of the wind causes it to rotate to drive the rotor.

nacelle
Metal structure that encloses and protects the main mechanical elements of the wind turbine (including the gearbox and the alternator).

hub
Part of the rotor to which the blades are attached; it turns the low-speed shaft.

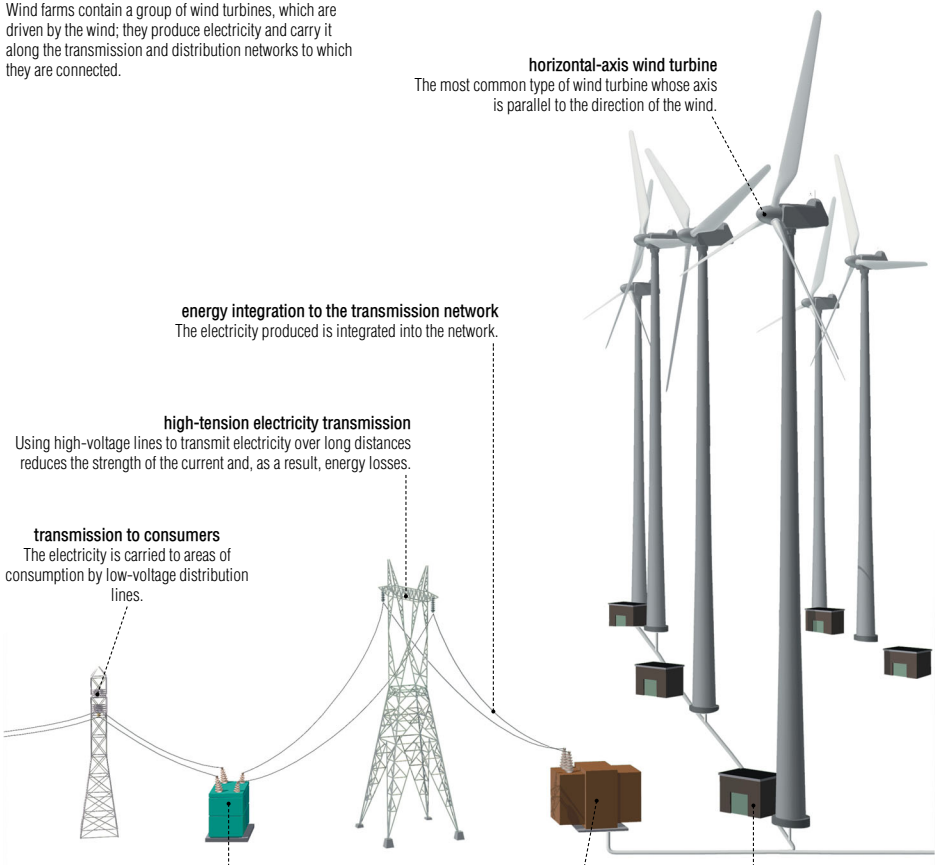
tower
Tower that reaches 260 ft in height; it supports the nacelle and rotor and houses the electric cables.

nacelle cross-section



wind turbines and electricity production

production of electricity from wind energy
Wind farms contain a group of wind turbines, which are driven by the wind; they produce electricity and carry it along the transmission and distribution networks to which they are connected.



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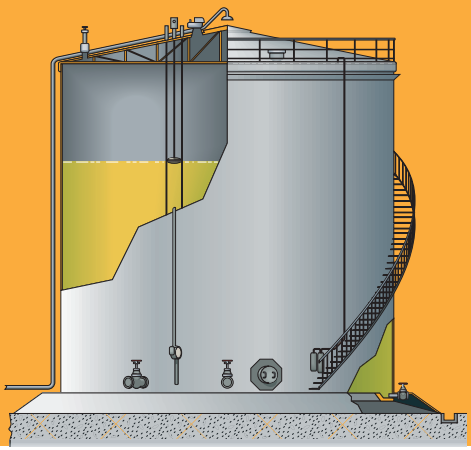

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