Mechanisms

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Focus on Cams and Levers

There are five basic types of mechanisms:

Levers	Enables a small amount of force to exert a larger force at a particular point (bolt cutters).
Linkages	Connects different systems together and have the important function of changing the direction and size of the force, these can also produce parallel movements.
Rotary Systems	There are many other mechanisms under this heading such as gears, pulleys and belts, chains and sprockets which transmit force, and can change the speed and direction of movement.
Cams and Cranks	These can convert rotary motion to linear and/or reciprocating movement.
Screws	These allow a rotary motion to exert a linear (straight –line) force, for example a G-Clamp or vice.

Leavers

These are simple mechanisms which create an ‘advantage’ for the user.

A leaver is a long ridged object or beam with a pivot (sometimes called a fulcrum) somewhere along its length.

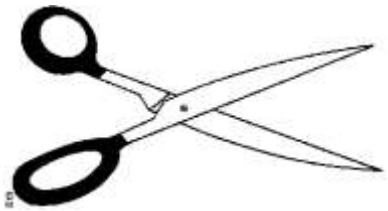
The beam rotates around the pivot (this is a fixed point), this is generally used to apply effort to move a load, though in graphics products leavers can be used to increase or decrease movement.

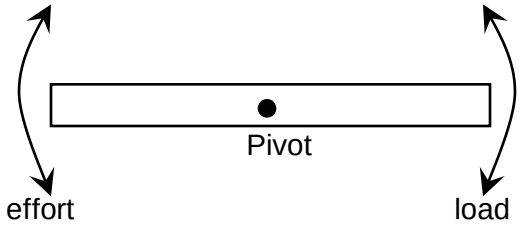
There are 3 key parts to all levers:

- **Effort** – The force exerted by the user
- **Load** – The force exerted by the object being acted upon
- **Fulcrum (or pivot)** – The point at which the lever revolves around

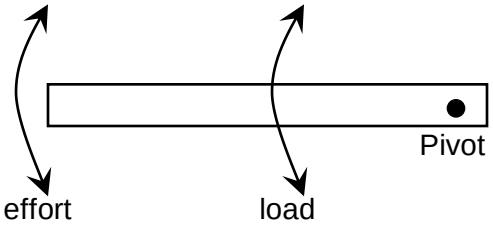
There are three different types of leaver each with the pivot, effort and load arranged in a different way. The three different kinds are called classes of leaver, these are illustrated below:

Class 1

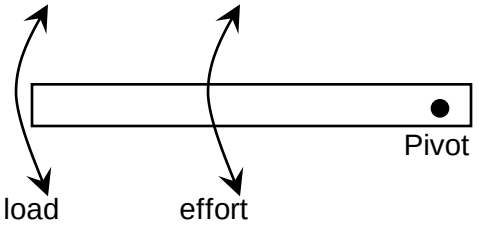




Class 2



Class 3

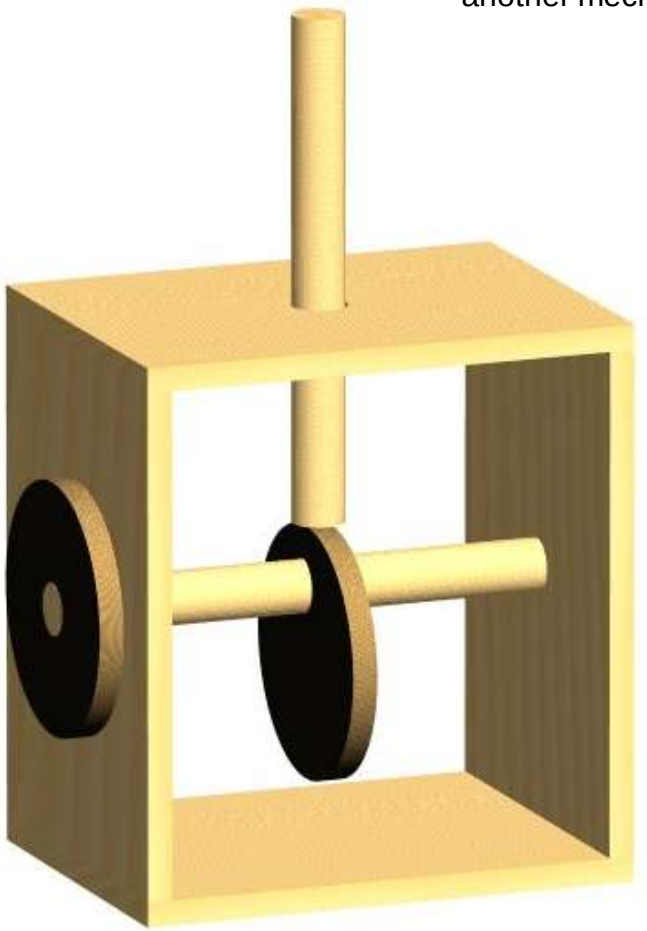


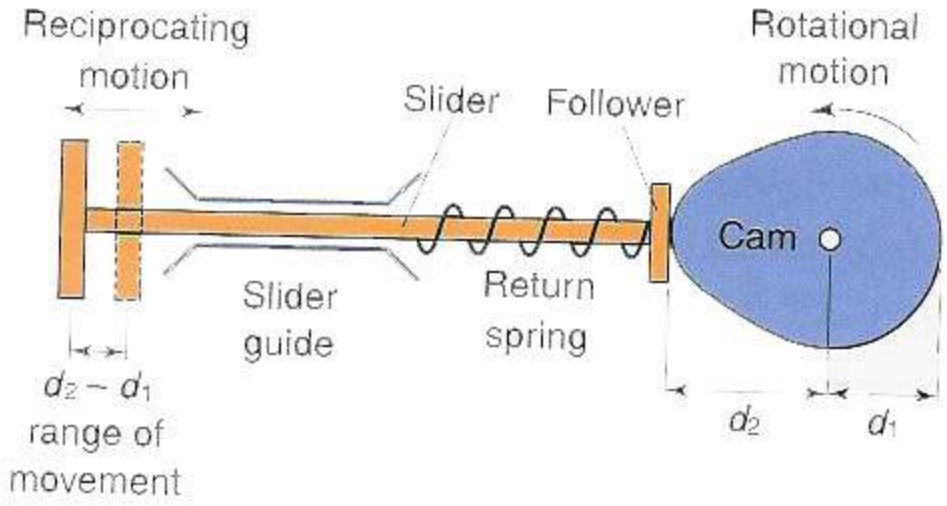
Cams

Cams are mechanisms which convert rotary motion to linear motion (up and down motion). The cam is fixed to a rotation shaft. A follower rests on the edge of the cam and as the shaft is turned the follower moves up and down (reciprocates).

Dependant on the shape, size and position of the cam or follower the motion in which the follower reciprocates can be altered.

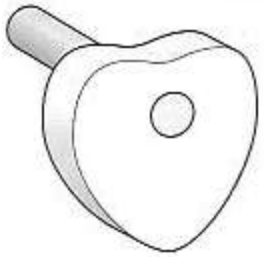
It is also possible that the movement on the other end of the follower can be used to control another mechanism.





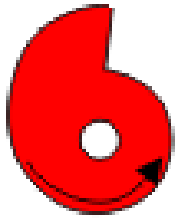
Examples of cam shapes

Heart-shaped cam



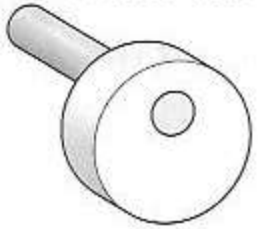
This shape will cause the follower to rise and fall three times in one rotation

Snail Shaped cam



This shape rotates smoothly then causes the follower to drop suddenly

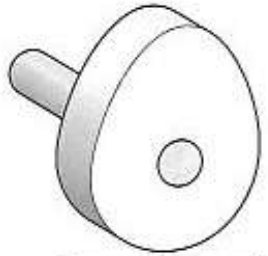
Circular cam



Sometimes known as an eccentric cam

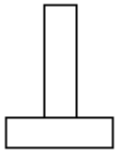
This achieves a smooth continuous movement.

Pear shaped cam



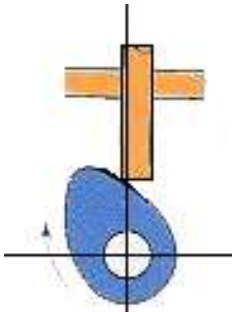
This shape can be used to create a smooth rise and fall motion from the follower

The follower



If the follower is big and wide such as this one the follower will not respond to bumps in the cam and there may be some shapes of cams that this type of follower will not be able to follow as the big surface may get stuck on indentations in the cam.

If the follower has a pointed tip such as this one the follower will be able to respond to even the slightest indentation in the cam



By placing the follower slightly to the side of the cams shaft it is possible to create a smoother motion with the follower.