

# Gears and Ladder Chain

Bob Sorenson

# Objectives

- Type of gears
- Basics of ratio
- Tooth profiles
- How gears are measured
- How gears are made
- Special applications
- Ladder chain and sprockets

# Types of Gears



Spur Gear



Helical Gear



Double Helical Gear  
(Herringbone Gear)



Spiral Bevel Gear



Miter Gear



Straight Bevel Gear



Internal Gear

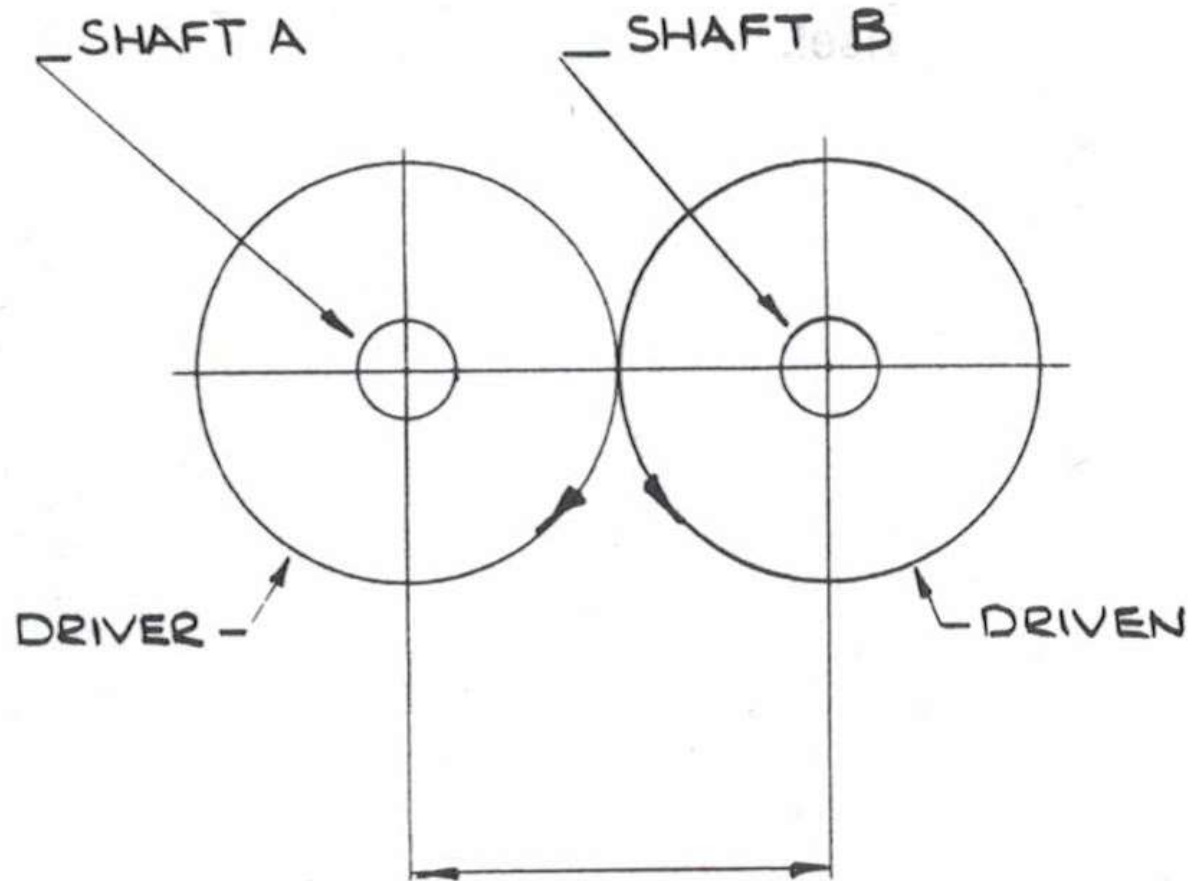


Worm Gear



Rack and Pinion

# Basics -- Friction Wheels

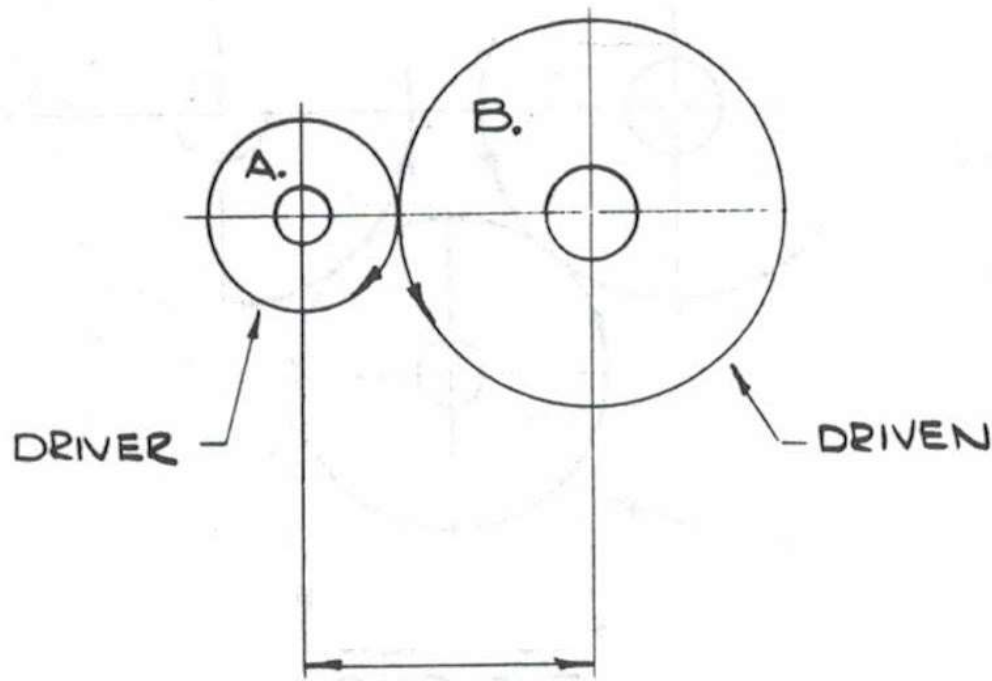


CENTRE DISTANCE DEPENDS ON  
THE DISC DIAMETERS.

# Basics -- Friction Wheels

$$\frac{\text{SPEED OF SHAFT A.}}{\text{SPEED OF SHAFT B.}} = \frac{\text{DIA OF DISC B}}{\text{DIA OF DISC A}}$$

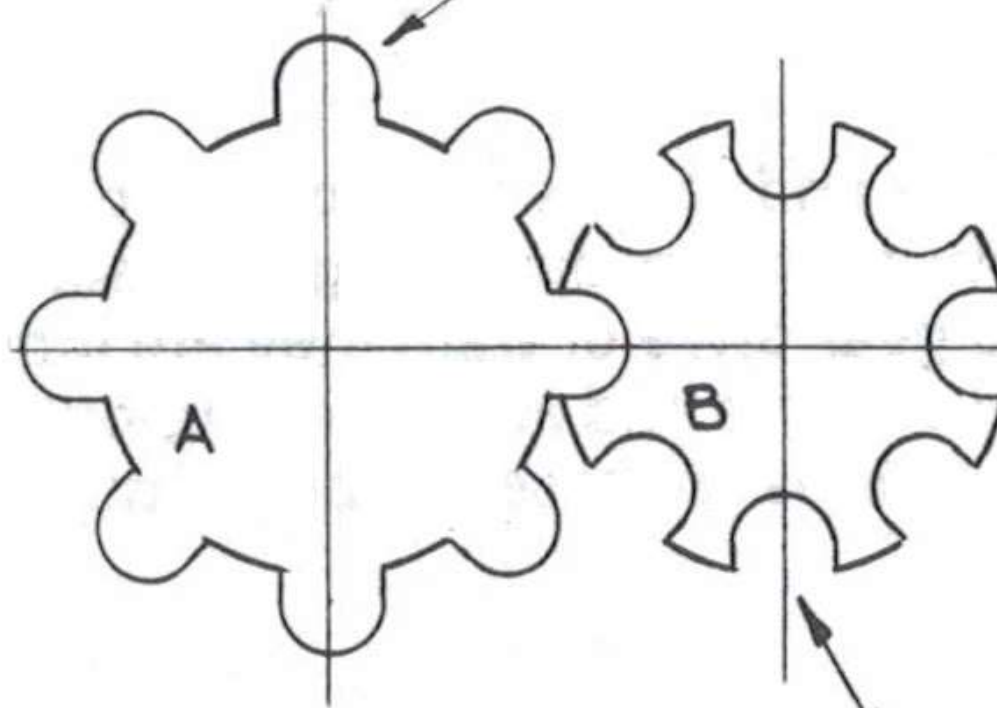
RATIO



$$\text{CENTER DISTANCE} = \frac{\text{DIA. A.} + \text{DIA B}}{2}$$

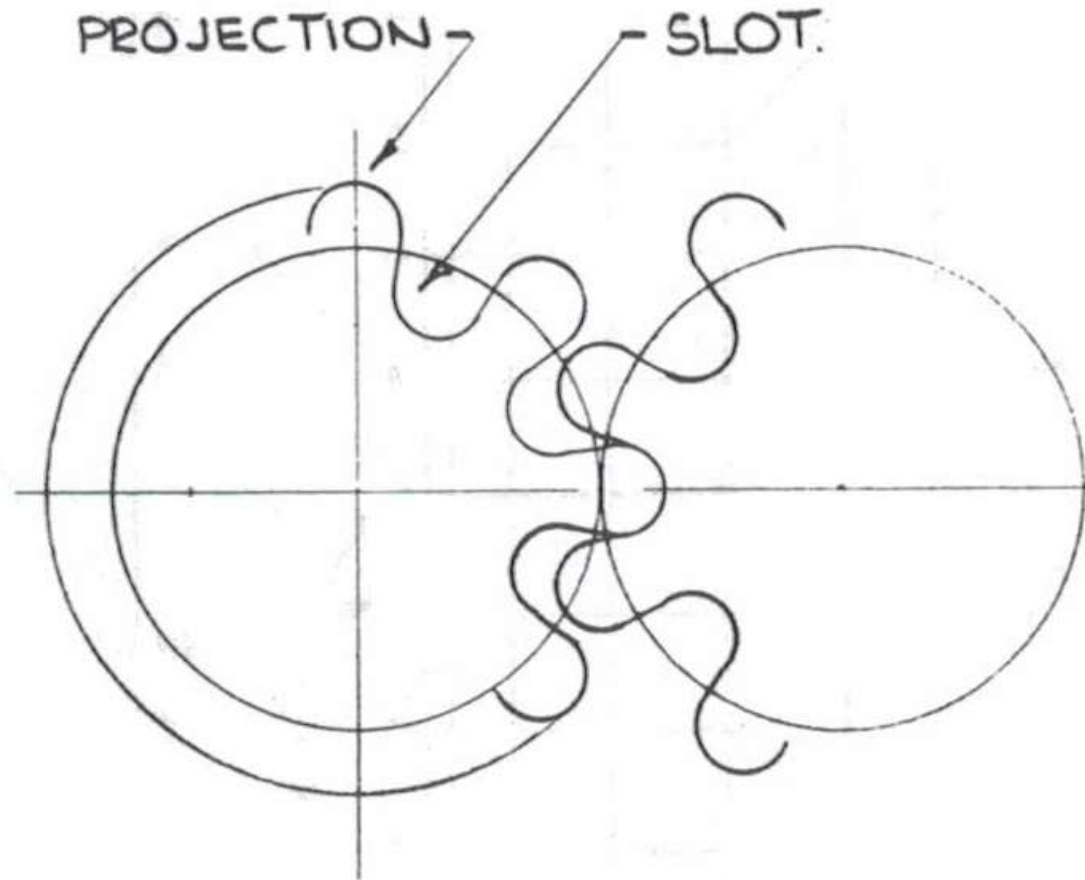
# Basics -- Teeth

THIS WHEEL IS A SERIES OF PROJECTIONS →



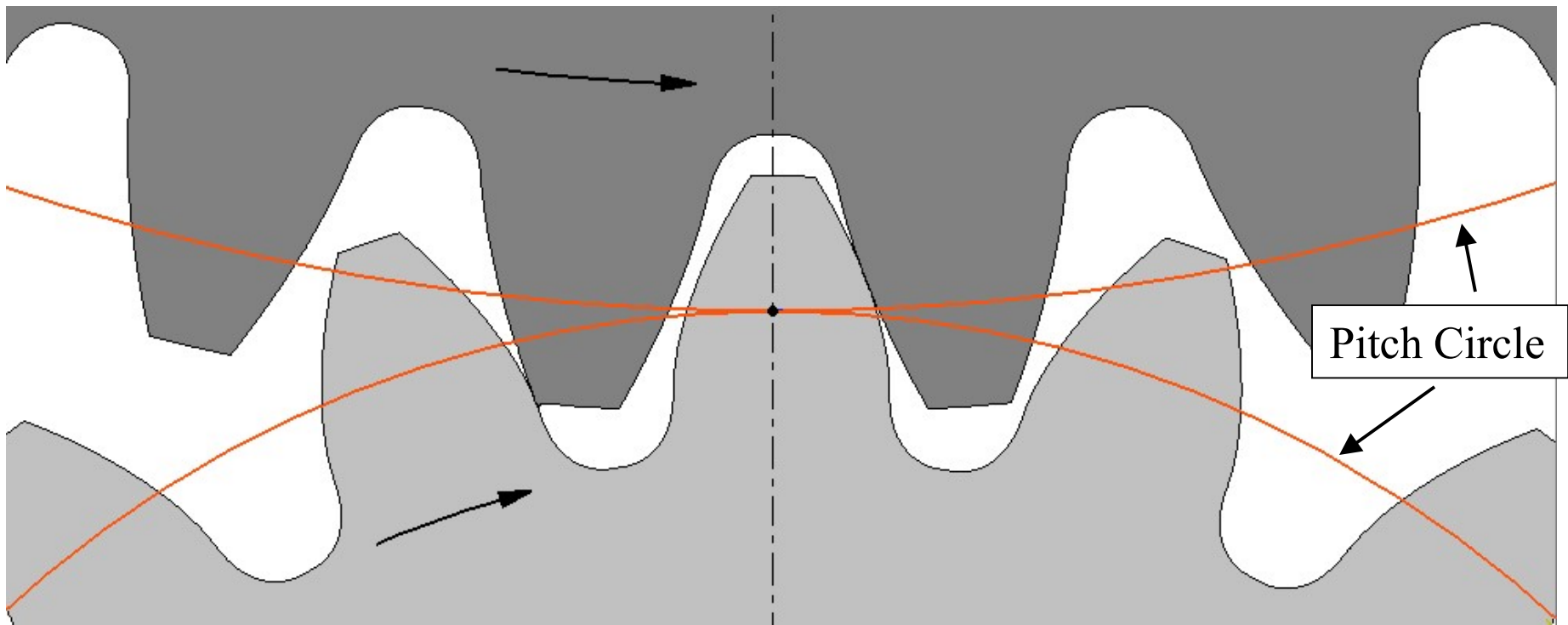
THIS WHEEL IS A SERIES OF SLOTS →

# Basics -- Teeth



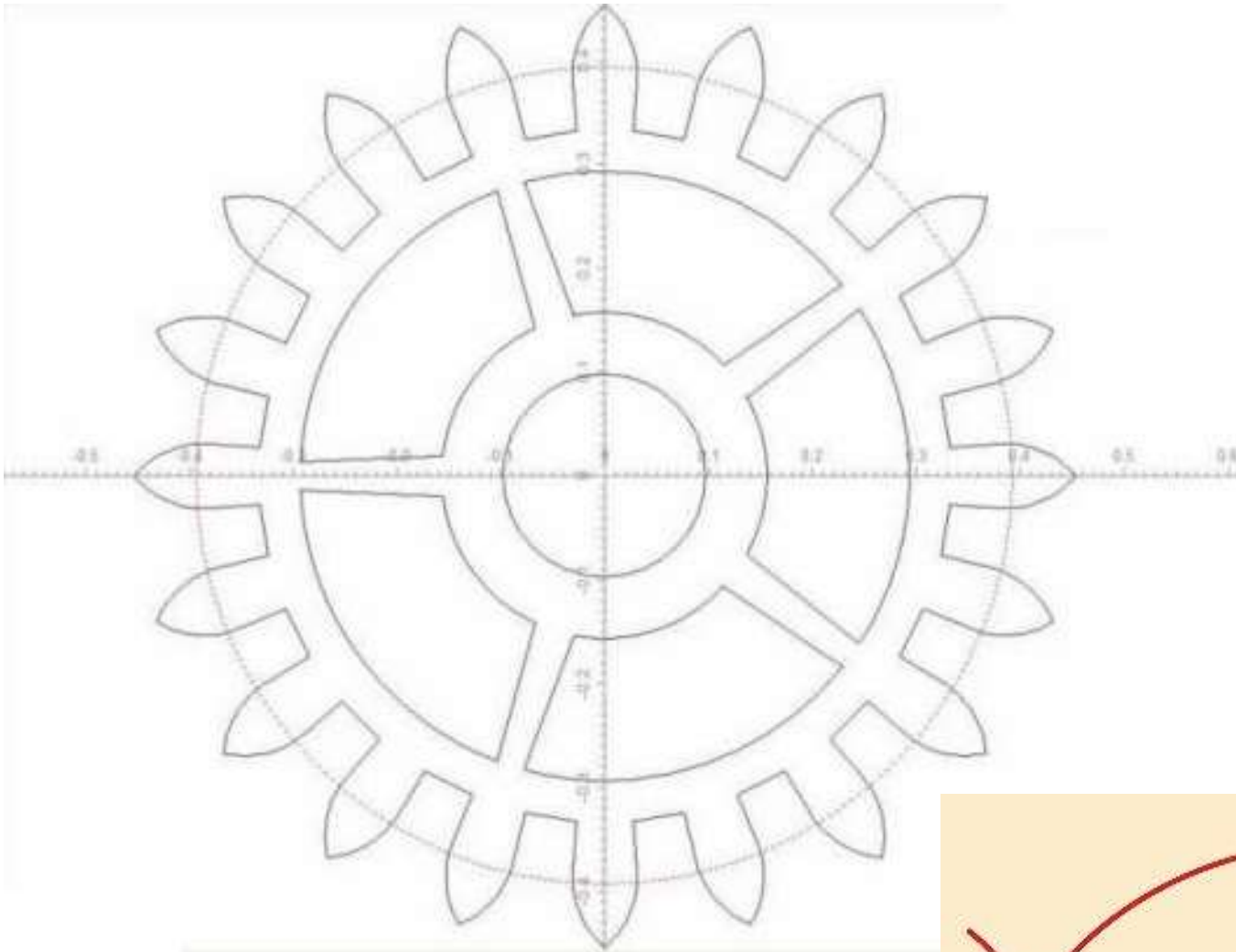
A SLOT & PROJECTION  
HAVE BECOME A TOOTH

# Basics -- Teeth

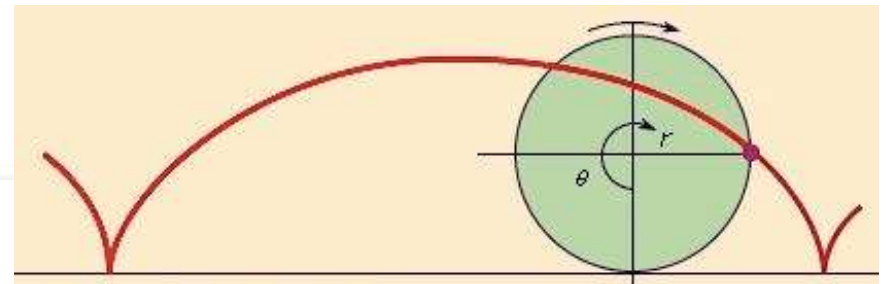




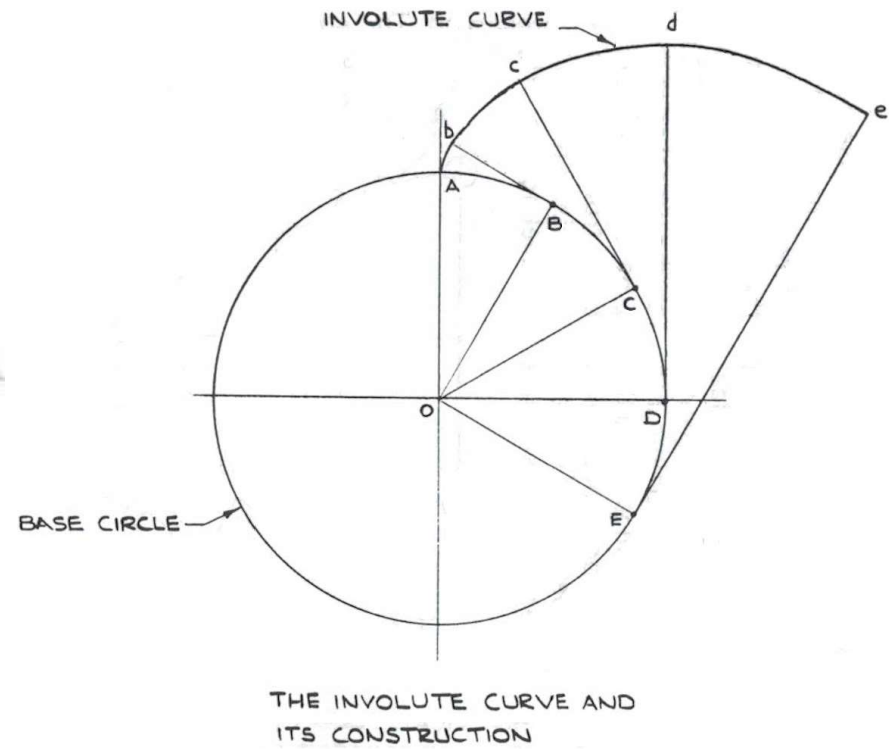
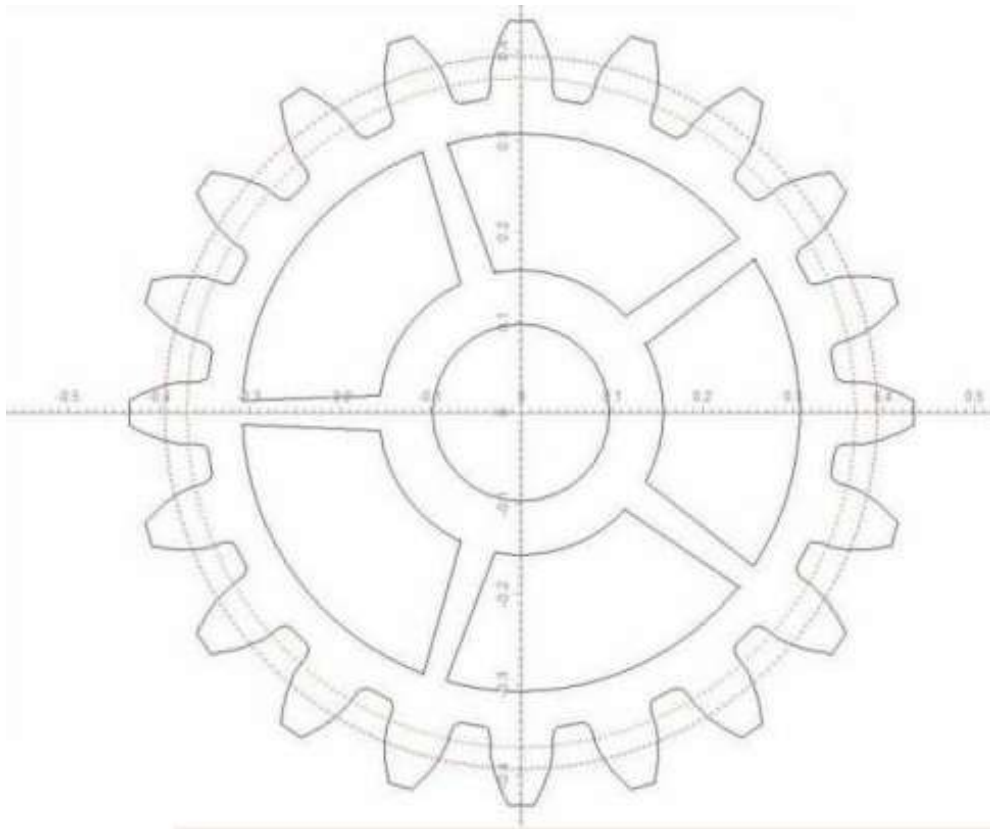
# Tooth Profile -- Cycloidal



Used in  
clock making



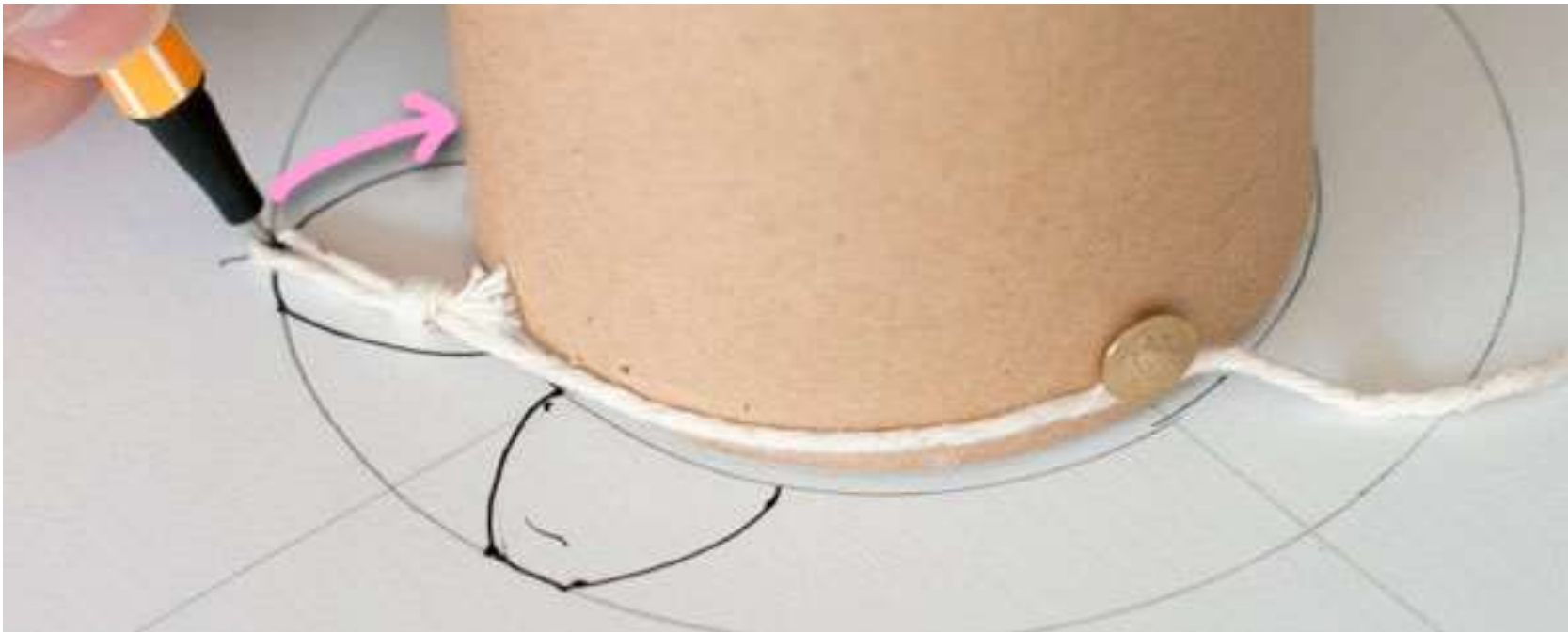
# Tooth Profile -- Involute



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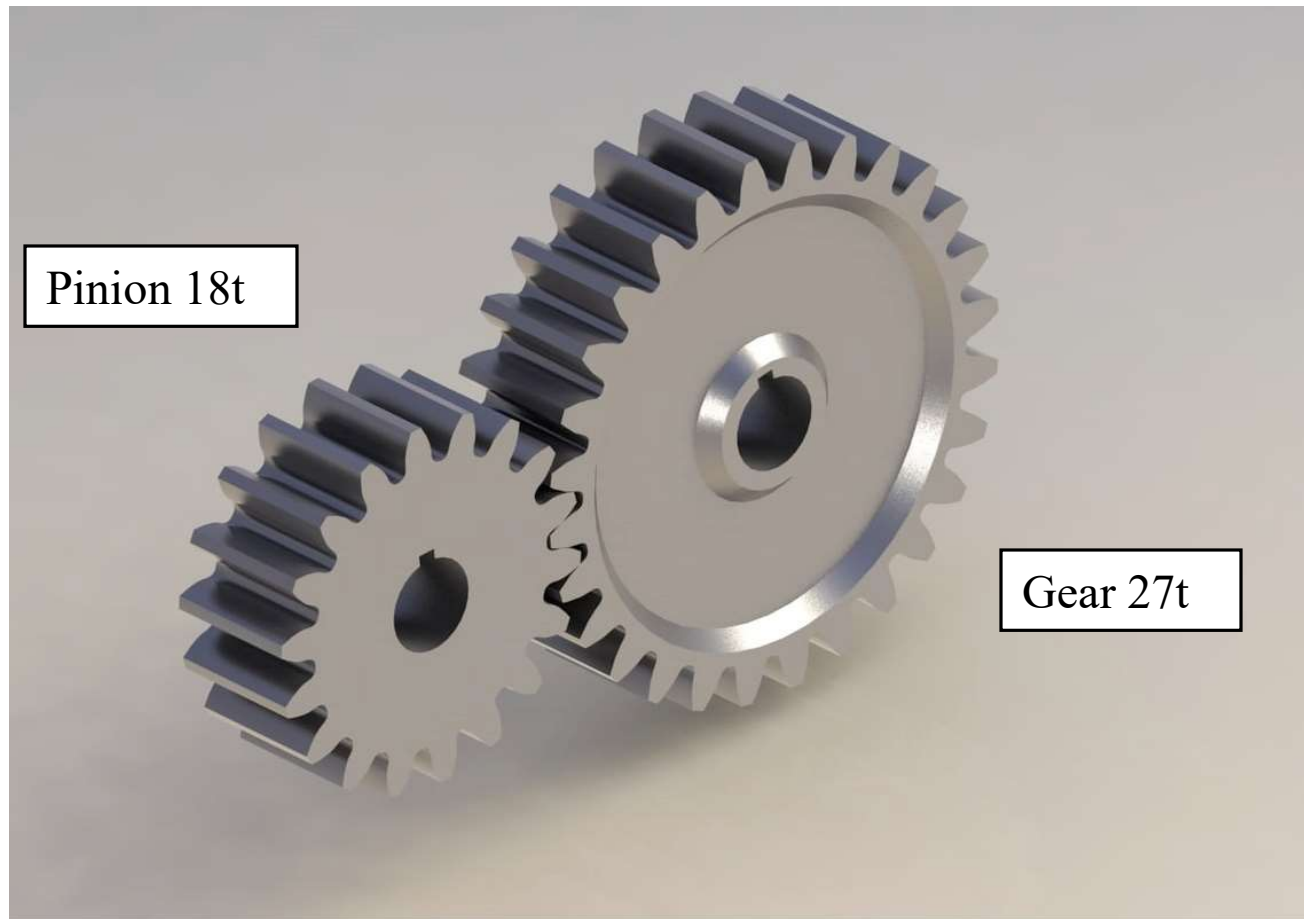
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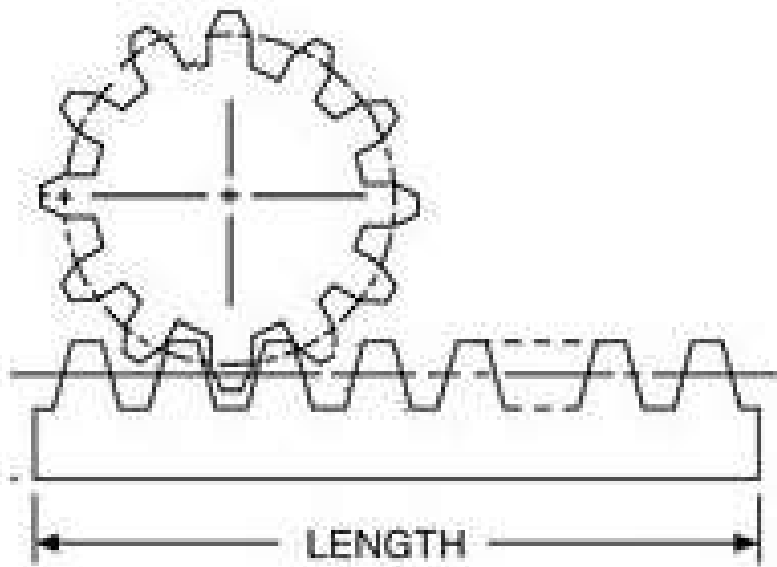


# Involute Spur Gear

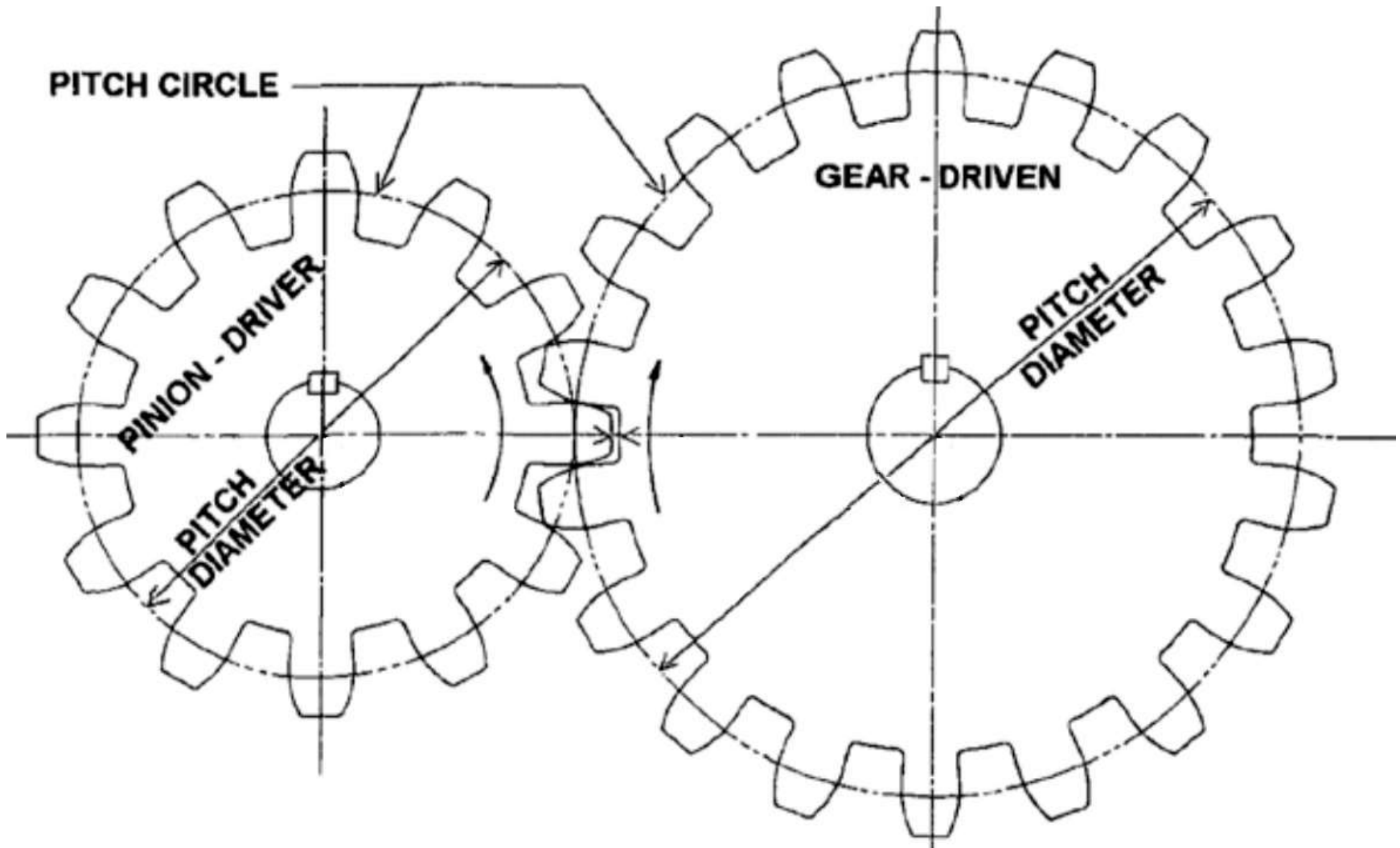


$$\text{Gear Ratio: } \frac{\# \text{ Teeth on Gear (Driven)}}{\# \text{ Teeth on Pinion (Driver)}} = \frac{27t}{18t} = 1.5 : 1$$

# Involute Rack and Gear

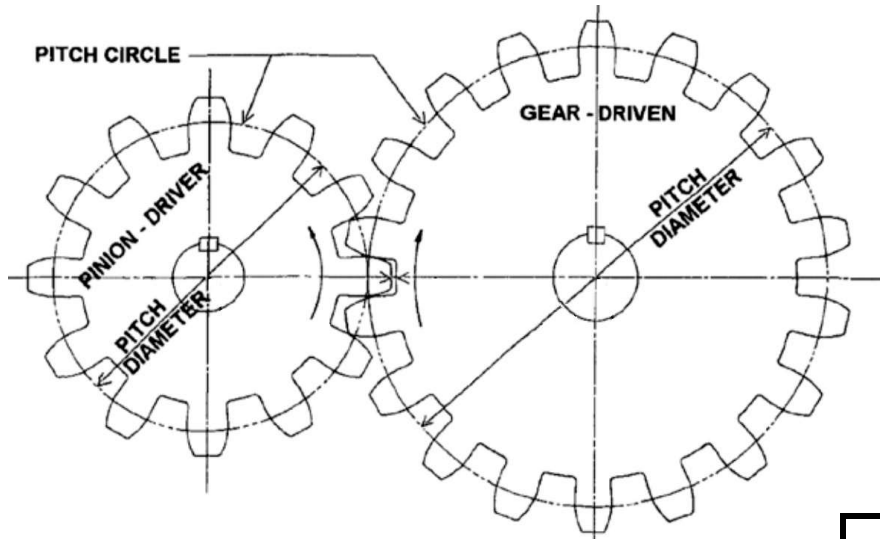


# Pitch Circle, Pitch Diameter





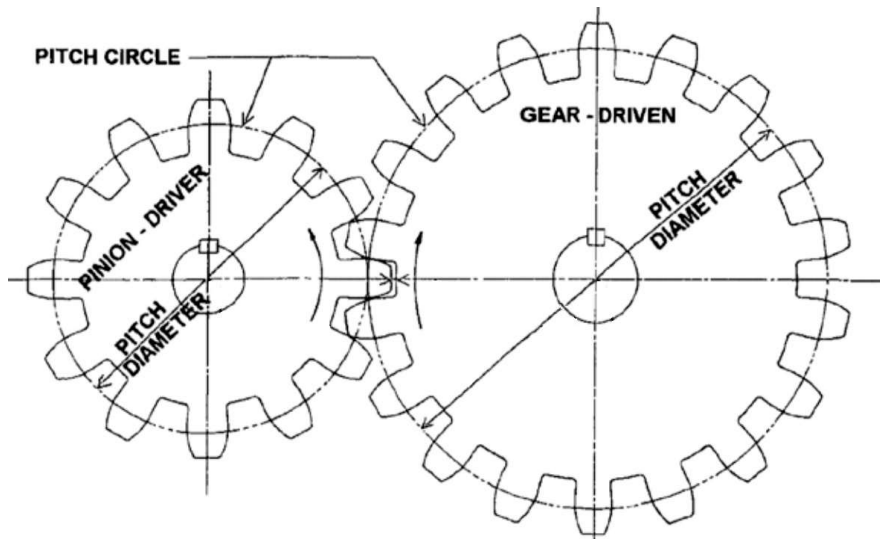
# Diametral Pitch, DP (inch)



Is the number of teeth on a gear for each inch for pitch diameter.

Pitch Diameter	# Teeth	DP
1.00"	48	48
1.25"	60	48
0.75"	36	48

# Module, Mod (metric)

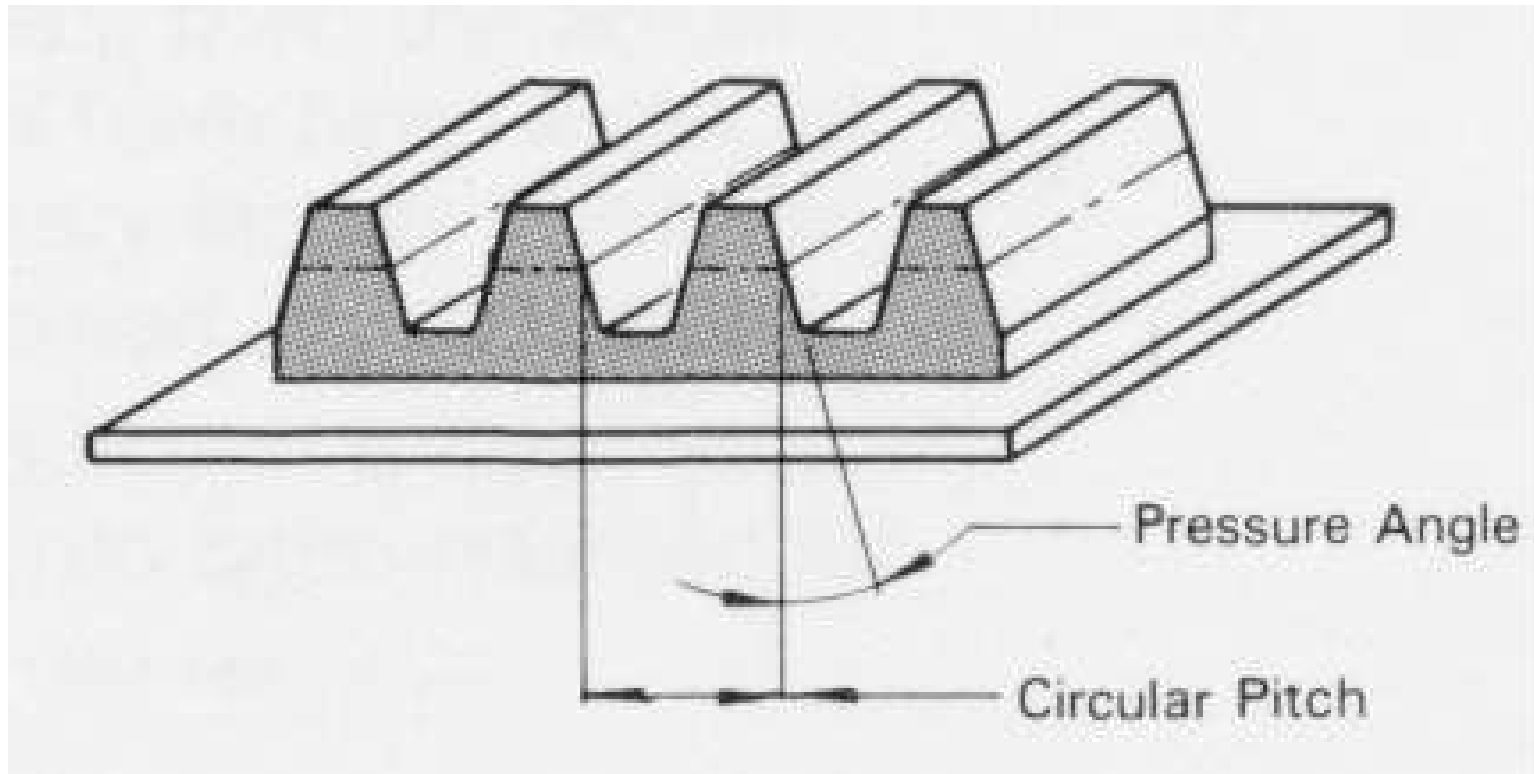


Is the reciprocal of Diametral Pitch.  
Module is the Pitch Diameter divided by the number of teeth

Pitch Diameter	# of teeth	Module
22.5 mm	45	0.5
12.5 mm	25	0.5
27.0 mm	54	0.5

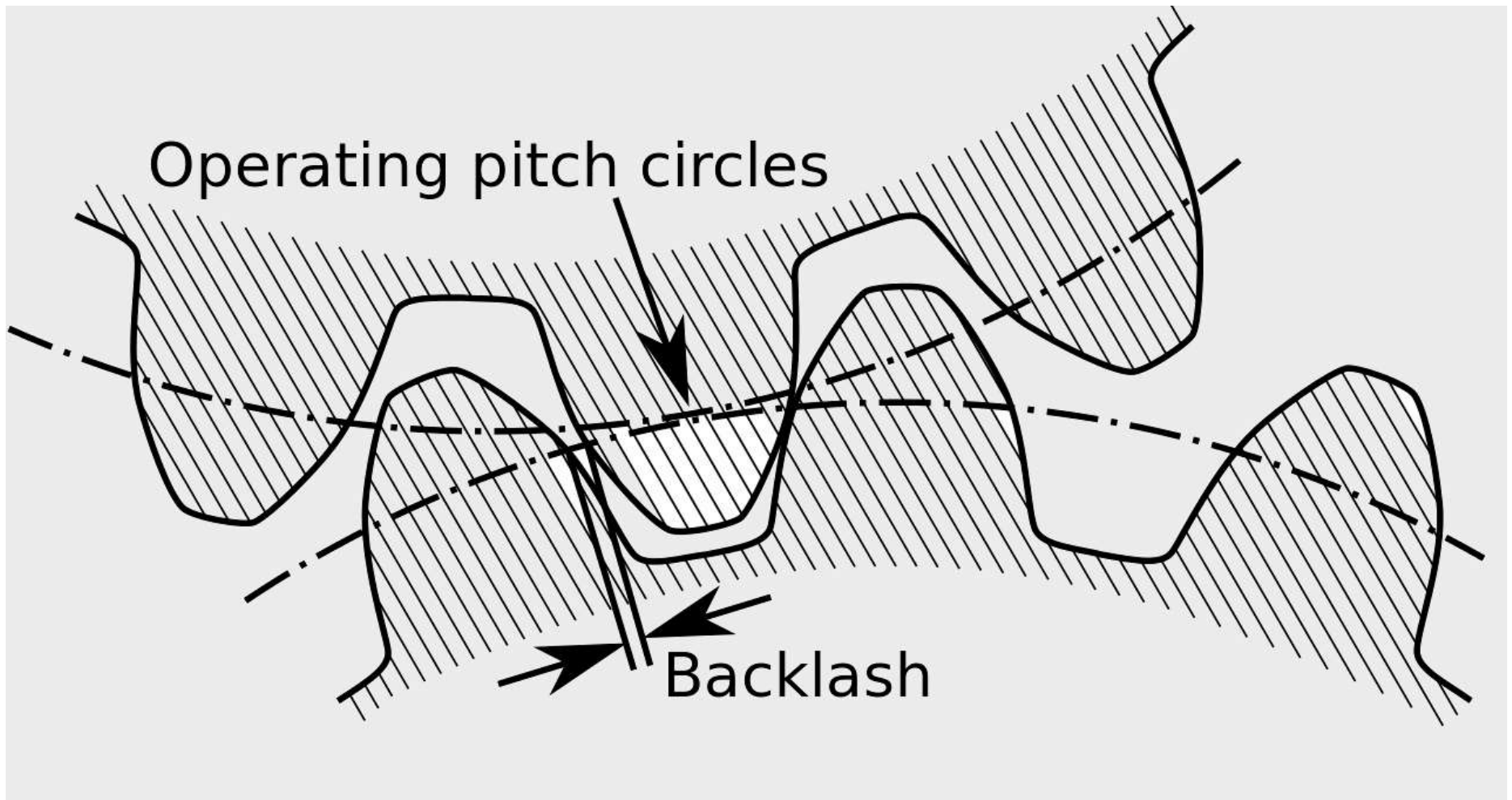
Note: 0.5 Mod ~ 50.8 DP

# Pressure Angle

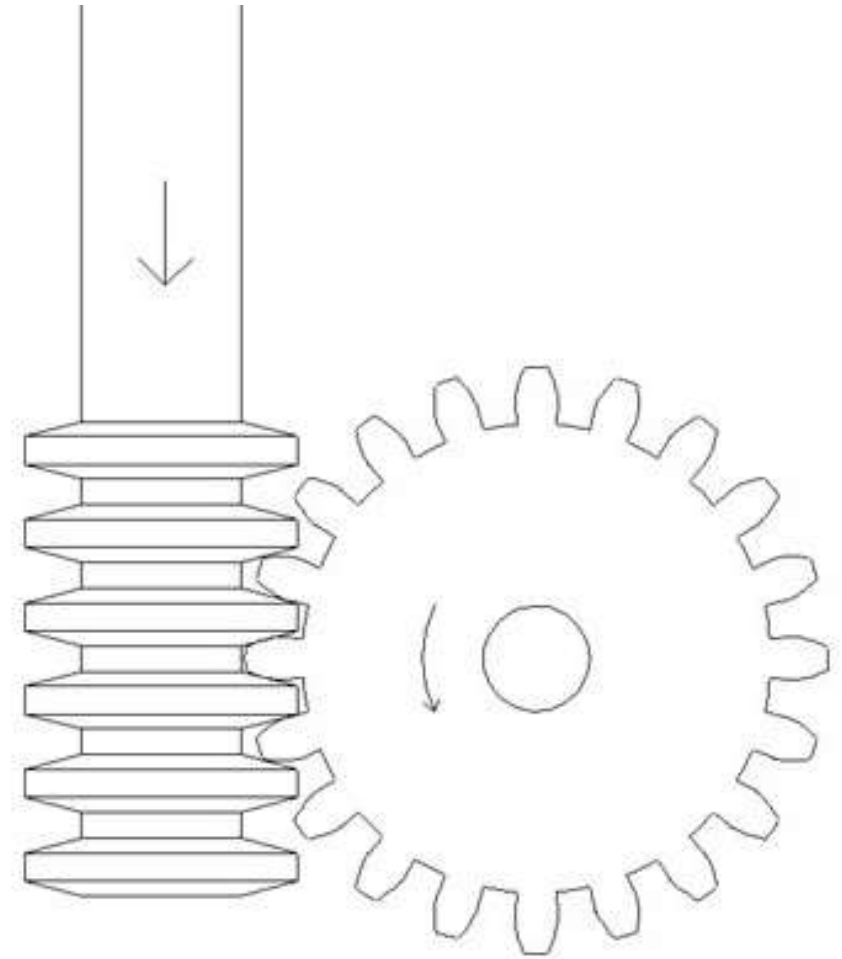
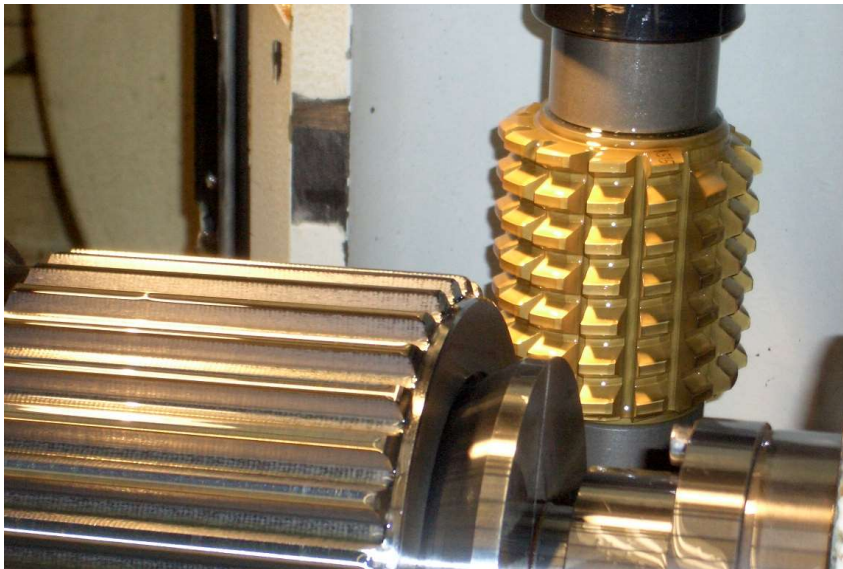
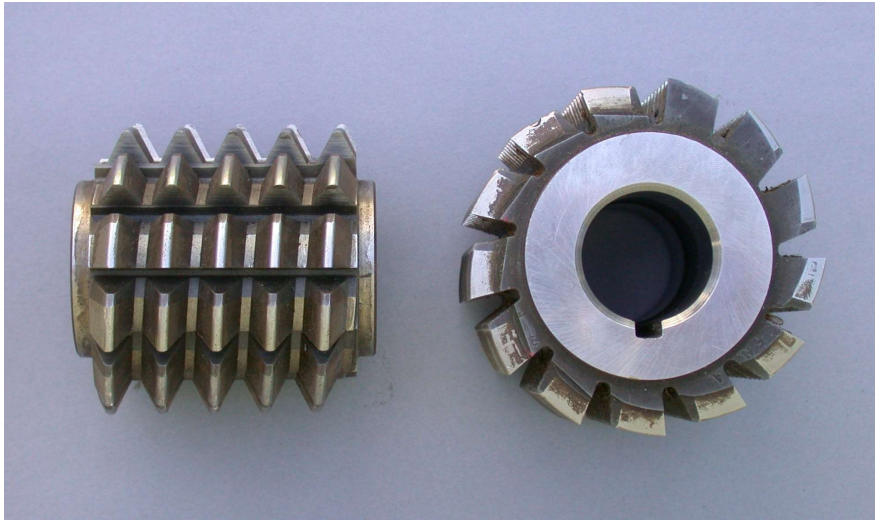


Commercial gears are either  $14.5^\circ$  or  $20^\circ$  pressure angle

# Backlash



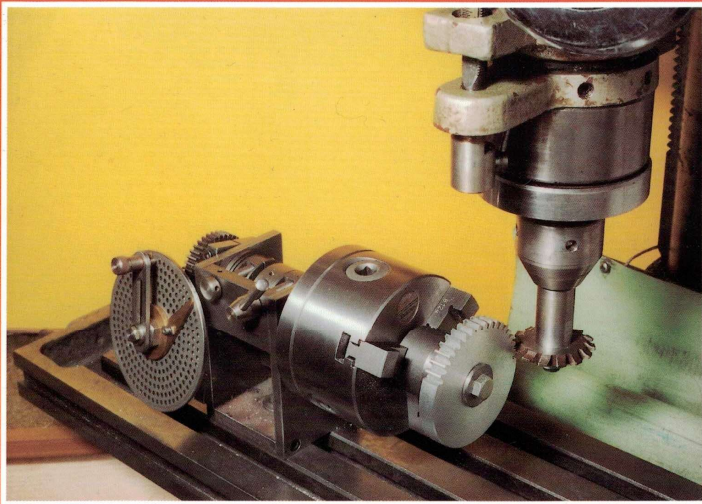
# Manufacturing Process, Hobbing



# Hobby Gear Cutting

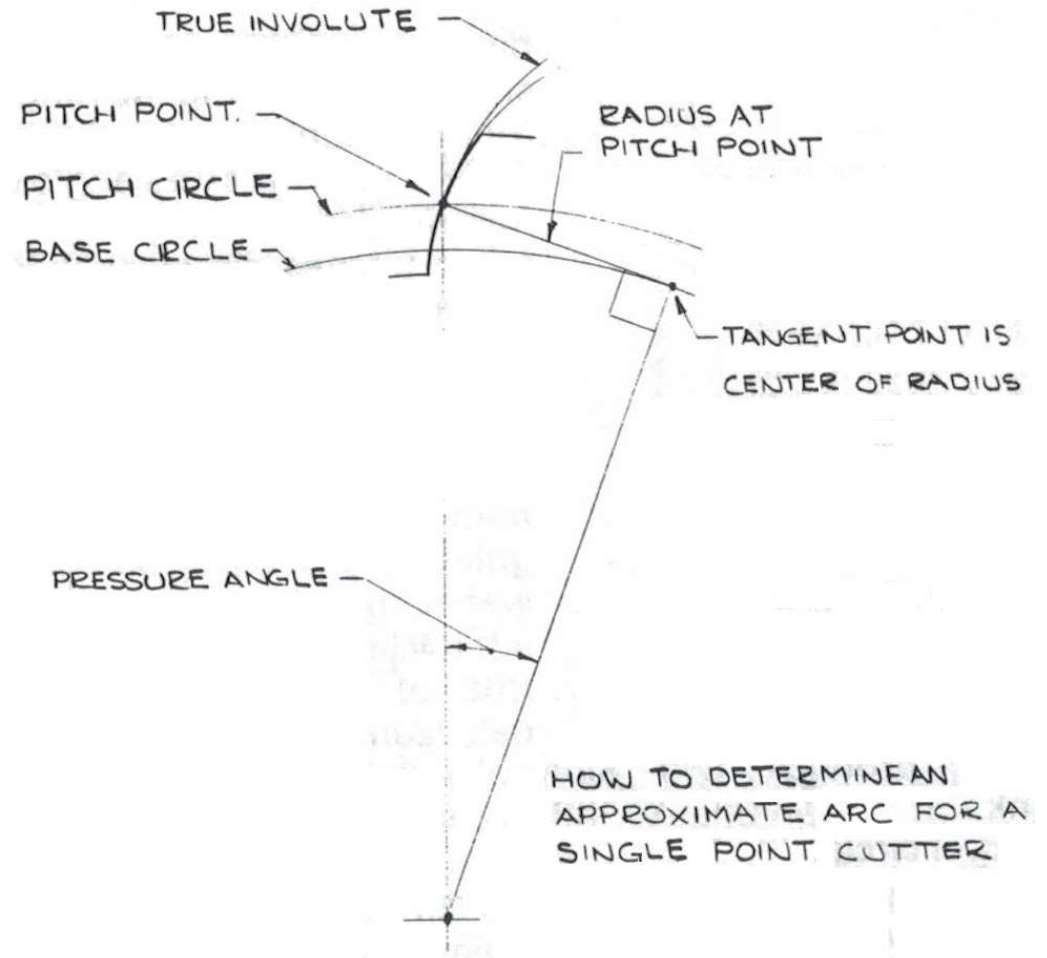
## GEARS AND GEAR CUTTING

Ivan Law

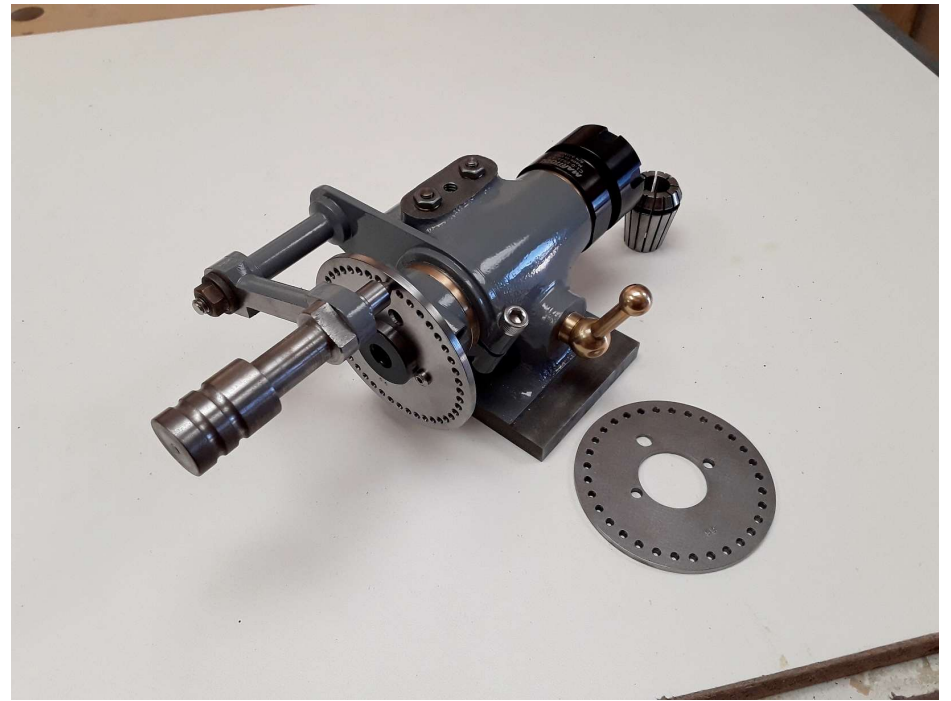


WORKSHOP PRACTICE SERIES

NUMBER  
17



# Hobby Gear Cutting

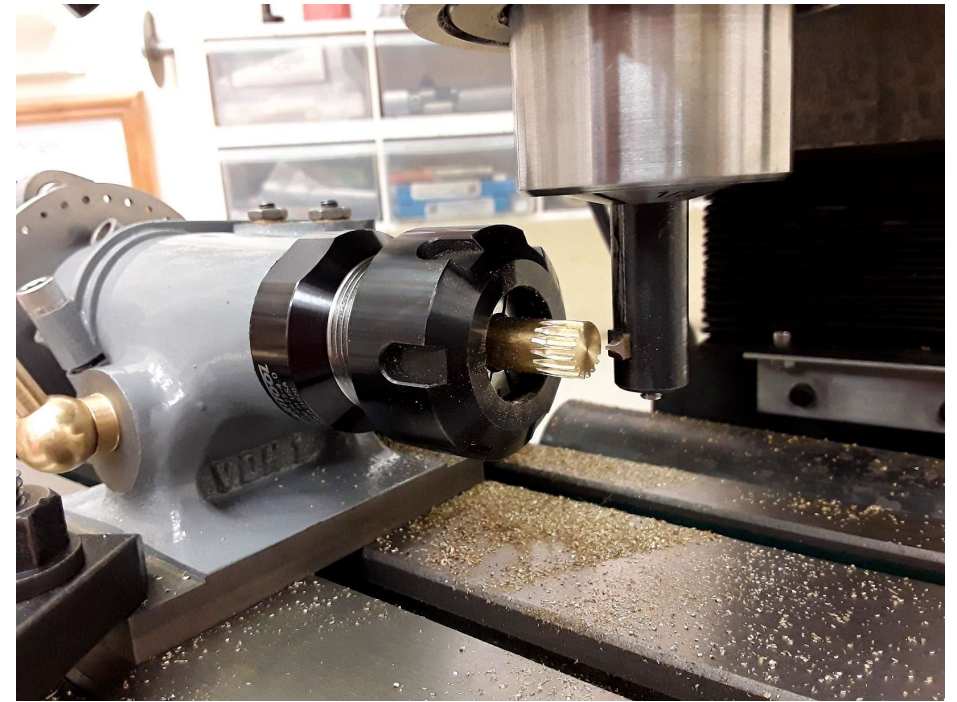


# Hobby Gear Cutting





# Hobby Gear Cutting



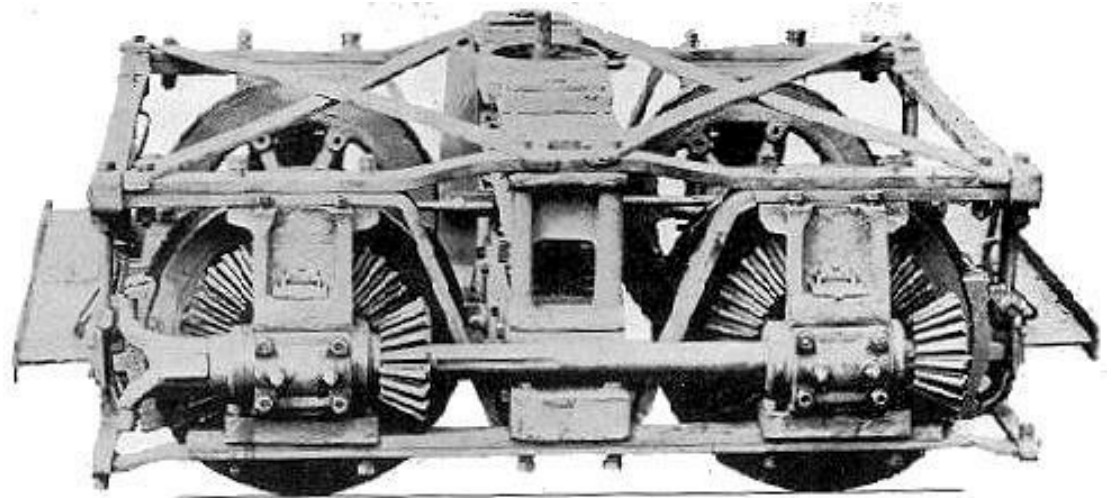
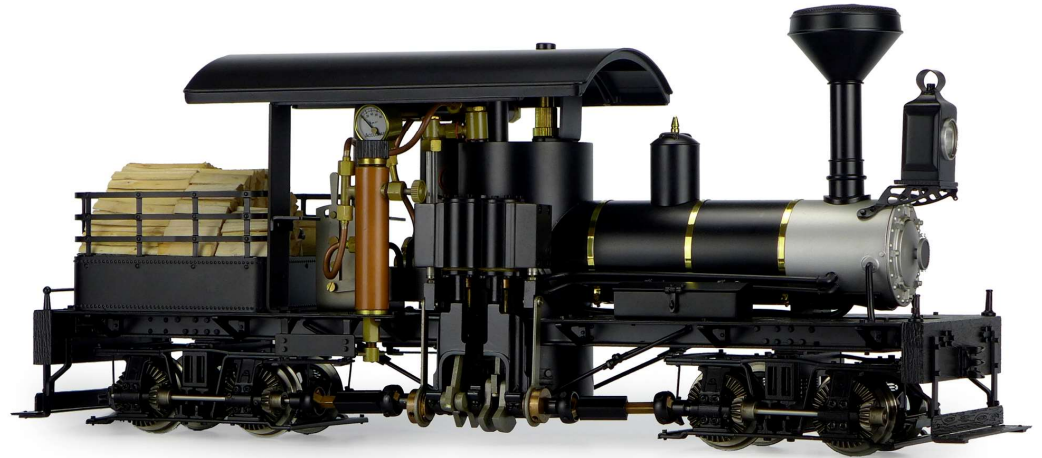
# Hobby Gear Cutting



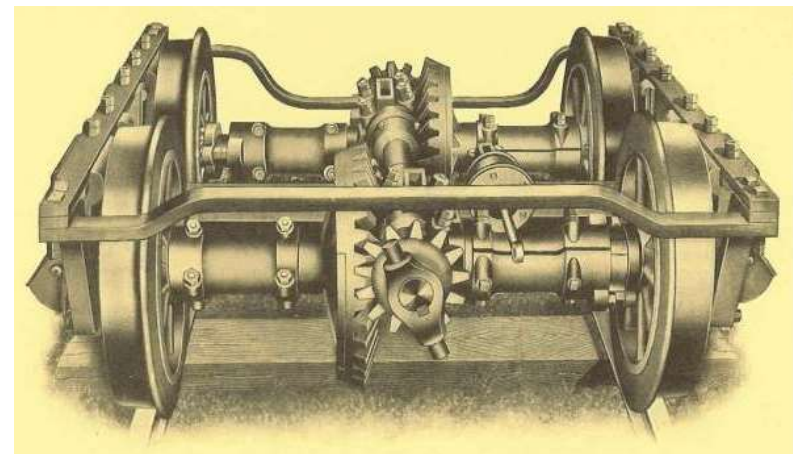
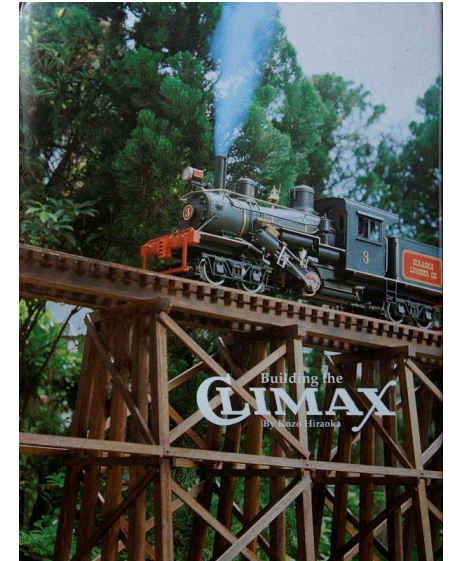
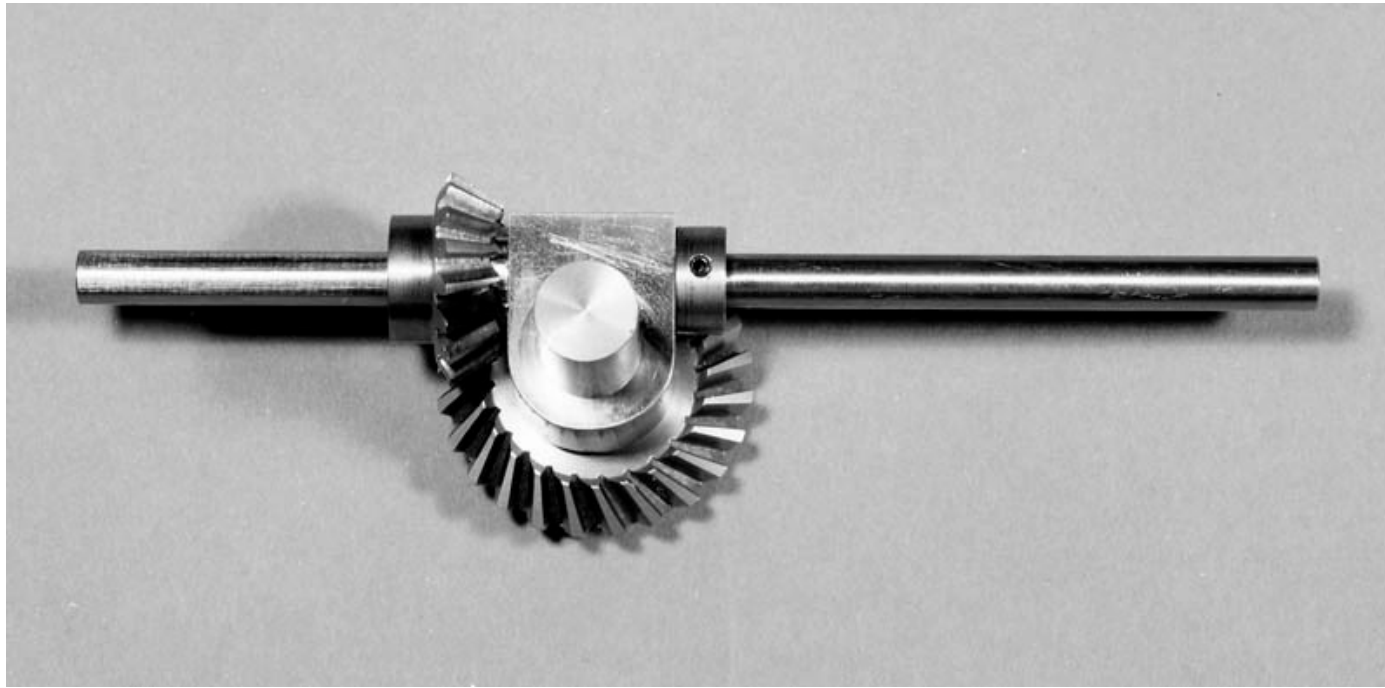
# Special Applications, Shay



**Straight Bevel Gear**



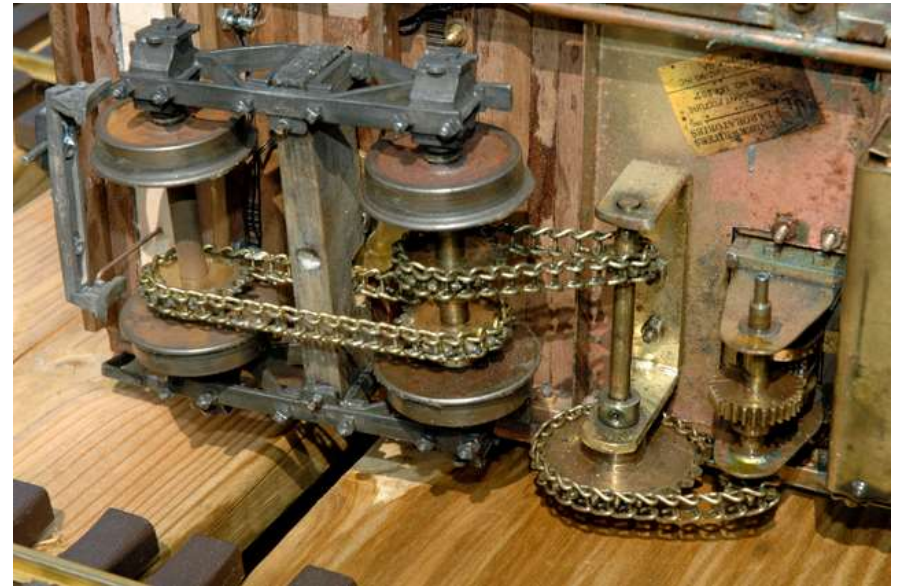
# Special Applications, Climax



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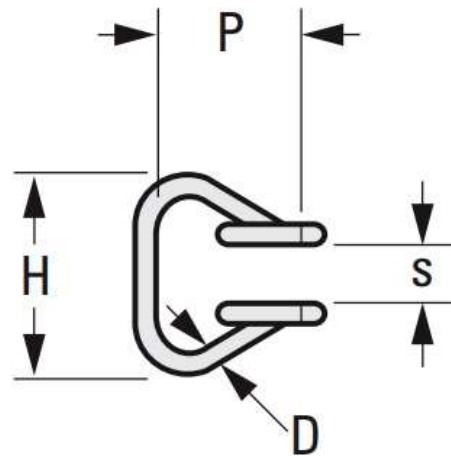
# Ladder Chain and Sprockets



# Ladder Chain and Sprockets



Pitch	Wire Dia
0.185"	0.041"
3.75 mm	0.80 mm

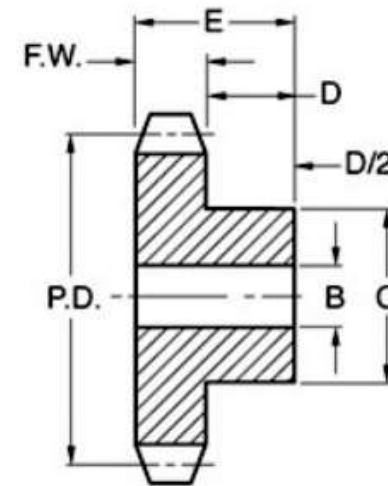


- Brass and steel
- 0.185" pitch also called "Size 19"

# Ladder Chain and Sprockets



Pitch	PCD range	# teeth range
0.185"	0.360" 4.210"	6 to 72
3.75 mm	12.12 mm 35.84 mm	10 to 30



Stock Drive Products, Sterling Industries <https://sdp-si.com/>



Questions?