Booklet and Models supported by the
Primary Science Teaching Trust

why & how?

PRIMARY SCIENCE TEACHING TRUST

How things Move

Ideas, Activities & *Curriculum links* to accompany your box of Wooden Models

Contents

Introduction

This booklet is designed to enable you to make the most out of the box of wooden models you have been given. These models were commissioned by the Primary Science Teaching Trust, with the intention of creating a beautiful, hands-on resource. By engaging with these models in class, you will soon discover that they can not only be used to explain and demonstrate science topics, but also provide inspiration in Design & Technology and link with History topics.

The models were initially sent out to a few Fellows of the Primary Science Teacher College, a group of award winning science teachers, who introduced them into their classrooms, with very different responses. This booklet contains ideas on how to use them in your classroom, from generating interest, activities for use in a lesson, application to real life contexts and also cross-curricular links.

The ideas and activities in this booklet have been tried and tested in various classrooms with children from Year 2 to Year 6. In this booklet you will find an information sheet on each of the 12 individual models, with background information, movements demonstrated, real life applications, links to videos and pictures. What follows is a series of activities, differentiated by year group. The activities do not need to be used as a whole lesson. You can design an introductory 10 minute activity with the models, or a full 60 minute workshop on 'How Things Move'. Finally, you will find photocopiable sheets for children to record their findings during the activities.

We would love to hear how you have been using the models so we can continue to update this booklet with new ideas, so do let us know what you've been doing, by getting in contact with the Trust's Cluster Director, Dr. Sophie Franklin on sophie.franklin@pstt.org.uk

Enjoy!

Vocabulary

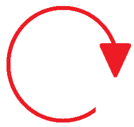
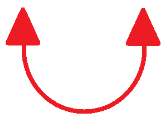
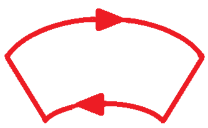
Basic Vocabulary

Force
Push
Pull
Gear
Pulley
Material
Movement

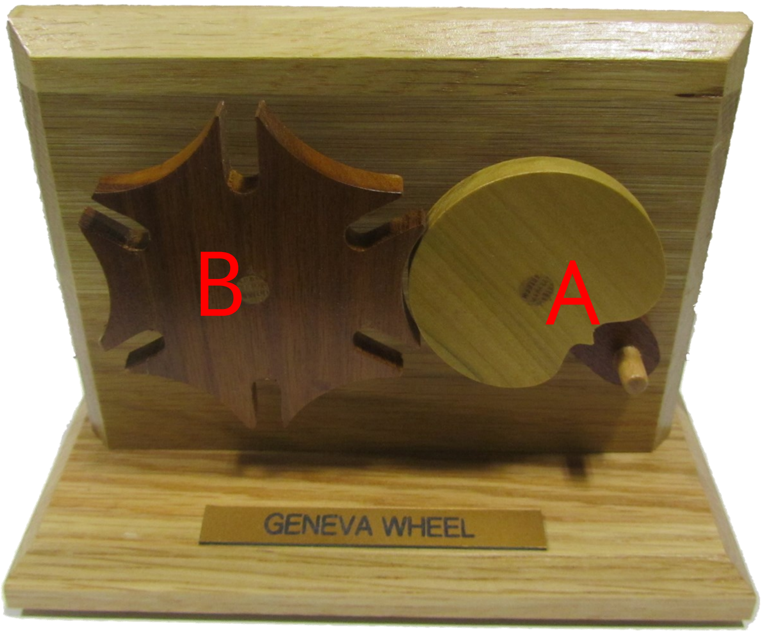
Advanced vocabulary

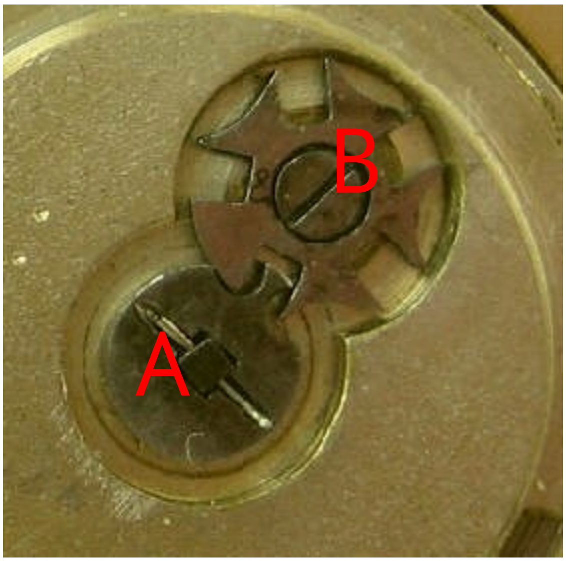
Cam	Something used to transform motion
Cog	Cogwheel, also known as a gear. A rotating machine part, with teeth which mesh with other cogs
Actuator	A device that turns input energy into motion
Conjugate	To connect/marry together
Coupling	Used to join two pieces of rotating equipment, while permitting some degree of misalignment
Pneumatic	Application of pressurised gas to produce mechanical motion

Movements

Rotary	Turning around in a circle	
Linear	Moving in a straight line	
Continuous	Constant motion	
Intermittent	Motion with stationary intervening periods	
Reciprocating	Moving forwards and backwards in a straight line	
Circular Arc	Movement is the segment of a circle	
Arc-shaped trapezium	'D' shaped motion	

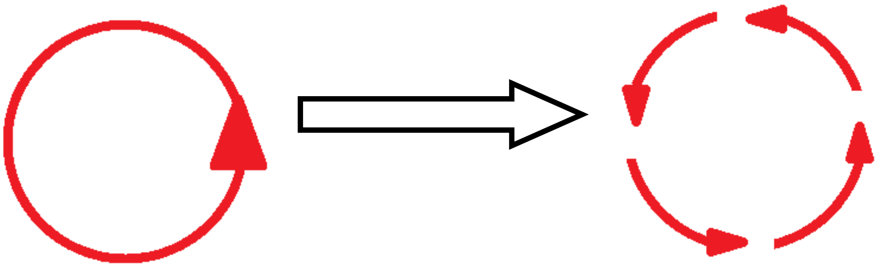
Geneva Wheel





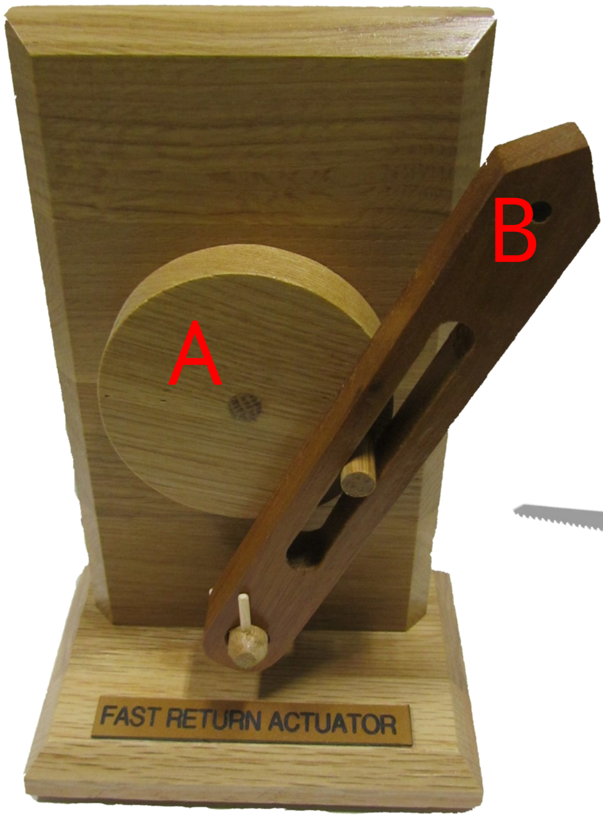
Also known as a Geneva Drive or the Maltese Cross
The name derives from its uses in the earliest Swiss watches.

Movement
Converts continuous rotary motion into intermittent rotary motion. Wheel A locks into wheel B intermittently.



Uses
Watches
Frame by frame film projectors
Bank note counting machines

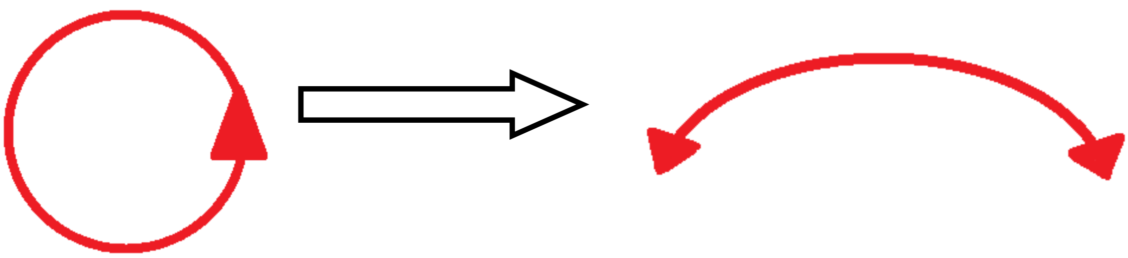
Fast Return Actuator



The name of this mechanism comes from the fact that the 'return movement', when the pin is near the bottom of the slot and closest to the ground, is roughly twice as fast as the so called 'working movement', when the pin is at the top of the slot.

Movement

Converts continuous rotary motion into reciprocating motion.
Wheel A slides part B in an arc from left to right and vice versa as a result of the continuous rotation of the wheel. .

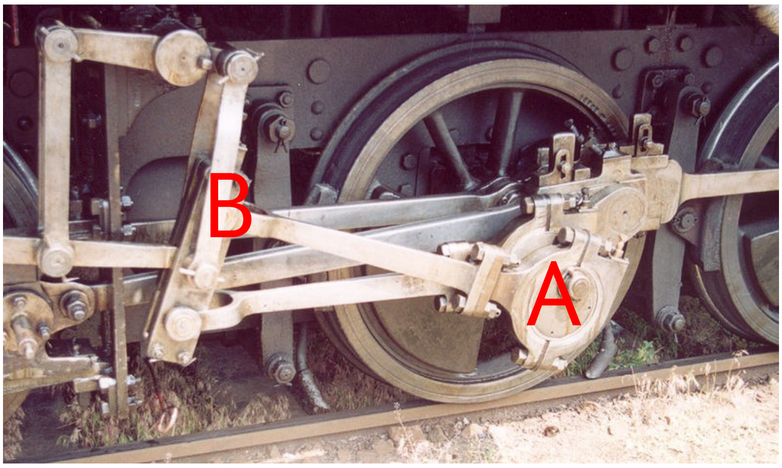


Uses

Sewing machines
Metal shapers—for scraping metal from surfaces Reciprocating saw (imagine the point of part B has a blade attached to it, which moves from left to right)

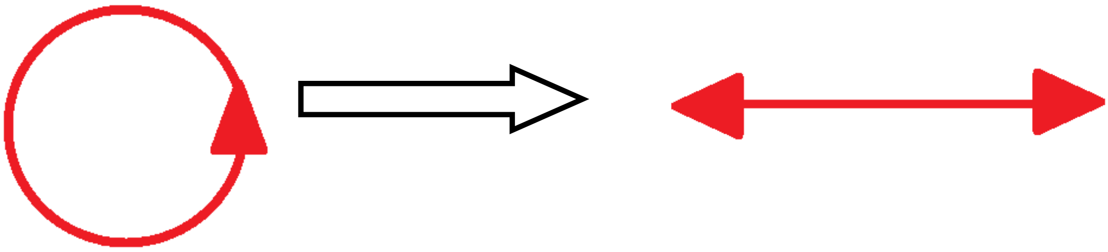
Eccentric

Eccentric in this context simply means "out of centre". The centre of wheel A is slightly offset from the axle.



Movement

Converts continuous rotary motion into linear reciprocating motion. Wheel A slides part B in an arc from left to right and vice versa as a result of the continuous rotation of the wheel.



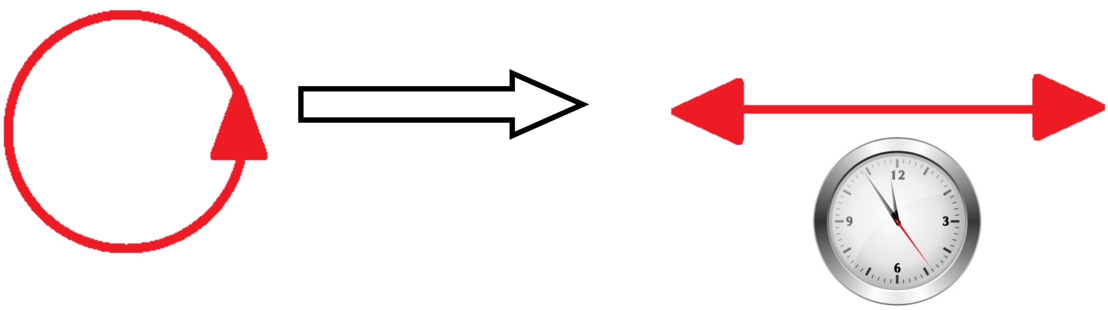
Uses

Steam engine
Punch Press
High pressure piston pumps

Cam & Follower

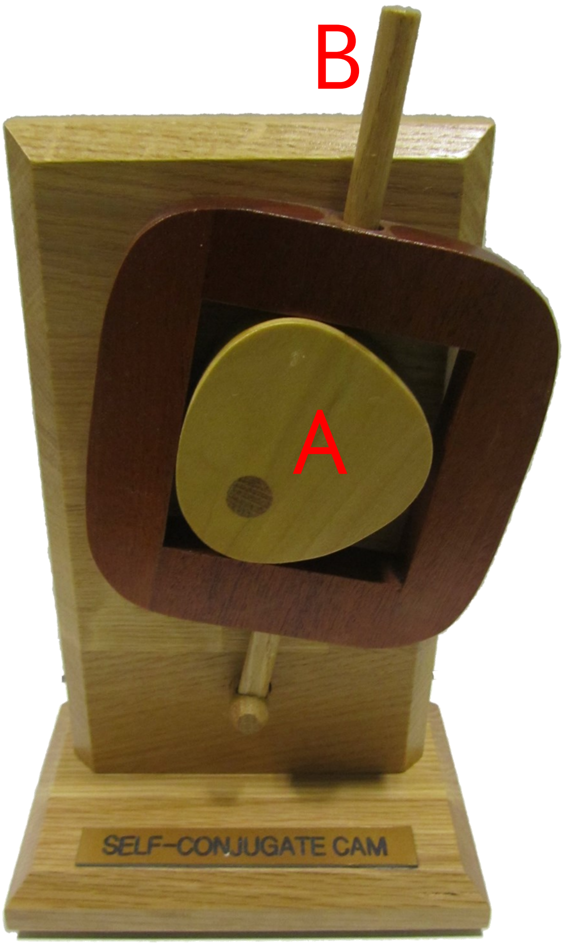
The shape of the cam is determined by the task it is to be used for. They come in a variety of shapes, the most common being pear-shaped.

Movement
Converts rotary motion into timed linear motion.
As wheel A rotates, the follower (B) moves up and down by various distances. In this case, part C is a pin which moves up and down.



Uses
Camshaft in cars - used to open valves in internal combustion engines. Allows fuel to be pushed through the engine.
Electrical time switch on a washing machine

Self–Conjugate Cam

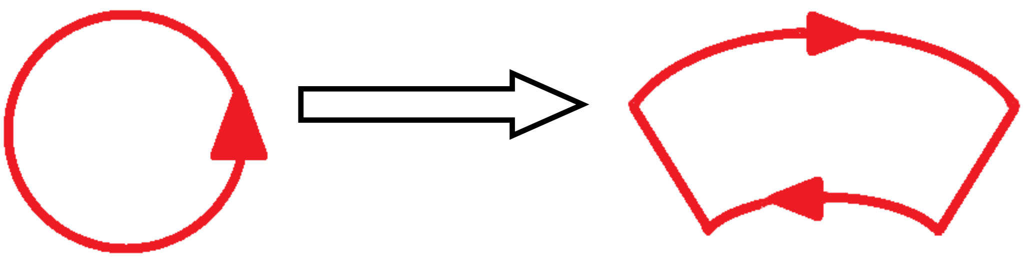


Self-conjugate means two things that are conjugate parts of the same figure. The two parts must be touching and be on parallel surfaces.

Movement

Like the cam and follower and eccentric, the movement is continuous rotary, but rather than converting to linear, the resulting movement is described as an arc-shaped trapezium.

As wheel A rotates, the follower (B) moves up and down creating a 'D' like shape.

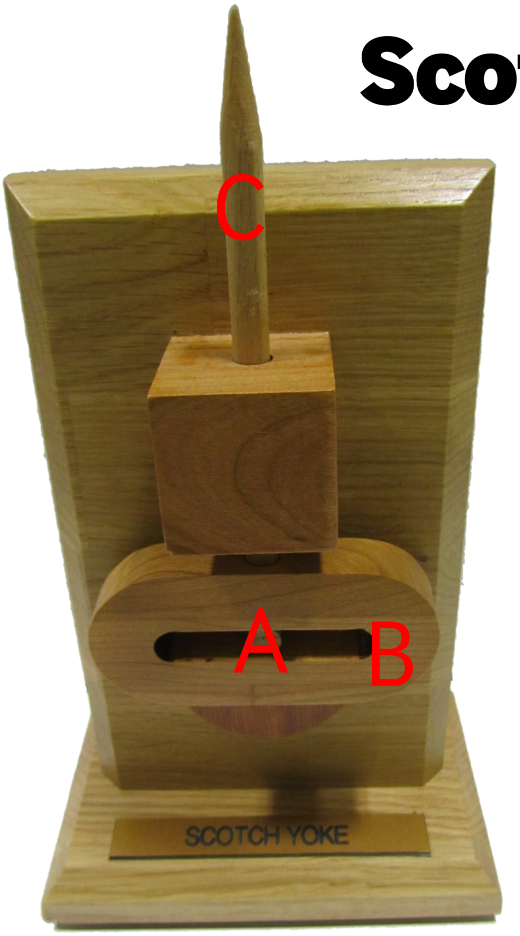


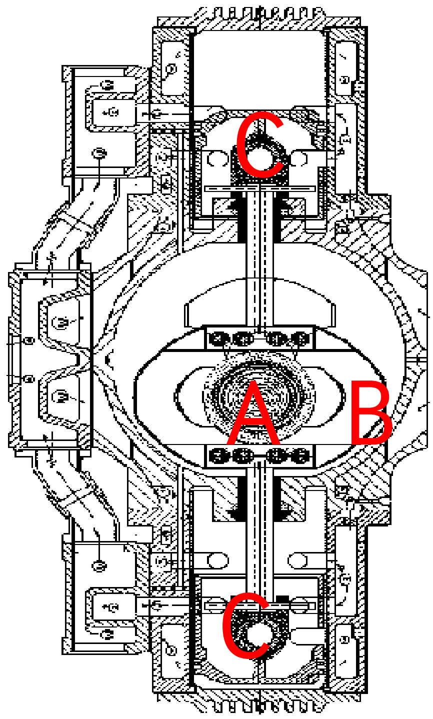
Uses

Most famous for use in the Mitchell Motion Camera.

Pins (part B) from two parallel self conjugate cams slide into the perforated holes on the side of film (as seen in the picture above). The film is then slid along a frame before the pins move out of the perforations and then back down into the holes in the next segment of film ready to slide along again.

Scotch Yoke



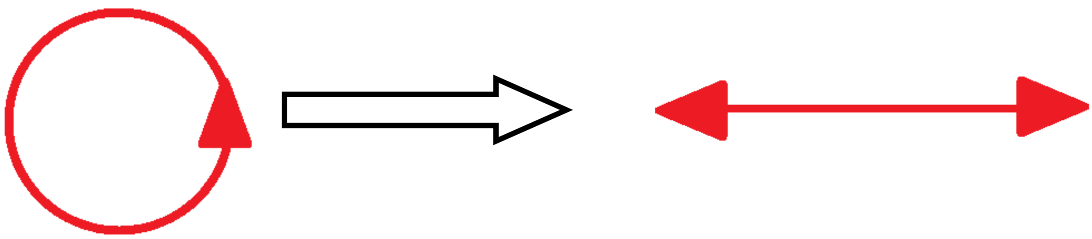


Also known as the pin and slot actuator. It is similar to the cam and follower and the eccentric; it provides an up and down movement. The movement in this mechanism is much smoother.

Movement

Like the cam and follower and eccentric, the movement is continuous rotary to linear reciprocating.

A pin on the rotating disc (A), fits in a slot on a sliding yoke (B). This is directly coupled to the sliding pin (C) which moves up and down.

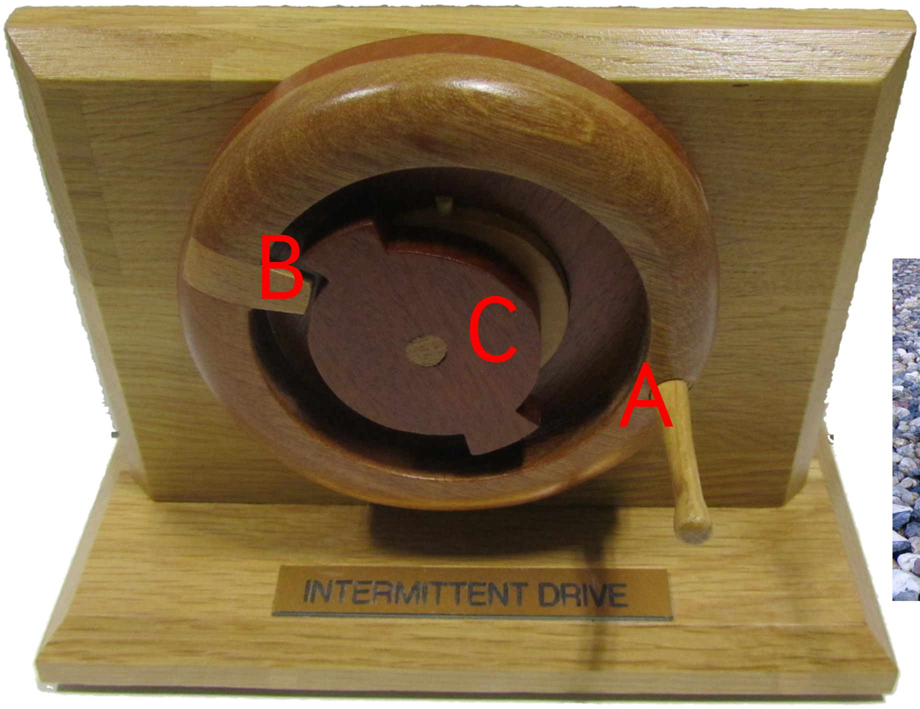


Uses

Due to its smooth movement, it is most commonly used in control valve actuators in high pressure oil and gas pipelines.

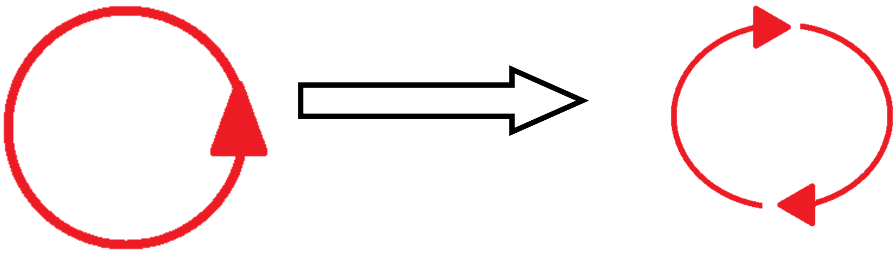
It is also famously used in the Bourke steam engine in the 1920's. The engine was designed by Russell Bourke, but due to World War II, it was never put into large scale production. Above is an image of the plan of the engine.

Intermittent Drive



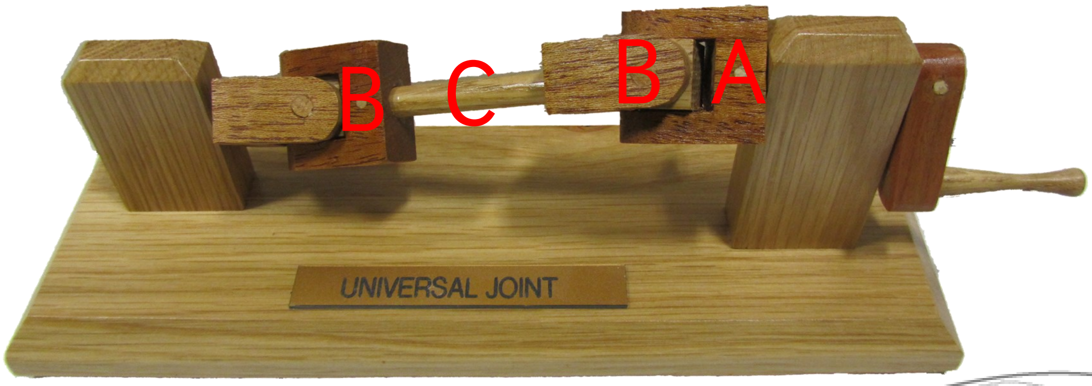
Intermittent mechanisms were first used in sewing machines, in order for the fabric to be fed through correctly. This ensures fabric is stationary as each stitch is made, while moving the required distance between stitches. 'Move, rest, move' mechanism.

Movement
Converts continuous rotary motion into intermittent rotary motion.
This is very similar to the Geneva Wheel, but only has two steps. Wheel A is turned and every half turn it turns wheel C at point B.



Uses
Feed mechanism of sewing machines
Counting mechanisms

(Double) Universal Joint



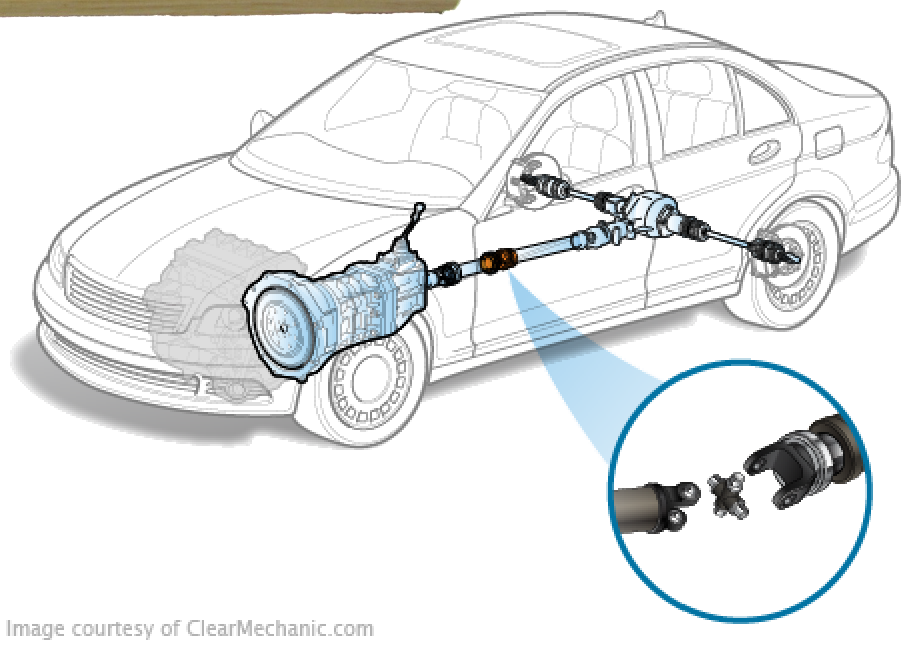


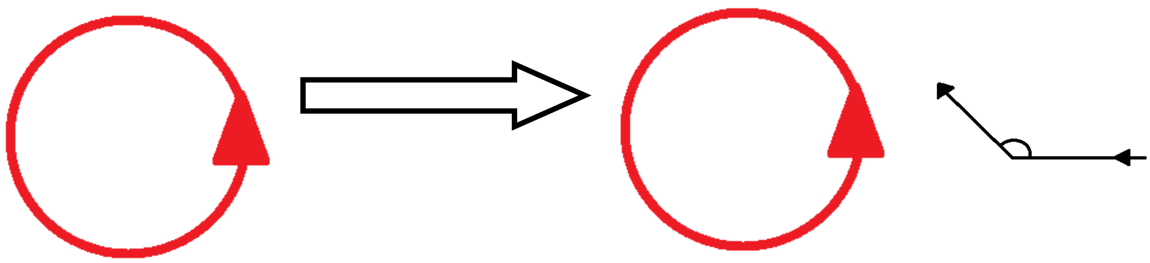
Image courtesy of ClearMechanic.com

This joint is also known as Hooke's Coupling. It allows a rigid rod to bend in any direction. It consists of a pair of hinges, located close together, orientated at 90° to each other.

Movement

Converts continuous rotary motion into continuous rotary movement at a deflected angle.

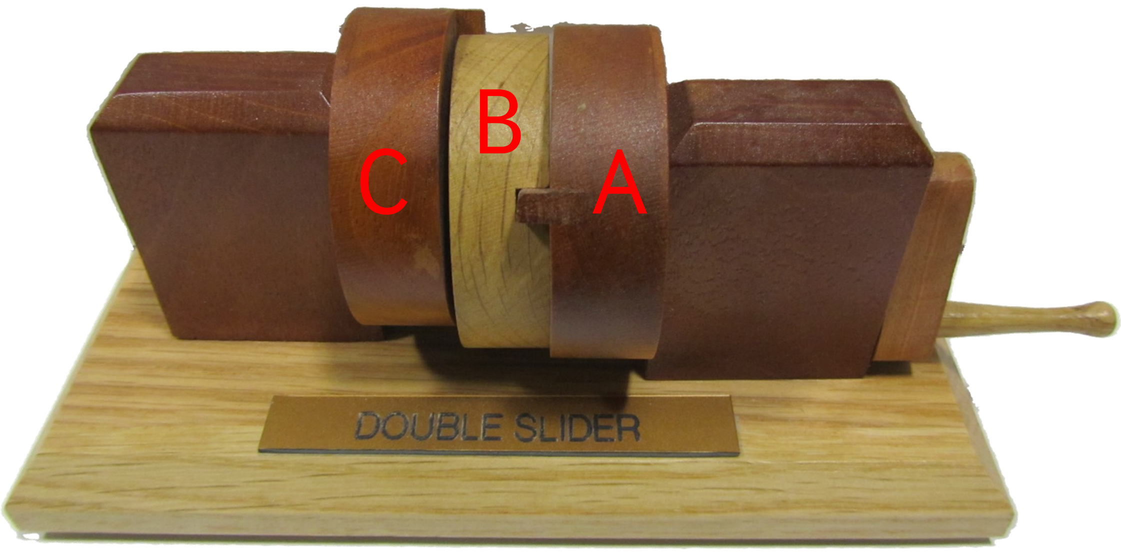
The handle turns rod A which is attached to a pair hinges (B). The hinges change the angle of the secondary rod C. This model is a Double Universal Joint as there are two sets of hinges (B).



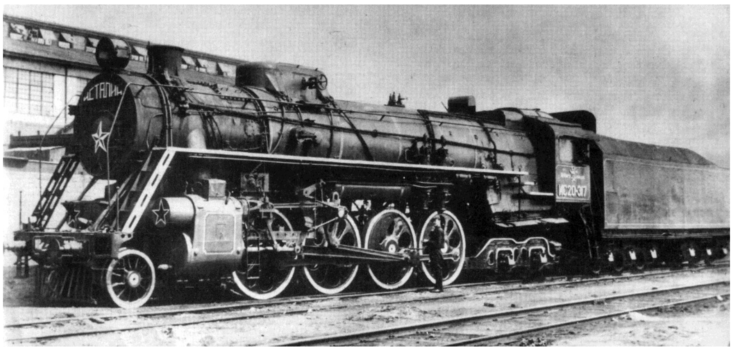
Uses

Most commonly used in cars. The front of the car is connected to the back via an axle. This allows the motion created by the engine to turn the wheels at the back. This rod has a universal joint, which allows the car to move more freely going over bumps in the road. Without the joint, the rod could potentially snap.

Double Slider



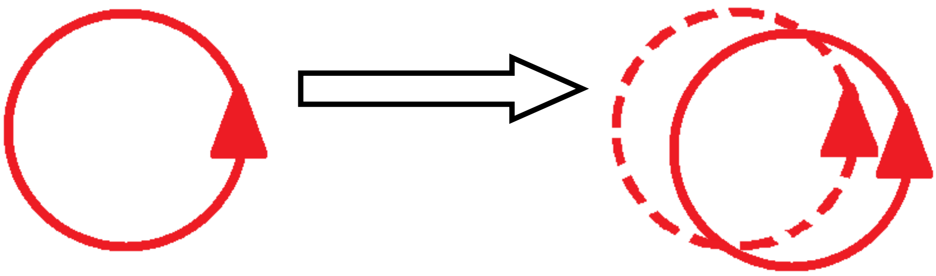
This joint is also known as Oldham's Coupling after the Irish engineer John Oldham. It is similar to the universal joint, but the movement is much smoother.



Movement

Converts continuous rotary motion into continuous rotary movement to a another shaft which is parallel but not directly aligned.

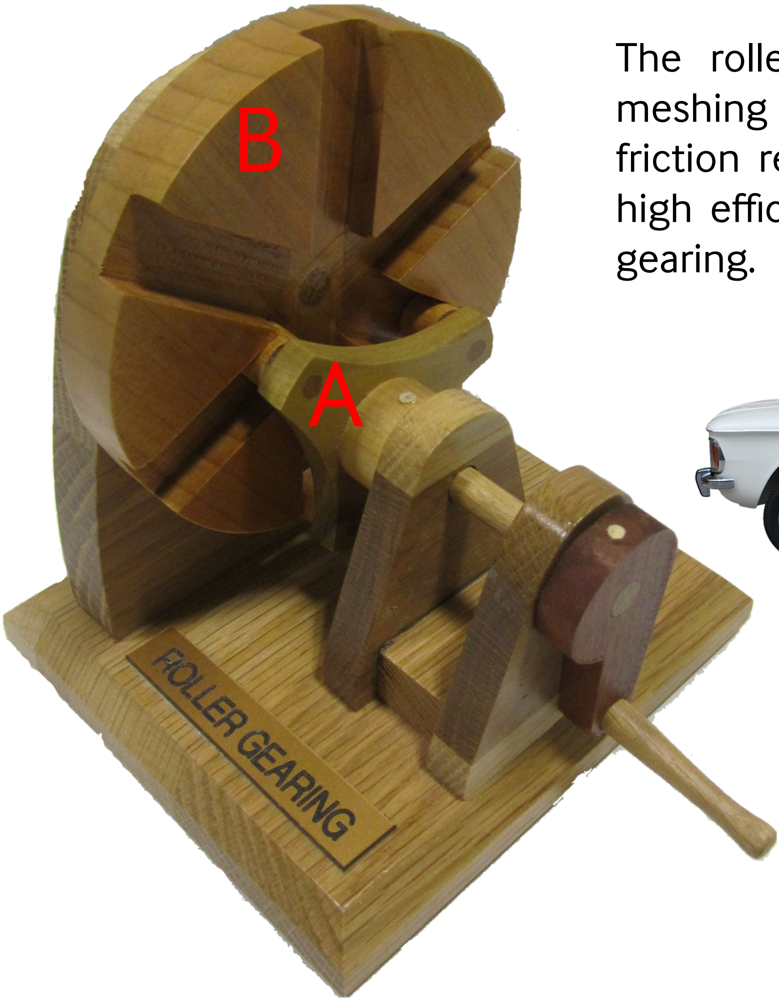
The handle turns wheel A which is attached to middle block (B), which is offset to wheel C.



Uses

It is commonly used as part of the driving gear of steam pumps, part of a steam locomotive.

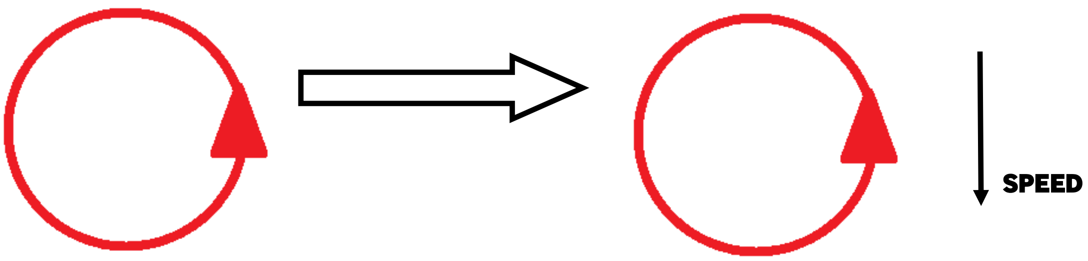
Roller Gearing



The roller gear consists of a pair of meshing gear members. The low levels of friction result in low wear and tear and high efficiency. Also known as multiple gearing.

Movement

Converts continuous rotary motion into slower continuous rotary motion. The handle turns wheel A which is locks into grooves on wheel B. The speed of wheel B is slower than that of wheel A.

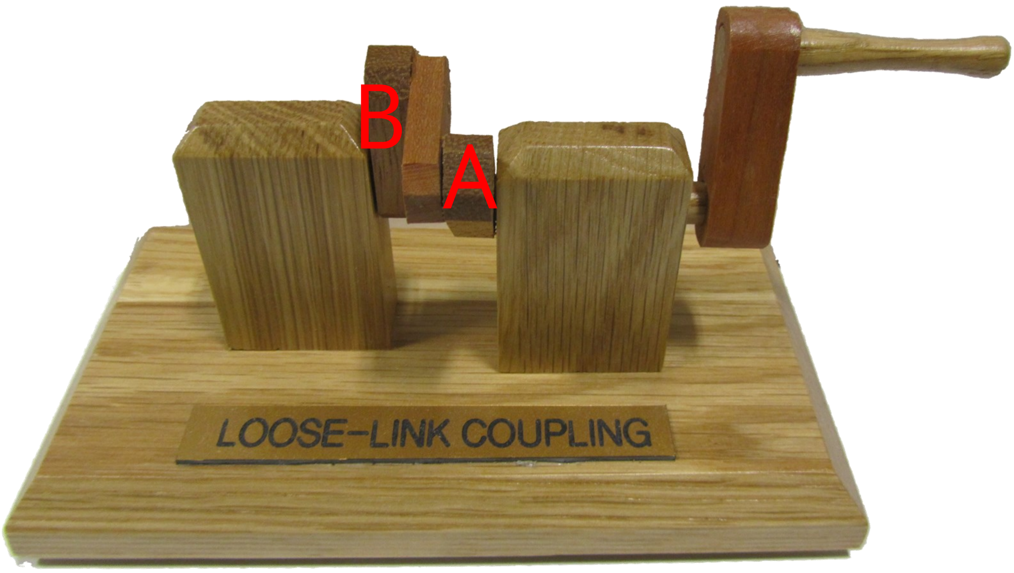


Uses

Any machinery which requires a decrease in rotary speed may utilise roller gearing.

As these gears require little lubrication, they are often used in gear boxes in cars.

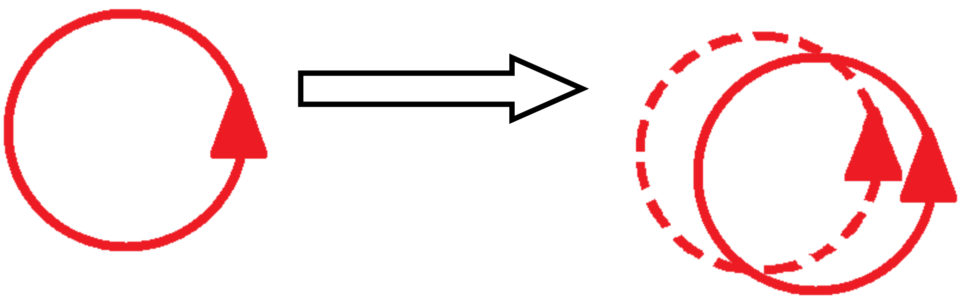
Loose Link Coupling



Loose link coupling is another example of a mechanism which transfers rotary motion from one shaft to another, which is on a different line. (This is very similar to double slider and double universal joints.)

Movement

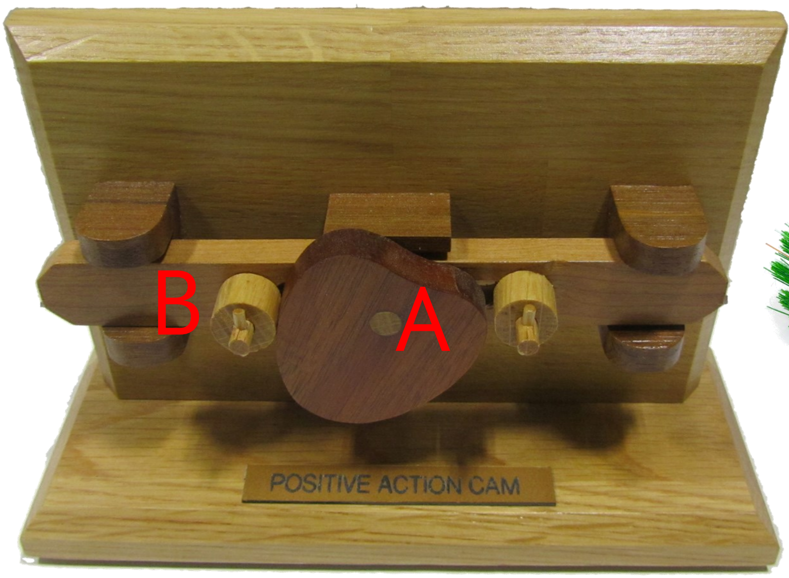
Converts continuous rotary motion into continuous rotary motion on a different shaft.
The handle turns wheel A which turns an offset wheel B.



Uses

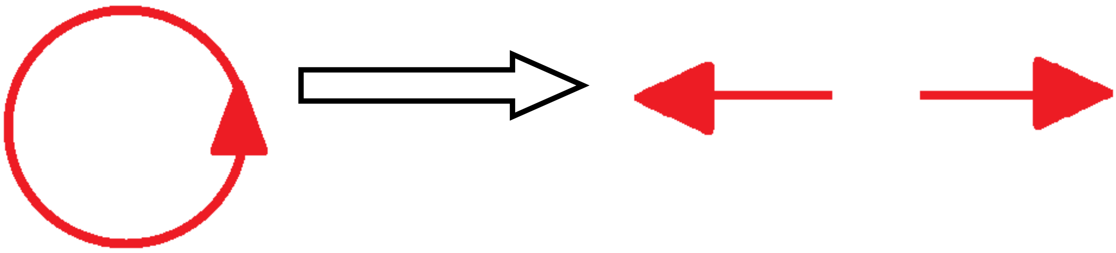
Similar applications to the universal joint and double slider, e.g. steam pump gears in locomotives and car transmission.

Positive Action Cam



Movement

Converts continuous rotary motion into intermittent linear motion .
As wheel A is rotated, the shaft (B) moves forwards and backwards in a linear movement with an intermittency.



Uses

For use in manufacturing machines where an object is moved into place and remains there for a period of time during which a process is carried out before the object is then moved on to the next stage, for example as part of a brush/ broom making machine.

Curriculum Links

Science

Key Stage 1	Yr 1+2	*Identifying and Classifying*
	Yr 1+2	*Comparing suitability of a variety of everyday objects*
Lower Key Stage 2	Yr 3+4	*Talk about criteria for grouping*
	Yr 3+4	*Forces – notice that some forces need contact between two objects (vs non-contact forces)*
Upper Key Stage 2	Yr 5+6	*Forces - understand that force and motion can be transferred through mechanical devices such as gears, pulleys, levers and springs.*

Art and Design

Key Stage 1		*Use drawing, painting and sculpture to develop and*
Key Stage 2		*Improve mastery of Art and Design*

Curriculum Links

Design and Technology

Key Stage 1		*Design purposeful, functional, appealing products for themselves and other users based on design criteria*
		Generate, develop, model and communicate their ideas through talking, drawing, templates, mock-ups and, where appropriate, information and communication technology
		Explore and evaluate a range of existing products evaluate their ideas and products against design criteria
		Explore and use mechanisms [for example, levers, sliders
Key Stage 2		*Use research and develop design criteria to inform the de-sign of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups* *Generate, develop, model and communicate their ideas through discussion, annotated sketches, cross-sectional and exploded diagrams, prototypes, pattern pieces and computer-aided design*
		Investigate and analyse a range of existing products *Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work* *Understand how key events and individuals in design and technology have helped shape the world*
		Understand and use mechanical systems in their products [for example, gears, pulleys, cams, levers and linkages]
		Ancient Egyptians, levers. Used wooden and bronze levers.
		Romans - catapults
		Archimedes – levers

Generating Interest

Here's what happened when PSTT College Fellow Peter Sainsbury took his box of models into school. Maybe you could do the same?

Let the creative cogs turn – give science to the children

The children exploring the cams and cogs

Peter Sainsbury

Published in Primary Science Nov/Dec 2011 (issue 120)

"The inaugural conference of the AZSTT Primary Science Teacher College, made up of winners of the AZSTT Primary Science Teacher Awards since 2003, was held in April 2011. Like my colleagues, I came away with so many resources, contacts and ideas that it was difficult to know where to start. One such resource was a box of exquisitely made wooden cams and cogs from South Africa, on loan to a willing volunteer to try them out in school. Back at base, not wanting the box to be stored away for another day and swamped by everything else, the models were simply put on display in the school's entrance hall. What happened next exemplifies what children can do when given a stimulus and the freedom to be creative as they explored science and developed their learning.

Small groups of children were constantly seen playing with, exploring and talking about the cam modes – often having to be encouraged back into class or to re-join the lunch queue. With the interest thus generated, it was quite an easy step to develop a challenge to further the children's curiosity and focus it into something purposeful. A group of year 4 children (8- and 9-year-olds) soon devised a challenge to see who could find real-life examples of applications of cams and cogs, applying the models to the real world. ICT and photography were used to devel-op interest and entry forms. The children, with their ideas and the freedom to see these through, moved from exploration and inquisitive play with the box of cams and cogs to develop-ing their thinking and understanding of science. The search and challenge went far and wide, even to fathers serving in the armed forces in Afghanistan who helped to find examples from their equipment!

These are our conclusions:

⇒ Get involved with AZSTT* or tap into the world of science outside school – there is so much goodwill out there.

⇒ Sometimes just dropping science into the children's experience is enough; the 'wow!' factor and a little direction is all they need to set them off.

⇒ Let the children be creative and independent with science."

Peter Sainsbury is deputy head and science subject leader at Winterbourne Earls C of E Primary School, Wiltshire.
Email: peter@winterbourneearls.wilts.sch.uk

*now PSTT

Initial Activities

EYFS

Identify movements: up down, round and round
Grouping of models

KS1

Think about how things move in videos/pictures
Name something that moves
Predictions—what will happen if we turn this lever (on the model)
Grouping of models
What in the classroom moves and how? (possibility of taking pictures on iPads and drawing movement arrows)

KS2

Once children have become familiar with the models and movements associated with them, put to them the task of designing a fairground ride. Considering the following points:

1. How will we get it to move?
2. What materials will you use?
3. What age of people is the ride aimed at?
4. Is it a thrill ride or a fun ride?

What follows are a series of ideas from people who have used the models in their classrooms, and resources they believe would be useful when using the models.

This is a resource we plan to continually update with your help, so please do send in your ideas!!

Models

Use these images to photocopy for children to annotate or group and stick in their books

Models

Use these images to photocopy for children to annotate or group and stick in their books

Pictures of Moving Objects

Use these images to photocopy for children to annotate and match the movements with those of the models

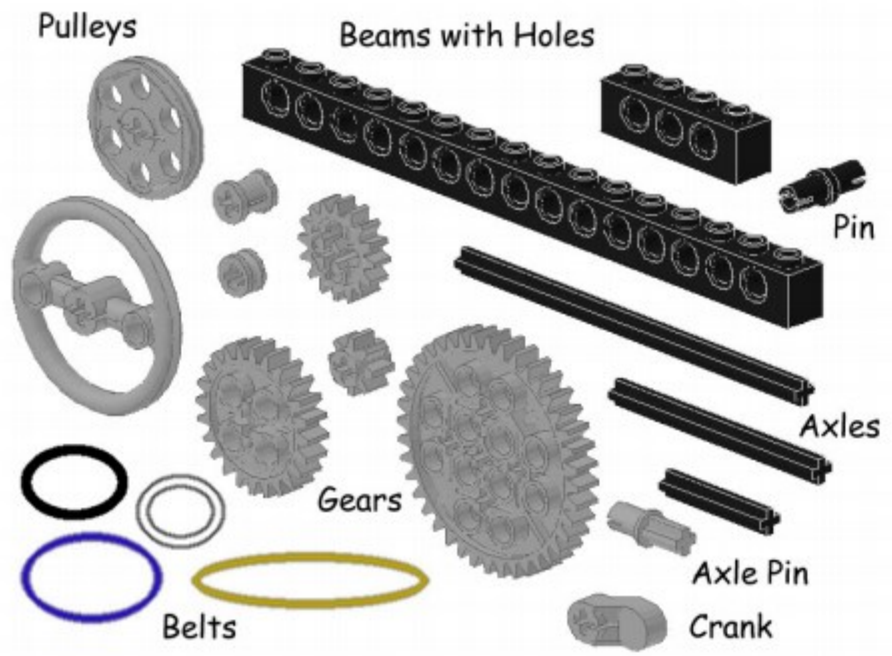
Pictures of Moving Objects

Use these images to photocopy for children to annotate and match the movements with those of the models

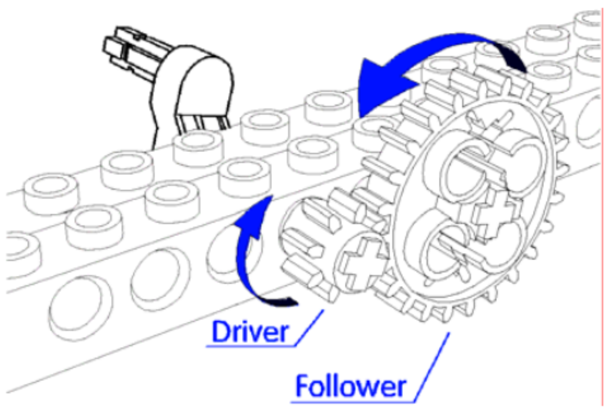
Introducing Gears & Pulleys

The lesson plans that follow were developed by a final year chemistry student who was tasked with developing ideas for using the models. As an extension to the models, the student moved onto introducing gears to the children. He was lucky enough to have access to a Lego™ modelling kit (like the one pictured below). If you have access to this type of kit, then this is a great activity to follow on from the models.

This resource is fantastic for getting children to grips with different types of gears.



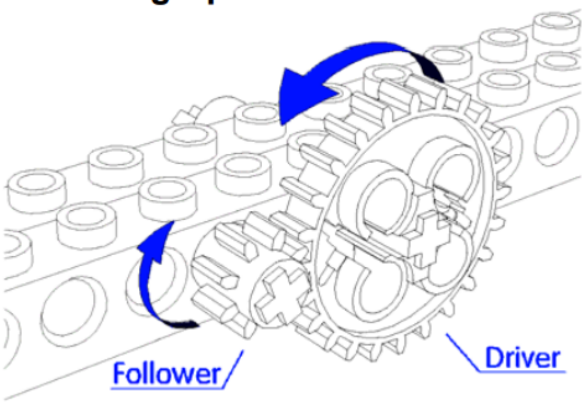
1. Gearing Down



Main Idea:
If you use a small gear to drive a large gear, the large one will turn slower.

Additional Information:
Here we see a small driver gear and a large follower. It's really hard to make a gear like the big one turn - we'd have to use a lot of force. But with a smaller gear, we can use a process called gearing down to help us out. Gearing down decreases speed but increases force. Since it's easy to turn a small gear at a fast speed, we use it to move the large one. A small driver gear makes a large follower gear turn more slowly. For this model, five turns of the 8-tooth driver produce one turn of the 40-tooth follower. This ratio of 5:1 is called the gearing down ratio.

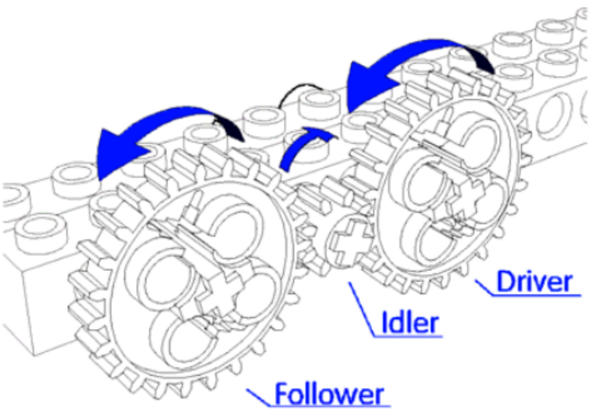
2. Gearing Up



Main Idea:
If you use a large gear to drive a small gear, the small one will turn faster.

Additional Information:
Here we see a large driver gear and a small follower. We can move the small gear pretty fast on our own, but we can use a process called gearing up to move it even faster. Gearing up increases speed, but decreases force. A good example of a gearing-up system in real life is a 10-speed bike - when you shift into 10th gear, you turn a large gear with the pedals, which drives a small gear attached to the rear wheel. For this model, one turn of the 40-tooth driver produce five turns of the 8-tooth follower. This ratio of 1:5 is called the gearing up ratio.

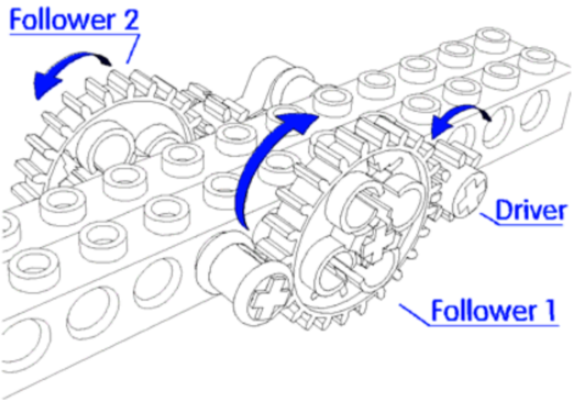
3. Idler Gearing



Main Idea:
An idler gear is used to make a driver gear and a follower gear turn in the same direction.

Additional Information:
Sometimes you need to have gears turn in the same direction. Since a driver gear and a follower gear turn in opposite directions, an idler gear is placed in between the two gears. The idler gear rotates in the opposite direction as the driver gear, and the follower gear rotates in the opposite direction of the idler - i.e. the same direction as the driver!

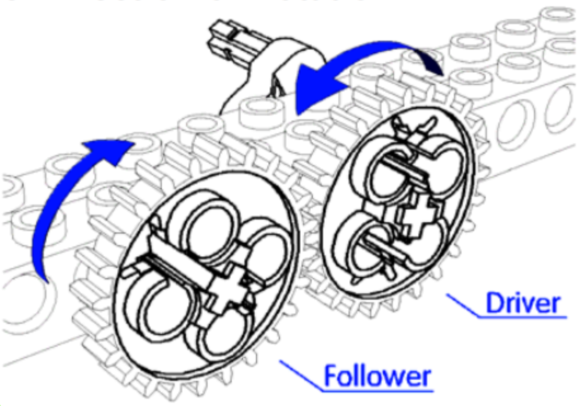
4. Compound Gearing



Main Idea:
Gears of different sizes on the same axle can be connected to other gears to build more extensive gearing down (and gearing up) arrangements.

Additional Information:
Compound gearing gives you the ability to use even more force by adding more gears to the arrangement. You can connect more gears on the same axle to build more complicated arrangements. In this model, we see two separate 5:1 gearing down arrangements, connected to each other by the axle passing through the first 40-tooth gear and the second 8-tooth gear. The first 40-tooth gear turns slowly. The second 40-tooth gear turns even slower. This connection increases the gearing down ratio to 25:1.

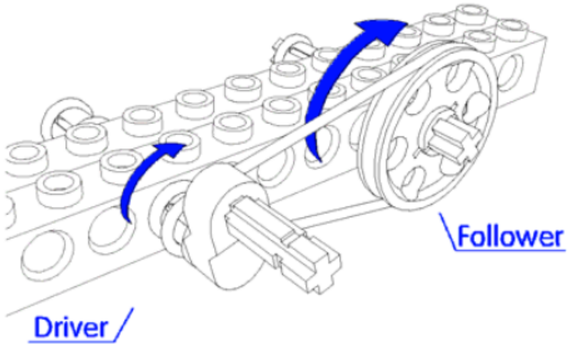
5. Direction of Rotation



Main Idea:
Two gears which are meshed together turn in opposite directions.

Additional Information:
Here we see two gears meshed together. When you mesh two gears, turning the driver gear makes the follower gear turn in the opposite direction.

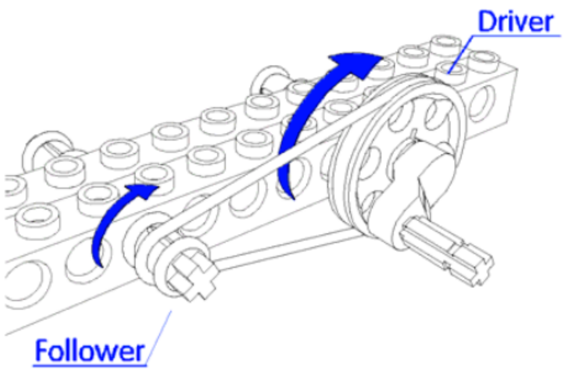
6. Decreasing Pulley Speed



Main Idea:
If you use a small pulley wheel to drive a large pulley wheel, the large one will turn slower.

Additional Information:
With this model, we have a pulley with a small driver wheel and a large follower wheel. It's really hard to make a wheel like the big one turn - it would take a lot of force. But with a smaller wheel, we can use a process called gearing down to help. Gearing down decreases speed but increases force. Since it's easy to turn a small wheel at a fast speed, we use it to move the large one. A small driver wheel makes a large follower wheel turn more slowly. Since this is a pulley model, both wheels turn in the same direction.

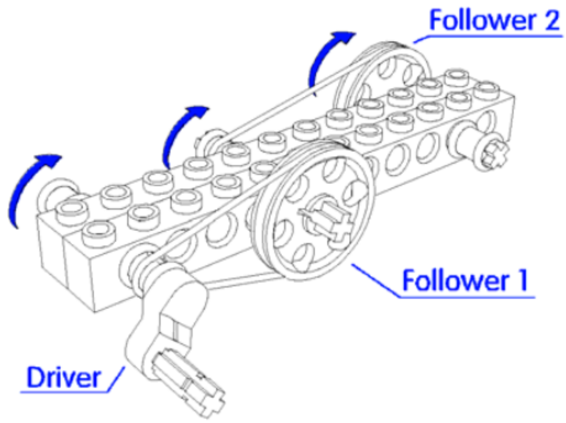
7. Increasing Pulley Speed



Main Idea:
If you use a large pulley wheel to drive a small pulley wheel, the small one will turn faster.

Additional Information:
In this pulley model we have a large driver wheel and a small follower. We can move the small wheel pretty fast on our own, but these pulleys use a process called gearing up to move it even faster. Gearing up increases speed, but decreases force. A large driver wheel makes a small follower wheel turn faster. However, unlike gears, in this pulley model both wheels turn in the same direction.

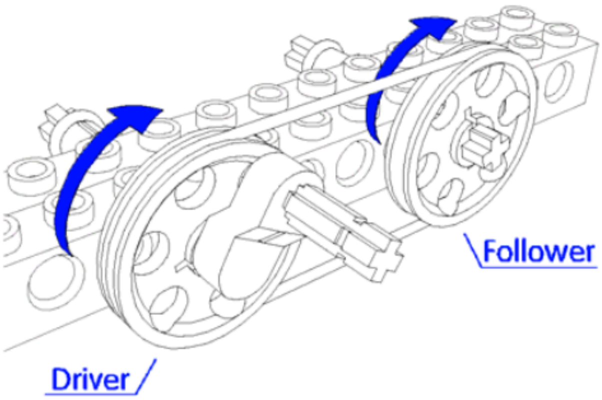
8. Compound Belt Drives



Main Idea:
Pulley wheels of two different sizes on the same axle can be connected to other pulley wheels to build more extensive gearing down (and gearing up) arrangements.

Additional Information:
If you need to have even more force or speed than you can get from a two-pulley arrangement, you can combine pulleys and belt drives to create a more extensive gearing combination. In this model, we see another axle and pulley added to gear down to an even greater extent. The first follower wheel turns slowly - the second turns even slower. You can also build larger gearing up arrangements.

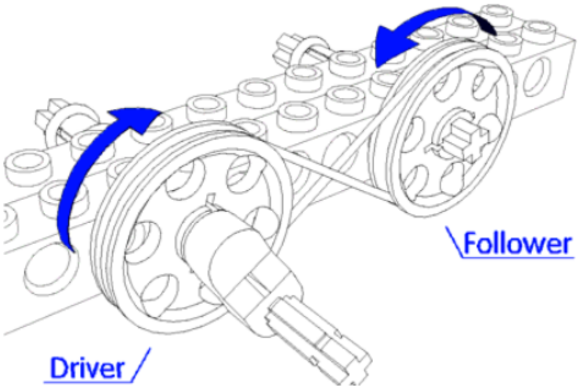
9. Direction of Pulley Rotation



Main Idea:
Two pulleys connected by a belt turn in the same direction.

Additional Information:
Here we see two wheels connected by a belt. When you turn the driver wheel, the belt causes the follower wheel to turn. This is a pulley system. The two pulley wheels connected this way will turn in the same direction. As in any pulley model, the belt has a small amount of slippage, which keeps the belt loose so it won't break if the wheels are forced to stop.

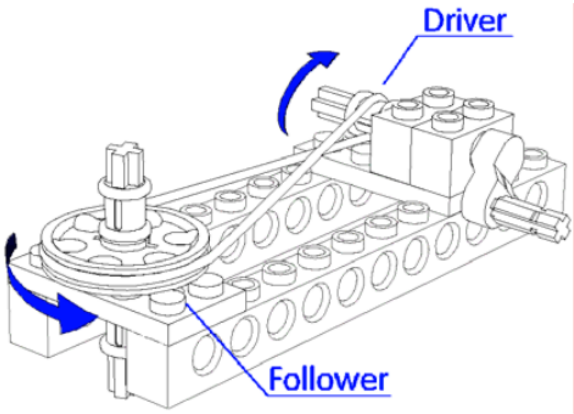
10. Changing Direction of Pulley Rotation



Main Idea:
Two pulleys connected by a crossed belt turn in opposite directions.

Additional Information:
Two pulleys connected by a straight belt turn in the same direction. If you want the pulleys to turn in opposite directions, you have to cross the belt and make a figure-eight shape. In this model, the belt is crossed so the driver and follower pulleys turn in opposite directions. As in any pulley model, the belt has a small amount of slippage, which keeps the belt loose so it won't break if the wheels are forced to stop.

11. Pulleys At An Angle



Main Idea:
A belt drive can be used to change the direction of rotation by 90 degrees.

Additional Information:
If you need to change the direction that an axle is facing, you can place your pulley at an angle. In this model, the driver gear is at a 90 degree angle to the follower. The direction of rotation changes 90 degrees when the driver is turned. The driver pulley and the follower both turn in the same direction. This model also shows a gearing down arrangement, as the driver pulley is smaller than the follower.

In one activity, children were asked to match up the description with the image before making the mechanism. This helped not only with their understanding of gears and pulleys but also with imagining how a mechanism would work when they came to designing their own fairground ride.

Sample Year 2 Lesson Plan

Lesson Objective: To explore and make connections of movements in real life using a gears set.

Resources:

- Videos (of fairground ride or various moving objects) or discussion of things that move in the classroom
- Pictures worksheet
- Wooden gears set
- Pictures on Powerpoint or paper

Introduction (~15 – 20 min):

- Play video (ca. 30 s – 1 min) followed by a 3-4 min discussion.
- Go through merry-go-round example, drawing movement arrows on pictures.
- Give out the worksheet (simply pictures of things that move, children to draw on movement arrows). 5 – 10 min working time. Work way around as pupils work.
- Bring pupils back together and then discuss.
- Do the machines just go around one way? e.g. Swings appear to go side to side and up and down.
- Finish on the bike. How does turning the pedals in a circle make the wheels go in a circle which then makes the bike move forwards? Brakes need *pulling* to slow the wheels down.

Activity:

Practical:

- Now get the gears out and allow pupils to play with these freely, observe and explore the models for themselves.
- Begin to feed in questions as they explore:
  - What changes as you turn the handle?
  - How does this happen?
  - How can you make them go faster/slower/in different directions?
  - When the handle is steadily turned one way, some models automatically speed up/slow down, have you noticed this?
  - Do they go in the same direction all the time and at the same speed or does this change and if so, why?
- This leads on to the similarities and differences between the models:
  - Which ones are similar/do the same thing? *(e.g. several go up and down in a similar way).* 10 mins
  - Can you sort similar models into groups? *(Some may be in two groups – ask what the groups are and why particular models are in them).*
- Now move on to real life uses:
  - Provide pictures (maybe with Powerpoint on interactive whiteboard) of everyday items (some of which are likely to have have cropped up at the start of the lesson) and get the pupils to suggest which gears could be used where. This can be done on several sheets with a picture of the relevant model (15min) or do as a group/class discussion.

  (Make it clear that there is no definite correct answer – more than one gear might be useful).
- Again, feed in questions so that pupils think about why they have chosen a particular matching etc.
- If time and technology is available, show videos from the links below.

Sample Year 2 Lesson Plan cont.

Extension for older years:

- Can you think of anything yourself that goes round in circles (e.g. microwave, washing machine), moves up and down (e.g. hammer) or from side to side (e.g. electric doors on a lift/shop)?
    - This can be big, small or part of something else.
    - E.g. from home (e.g. kitchen), in the city/country (e.g. on a farm), on TV (favourite programme), or the playground/park.
- Draw your example and add arrows to show motion.
- What else might you use some of these gears for? Can you think of an example where more than one one gear used in something? e.g. train, car engine

Plenary (10 – 15 min):

- Which are best examples and which are not so good? Why?
- Discuss why some of the gears are better suited to a particular job/function.
- Have some pupils come to the front and explain what their gear does.
- For older pupils, highlight the conversion of circular motion (of the handles) into other forms such as intermittent (in steps like the Geneva Wheel and Intermittent Drive), up and down (Eccentric, Scotch Yoke etc), sideways (Positive Action Cam).
- Talk about how the Universal Joint and Double Slider do not change the circular motion from the movement of the handle into another form. These both transfer the circular motion from one line to another parallel line.

You may wish to explore the notion that 'up and down' is really the same as 'side to side' (i.e. linear motion) but in a different orientation.

[Max. total time estimate: 1 hr 20 min]

Source:

Worksheet developed from ideas on the TES website: http://www.tes.co.uk/teaching-resource/Pushes-and-Pulls-3002754/

Sample Year 6 Lesson Plan

Lesson Objective: To explore and make connections with real life using a gears set.

Resources:

- Wooden gears set
- Instruction sheet
- Pictures on powerpoint

Introduction (15 min):

- Introduce idea of theme park/ fair ground.
- Discuss force directions.
- Ask one or two pupils to describe movement in pictures.

Activity :

- Give out gears to groups for pupils to sort them into 'movement' groups.
- What changes as you turn the handle?
- How does this happen?
- How can you make them go faster/slower/in different directions?
- Do they go in the same direction all the time and at the same speed or does this change and why? When the handle is steadily turned one way, some models automatically speed up/slow down and change direction.
- Highlight conversion of circular motion (of the handles) into other forms, such as intermittent (in steps like the Geneva Wheel and Intermittent Drive), up and down (Eccentric, Scotch Yoke etc), sideways (Positive Action Cam).
- Talk about how the Universal Joint and Double Slider do not change the circular motion from the movement of the handle into another form. They both transfer the turning circular motion from one line to another parallel line.

Also explore the fact that up and down is really the same as side to side (i.e. linear motion) but in a different orientation.

- Go through the gears slide and explain handout and tasks and then set the children going.
- You could use the speed increase pulley as an example being used on a bike.
- Now get kit out and ask pupil groups to make some of the gears/pulleys shown in their handout.
- Have some groups explain what they have constructed to the class.
- Move on to the 'plan your own ride' activity
- Draw this plan out and go back to wooden models and kit for inspiration.

Extension:

- Can you think of any machine that has movement: in circles (e.g. microwave, washing machine); up and down (e.g. hammer); or side to side (e.g. electric doors on a lift/shop)? This could be:
  - big, small or part of something else;
  - from home (e.g. in the kitchen); in the city/country (e.g. on a farm); on TV (e,.g. on a favourite programme); in the playground/park.
- Draw the example and add arrows to show movement/forces.
- What else might you use some of these gears for? There could more than one gear in use in this example. (e.g. train, car engine).

Plenary:

- Have some pupils come to the front and explain their design and how their ride behaves.

Comments from College Fellows

"The children explored the different models and mechanisms, drew detailed diagrams of how they worked including direction arrows. They then began to think about how the various mechanisms could be incorporated into a design of their own fairground ride. They had to decide which model was most suitable to incorporate into their design and why."

"We've been using them mainly in Year 5 as we were making cams in our space unit and the children have loved them."

"I found they made a very good subject for observing closely and making links between cause and effect. We talked about how and why some of the movements worked in a particular way and about pivot points, circular and linear movements and general uses for them."

"Children found them useful demonstrating mechanisms that they later explored in DT."

"We used them as part of a lesson on Victorian technology and the industrial revolution."

"Our teachers have also used them in art work, looking at textures of wood and the shapes they create."

"Children have predicted what they think will happen when they turn the handle."