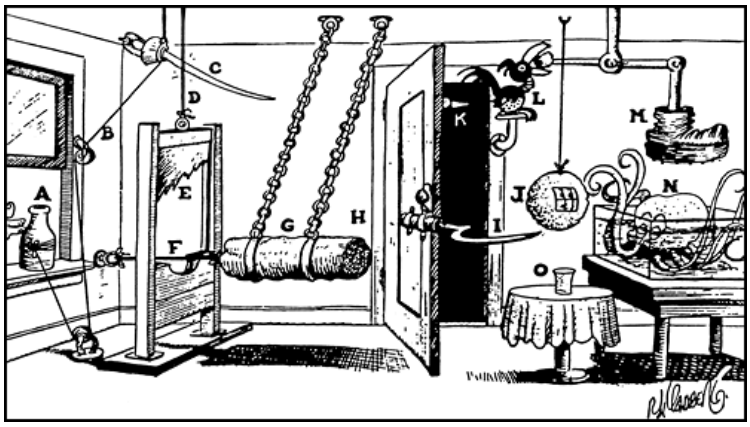
Project 1.1.6 Compound Machine Design – Option 1

Introduction

Reuben Garret Lucius Goldberg was born in 1883 in San Francisco, Ca. Goldberg's father who happened to be a police and fire commissioner insisted on him becoming a engineer. Rube graduated from the University of California, Berkeley with a degree in Mining. He then worked for San Francisco's Water and Sewer Department for 6 months before he quit and started working as a cartoonist. He worked on a number of famous cartoons of the time but became famous because of his crazy engineering of complex contraptions for simple tasks, now known as Rube Goldbergs



Challenge

- Your group is tasked to build a Rube Goldberg Machine that will lift a 2 pound weight at least 12" from its starting position with the least amount of input force.

Equipment

- VEX POE kit, including gears (sprockets), chains, belts, axles, and support pieces
- Rope for pulley systems (masonry line works well)

Design Constraints

- The applied effort force may only be provided by a single human input.
- The compound machine must lift the 2 pound weight at least 12" from its starting position
- The final design must include a minimum of 4 different simple machines with a maximum of 6
  - Note: 2 of the same type of gear trains do not count as two separate machines.
- The compound machine must have a mechanical advantage greater than 3 and an efficiency of 70%
- The compound machine can only use 4 base plates in any configuration
- The compound machine itself may not exceed 24" in any direction
- The compound machine must be easy to store, move and disassemble if needed
- Extra Points will be awarded for highest AMA with the highest efficiency

Note: Top three teams will be allowed to present their design at the "Make Fair" to professional engineers and have their design placed in the hall for display. Top three will be determined by:

- Quality of the Design Brief
- Quality of the Reflection
- Quality of the Machine
- Dedication to the Project and Group Members

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Project Lead The Way, Inc.

Deliverables:

1. A working prototype that meets all design criteria
2. Portfolio Entry (Pages on the iPad, if you use Google Doc your product must be submitted as a .pdf to Canvas and it will be graded on the formatting turned in not what you intended)
    a. Cover Page
        i. Photo of Prototype
        ii. Project Name
        iii. Names
        iv. Date
        v. Period
    b. Table of Content
    c. Design Brief
    d. Identification and Breakdown
    e. Brainstorming Evidence
        i. Only 4 small post-it notes per photo or 1 large sheet per page
    f. Initial Sketches
        i. 5 initial sketches with annotations
        ii. Approximate sizes
        iii. And general description
    g. Decision Matrix
        i. 5 measurable criteria using the constraints as the criteria
    h. Justification
        i. Written justification of each design and why the design received the scores it did
    i. Final Sketch with explanation of layout and functions
    j. Sketches of any modifications made after final sketch or photos
        i. Must include reasoning or issue overcome
    k. Photos of your prototypes
        i. At least 5 images of the overall view of your prototype
        ii. At least an image of each simple machine
        iii. All photos should have a caption containing the following information
            1. Identify the simple machine or view being shown
            2. If it is a simple machine, you must give the IMA of that simple machine
    l. Calculations (all formulas and work must be shown in typed format)
        i. Individual IMA of each simple machine
        ii. Total IMA of the Machine
        iii. Total AMA of the Machine
        iv. Efficiency Calculations
    m. Reflection from each member

General Notes about the Project

- Design Brief
  - Do not put this document off until the last night, work on it as we move along in class.
  - Assign specific people to do specific sections and document those responsibilities on your board… This will help not only you but also me!
  - All of the red text in the template should be read carefully. Someone has taken the time to describe the expectation for each section, don't understand…. ASK!!!!
  - Red text should be deleted from the template when done
  - Show the teacher your work on design brief often.
- Build
  - Work everyday like it is the last day
  - Use open labs and free periods before you think you need to
  - Famous last words "we can worry about that later"
  - Supporting axles and bearings are very important
  - Suggestions from the teacher or SILCs should make your group stop and think for a few moments… They might be trying to tell you something.

Grading Criteria

1. Final Grade Weighting
   a. Working Prototype 50%
   b. Official Proposal 50%