

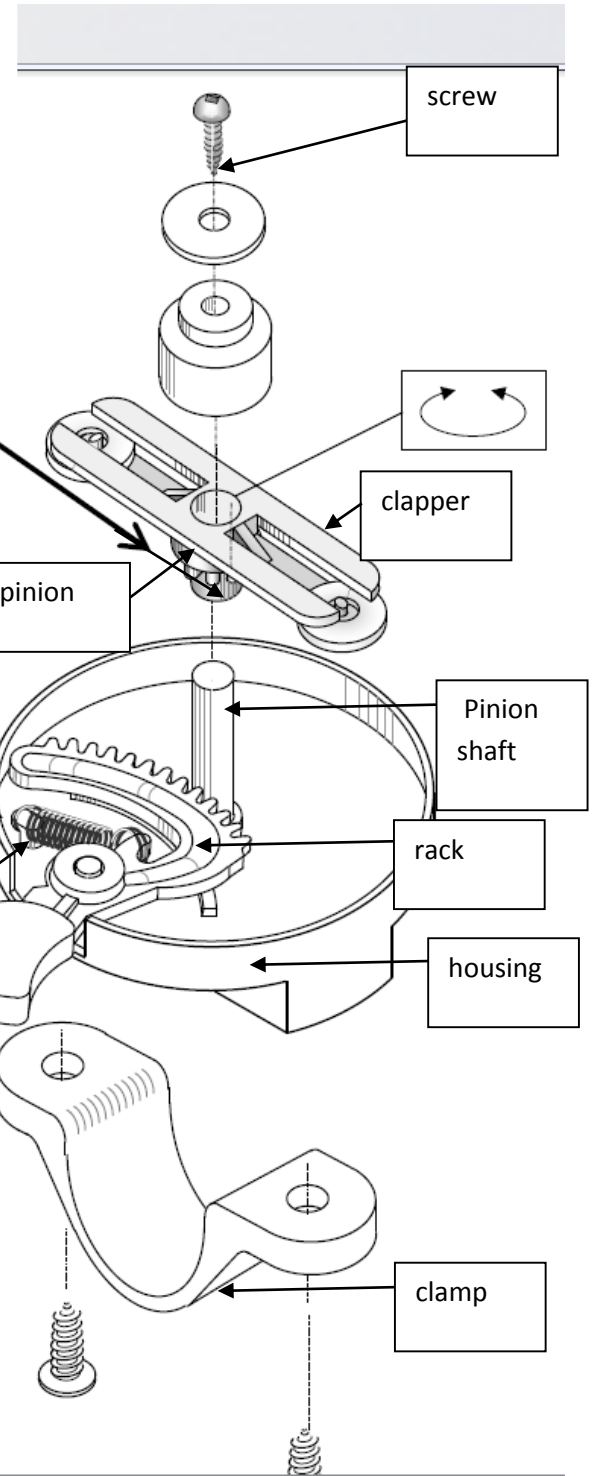
ST PreTest 3.3 2016

1. In the tables below, choose the right characteristic for each link. This is a bicycle bell. (the top part of the bell that the little washers make contact and create sound is not shown) a) The 1st link is the cylindrical slide-on base of the pinion gear. Since it just slides on, there's no 3rd part. The shaft does not move while the clapper can rotate and hit the sides of the bell. The 2nd link is the loop part of the spring; it can be removed with the spring and they stretch together. The spring is flexible, but the link itself (the loop part) is unbendable.

Link between: the clapper and the pinion shaft		
Direct	or	Indirect
Rigid	or	Flexible
Removable	or	Non-removable
Complete	or	Partial

Link between: the return spring and the spring retainer		
Direct	or	Indirect
Rigid	or	Flexible
Removable	or	Non-removable
Complete	or	Partial

Link between: the clamp and the housing		
Direct	or	Indirect
Rigid	or	Flexible
Removable	or	Non-removable
Complete	or	Partial



See last page for all answers and diagram.

2. Which twisting constraint is experienced by buildings during earthquakes?

- (A) Shearing
- (B) Torsion
- (C) Tension
- (D) Compression

3. What constraint is symbolized by  ?

deflection

4. a) What is the difference between compression and tension?

Compression is a squishing constraint; tension occurs when a material is being stretched.



b) Which of the two affects a car in a head on collision?

compression

5. List two elements with an atomic number less than 4 that have poor thermal conductivity.

He and H

6. What third period material has decent electrical conductivity but lousy thermal conductivity?

Si

7. a) If we refer to the power needed per meter of material to get a certain temperature difference across, is that specific heat? Or thermal conductivity?

Or thermal conductivity?

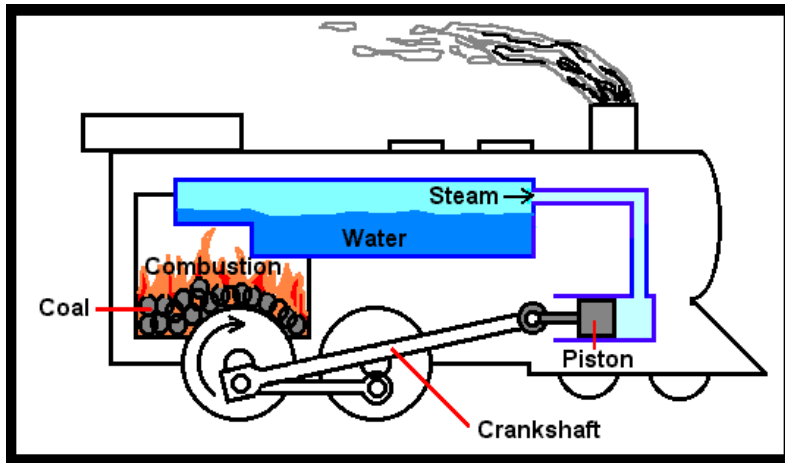
b) What are the units of thermal conductivity if we do not use watts?

J/(s m °C)

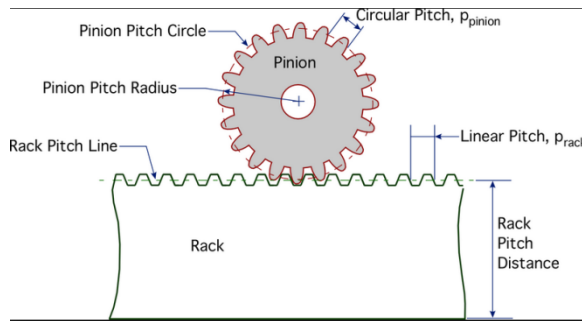
c) What property is being referred to if we note that it takes very little heat to get copper to reach a high temperature?

Specific heat

8. Draw a steam engine with a crank and slider transformation mechanism. Attach the slider to the train's wheels.

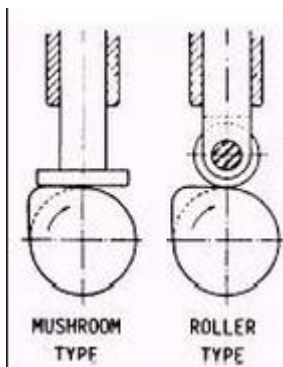


9. It is possible to slide the rack to the left or right. What transformation is involved?



Linear to rotational

10. a) What motion transformation system is being represented below?

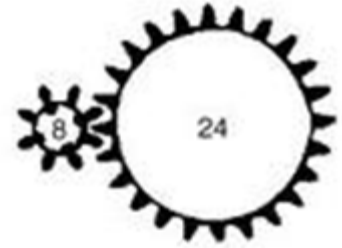


cam and follower

11. a) If the smaller gear is the input, calculate the velocity (speed) ratio in lowest terms.

$$V_{\text{out}}/V_{\text{in}} = n_{\text{in}}/n_{\text{out}}$$

$$= 8/24 = 1/3$$



- b) Again with the same small one as the input, calculate the mechanical advantage.

$$3/1$$

- c) What kind of gear system is this?

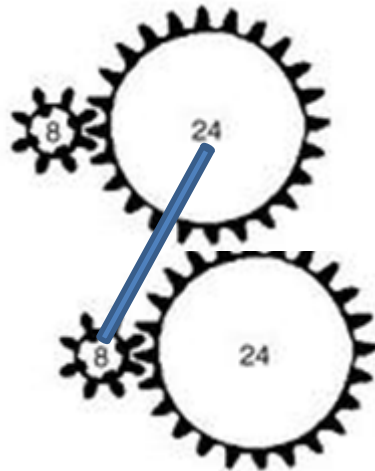
Gear train

- d) How can you modify the above system so that the output and input gears move in the same direction? Draw it.

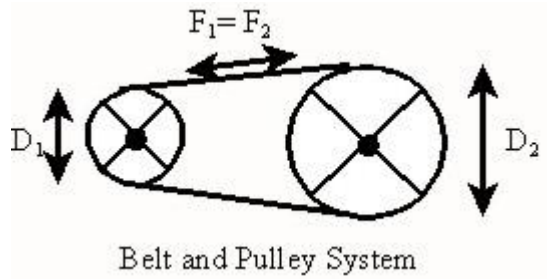
Draw a middle gear

- e) How can you create a gear ratio of 9 using only 8 and 24 toothed gears?

You need a gear box:



12.



- a) What does the above system have on the wheels to prevent the belt from slipping off? _____

Grooves

- b) If the small wheel(input) has 0.67 the diameter of the larger wheel, and the small wheel moves at a speed of 360 rpm, what is the speed of the larger wheel? Show work.

$$V_{out}/V_{in} = d_{in}/d_{out}$$

$$V/360 \text{ rpm} = 0.67$$

$$V = 360 \text{ rpm} * 0.67 = 240 \text{ rpm}$$

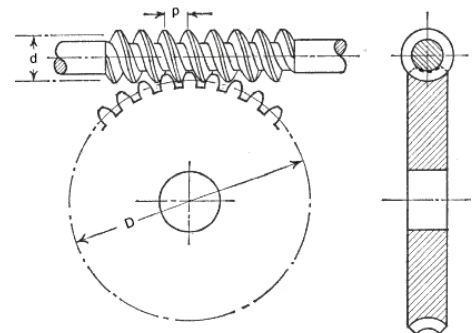
- c) Does this system make use of a chain? _____

no

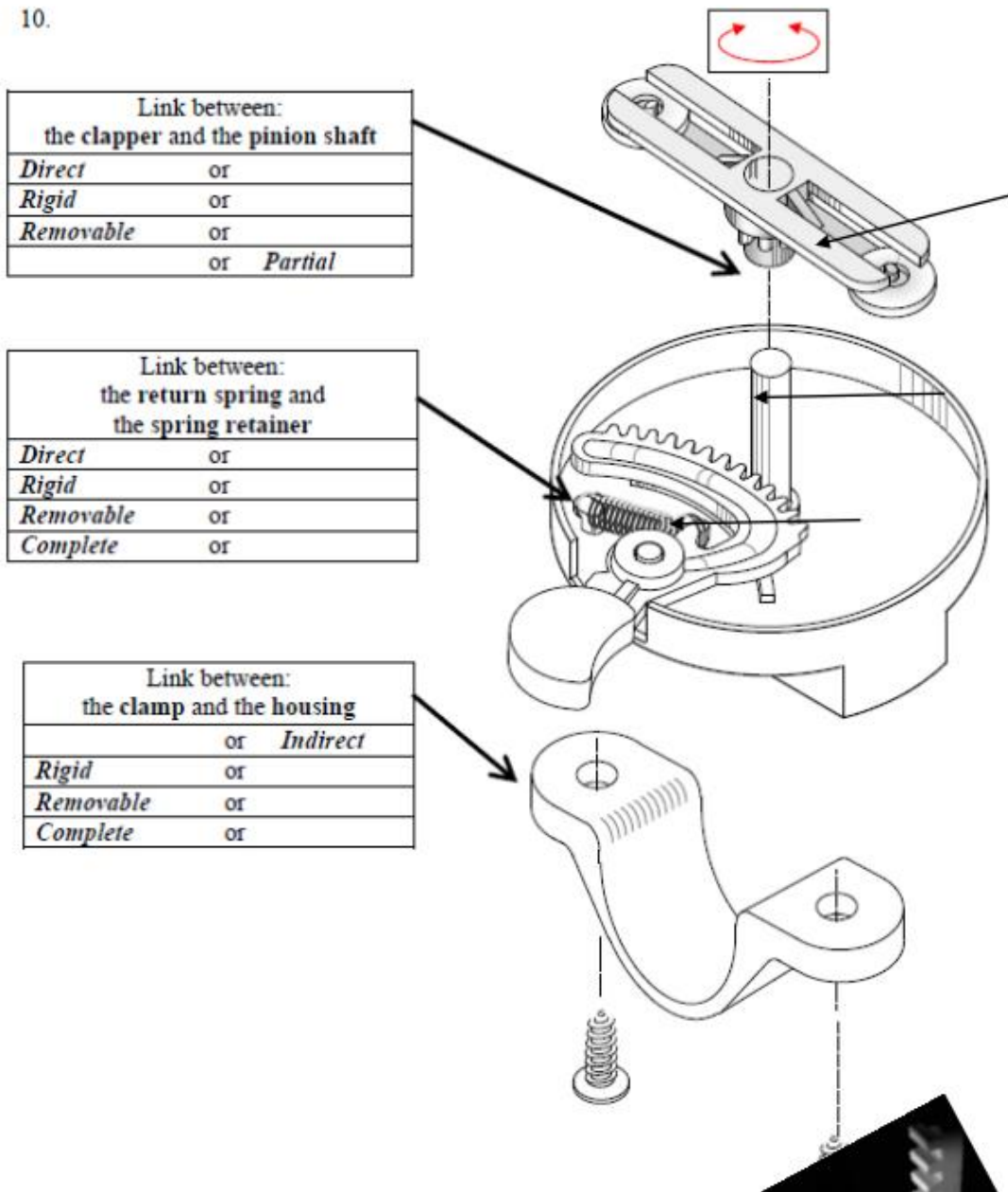
13. a) What kind of gear system is this? **worm-gear**

- b) If the mechanical advantage is 120, how many teeth are on the circular gear?

120



10.



This is a bicycle bell. (the top part of the bell that the little washers make contact and create sound is not shown) a) The 1st link is the cylindrical slide-on base of the pinion gear. Since it just slides on, there's no 3rd part, making it direct and removable. The shaft does not move while the clapper can rotate and hit the sides of the bell, which is why the link is partial. The 2nd link is the loop part of the spring; it can be removed with the spring and they stretch together (complete). The spring is flexible, but the link itself (the loop part) is rigid.