# Steam Engine Project

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**Problem Statement**

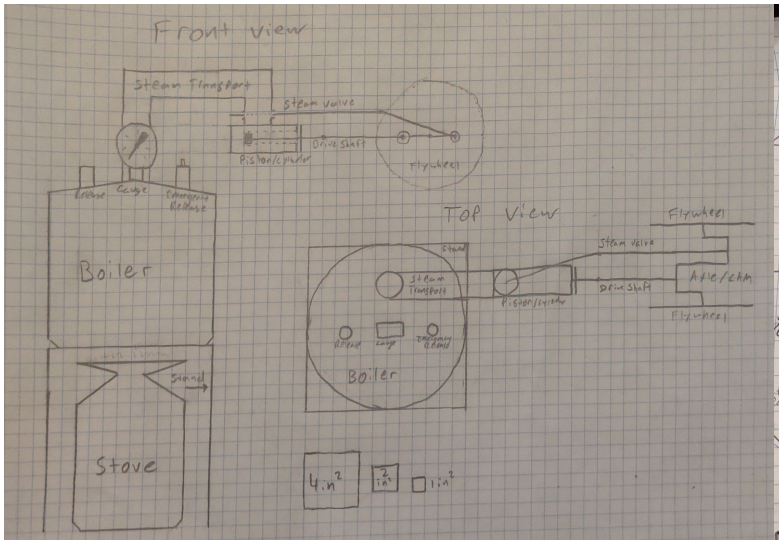
**Research**

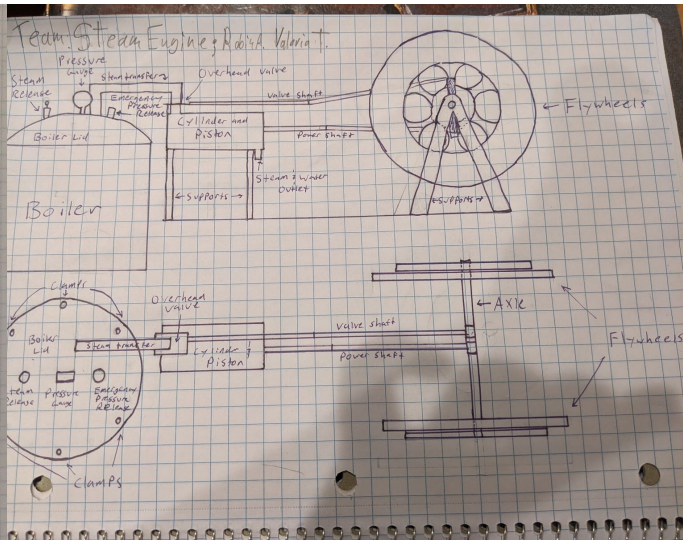
1. Steam Engine Diagram High Resolution Stock Photography and Images
2. Calley, John: steam engine, 1712 - Students
3. Lecture 11. Extending Material Capabilities
4. Generator
5. Transportation 1: Jobe, Paroz, Hudepohl - Lessons
6. Steam Engine History
7. Aluminum, Copper, Carbon Steel Tube Pressure Ratings

**Design**

Lego Model

Sketches:



**The Boiler**

The boiler is made from a vintage 12 quart NATIONAL pressure cooker/canner with valves tapped into the top. One valve is set to release at 25-50psi, and there is another backup valve set to release at 60psi. The pressure gauge is on a scale of 0-100 psi, enough to measure up to the max pressure we expect to have, but with extra in case we decide to increase the pressure. The valves and gauges are rated for 350°F, and with the 100 psi max pressure release, the water boiling will only reach 350°F. The boiler will have a fourth hole drilled on top with a pipe to transport steam from the boiler to the piston. The boiler is held up by a one foot tall welded stand made from about eight feet of steel tubing. This stand is to allow more stability for the boiler and easier switching of the camping stove heat source.

**The Piston**

The final cylinder will be made from a hexagonal bronze rod, and will be drilled out to fit a smaller bronze rod as the piston. The piston will have a vertical elbow joint on the end to allow for rotational power to be transferred to the axle. Overhead valves will be mounted on the axle and attached to the steam pipe to allow for controlled steam input and steam timing. We decided to build a mockup of the piston with aluminium in order to test the design and practice on a piece that is not intended as our final piece.

**The Flywheel and Axle**

The flywheels are made of circular steel discs, 8in diameter and 0.5in thick. We drilled center holes, and will attach the flywheels to the axle by welding them in place. Welding them allows the flywheels to be directly connected, and less likely to come apart. The axle design allows easier additions to the axle, rather than having the piston drive arm power the flywheel directly. The axle is made using a central steel rod, with steel bars allowing the axle to form a cam, and the central steel rod is cut out to allow for the piston rod to rotate.

**Power Generation**

We plan on attaching an AC or DC motor to the axle and drawing current from there.

**Timeline**

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|---|---|
| 7/20: | Pressure cooker arrived. |
| 10/5: | Flywheels purchased. |
| 10/8: | Center holes drilled into flywheels and boiler base started. |
| 10/9: | Replacement valves and gauges arrived. |
| 10/10: | Initial sketch made. |
| 10/14: | Boiler base continued and valve/gauge holes drilled. |
| 10/15: | Valve/gauge holes tapped and valves/gauge installed. |
| 10/15: | First pressure test. Steam releases at ~33psi. |
| 10/16: | Purchased bronze for linkage arms, piston, and steam pipe. |
| 10/21: | Base for boiler built and lego model built. |
| 11/3: | Purchased brass filler rod and mock up piston aluminium. |
| 11/5: | Threaded axle. |
| 11/11: | Manufactured prototype piston/cylinder. |
| 11/18: | Planned cap for piston and turned rectangle cylinder to circle. |
| 11/25: | Fabricated cap and piston head, tapped piston head. |
| 12/4: | Manufactured elbow joint. |
| 12/7: | Illustrated dimensioned sketch. |
| 12/23: | Designed axle. Bought steel bar and rod. |
| 12/30: | Worked on axle components |
| 1/6: | Assembled axle |
| 1/10: | Started axle-driveshaft linkage |
| 1/20: | Finished axle, and progress on linkage |
| 2/3: | Manufactured piston cap and mounted pillow blocks |
| 2/10: | Finished linkages and assembled driveshaft/axle. |
| 2/17: | Welded flywheels and continued progress on driveshaft |
| 2/24: | Bore cylinder deeper and started steam transport |