

OPEN SOURCE PLANS

Steel Roller Hemp Break

*Created by Rezolana Institute & Growing Warriors
Published by Fibershed and supported by Clif Bar Family Foundation*

THE wooden hand lever hemp break can be quite efficient for processing small amounts of hemp fiber, however, for larger quantities, the break requires a considerable amount of mechanical labor to operate the hand lever. A less labor intensive hemp break can be constructed out of metal rollers operated by a hand crank that reduces the physical labor or up and down arm movement. The metal roller system is supported by a steel shaft resting on flange pillow block bearings. This system allows the rollers to mesh and crush the hemp stalks via circular motion of the crank.

The Steel Roller Hemp Break is based on a design and prototype built by The Growing Warriors Project. The Growing Warriors break is built out of wooden rollers that require elaborate and labor intensive construction of the individual gears. The hardwood roller gears function well but are susceptible to cracks and broken gear teeth. The model is not supported by a bearing shaft therefore creates more friction and wear in the wooden support frame.

Rezolana Institute in collaboration with Growing Warriors and Fibershed has studied the model and built a steel roller version of the wooden prototype. Utilizing steel for the rollers creates a durable and heavy unit that operates efficiently with a hand crank system. In addition to the metal rollers, a few other minor improvements have boosted the efficiency of breaking hemp for fiber processing. The information in these plans allow for the construction of a table top unit using mostly locally available labor and materials.



Top: Rebecca Burgess of Fibershed, Mike Lewis of Growing Warriors, and Arnold Valdez of Rezolana Institute with the Growing Warriors Wooden Hemp Break (Photo by Paige Green). Bottom: detail of the Growing Warriors Wooden Hemp Break (Photo by Meg Wilson Photography)



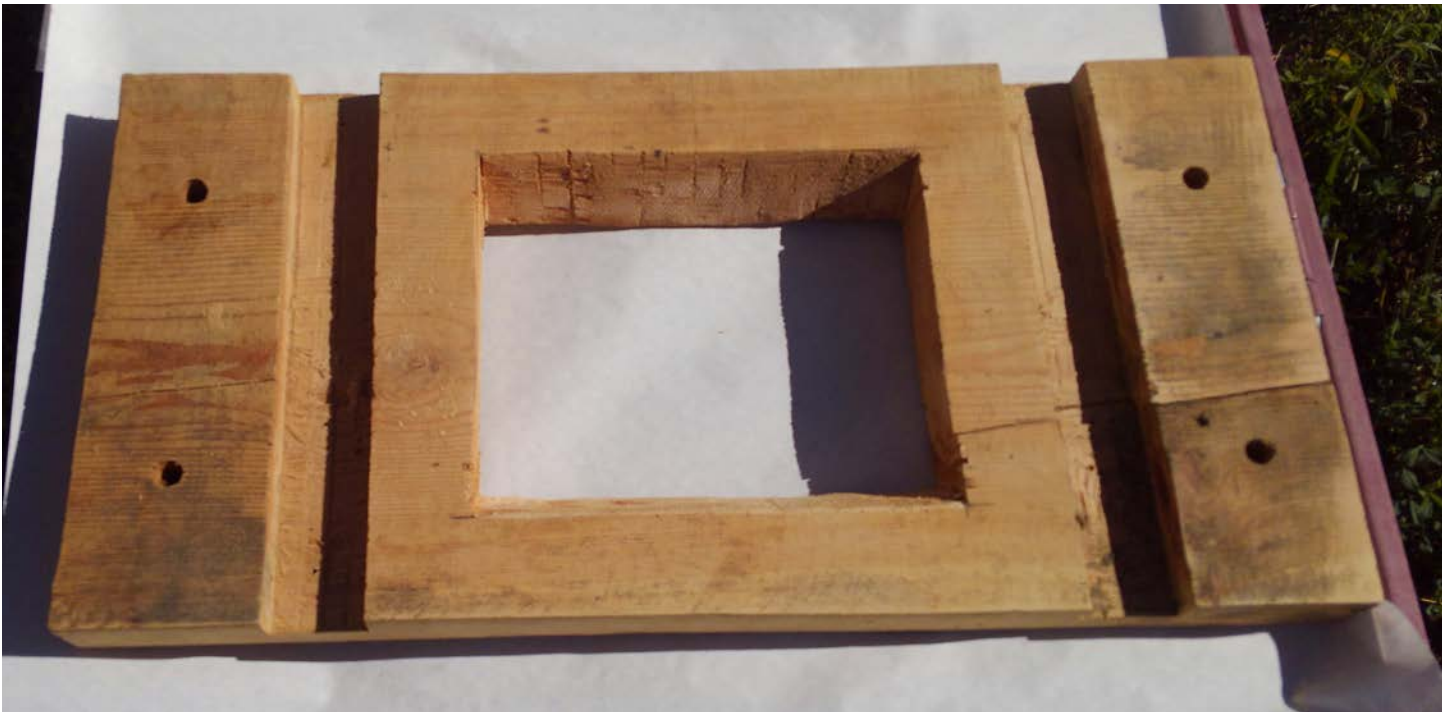
Metal Roller Hemp Break (Photo by Arnold Valdez, Rezolana Institute)

The Steel Roller Hemp Break is a table-top unit that utilizes two 7-inch diameter by 12-inch long metal rollers that mesh together when rotated by the hand crank. The hemp stalks are fed into the rollers which then crimp the stems into a “W” configuration thus breaking the stalks and releasing the wood inner core known as shiv or hurd.

Construction of the unit utilizes common dimensional 2" x 12" lumber for the frame or box that holds and houses the metal rollers. In addition to the wooden boards the other main component are the metal rollers and steel rod. The hardware includes the flange bearings, collars and fasteners.

Materials List

- One 2" x 12" x 8' board (base, sides and top of unit)
- One 2" x 6" x 8' board (side panels, feed board)
- Two 12" x 6" ID steel casing sections (rollers)
- Two 8" x 8" x ¼" steel plate (roller sides)
- One 1/2" x 48" steel rod (roller axle)
- 40 feet of ½" x ½" angle iron (12" pieces for roller blades)
- Two ½" collars with set screws (roller axle ends)
- Four ½" bore flange bearing blocks
- Four ½" x 3½" bolts with washers/lock nuts (for upper axle attachment)
- Four ¾" x 1½" lag bolts (for lower axle attachment)
- Twenty-four 3½" deck screws (for attaching wood panels that form box)
- 2½" x 10" bolts with nuts (for roller tension adjusters)
- Twenty-four 2" deck screws (for attaching top and bottom panels)
- One recycled brace (handle or crank of unit)



Base of box

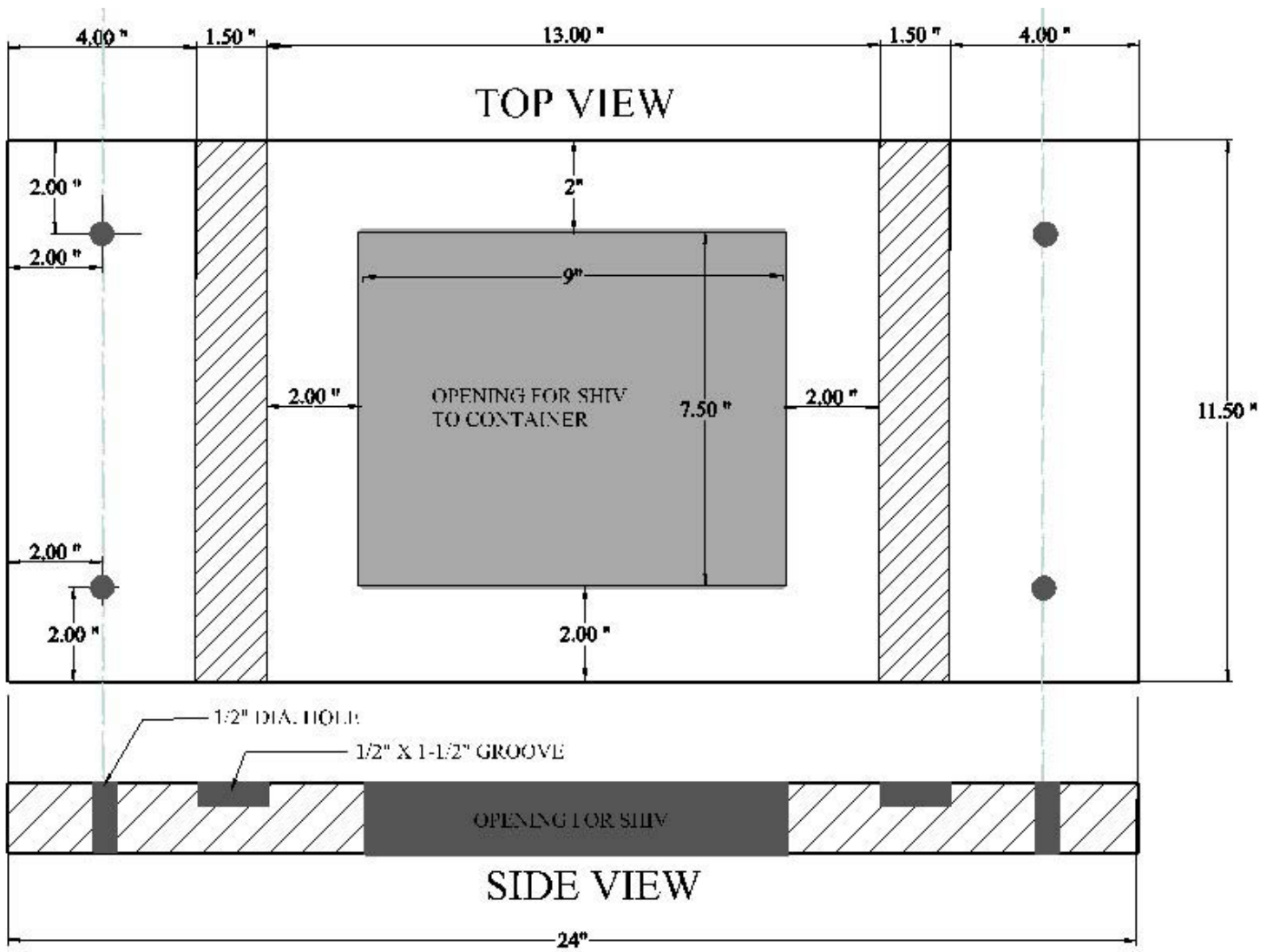
The Base

The base of the unit is 24" long and is designed to be bolted onto a sturdy wooden or metal base. There are two ½" diameter holes drilled on each side for ½" bolt or lag screws. A hole or slot is cut into the base so the shiv can collect and fall onto a sack or container. Two 1½" wide grooves, ½" deep are cut on the base to serve as an attachment point for the two upright sides.

See the drawing of the base on the following page.



Bearing blocks, bolts and deck screws



Base of box



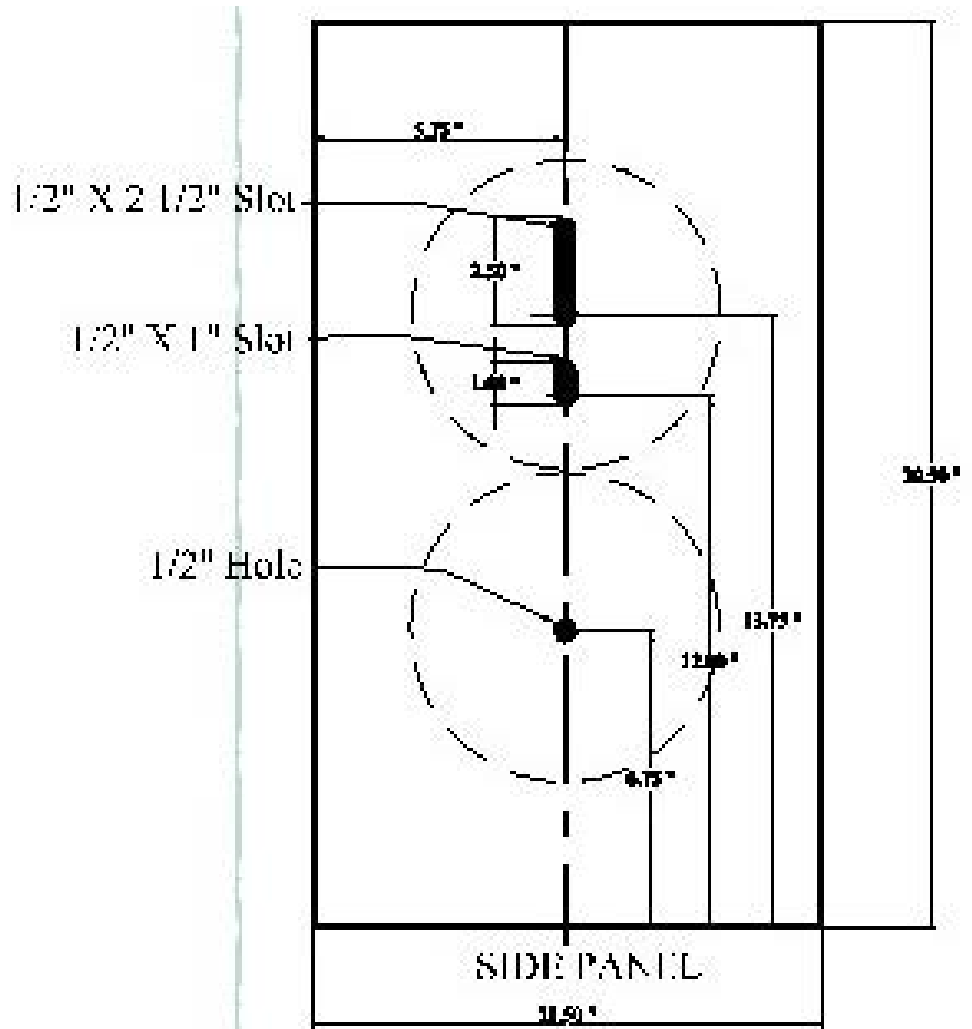
Side panel



Side view of side panel showing roller shafts

The Sides

The two upright sides are 20½ inches tall and are identical in design. These side panels will attach to the base with 3" deck screws. The sides of the box will support the two metal rollers that are suspended by a ½" diameter steel rod supported by flange bearing blocks. The bottom roller is in a fixed position and is powered by the hand crank. The upper roller is designed to float or have the ability to move up as the diameter of the hemp stalks increases. Two ½" wide slots are cut to accommodate the shaft and flange bearing. The lower slot is 1" long while the upper slot is 2½" long.



The Top

The top of the box is a 2" x 12" cut to 20 inches. Two 1½" x ½" grooves are cut on the ends so that it can rest over the side panels and be attached with deck screws. Before assembly, the wood pieces can be coated with linseed oil or wood sealer.



Top of box

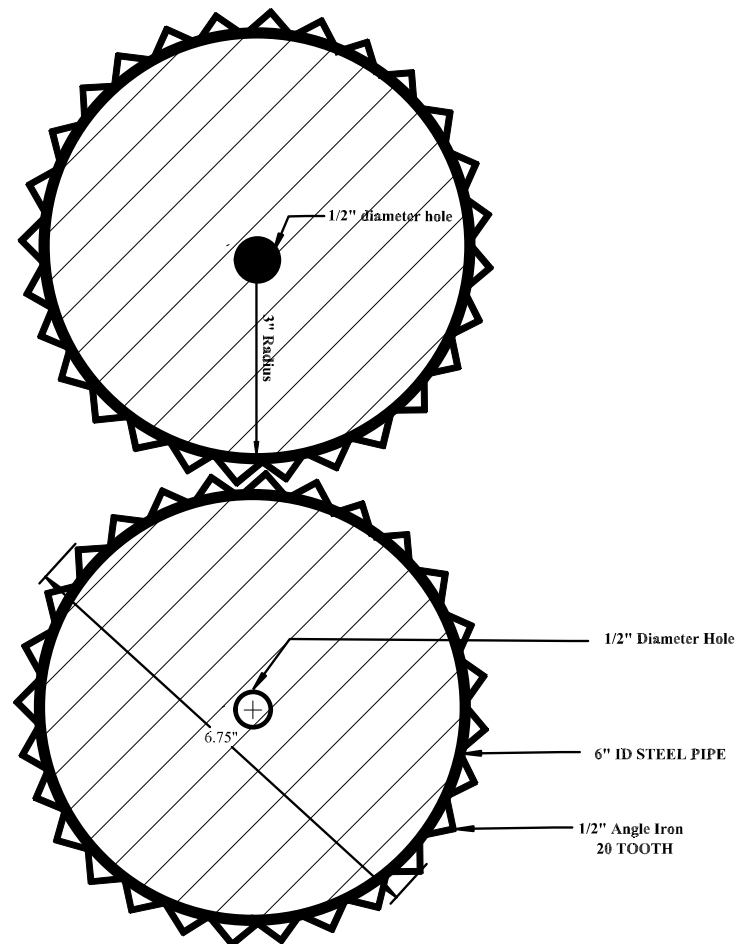
The Metal Rollers

The metal rollers used for crimping and breaking the hemp stalks are fabricated from 6" outside diameter steel casing cut to 12 inches. The ends of the cylinders are sealed with $\frac{3}{4}$ " steel plate. Two $\frac{1}{2}$ " diameter holes are drilled in the center of the sides to hold a $\frac{1}{2}$ " diameter steel rod that will serve as the axle, supported on the flange bearing blocks attached to the side panels. The length of the steel rod is 24" and protrudes 8" on one side and 4" on the other. The roller axis is offset so there is plenty of length for any modifications necessary in the future. A $\frac{1}{2}$ " diameter steel collar is attached to each axle end to provide clearance from the side panels and interior flange bearing bolts.



Metal rollers with blades and shaft attached

The blades forming the crimper are 12" lengths of $\frac{1}{2}$ " x $\frac{1}{2}$ " angle iron. Twenty pieces are spaced equally around the circumference of the metal cylinder. The angle pieces are held in place with a binding strap and tack welded in place. The welds can be ground down to remove rough and sharp edges. Each finished roller with blades, shaft and collar weighs around 25 pounds. Additional weight to the top floating roller could be added by creating a port on the upper side for adding sand. The extra weight could be useful for increasing the crimping force on the hemp stalks. A coat of anti-rust paint could be applied to protect the metal in humid climates.



Drawing of Metal Roller Assembly

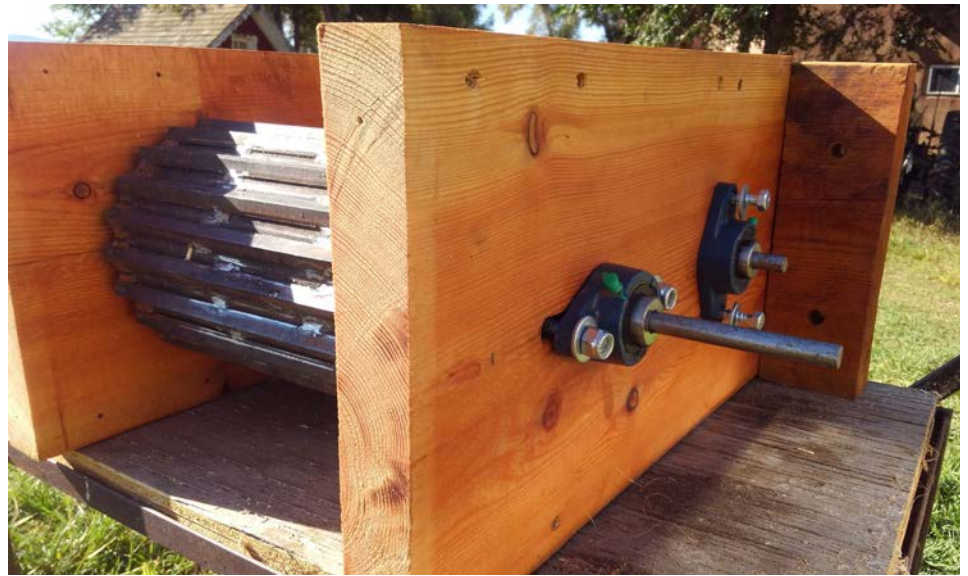
Assembly

Once all the box pieces are cut and the rollers are fabricated the unit can now be assembled. The two side panels are laid on their long side so that the rollers and upper bearing bolts can be fed through the holes drilled for the cylinder axle and floating flange bearing. The bottom section can now be attached with the 3" long deck screws. Flange bearing blocks can be attached to the side panels. The lower roller bearing block is attached with $1\frac{1}{4}$ " x $\frac{3}{8}$ " lag bolts. Upper bearing block is attached with $\frac{1}{2}$ " x 3" bolts with a lock nut. The upper bearing tension is left loose so that the roller shaft can float or move upwards in the slot.

The assembly of the Steel Roller Hemp Break takes a couple of hours once all the materials are cut to size and the rollers fabricated. Welding for the metal rollers should occur via an experienced local welder. The time required to fabricate them is several hours. A crank for operating the unit was made from a recycled Brace handle. The brace handle fits over the protruding steel axle shaft. The shaft is ground or flattened so the handle can fit over the shaft and lock onto the flat spot. There are other options for the crank attachment using welded nuts or bushings attached to a bent metal rod forming a crank configuration.



Roller placement between side panels



Roller axle attached to flange bearing blocks

Assembled Steel Roller Hemp Break



Clockwise from top: Box assembly showing feed rest and hand crank, side view of unit, back side of unit with upper cross panel

Assembled Steel Roller Hemp Break



Left to right: Front view of unit showing upper cross panel, back view of assembled unit

Steel Roller Hemp Break in Operation

The lower metal roller drives the unit, a few hemp stalks are fed into the rotating roller so they can be crimped or broken releasing the shiv or interior woody portion of the stalks. Crimping or breaking the stalks to release the fiber strands requires repeated runs through the rollers. The size of the particles ranges from ½ to 1 inch. This is because of the size or distance of the roller blades. The closer the blades mesh onto each other the smaller the particles will be. For finer or smaller shiv sizes, a closer mesh roller system would be necessary.

The Steel Roller Hemp Break works well by feeding the stalks to the end and then reversing the rollers so that they get crimped again until the shiv pieces are released. Proper retting of the stalks will assist in more efficient breaking of the hemp stalks.



Left to right: Operation of Steel Roller Hemp Break, close up of crimped hemp stalks and shiv pieces

