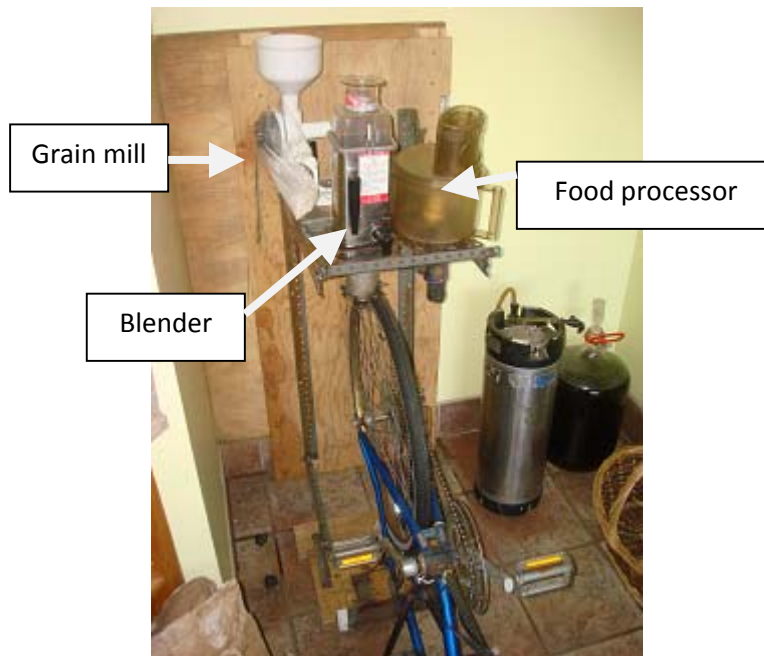




Bicycle-Powered Food Station

Introduction

D Acres is a place of people and food; as such, cooking is one of the many processes involved in harvesting the bounty of the land. Some of the equipment used requires electricity, such as the blender and food processor, and others require arm power, such as the grain mill. What if these things didn't require coal-powered energy or arm strain? The project below describes the "Food Unit", a bicycle-powered device that incorporates a blender, food processor, and grain mill.



Design

Tools needed:

- Welder
- Metal cutter
- Metal grinder

The Food Unit uses a chopped and mounted bicycle to power a modular system of food preparation devices. The bicycle is cut at its midsection so that it can reasonably fit in the kitchen. The bicycle is then turned upside down and welded to rebar and angle iron for stability. The absence of a seat also means that any chair can be used to sit on while pedaling the device. The chair can be placed at any distance from the bicycle, allowing any sized person to power it. A taller chair will put the forces applied to the bicycle into the floor and keep the chair from sliding back during operation. In the picture above, the Food Unit is mounted to a wall in the D

Acres' kitchen. When the Food Unit is not being operated, the bicycle can be stored underneath the device.

It is important to note that all the parts used were chosen due to availability. For any person attempting to build a similar unit, creating a station out of readily available resources cuts down on waste as well as cost and increases opportunity for creativity.

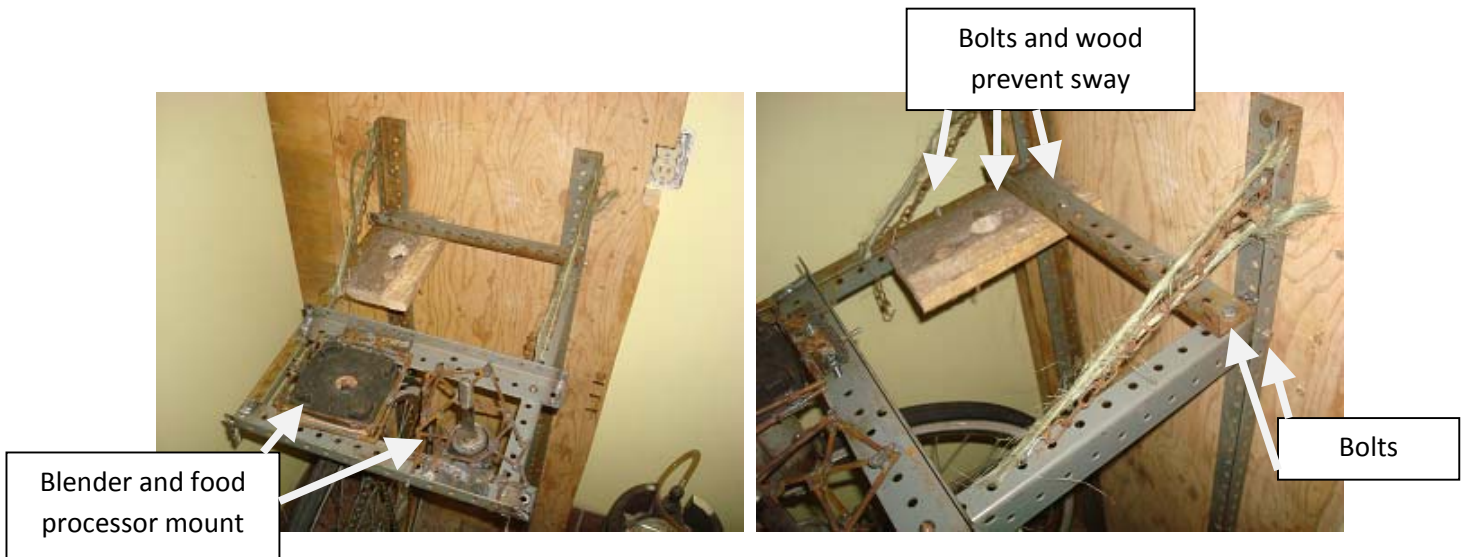


Table

Parts needed:

- Perforated angle iron
- Nuts and bolts
- Plywood
- String
- Small chain



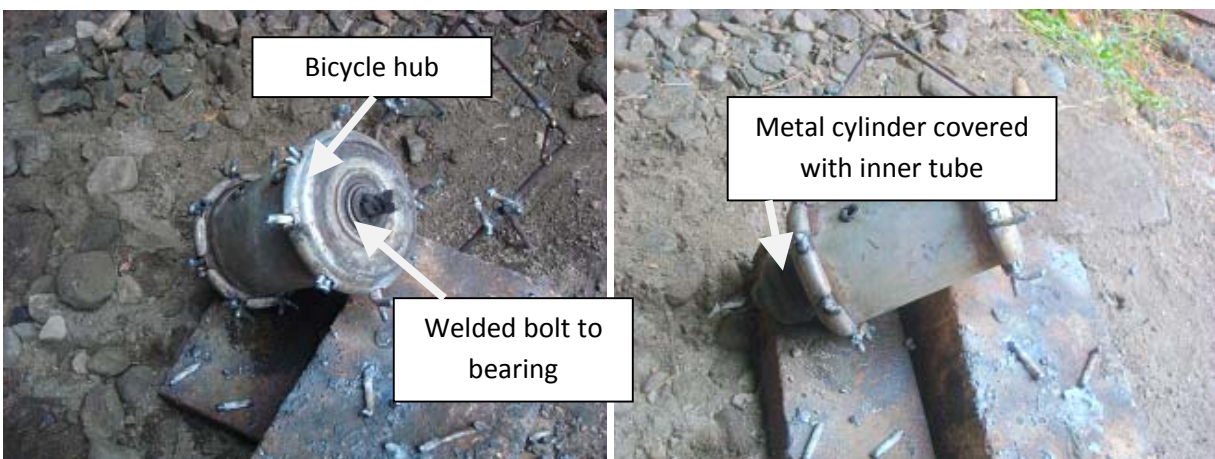


The table holding the food equipment is made of plywood, metal, and bolts. The angle iron is bolted to the plywood backing for stability. Lengths of perforated angle iron were cut to fit the dimensions of the space being used in the kitchen and bolted to the back brackets. Five pieces were used for the tabletop. To hold these lengths level, rope and chain were used. A piece of wood bolted to the table keeps the metal from swaying.

Blender

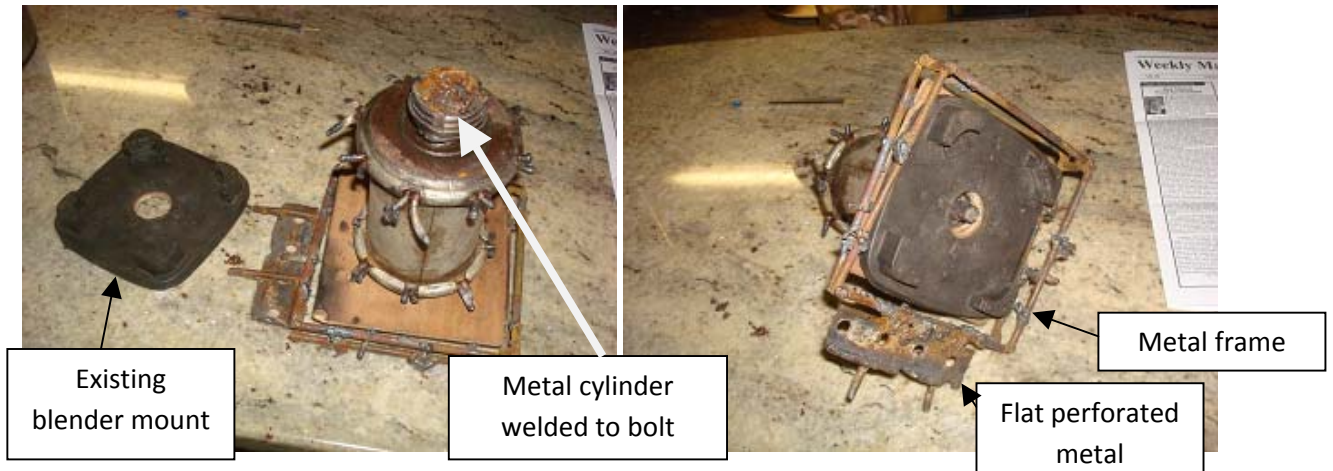
Parts needed:

- Blender
- Bicycle wheel hub
- 1/8" metal rod
- 2" diameter metal cylinder
- 8" bolt (same diameter as bicycle wheel hub)



The blender was modified to be driven by a bicycle tire. To do this, the hub of a bicycle wheel was cut out. This provides the bearings for the axle connecting the tire and the blender. A bolt is used as the axle. One end of the bolt is modified to fit the blender blade, originally driven by the

motor. This fitting is dependent on the blender. The blender for this particular set up used a hex nut. The bolt is welded to the hub bearing allow it to still spin freely. The other end of the bolt is welded to a metal cylinder; a chaining piece of another bicycle wheel was used as the cylinder. The outside of the cylinder is covered in rubber. A strong adhesive was used with bicycle inner tubes.



To connect the blender to the custom table, a square frame was made of 1/8" thick metal rods and welded to the hub. Another piece of perforated metal (cut from perforated angle iron) was welded to the frame. This piece is bolted to the table to keep the blender stable. A platform was made of the existing mount and wood for the blender to sit on.

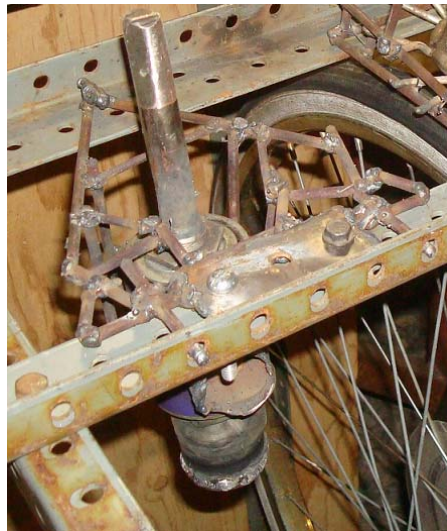
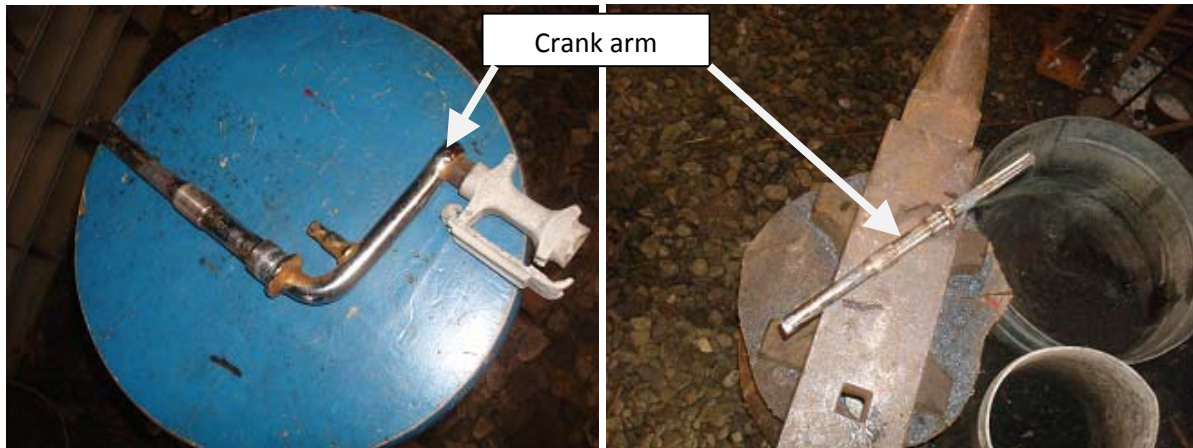
Food Processor

Parts needed:

- Food processor
- Bicycle bottom bracket with crank arms
- 1/8" metal rod
- 2" diameter metal cylinder



The food processor runs on a similar set up as the blender. It is friction-driven by the bicycle tire. The bottom bracket of a bicycle was cut out to be used as the axle and bearings. The crank arms were heated and hammered straight and the pedals were cut off. One end was ground to fit the food processing blades and the other end was welded to a metal cylinder made of a section of pipe. The section was covered with a piece of bicycle inner tube to keep the bicycle tire from wearing out quickly. A piece of perforated angle iron is welded to a frame made of 1/8" metal rod so that the food processor can be bolted to the table.



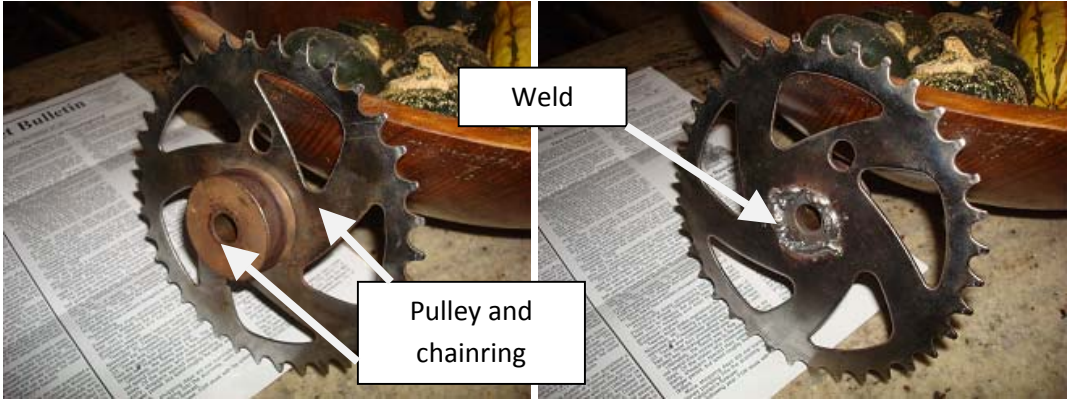
Grain Mill

Parts needed:

- Hand-powered grain mill
- Bicycle chain ring
- Bicycle chain
- 1/8" metal rod



The grain mill is a hand-powered model that has been fitted with a bicycle chain ring. The chain ring is welded to a pulley with the same diameter opening as the mill's axle. The chain ring can then be interchanged with the hand crank without damaging the mill. The grain mill is fixed to a piece of wood bolted to the table. The bicycle chain runs from the grain mill to the bicycle. A bicycle chain was chosen to power the grain mill because it is a much stronger driving mechanism than a belt or friction and the grain mill requires a large amount of force to grind properly.



The chain is attached to the grain mill and the rear gear set of the bicycle. This means that two chains are on the same gear set during operation. When the bicycle is being used for the blender or food processor, the chain is hung on a rack made of 1/8" metal rod. The rack is welded to the frame of the bicycle so that the chain does not interfere with any of the moving parts, such as the wheel or the driving chain.

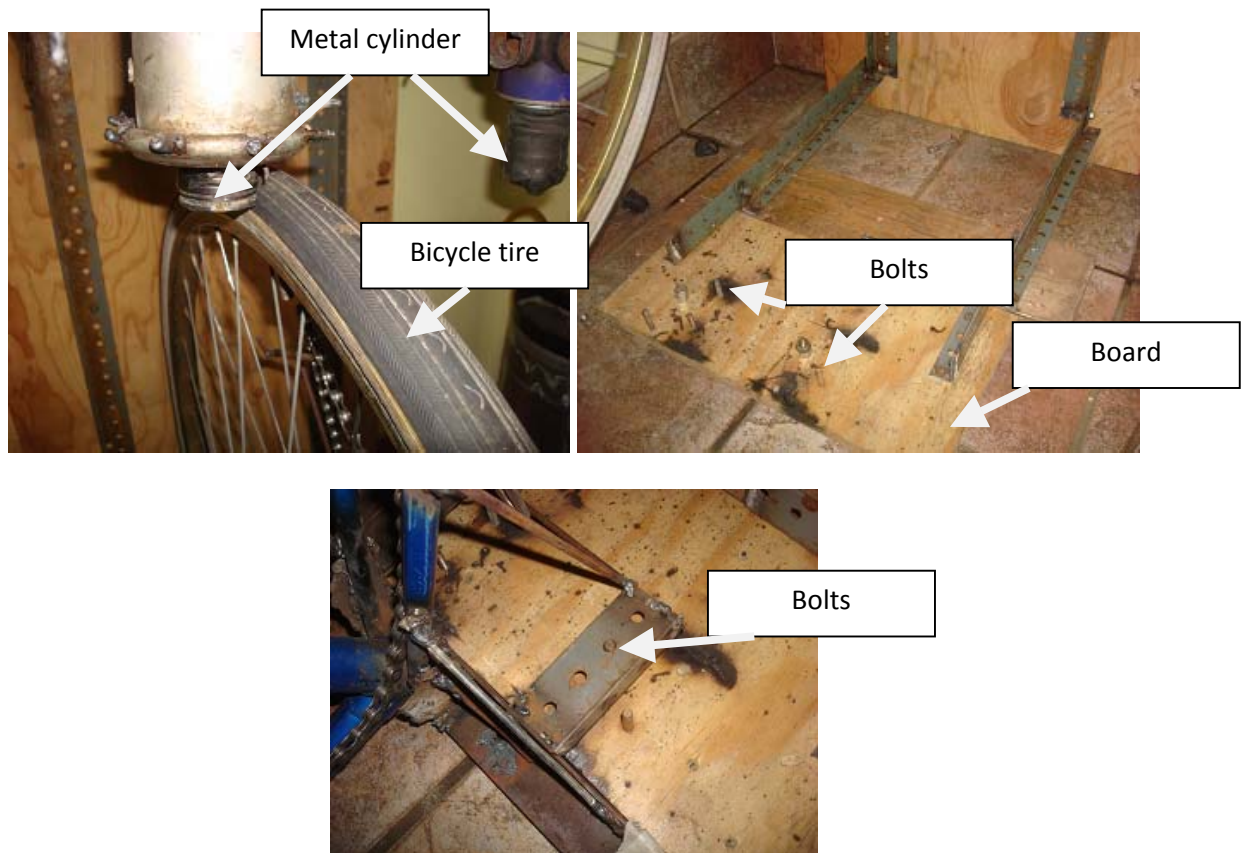


Friction Contact

Parts needed:

- Plywood
- Bolts
- Perforated angle iron

To keep the bicycle tire in contact with the rubber-covered cylinders, a board was bolted to the back bracket of the table with perforated angle iron. The board has bolts sticking upwards for the bicycle to sit on using perforated angle iron that was welded to the frame of the bicycle. The placement of the bolts is consistent with the location of the rubber-covered cylinders so that the bicycle tire will remain in contact during operation.



Ratios

The circumference of the driving wheel in comparison to the circumference of the driven cylinders and chainring is important for the use of the devices. A blender requires a large number of blade rotations within a short amount of time, as does the food processor. The bicycle wheel has a much larger circumference as compared to the cylinders and will provide a high blade

rotation output. The grain mill does not need speed, but it does require a large amount of force. The ratio of the chainring on the grain mill and the chainring on the bike is larger than 1:1. This allows the operator to grind grain with minimal effort.

Application

The Food Unit is a design incorporating two types of driving forces—friction and chain. Each type is specific towards the devices power and speed needs for operation. The blender, food processor, and grain mill can be used for food preparation in meals and preservation without having draw power from anything other than two legs.