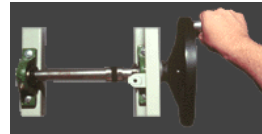


## Gadget Anatomy Lab

### *Pre-lab Survey*

## Wheel and Axle



- In this machine a wheel or spoke is locked to a central axle so that when one is turned the other must turn.
- A longer motion at the edge of the wheel is converted to a shorter more powerful motion at the axle.
- In reverse, a short powerful force at the axle will move the wheel's edge a greater distance.

## Pulley System



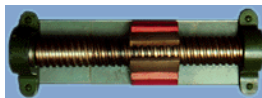
- A single pulley simply reverses the direction of a force.
- When two or more pulleys are connected together, they permit a heavy load to be lifted with less force.
- The trade-off is that the end of the rope must move a greater distance than the load.

## Wedge



- A wedge converts motion in one direction into a splitting motion that acts at right angles to the blade.
- Nearly all cutting machines use the wedge.
- A lifting machine may use a wedge to get under a load.

## Screw



- A screw is a central core with a thread or groove wrapped around it to form a helix.
- While turning, a screw converts a rotary motion into a forward or backward motion.

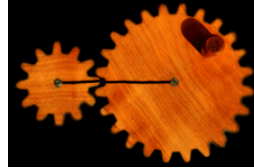
## Lever



- A lever is a stiff rod that rotates around a pivot point or fulcrum.
- Downward motion at one end results in upward motion at the other end.
- Depending on where the pivot point is located, a lever can multiply either the force applied or the distance over which the force is applied.

## *Other Elements of Machines*

### Gears



- are toothed or pegged wheels meshed together to transmit motion and force.
- In any pair of gears the larger one will rotate more slowly than the smaller one, but will rotate with greater force.
- Each gear in a series reverses the direction of rotation of the previous gear.

### Bevel Gears



- mesh at an angle & change the direction of rotation

### Worm Gear



- a combination of a gear meshed with the threads of a screw.
- This combination changes the direction of turning motion by ninety degrees.
- Worm gears also decrease the speed of turning from screw to gear and increase its force

### Ratchet



- a device that allows a wheel to turn in only one direction.
- The ratchet wheel has specially shaped teeth.
- A bar on a pivot called the "pawl" is fixed above the ratchet wheel.
- The pawl slides over the teeth of the ratchet in one direction, but blocks the motion of the teeth if the wheel turns in the other direction.

### Rack and Pinion



- A single gear, the pinion, meshes with a sliding toothed rack.
- This combination converts rotary motion to back and forth motion.
- Windshield wipers in cars are powered by a rack and pinion mechanism.
  - A small pinion at the base of the wiper meshes with a sliding rack below.

## Chains and Belts



- A chain or belt connects two separated wheels so that one turns, the other will turn in the same direction.

## Cam



- a wheel with shaped bumps on it.
- Cams are often connected to rods, levers, or springs.
- In the gravity trip hammer shown here, the bumps on the turning cam push down on the end of the lever making it raise the hammer again and again.

## Let's Look



at some examples  
and test your memory...

Simple Machines

## Hand Powered Drill



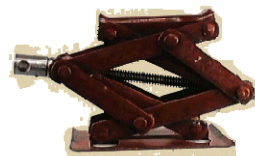
- Which elements of machines do you see in each gadget?
  - Bevel Gears
  - Worm Gear
  - Screw
  - Rack and Pinion
  - Wheel and Axle
  - Crank and Rod

## Wing-Handle Corkscrew



- Which elements of machines do you see in each gadget?
  - Pulley
  - Wheel and Axle
  - Screw
  - Rack and Pinion
  - Lever
  - Cam

## Scissor Style Jack



- Which elements of machines do you see in each gadget?
  - Screw
  - Cam
  - Pulley
  - Gears
  - Lever
  - Wedge

## Good Job!

- Now, go to the lab station and begin your Gadget Anatomy Lab
- Straighten up area when finished... and I MEAN do it right!!!! Everything should look like it did when you got here. Including lab stools.