



Introduction

The goal of the Mechanized Percussion Well Drilling project is to develop an engine powered system that reduces the labor required to manually drill shallow garden wells, while retaining portability and low capital investment. Percussive well drilling technology is currently used by our client in Burkina Faso, West Africa, to drill wells that provide access to water during the dry season for agricultural purposes.

This project was started by Matt Walsh after he met a group of men in Burkina Faso who had been forced out of their homes for becoming Christian. He created a well drilling business to allow them to still earn an income. The hand augering system they currently use is slow and has issues with hard soils and rocks. The drilling rig we are working on will eventually be used by these drillers.



Clients

Joseph Longenecker, Open Door Development, SIM

Joseph Longenecker is the liaison between ODD and Messiah College. He is a Messiah College alumni and he currently lives in Ouagadougou, Burkina Faso.

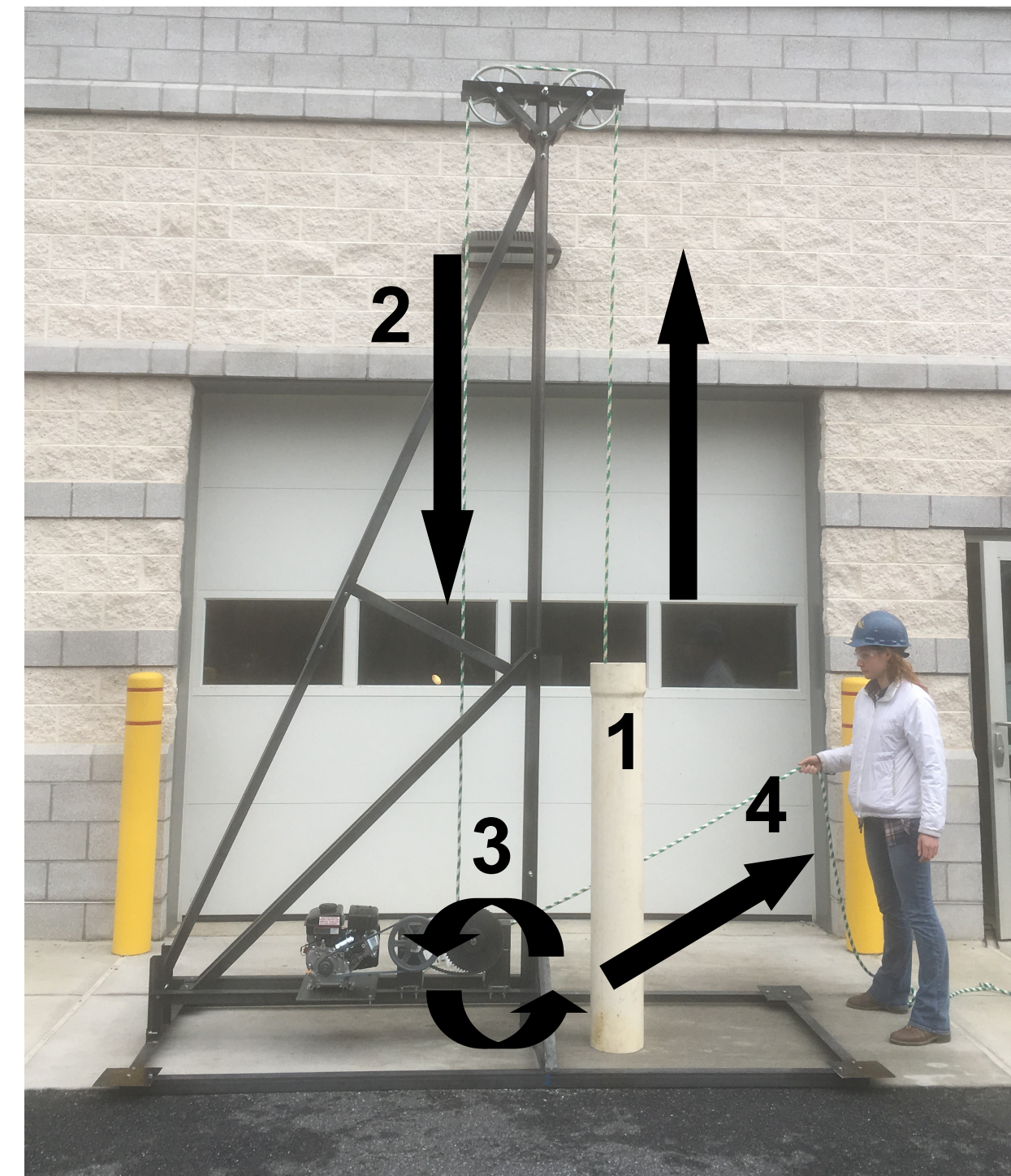
Open Door Development

ODD was officially founded by Dale Johnson and Matt Walsh in 2012 as an SIM community development ministry based in Mahadaga, Burkina Faso. Their mission is to share the gospel by equipping the local church for community service and by ministering to human needs.



Joseph and Erin Longenecker with their children

Mechanized Percussion Drilling



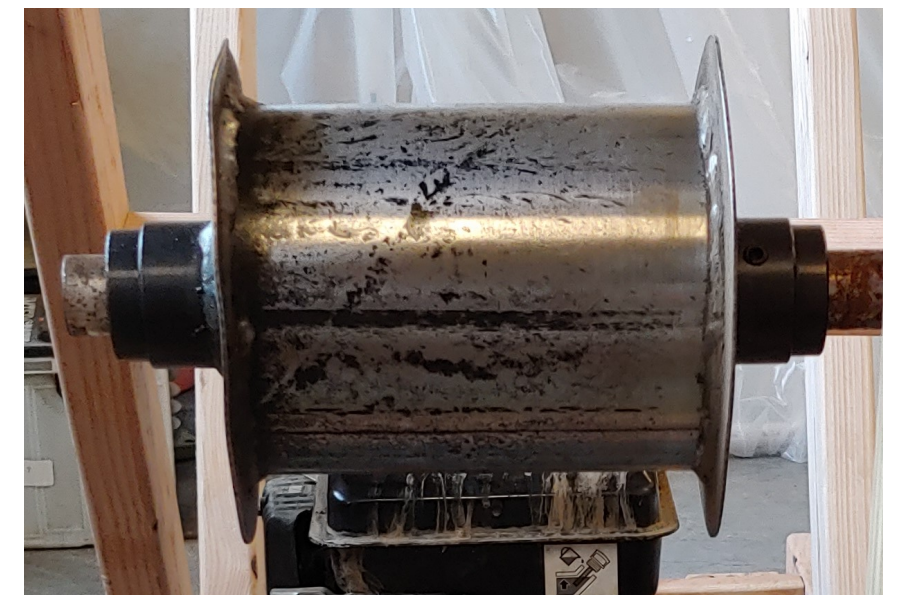
The cathead is connected to the engine through a gear-reducing transmission. When the rope is pulled, it tightens around the cathead, allowing the cathead to wind up the rope using the power of the engine. When the tension is released, the rope loosens and slides freely over the cathead.



1. A 150-lb drill bit is attached to one end of the rope
2. The rope comes out of the hole and over the pulleys
3. The rope is wrapped around the cathead
4. When the driller pulls on the rope, the bit is lifted
5. The driller releases the tension on the rope, allowing the bit to fall
6. Steps 4 and 5 are repeated to break up material at the bottom of the hole
7. The material is removed from the hole, increasing its depth

Cathead Improvements

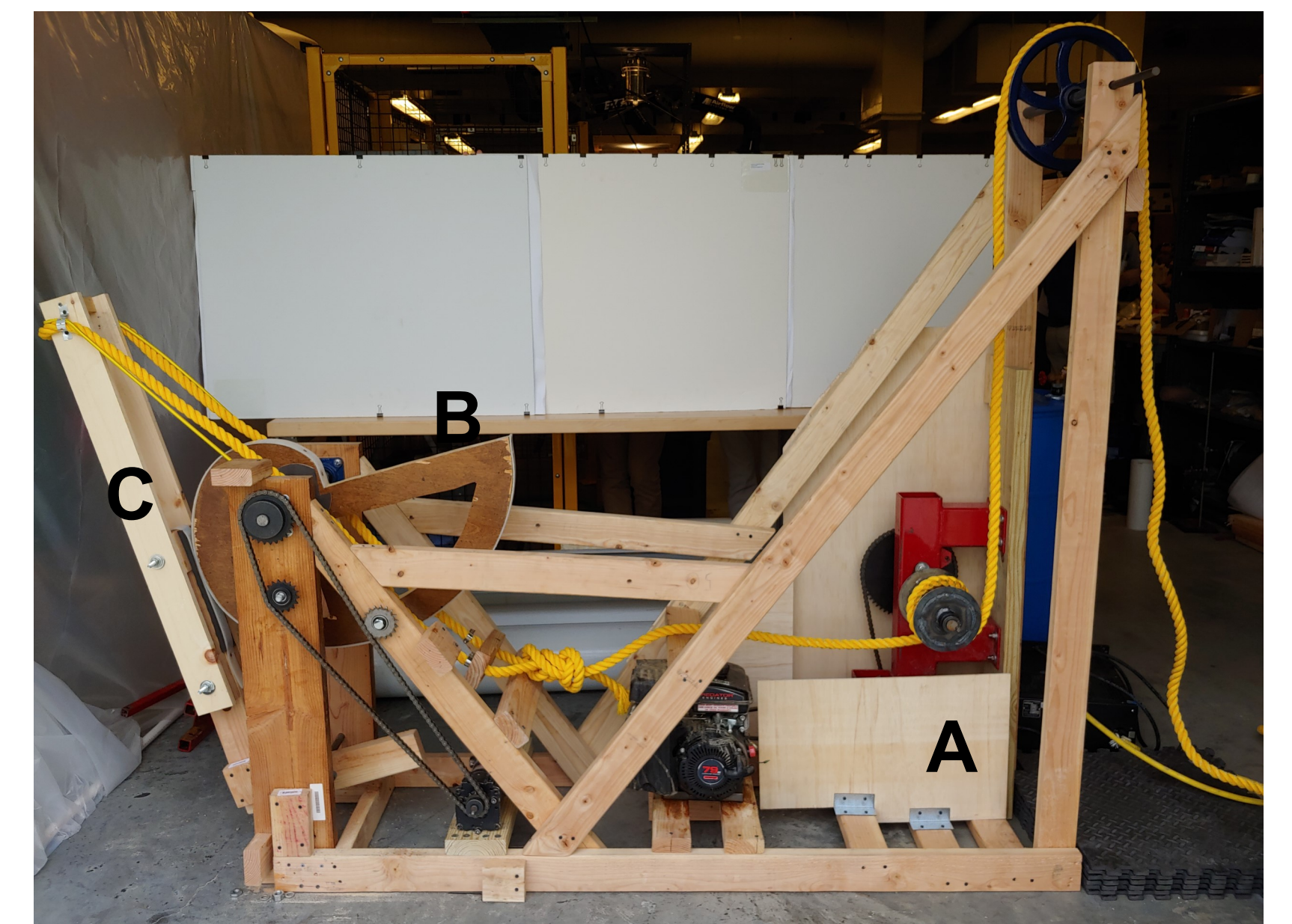
- Previous aluminum cathead experienced too much wear
- Cathead shape was changed from hourglass to cylinder to more evenly distribute wear
- Steel, wood, and three types of plastic were tested
- Steel proved to be the most wear resistant and was inexpensive



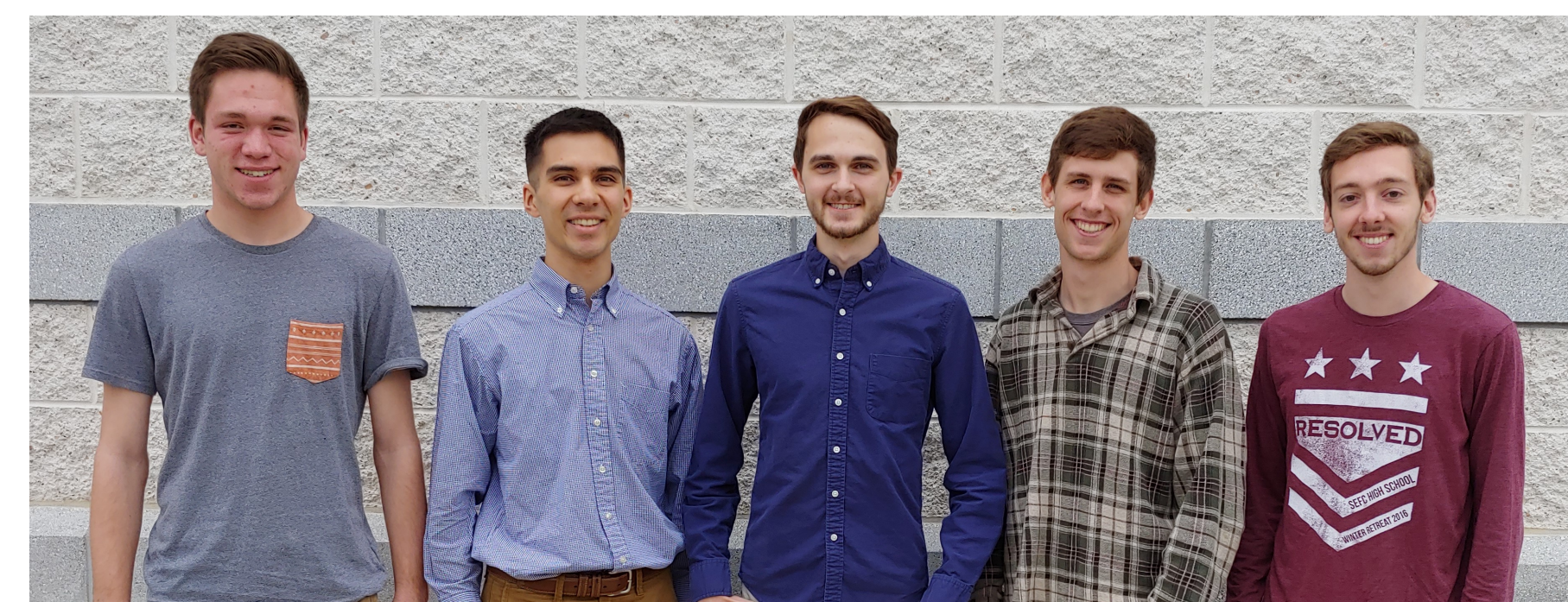
Aluminum (left) and steel (right) catheads

Automated Testing Rig

- 100 hours of testing were requested
- An automatic testing rig was designed in order to achieve this goal
- Rig will help assess the amount of wear experienced by the rope and cathead (A)
- Utilizes a cam (B) and arm (C) assembly to replicate lifting, dropping, and clutching stages of drilling
- As the cam rotates, it pushed back the arm, which pulls the rope
- At the drop, the arm goes forward,



Our Team



Nate Harnish, Dr. Philip Tan, Chris Martin, Cole Hiduk, Nate Henry

Conclusions

- **Goal:** Create a mechanized drilling system that reduces the labor required by manual well drillers while retaining the benefits of low capital investment and portability.
- **Progress:** Improved cathead, built testing rig
- **Future Goals:** This fall, our team will continue testing our steel cathead and refining our mechanized drilling system.

Acknowledgements

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- **Project Review Panelists:** Doug Flemmens, Michael Funck, Mike Guion, J. Scott Heisey, Josh Joyce, Bruce Lindsey, Andrew Parkhurst, Dereck Plante

