

CALIFORNIA STATE SCIENCE FAIR

2001 PROJECT SUMMARY



Your Name (List all student names if multiple authors.)

Matthew J. Bartel

Science Fair Use Only

J0103

Project Title (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9)

Gears, Gears, Gears

Division

J Junior (6-8) J Senior (9-12)

Preferred Category (See page 5 for descriptions.)

1 - Applied Mechanics/ Structures & Mechanisms/ Manufacturing

Abstract (Include Objective, Methods, Results, Conclusion. See samples on page 14.)

Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.

Objective: The objective of this experiment is to compare four different types of mechanical gears and determine which type of gear produces the least resistance.

Materials and Methods: four stands of equal height were constructed to mount gear trains on. Sets of spur, rack and pinion, bevel, and worm and pinion gears of equal size were mounted on the stands using equal diameter axels. Weights of equal size were hung from string on one end of each gear train. A string was attached to the other end of each gear train and wound around the axel. A common food scale was attached to the string using a pen taped to the scale. When the scale was lifted, the string lifted the weight and registered grams of resistance on the scale. This was done five times with each gear train. Lubrication was added to the gears and testing was performed again, five times with each gear train. The gear in which the scale registered the least weight had the least resistance.

Results: The worm gear without lubrication was the most efficient with an average of 123 grams of resistance. The spur gear with lubrication was the least efficient with an average of 450 grams of resistance.

Conclusion: Overall the worm gear was the least resistant and the spur gear produced the most resistance. The lubrication didn't do what I thought it would because all the tests with lubrication were so much higher in resistance than the tests without lubricant. Theoretically, the lubricant should have helped lessen the resistance, but it did the opposite. It could be that WD-40 doesn't work to lubricate plastic parts, but that would be a whole experiment in itself. The highest resistance was with the spur gear with lubrication. That was over 450 grams. The least resistance was an average of 123 grams, which was attained by the worm gear without lubrication. My hypothesis was only partially correct.

Summary Statement (In one sentence, state what your project is about.)

This project attempts to decide which type of mechanical gear produces the least amount of resistance.

Help Received in Doing Project (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4.

Mom helped organize thoughts on the research paper; Mom took pictures; Mom helped organize board.