LEGO ® MECHANISMS ON THE MOVE

Welcome. This collection of LEGO ® mechanisms was built by David Gaier between 2010 and 2011. Photos were taken by Thomas Gaier. The building ideas came from many sources: books, internet, imagination, etc.

The collection consists of the following: My Own Creation (MOC), Contraptions, Simple Machines, Basic & Incredible Mechanisms, Whimsical & Mechanical Toys, plus a couple of Awesome Robots. Included are FLL, FTC and VEX robotics teams that I have coached.

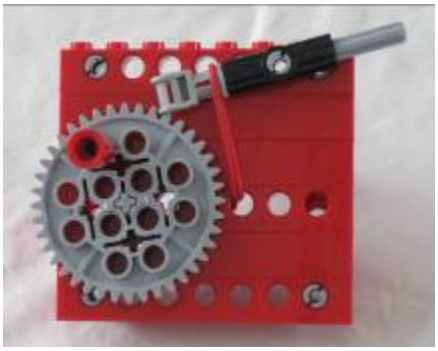
You can probably determine how to build these mechanisms from studying the pictures. Each picture includes a title and description. Enjoy!

One-Way Rotation Mechanism:

The idler gear meshes and locks the gear set when reversing the rotation.

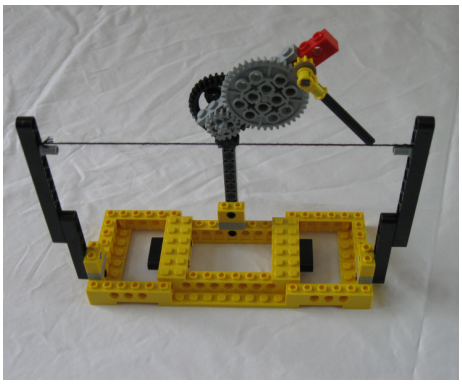
One-Way Ratchet Mechanism:

The pawl finger locks the gear when reversing the rotation.



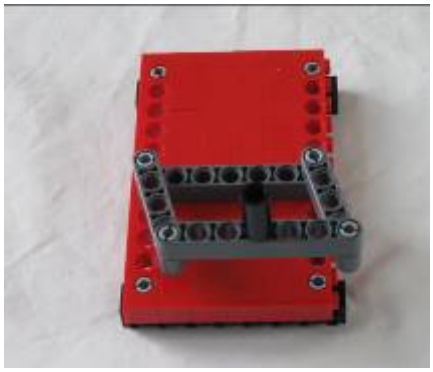
Oscillating Mechanism:

Rotary motion translates to linear motion at the gear set as illustrated by the pointer following the string.



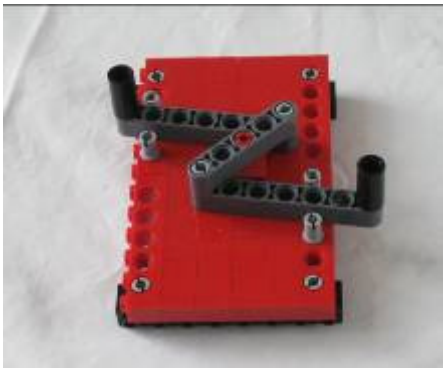
Parallelogram Linkage:

The 4 Bar linkage can maintain a parallel position to the base through 360 degrees of rotation.



3 Bar Linkage:

The 3 Bar linkage can make objects or forces move in opposite directions.

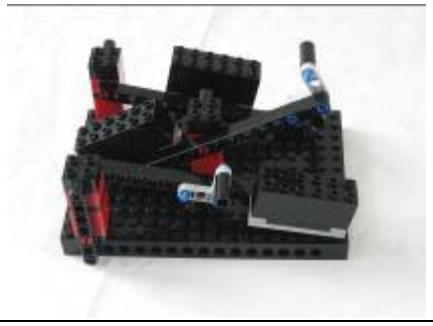


Parallel-Link Coupling:

Richard Schmidt of Madison, AL created the offset coupler mechanism in 1963.

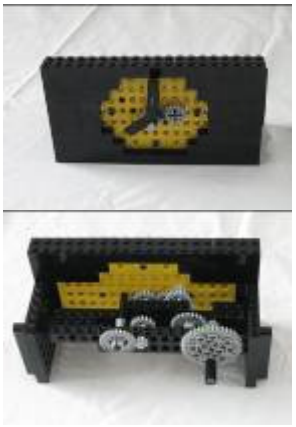
Levers:

Class 1, fulcrum between the load and effort.
Class 2, load between fulcrum and effort.
Class 3, effort between fulcrum and load.



Gear Train:

A clock requires 12:1 gearing between the minute and hour hand.
Gearing 2:1 + 2:1 + 3:1



Parallel-Guidance Drive:

The member fixed to the outbound gears will remain parallel to its previous position throughout the rotation.

Gyroscope:

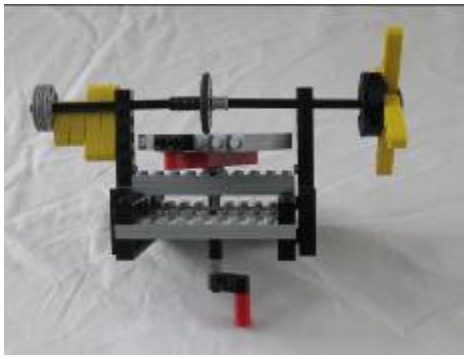
The rotating wheel pivots inside a circular frame whose movement does not affect the wheel's orientation in space.

Catapult:

The siege/war machine/engine was used in medieval times to hurl/launch large stones.

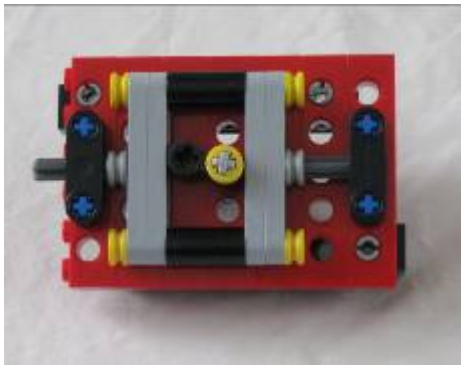
Variable-Speed Friction Drive:

The relative rotation of the output shaft reverses when the roller wheel moves past the center of the disk.



Scotch-Yoke Mechanism:

Rotary motion translates to reciprocating motion of the yoke.

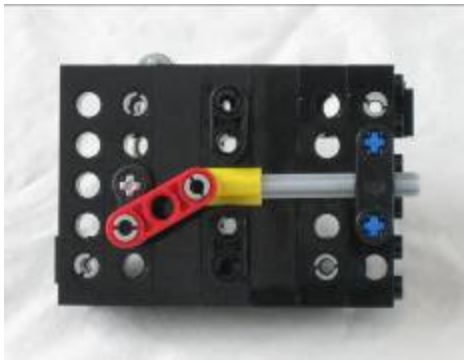


Gear Train:

A collection of gears (gear train) reduces the output speed:
3:1 = 5:1 + 3:5
5.4:1 = 3:1 + 3:1 + 3:5

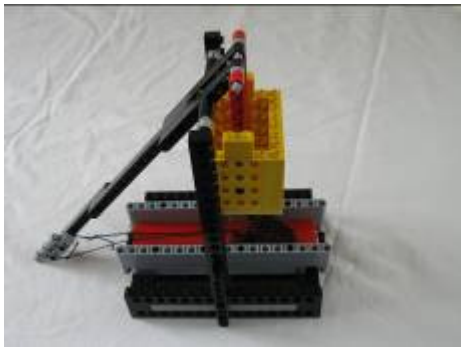
Slider-Crank Mechanism:

The crank translates rotary motion to reciprocating motion of the rod.



Counterweight Trebuchet:

A siege/war machine/engine was used in medieval times to hurl/launch large stones.

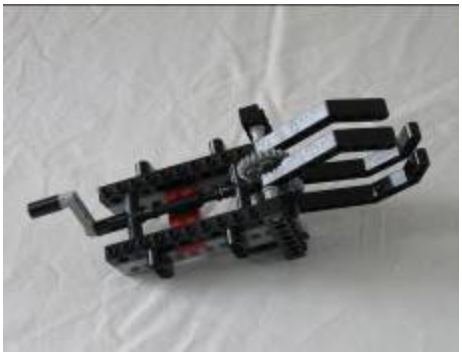


Bicycle:

A chain transfers energy from the bicycle pedals to the rear wheel.

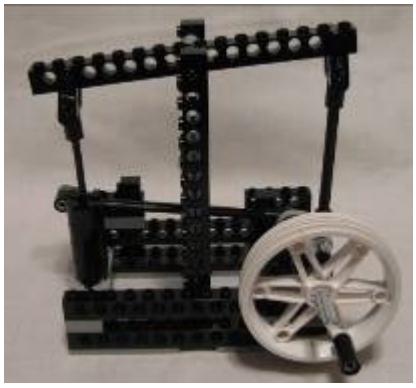
Gripper, Claw, Hand, Pincher:

The double action fingers are driven by a worm gear.



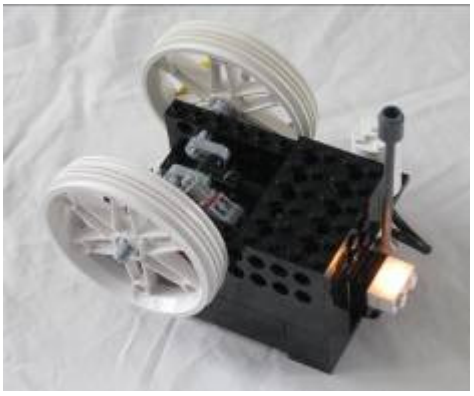
Steam-powered beam engine:

Thomas Newcomen developed the walking beam engine around 1705 to remove water from mines.



Internal Combustion Engine:

This model uses a light timed to spark when the piston passes top dead center (TDC).



Governor Mechanism:

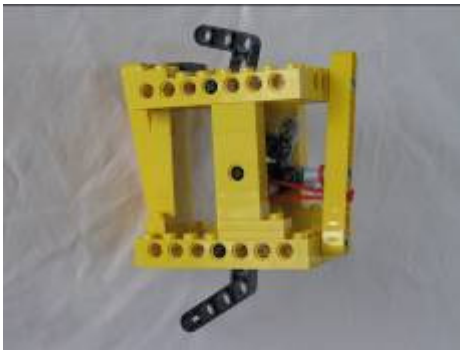
James Watt perfected the centrifugal fly ball governor in 1788. It was used for regulating the speed of a steam engine.

Single Action Trigger Mechanism:

A rubber band helps the trigger actuate a resettable hammer mechanism.

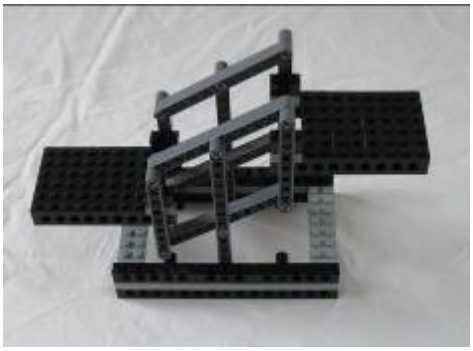
Semi Automatic Trigger Mechanism:

A rubber band helps the trigger actuate a bell crank that is linked to the hammer mechanism.



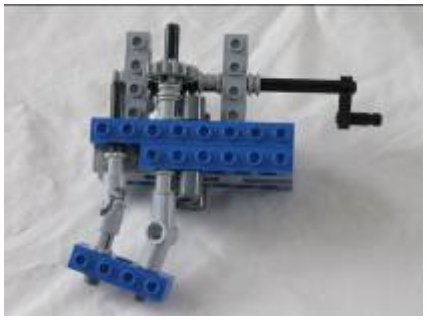
Balancing Beam Mechanism:

The 4 bar linkage allows objects to be weighed using pans that remain parallel to the base.



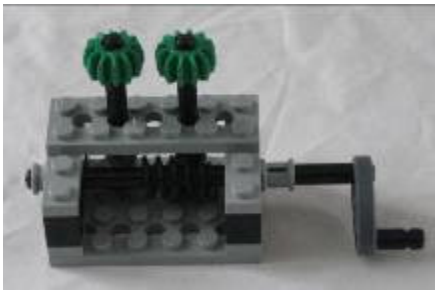
Orbiting Rotation Drive:

The orbital turtle foot motion uses a universal joint and is driven by a worm gear.



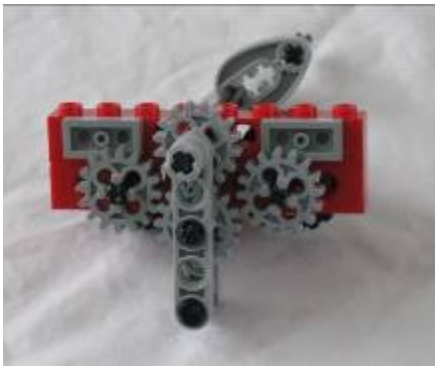
Two Outputs from One Input:

The forward or reverse input rotation produces either a CW or CCW 8:1 output rotation that is driven by a worm gear.



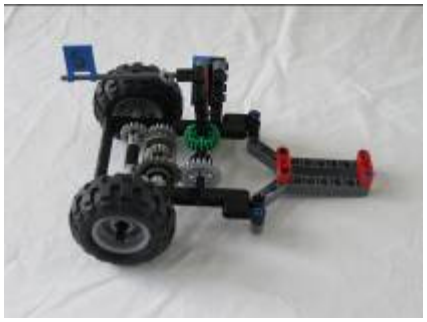
Two Outputs from One Input:

The forward or reverse input rotation produces either a CW or CCW 1:1 output rotation.



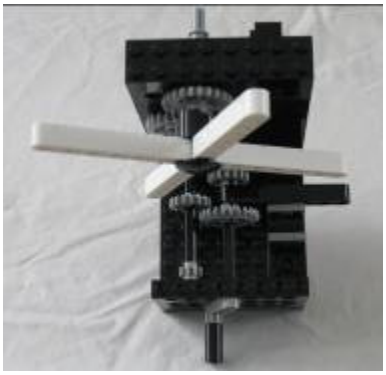
South Pointing Chariot:

Chinese invented the differential gear around 2600 BC. The chariot will always point in the same direction (acting as a non-magnetic compass vehicle).



Gear Train (3 speed):

The output speed is changeable using a manually shifted transmission:
3:1, 1:1 & 1:3



Single Rotation Drive:

The forward or reverse input rotation produces a single output rotation.

Differential Gear & Ackerman Steering:

This model uses both mechanisms.

Gear Train (3 speed):

The output speed is changeable using a collection of gears: 1:1, 1:3 & 1:9

Gripper, Claw, Hand, Pincher:

The double action fingers are driven by a worm gear. A 4 bar linkage causes a parallel movement of the fingers.

Waddling Mechanism:

The waddling robot is powered by simple physics - gravity and friction.

Expanding Scissors:

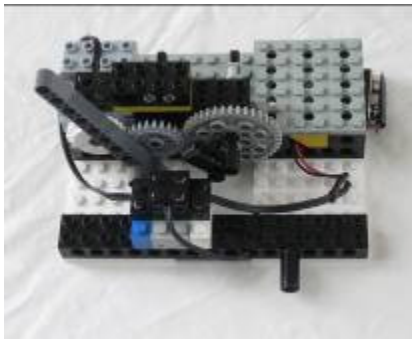
The scissor mechanism is capable of expanding and gripping.

Gripper, Claw, Hand, Pincher:

The double action fingers are driven using a worm gear.

Do Nothing Machine:

This contraption has the ability to turn off by itself.



Worm Gear – Self Locking Mechanism:

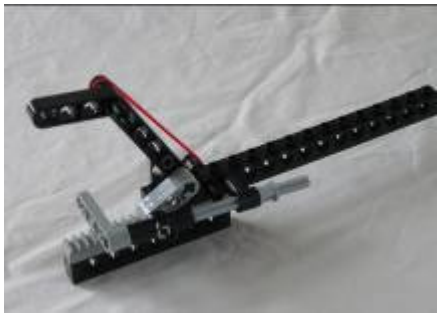
The self-locking worm gear prevents the crane from dropping if the drive unit fails.

Compound Gears:

The use of even or odd number of gears causes different directions of rotation.

Over The Center (OTC) Mechanism:

The trigger mechanism actuates the pincher.



Lead Screw Mechanism:

Rotary motion translates to linear motion by a worm gear.

Rack and Pinion Mechanism:

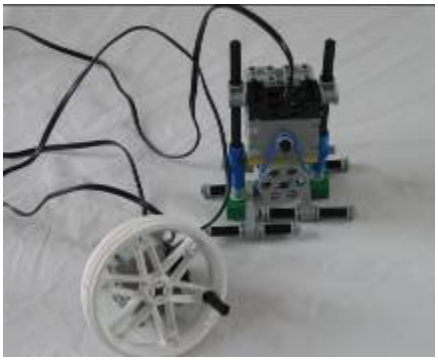
Rotary motion translated to linear motion by a gear rack.

Ball In Cup Toy:

This example of an old style toy can improve hand-eye coordination.

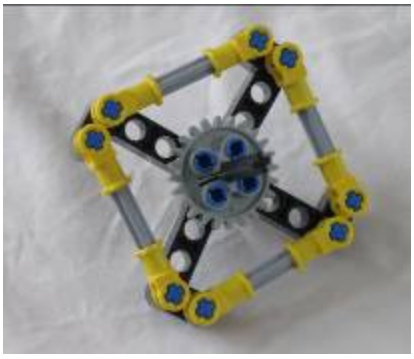
Walking Mechanism:

A generator/motor combination powers this walking mechanism.



Whimsical Top Toy:

This example is of an old style toy top.



Music Box Mechanism:

My Own Creation (MOC) The Christmas scene rotates using a wind up music box.

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Rail Trolley, Tram, Streetcar, Cable Car:

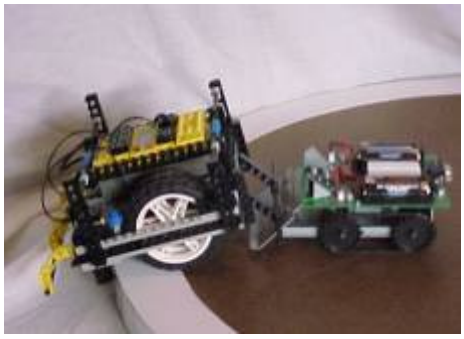
San Francisco, CA was the first cable car line in the USA in 1873.

Mini Sumo Bot:

This 2 motor robotic sumo bot uses the Mindstorms RCX with a light sensor to stay in the boundary area.

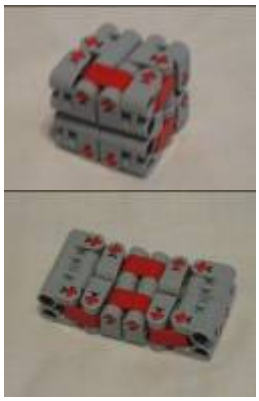
Mini Sumo Bot:

This Mindstorms RCX sumobot will lose because it is being pushed out of the sumo ring.



Nano Magic Cube Toy:

This unique contraption can entertain by unfolding continuously.



Whimsical – Illusion Toy:

This example is of an old style toy which can trick the eye with a fast rotating image.

Whimsical Whirligig Toy:

Native American cultures had their own version of this toy in 500 BC. A gear replaces the button.

FIRST LEGO LEAGUE (FLL):

State of Ohio FLL robotics trophy.

Boonshoft Museum of Discovery FLL Team :

2002 FLL robotics team that competed at state.

Boonshoft Museum of Discovery FLL Team :

2003 FLL robotics team that competed at state.

Tipp Monroe Community Services FLL Team:

2004 FLL robotics team that competed at state.

Tipp Monroe Community Services FLL Team:

2005 FLL robotics team that competed at state.

WACO Museum FLL Team:

2006 FLL robotics team that competed at state.

WACO Museum FLL Team:

2007 FLL robotics team that competed at state.

Tippecanoe STEAM Boosters FTC Team:

2007 FTC robotics team that competed at Univ. of Cincinnati.

Photo to be added

WACO Museum FLL Team:

2008 FLL robotics team that competed at state.

Tippecanoe STEAM Boosters VEX Team:

2009 VEX robotics team that competed in OH and IN.

RCX FLL Robot:

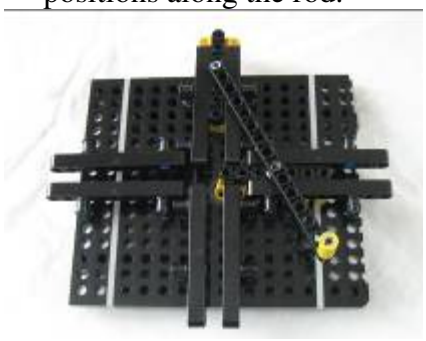
This 3 motor FLL robot uses the Mindstorms RCX for competitions before 2006.

NXT FLL Robot:

This 3 motor FLL robot uses the Mindstorms NXT for competitions starting in 2006.

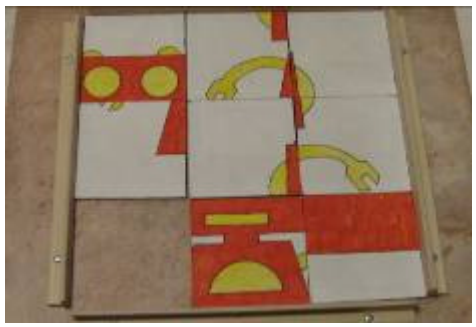
Trammel of Archimedes:

This mechanism can trace out an ellipse. It consists of two shuttles and a rod which is attached to the shuttles by pivots at fixed positions along the rod.



Sliding Puzzle 9 square:

Players are challenged to slide flat pieces along certain routes on a board to establish a certain end-configuration.



Sliding Puzzle 9 square:

Noyes Chapman created the puzzle craze in 1880. Sliding block puzzle prohibits lifting any piece off the board.