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General Principles in the working of Simple Pendulum, Simple Pulleys, Siphon, Levers, Balloon, Pumps, Hydrometer, Pressure Cooker, Thermos Flask, Gramophone, Telegraphs, Telephone, Periscope, Telescope, Microscope, Mariner's Compass; Lightning Conductors, Safety Fuses

Simple Pulleys

Pulley is a simple wooden or metallic machine that uses a wheel and rope to lift heavy loads. Nowadays, plastic pulleys are also available in the market to carry small loads. This can be rotated freely about an axis passing through its center. It can change the direction of a force which makes it much easier for people to lift anything. With this, you can pull down on one end to lift the 10 kgs and one-meter high object.

Types of Pulley

- **Fixed Pulley**

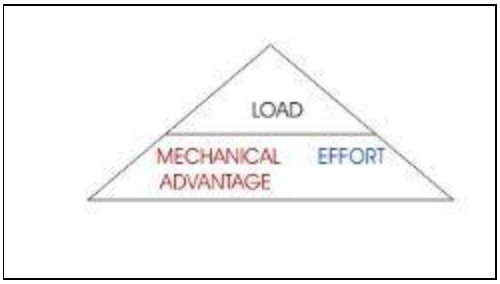
When the block of the pulley is fixed on a high platform, it is known as fixed. An extensible string passes over the groove where its one end is attached to the body to be lifted while the other end is free.

- **Movable Pulley**

When the block of the pulley is not fixed but carries the load, it is known as Movable. An inextensible string is tied around the groove where its one end is fixed to fixed support while the other end is kept free to apply the effort. As the effort is applied, the block together with the load moves upward.
Pulley Formula

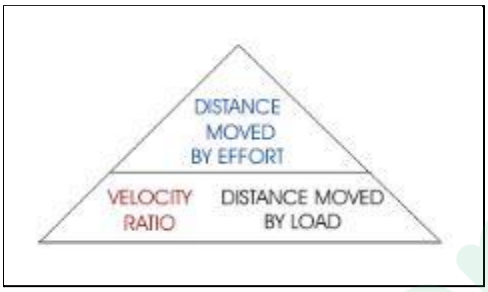
Following are the formulas that are used when pulleys are used for lifting. There are formulas that are important and they are:

- **Mechanical advantage formula:** It is defined as the ratio of load to the effort.



Using a single formula inside the triangle, mechanical advantage, load, and effort can be generated.

- Mechanical advantage = (Load/Effort)
- Load = Mechanical advantage*Effort
- Effort = (Load/Mechanical advantage)
- Velocity ratio: It is defined as the ratio of the distance moved by the effort to the distance moved by the load.

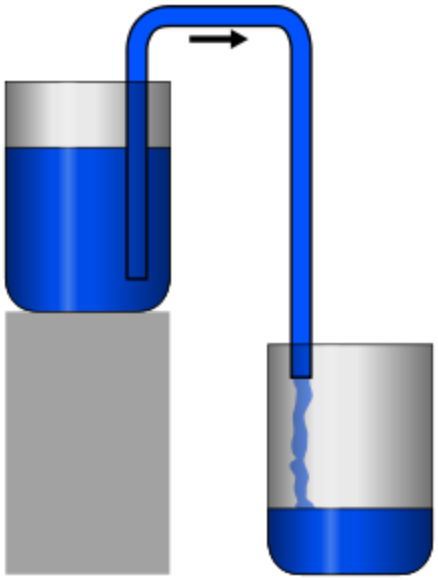


Using a single formula inside the triangle, distance moved by the load, velocity ratio, and distance moved by the load can be generated.

- Distance moved by load = (distance moved by effort/Velocity ratio)
- Velocity ratio = (distance moved by effort/Distance moved by load)
- Distance moved by effort = Distance moved by the load*Velocity ratio

Siphon

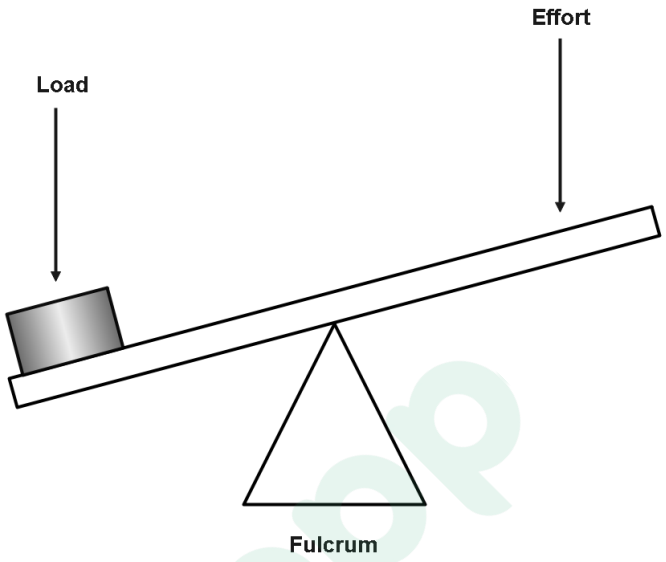
- A siphon (from Ancient Greek: σίφων, romanized: síphōn, "pipe, tube", also spelled non etymologically syphon) is any of a wide variety of devices that involve the flow of liquids through tubes. In a narrower sense, the word refers particularly to a tube in an inverted "U" shape, which causes a liquid to flow upward, above the surface of a reservoir, with no pump, but powered by the fall of the liquid as it flows down the tube under the pull of gravity, then discharging at a level lower than the surface of the reservoir from which it came.



- There are two leading theories about how siphons cause liquid to flow uphill, against gravity, without being pumped, and powered only by gravity.
    - The **traditional theory** for centuries was that gravity pulling the liquid down on the exit side of the siphon resulted in reduced pressure at the top of the siphon. Then atmospheric pressure was able to push the liquid from the upper reservoir, up into the reduced pressure at the top of the siphon, like in a barometer or drinking straw, and then over. However, it has been demonstrated that siphons can operate in a vacuum and to heights exceeding the barometric height of the liquid.
    - Consequently, the **cohesion tension theory** of siphon operation has been advocated, where the liquid is pulled over the siphon in a way similar to the chain fountain. It need not be one theory or the other that is correct, but rather both theories may be correct in different circumstances of ambient pressure. The atmospheric pressure with gravity theory obviously cannot explain siphons in vacuum, where there is no significant atmospheric pressure. But the cohesion tension with gravity theory cannot explain CO
- 2 gas siphons, siphons working despite bubbles, and the flying droplet siphon, where gases do not exert significant pulling forces, and liquids not in contact cannot exert a cohesive tension force.
- All known published theories in modern times recognize **Bernoulli's equation** as a decent approximation to idealized, friction-free siphon operation.

Levers

A lever may be a machine made from a rigid beam and a fulcrum. The effort (input force) and cargo (output force) are applied to either end of the beam. The fulcrum is the point on which the beam pivots. When an attempt is applied to at least one end of the lever, a load is applied at the opposite end of the lever.



There are three parts to all levers:

Fulcrum: A resistive force that is to be overcome by a machine is called the Load. S.I. The unit is Newton (N).

Input force: (also called the effort) An external force applied to a simple machine to overcome a load is called the Effort. S.I. The unit is Newton (N).

Output force: (also called the load) The point on which something turns or is supported.

Mechanical advantage: ratio may be a measure of the force amplification achieved by employing a tool, robot or machine system. The device trades off input forces against movement to get a desired amplification within the output force. The model for this is often the law of the lever.

Principle:

- The lever may be a movable bar that pivots on a fulcrum attached to a hard and fast point. The lever works by putting forces at different distances from the or a

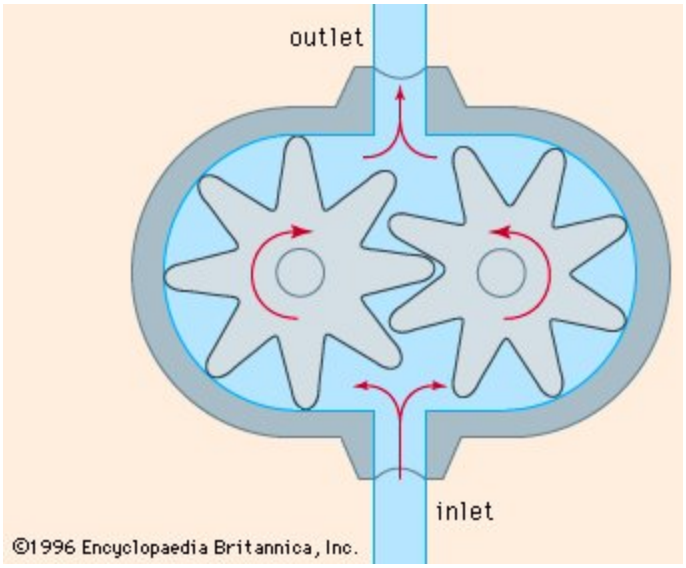
pivot. As the lever rotates around the pivot point or fulcrum the distant part moves faster than the closer point.

- Therefore, we can say that the force applied to the far point from the fulcrum must be less than the force located at a closer point, because power is the product of force and velocity.
- A principle that applies to a system of balanced forces a few fulcrum or pivot, during which the entire anticlockwise moment is adequate to the entire clockwise moment. Therefore, a lever will balance or turn regularly about the purpose of support when the range of the force and force arm equals the range of the resistance and resistance arm.

Note: Generally, the lever system is employed to lift loads using the **principle of moments.** When heavy loads must be lifted, they are put on the load end and then, the fulcrum is pushed close to the load. Hence, the load arm distance is reduced and energy arm distance is increased. Hence using the principle of moments, the load is often lifted employing a lower amount of effort force, since the products of load and cargo arm are going to be equal to the effort and effort arm.

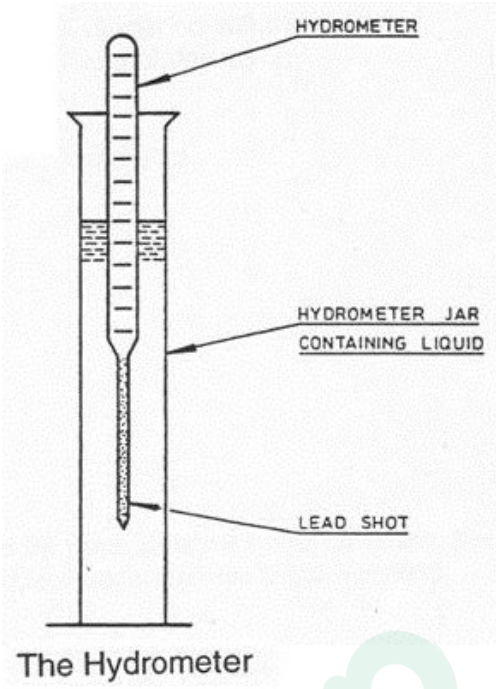
Pumps

- Pump, a device that expends energy in order to raise, transport, or compress fluids. The earliest pumps were devices for raising water, such as the Persian and Roman waterwheels and the more sophisticated Archimedes screw.
- The mining operations of the Middle Ages led to development of the suction (piston) pump, many types of which are described by Georgius Agricola in De re metallica (1556). A **suction pump works by atmospheric pressure**; when the piston is raised, creating a partial vacuum, atmospheric pressure outside forces water into the cylinder, whence it is permitted to escape by an outlet valve. Atmospheric pressure alone can force water to a maximum height of about 34 feet (10 metres), so the force pump was developed to drain deeper mines. In the force pump the downward stroke of the piston forces water out through a side valve to a height that depends simply on the force applied to the piston.



Hydrometer

A hydrometer is an instrument used to determine the specific gravity of a liquid. Again Archimedes's principle states that buoyant force on a body fully or partially submerged in a fluid, is equal to the weight of the fluid that body displaces. Now, we must see how the specific gravity is measured in a hydrometer. A hydrometer is a glass flask sealed at both ends. On one end it is filled with lead, this causes the hydrometer to float upright in a liquid. The second jar also known as a hydrometer jar is filled with liquid being measured. The hydrometer is then suspended into this liquid. On the sides of the hydrometer there are two scales indicating volume and density respectively. The hydrometer then balances itself by sinking or floating upwards in the liquid as the buoyant force and force of gravity by the hydrometer is always equal. Now readings are taken after the hydrometer is stabilized. The volume of the hydrometer submerged is measured. In a way, the amount of fluid displaced is measured and specific gravity of liquid is calculated. So, it is now clear that hydrometer works on **Archimedes's principle.**



The Hydrometer

While taking hydrometer readings care should be taken that the reading coinciding the liquid level is not taken but the reading just above it is considered. Also, the scale on the hydrometer should be checked as there are types of scales such as Brix scale, Baume scale, Alcohol scale, API scale.

Note:
The readings in the hydrometer may vary due to temperature or improper immersion. It should always be checked that the hydrometer is clean to avoid reading errors. The units of or scale marked on hydrometer is given by gram per cubic centimetre.

Pressure Cooker

A pressure cooker is based on the principle that with the increase in pressure, boiling point of water increases. It works by capturing the steam which increases the pressure in the vessel. Due to increase in pressure the boiling point of water rises up.
When the water inside the pressure cooker boils, the inside pressure is designed to build up to 1kg/sq.cm and at this pressure, the corresponding temperature is 120^{o}C as against 100^{o}C , which is the boiling point of water in conservative cooking. Thus, it increases food cooking speed upto four times. This helps in saving fuel.

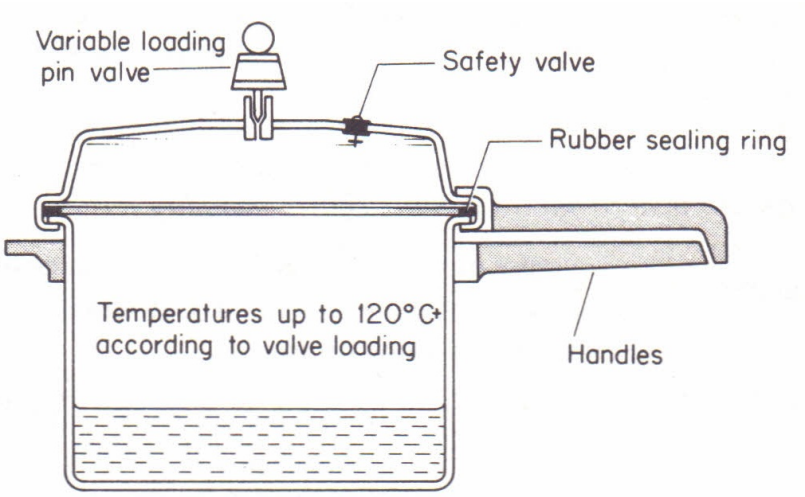


Fig. 20.5. Pressure cooker

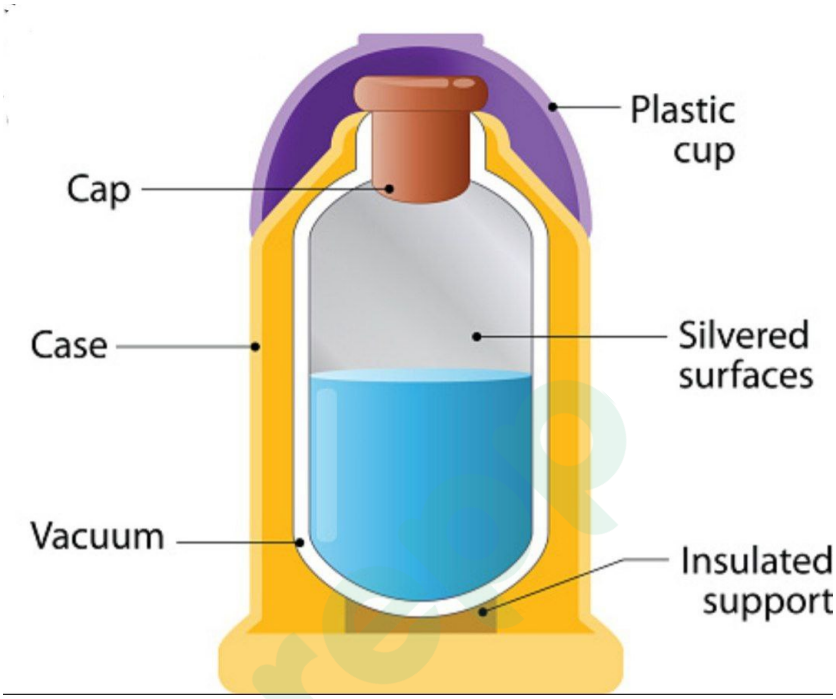
Safety precautions while using pressure cooker:
- Read all Instructions before use.
- Before putting the Weight Valve device on the cooker it should be ensured that the steam starts to come
- Do not touch hot surfaces. Use handles or knobs.
- Close supervision is necessary when the pressure cooker is used near children.

Note: Advantages of using Pressure Cooker: The advantages of using a pressure cooker are that they reduce the cooking time by almost two third, and also there is less loss of nutrients.
Disadvantages of using Pressure Cookers: Disadvantages of using a pressure cooker include that it does not allow you to cook different items at same time. Also, time taken by a pressure cooker to cook at higher altitudes is different.

Thermos Flask

Heat can be transferred from one plane to another through conduction, convection and radiation. The conduction takes place when two surfaces at different temperatures come in contact with each other. The convection takes place in fluids like liquids and gases where heat is transferred by actual motion of particles of the medium from one place to another. Radiation transfers heat through radiative processes and does not require a medium to take place.
A thermos flask is used to keep a liquid hot for a long duration of time. But the above processes between thermos flasks and surroundings lead to loss of stored heat. To prevent these processes, the walls of the thermos flask are double layered with a

vacuum between them. The vacuum does not allow the heat transfer between the hot liquid inside and the cold air outside. The processes of conduction and convection are unable to occur because of this insulation. This is the basic working principle of a thermos flask by which the contents of the thermos flask remain hot for a long duration of time.



Note:
It should be noted that the insulation is not able to prevent heat transfer through radiation since it does not require a medium to occur and can also occur through the vacuum between the walls of the thermos flask. But the process of radiation does not transfer heat at a very large rate and is slower compared to conduction and convection. Conduction is the fastest process of transfer of heat. The contents of thermos flasks eventually lose their heat over a long duration of time through radiation.

Gramophone

Phonograph, also called a record player, is an instrument for reproducing sounds by means of the vibration of a stylus, or needle, following a groove on a rotating disc. A phonograph disc, or record, stores a replica of sound waves as a series of undulations in a sinuous groove inscribed on its rotating surface by the stylus. When the record is played back, another stylus responds to the undulations, and its motions are then reconverted into sound.

Though experimental mechanisms of this type appeared as early as 1857, the invention of the phonograph is generally credited to the American inventor Thomas Edison (1877). His first recordings were indentations embossed into a sheet of tinfoil by a vibrating stylus; the tinfoil was wrapped around a cylinder that was rotated as the sounds were being recorded. Improvements in Edison's process followed, notable among which were Emil Berliner's innovation in 1887 of tracing sound grooves in a spiral on a flat disc rather than in a helix on a cylinder. A negative was made from the flat master disc, and the negative then used as a mold for making many copies that reproduced the original master disc. **These "records," as they came to be known, could be played on a reproducing machine Berliner named a Gramophone.**

Improved methods of molding disc records followed in the early 20th century, and by 1915 the 78-RPM (revolutions-per-minute) record, with a playing time of about 4 $^{1}/_{2}$ minutes per side, had become standard. In the early 1920s electric loudspeakers were adopted to amplify the volume of reproduced sound. In 1948 Columbia Records introduced the long-playing (LP) record, which, with a rotational speed of $33^{1}/_{3}$ RPM and the use of very fine grooves, could yield up to 30 minutes of playing time per side. Shortly afterward RCA Corporation introduced the 45-RPM disc, which could play for up to 8 minutes per side. These LP's and "singles" supplanted 78s in the 1950s, and stereophonic (or "stereo") systems, with two separate channels of information in a single groove, became a commercial reality in 1958. Stereo phonographs capable of the

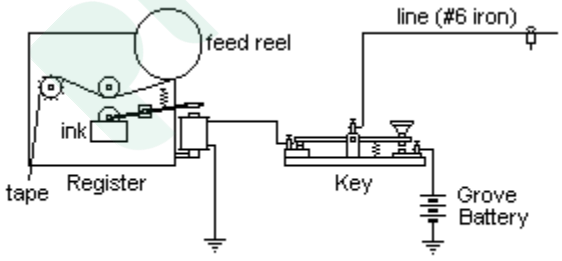
undistorted reproduction of sound became one component of what is known as a high-fidelity sound system.

All modern phonograph systems had certain components in common: a turntable that rotated the record; a stylus that tracked a groove in the record; a pickup that converted the mechanical movements of the stylus into electrical impulses; an amplifier that intensified these electrical impulses; and a loudspeaker that converted the amplified signals back into sound.

Phonographs and records were the chief means of reproducing recorded sound at home until the 1980s, when they were largely supplanted by recorded cassettes and compact discs.

Telegraphs

A telegraph is a communications system in which information is transmitted over a wire through a series of electrical current pulses, usually in the form of Morse code. The basic components include a source of direct current, a length of wire or cable, and a current-indicating device such as a relay, buzzer, or light bulb. The term comes from the Greek words "tele," meaning "at a distance" and "graphein," meaning "to write."



Typical Morse (Vail) Telegraph Station (1860s)

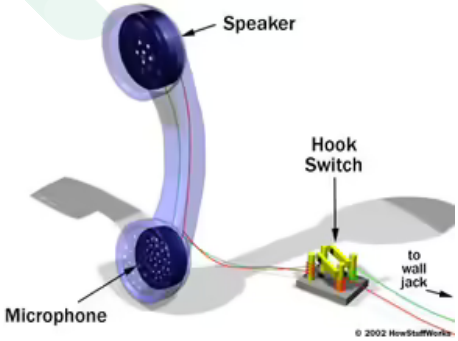
The telegraph has been in use for more than 150 years. The prototype of the telegraph was demonstrated by Joseph Henry in 1830. He transmitted an electric current over a length of wire approximately 1 mile (1.6 kilometer) in length to activate a bell on the opposite end of the circuit. This device was refined and developed by Samuel F. B. Morse into a system that used a solenoid, equipped with a marker, to record multiple pulses of varying duration on a moving strip of paper. These pulses appeared as so-called dots and dashes. Patterns of these dots and dashes were assigned to letters of the alphabet, single-digit numerals, and punctuation marks. On May 1, 1844, the first official telegraph message was sent.

The telegraph was, arguably, one of the two most important technological advances that contributed to U.S. settlement of North America west of the Mississippi River. (The other was the railroad.) The telegraph is still occasionally used for communication, but the Internet and the telephone are employed far more often. A variant of the original Morse code is used by amateur radio operators today, largely for recreation, but occasionally in emergencies when all other modes of communication fail as a result of infrastructure damage or because of poor wave propagation conditions. The amateur radio operator reads the code by listening to audio tones from a radio receiver. The human ear, working in conjunction with the brain, is one of the most sensitive known data interpreters, and the Morse code, because it is binary, remains among the most efficient, albeit slow, data transmission methods.

Western Union, a U.S.-based financial and communications service company, was founded in the 1850s to take advantage of the then new technology. Since then, Western Union has conveyed telegrams all over the world. However, as the Internet and e-mail have become increasingly prevalent around the globe, the telegram has been less frequently used and considered more and more anachronistic. In January 2006, Western Union announced -- on the Internet -- that it would no longer be sending telegrams.

Telephone

The very simplest working telephone would look like this inside.



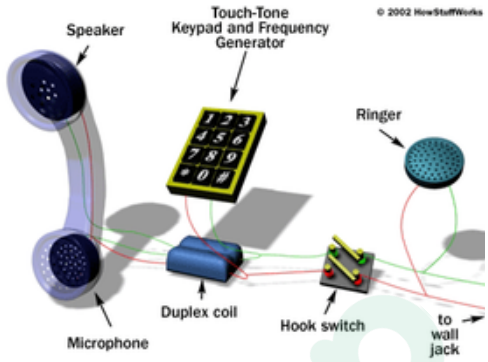
As you can see, it only contains three parts and they are all simple:

- A switch to connect and disconnect the phone from the network - This switch is generally called the hook switch. It connects when you lift the handset.
- A speaker - This is generally a little 50-cent, 8-ohm speaker of some sort.
- A microphone - In the past, telephone microphones have been as simple as carbon granules compressed between two thin metal plates. Sound waves from

your voice compress and decompress the granules, changing the resistance of the granules and modulating the current flowing through the microphone.

That's it! You can dial this simple phone by rapidly tapping the hook switch -- all telephone switches still recognize "pulse dialing." If you pick the phone up and rapidly tap the switch hook four times, the phone company's switch will understand that you have dialed a "4."

The only problem with the phone shown above is that when you talk, you will hear your voice through the speaker.



Most people find that annoying, so any "real" phone contains a device called a duplex coil or something functionally equivalent to block the sound of your own voice from reaching your ear. A modern telephone also includes a bell so it can ring and a touch-tone keypad and frequency generator. A "real" phone looks like this.

Still, it's pretty simple. In a modern phone there is an electronic microphone, amplifier and circuit to replace the carbon granules and loading coil. The mechanical bell is often replaced by a speaker and a circuit to generate a pleasant ringing tone.

The telephone network starts in your house. A pair of copper wires runs from a box at the road to a box (often called an entrance bridge) at your house. From there, the pair of wires is connected to each phone jack in your house (usually using red and green wires). If your house has two phone lines, then two separate pairs of copper wires run from the road to your house. The second pair is usually colored yellow and black inside your house.

Along the road runs a thick cable packed with 100 or more copper pairs. Depending on where you are located, this thick cable will run directly to the phone company's switch in your area or it will run to a box about the size of a refrigerator that acts as a digital concentrator.

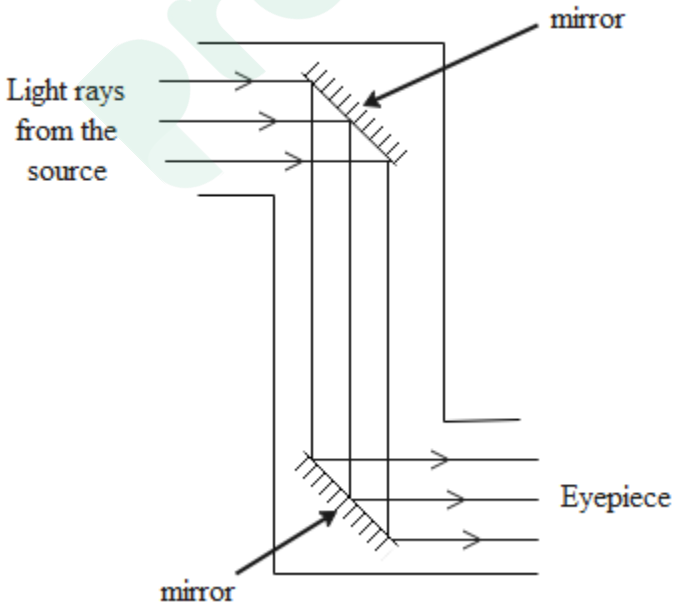
Digital Phone Calls

The concentrator digitizes your voice at a sample rate of 8,000 samples per second and 8-bit resolution . It then combines your voice with dozens of others and sends them all

down a single wire (usually a coax cable or a fiber-optic cable) to the phone company office. Either way, your line connects into a line card at the switch so you can hear the dial tone when you pick up your phone.
If you are calling someone connected to the same office, then the switch simply creates a loop between your phone and the phone of the person you called. If it's a long-distance call, then your voice is digitized and combined with millions of other voices on the long-distance network. Your voice normally travels over a fiber-optic line to the office of the receiving party, but it may also be transmitted by satellite or by microwave towers.

Periscope

A periscope is based on the Laws of Reflection, which says that the light from the object falls on a mirror at an angle of 45 degrees from the surface and is mirrored. The mirrored light then falls on another mirror and is mirrored again until it enters the human eye.
The periscope operates on the theory of light reflection (multiple reflections from plane mirrors).



Note: Periscope follows the laws of reflection of light and the reflection is a complete internal reflection. In total internal reflection light falls from denser to rarer medium then reflects back in denser medium itself. The condition happens when the angle of

incidence is greater than a certain angle of restriction, called the critical angle. Diamond is a perfect example of absolute internal reflection. Diamond has the highest refractive index, but can increase the amount of total internal reflection by being correctly cut to make the diamond sparkle. The fiber optic cables relay light as they pass through the cables by bouncing from side to side.

Telescope

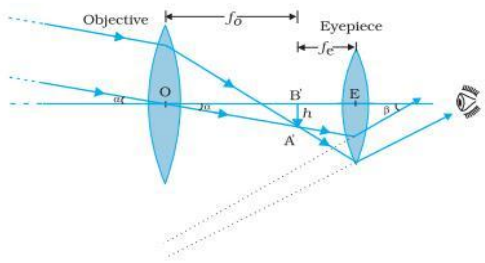
- An instrument used to view distant objects clearly.
- It consists of:- (a) Objective lens (b) Eyepiece

Working of Telescope

- The telescope is used to provide angular magnification of distant objects. The objective has a large focal length and a much larger aperture than the eyepiece because the object is very far away.
- Light from a distant object enters the objective and a real and inverted image is formed at its second focal point.
- This image acts as an object for the eyepiece; it magnifies this image producing a final inverted image.

Magnification

- The magnifying power m is the ratio of the angle β subtended at the eye by the final image to the angle α which the object subtends at the lens or the eye.
- Therefore, m≈ (β / α) ≈ (h/fe) x (fo/h) = (fo/h).
- In this case, the length of the telescope tube is (fo + fe).
- In addition, a pair of inverting lenses to make the final image erect.
- Refracting telescopes can be used both for terrestrial and astronomical observations.



Microscope

- Microscope is an instrument that gives an enlarged image of a minute object.
- There are 2 types of microscope:-
    - Simple
    - Compound

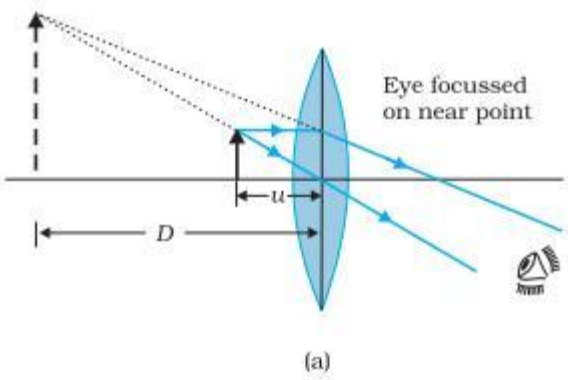
Simple Microscope

- A simple magnifier or microscope is a converging lens of small focal length.

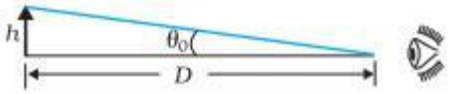
- The lens is held near the object, one focal length away or less, and the eye is positioned close to the lens on the other side.
- Image which we will get is an erect, magnified and virtual image of the object at a distance so that it can be viewed comfortably, i.e., at 25 cm or more.

To Increase Magnifying Power of Simple Microscope

- If the object is at a distance f, the image is at infinity. However, if the object is at a distance slightly less than the focal length of the lens, the image is virtual and closer than infinity.
- Although the closest comfortable distance for viewing the image is when it is at the near point (distance D ≅ 25 cm), it causes some strain on the eye.
- Therefore, the image formed at infinity is often considered most suitable for viewing by the relaxed eye.
- Both the cases can be seen in the figures given below:



(a)



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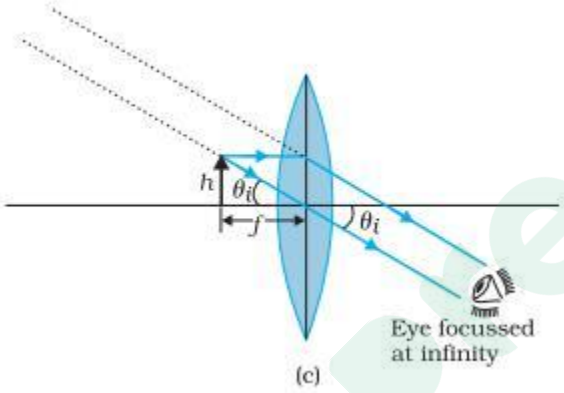


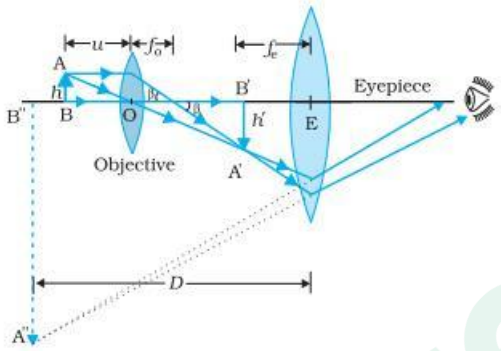
(c)

- The linear magnification m, for the image formed at the near point D, by a simple microscope can be obtained by using the relation:-
  - m=(v/u) = v((1/v)-(1/f))
  - =(1- (v/f))
  - Using the sign conventions, v= (-) ive and same as D.
- Therefore, magnification will be m =(1 +(D/f))
- Since D is about 25 cm, to have a magnification of six, one needs a convex lens of focal length, f = 5 cm.
- Magnification when the image is at infinity.
  - Suppose the object has a height h. The maximum angle it can subtend, and be clearly visible (without a lens), is when it is at the near point, i.e., a distance D.
  - The angle subtended is then given by:-
  - tan θ_0 =(h/D)≈ θ0

- To find the angle subtended at the eye by the image when the object is at u.
- Therefore, (h'/h) = m = (v/u)
- Angle subtended by the image will be;-
- tan θ_1= (h'/-v) = (h/-v) x (v/u)
- = (h/-u) ≈ θ.
- The angle subtended by the object, when it is at u=-f.
- θ_i =(h/f).
- The angular magnification is m =(θ_i/ θ_0) =(D/f)

Compound Microscope

- In order to have large magnifications, a compound microscope is used.



- The lens nearest the object, called the objective, forms a real, inverted, magnified image of the object. This serves as the object for the second lens, the eyepiece, which functions essentially like a simple microscope or magnifier, produces the final image, which is enlarged and virtual.
- The first inverted image is thus near (at or within) the focal plane of the eyepiece, at a distance appropriate for final image formation at infinity, or a little closer for image formation at the near point.
- Clearly, the final image is inverted with respect to the original object.
- Using tan β = (h/f_0) = (h'/L)
- Magnification (mo) due to objective = (h'/h) =(L/f_0)
    - Where h' = size of the first image
    - h= size of the object
    - f_o = focal length of the objective lens
    - f_e= focal length of the eye-piece
    - L (tube length) = Distance between focal length of the second objective lens and the first focal length of the eye-piece.
- When the final image is formed at the near point, then the angular magnification will be :-

- $m_e=(1+(D/f_e))$
- When the final image is formed at infinity, the angular magnification due to the eyepiece is:-
- $m_e = (D/f_e)$
- Total magnification will be given as:-
- $m=(m_o m_e) =(L/f_0)(D/f_e)$
- Note: In order to achieve a large magnification of a small object (hence the name microscope), the objective and eyepiece should have small focal lengths. In practice, it is difficult to make the focal length much smaller than 1 cm.

Mariner's Compass

A compass is a device that detects Earth's magnetic field. Global positioning systems (GPS) are the most advanced way to determine your position on Earth, and which way you are heading, which is called the heading or bearing. GPS utilizes satellites in orbit around Earth. Before GPS, the only way to have any inkling of which way you were sailing when at sea was to use star constellations or a compass. Submariners only had the compass when they were underwater.

It is a simple device that has a few parts:

- A round case holding water or air
- A magnetic needle with its north end marked with paint mounted on a frictionless pin so it can spin freely
- An angular grid ranging from 000° to 360° indicating direction

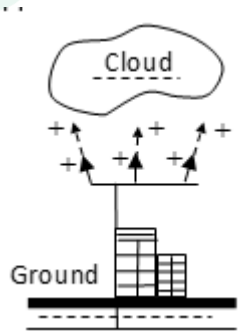
A navigator would be part of your great grandfather's submarine crew. He could hold the compass in line with the front of the boat. The marked end of the arrow always points to the north magnetic pole so he could determine the boat's exact heading, or direction of

motion relative to North. Using the heading, the speed of the boat, the time of travel, and charts, a navigator could track the course of the vessel.

Lightning Conductor

A lightning conductor is used to save big buildings from the damage by lightning flashes.

A lightning conductor consists of a number of pointed conductors fixed to the top of a building and connected to a thick copper wire. This wire runs down the side of the building and ends on a metal plate buried in the ground.



When a negatively charged cloud passes over the building, it induces a positive charge on the pointed ends of the lightning conductor and an equal negative charge at the metal plate. Due to discharging action of sharp points, a positively charged electric wind is set up, which neutralises the negative charge on the cloud. The negative charge on the metal plate is immediately neutralized in the earth. If the discharge of the cloud

occurs, it passes through the conducting copper strip and the building is saved from the damage.

Note: Electric field inside the conductor is zero that's why it is safer inside a metallic cage than under a tree during lightning. During lightning the conductor mounted on top of the building neutralizes flow of charge with lightning.

Electric Fuses

An electrical fuse is a safety device that operates to provide protection against the overflow of current in an electrical circuit. An important component of an electrical fuse is a metal wire or strip that melts when excess current flows through it. It helps to protect the device by stopping or interrupting the current. In this article, let us know in detail about the Working Principle of electrical fuse along with its functions and types.

Working Principle Of An Electrical Fuse

- To understand the working principle behind an electrical fuse, two critical concepts should be kept in mind
    - Current flows in a loop
    - Heating effect of current
- Electric current can flow through a conductor only when the circuit formed is complete. If there is a break in the loop, electric charges cannot flow through. This is also how switches operate. For example, when you put on the light switches at home, the lights come on because you have just completed the circuit allowing charges from the power source to flow through and power your lights.
- When current passes through a conductor, the different electrical components of the circuit like the devices attached or even the wire itself, offer resistance to the current flow. The work done to overcome this resistance presents itself in the form of heat. This is a simple explanation of the "heating effect" of current.

Principle Of Electrical Fuse

- The primary use of an electric fuse is to protect electrical equipment from excessive current and to prevent short circuits or mismatched loads. Electrical fuses play the role of miniature circuit breakers. Apart from protecting equipment, they are also used as safety measures to prevent any safety hazards to humans.
- The fuse wire in an electrical fuse is selected in such a way that it does not face any damage when the normally stipulated amount of current flows through the circuit. Under normal conditions, the fuse wire is a part of the circuitry,

contributing to a complete loop for charges to flow through it. However, when an excessive amount of current flows through the fuse wire, the heating effect of current causes the fuse wire to melt. This is because the fuse wire is chosen such that it has a low melting point. This causes the loop to break thereby stopping the flow of charges in the circuit.

- It is important to select a fuse that is properly specified for the circuit in consideration. For example, if the fuse that is used is underrated, then it will fail even under normal current conditions, unnecessarily breaking the circuit loop. If it is overrated, then it will not break the circuit when required and cause equipment damage and failure and may even present itself as a safety hazard.

Function of Fuse

In the field of electrical engineering, a fuse is a device that provides overcurrent protection to the functional electrical circuit. Here, we have listed a few major functions of the fuse.

- Acts as a barrier between the electric circuit and the human body
- Prevents device failure due to faulty circuit operation
- Fuse prevents short-circuits
- Prevents overload and blackouts
- Prevents damage that is caused due to mismatched loads

The markings on the fuse carry information such as the Ampere rating, voltage rating, and interruption rating.

Types of Fuses

Different types of fuses are available in the market, and they are classified on the basis of different aspects. But mainly, fuses can be divided into two categories based on the input supply as follows:

- AC fuses
- DC fuses

Given below is a flowchart of further classification of fuse: