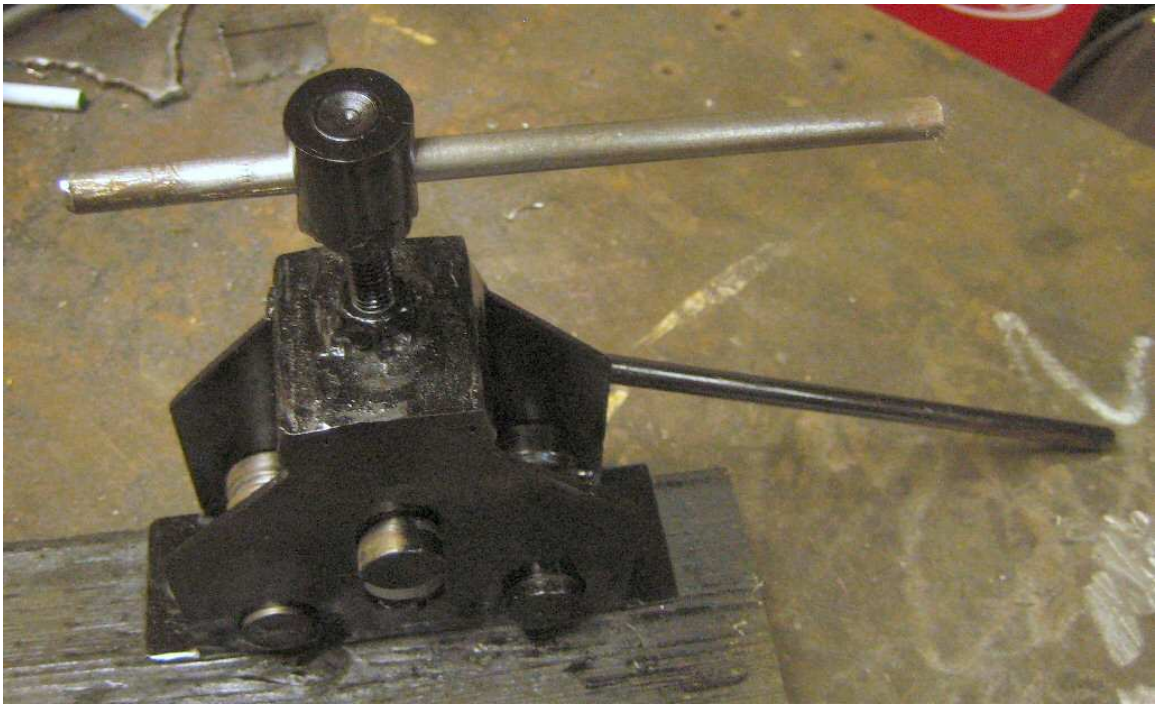
MAKING A SMALL RING ROLLER
Winter, 2009



Tools:

- Metal saw: Chop saw, cutting wheel on a grinder, jig saw with a metal cutting blade, sawzall with a metal cutting blade, or a band saw.
- Drill press
- Welder
- (Optional) Lathe

Materials: (cut offs from previous projects – use what you have and modify the design to suit)

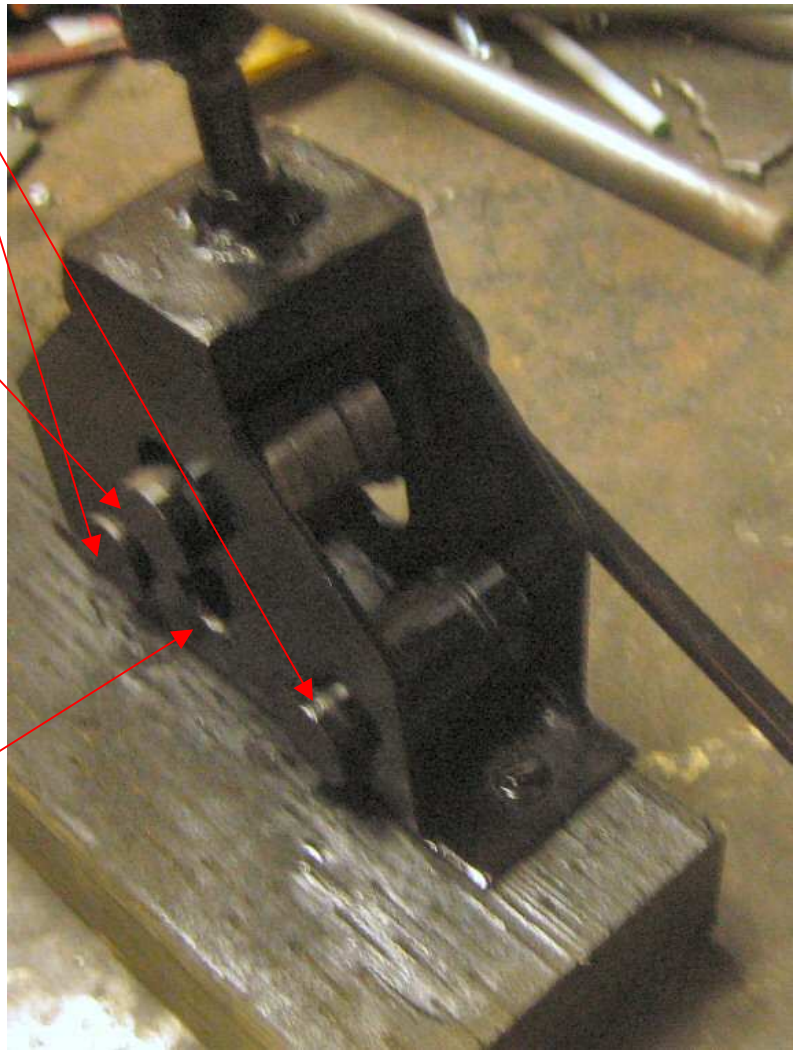
- 1/8" plate steel (the body)
- (3) pieces of rod; 2" – 3" long, ¾" to 1" for the rollers.
- (2) pieces of rod for handles
- 3/8" – 1/2" diameter bolt and (3) nuts to fit; (2) washers
- (Clevis pins, cotter pins, or wire if you do not have a lathe)

I needed a ring roller that would handle 1” to 1.25” wide bar, up to 1/8” thick. A second design criterion was using the materials I had around the shop. A third was to avoid bearings since I do not have an arbor press.

There are lots of plans for big ring rollers that use bottle jacks and can bend tube but very few for something lighter weight. After looking at pictures on the Internet I designed this roller.

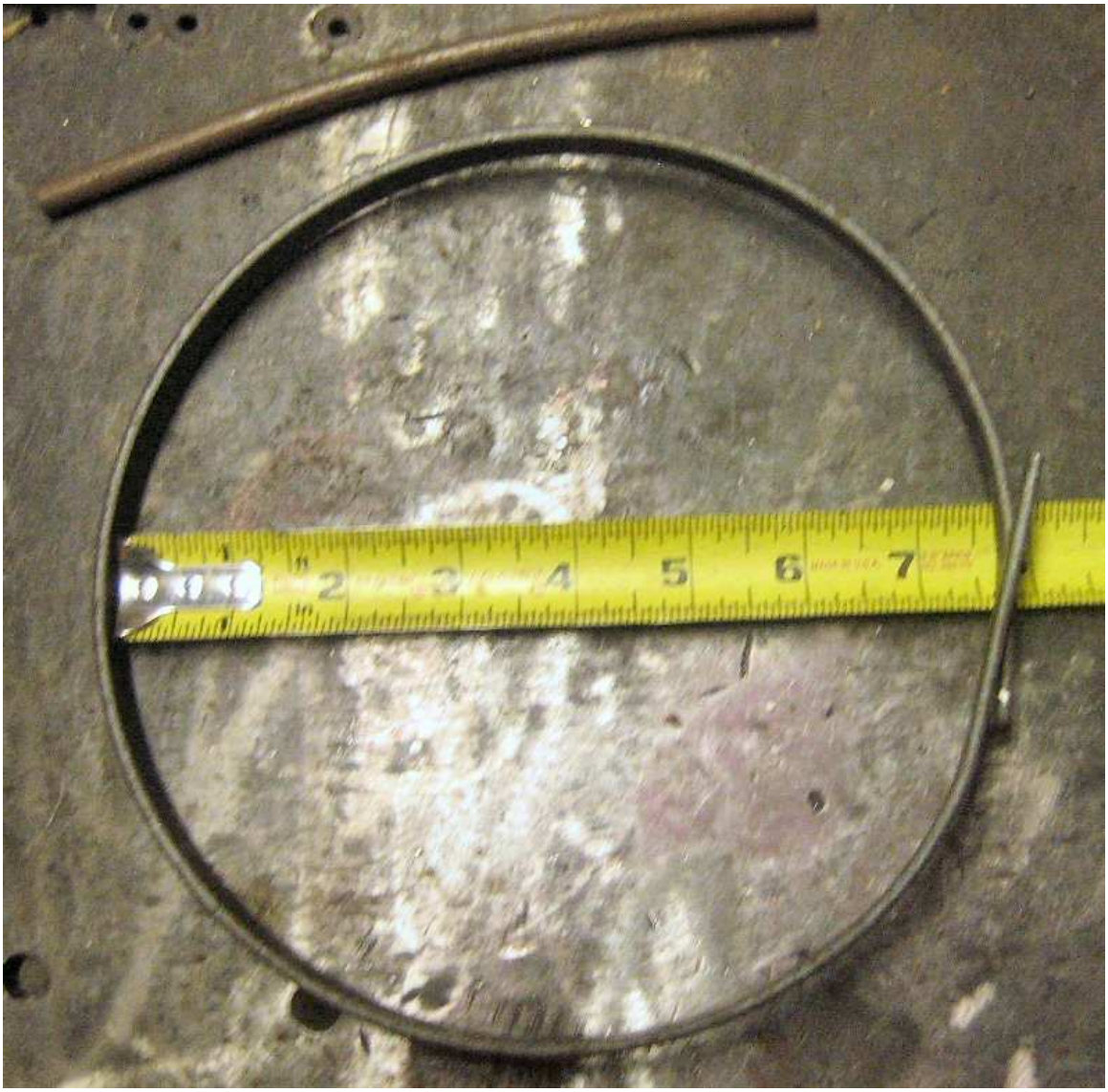
Although I used a lathe and a mill to improve my machining skills the basic design does not need them. I used a jigsaw with a metal blade. The drill press is essential – a hand held power drill will not do the job.

There are two fixed rollers at the bottom and a movable roller in the middle. A 3/8” diameter machine screw is used to adjust the height of the movable roller and control the amount of bending. The horizontal rod at the top is used to turn the screw and adjust the movable roller. The horizontal rod at the bottom is used to turn the middle roller which pulls the material through the rollers.



The middle roller is held by a three sided cage (not seen in the photo) attached to the machine screw with nuts. As the screw is turned it moves this roller up and down in the slot that is in both sides. The roller is screwed to a scrap piece of 2” x 4” that can be clamped to a table.

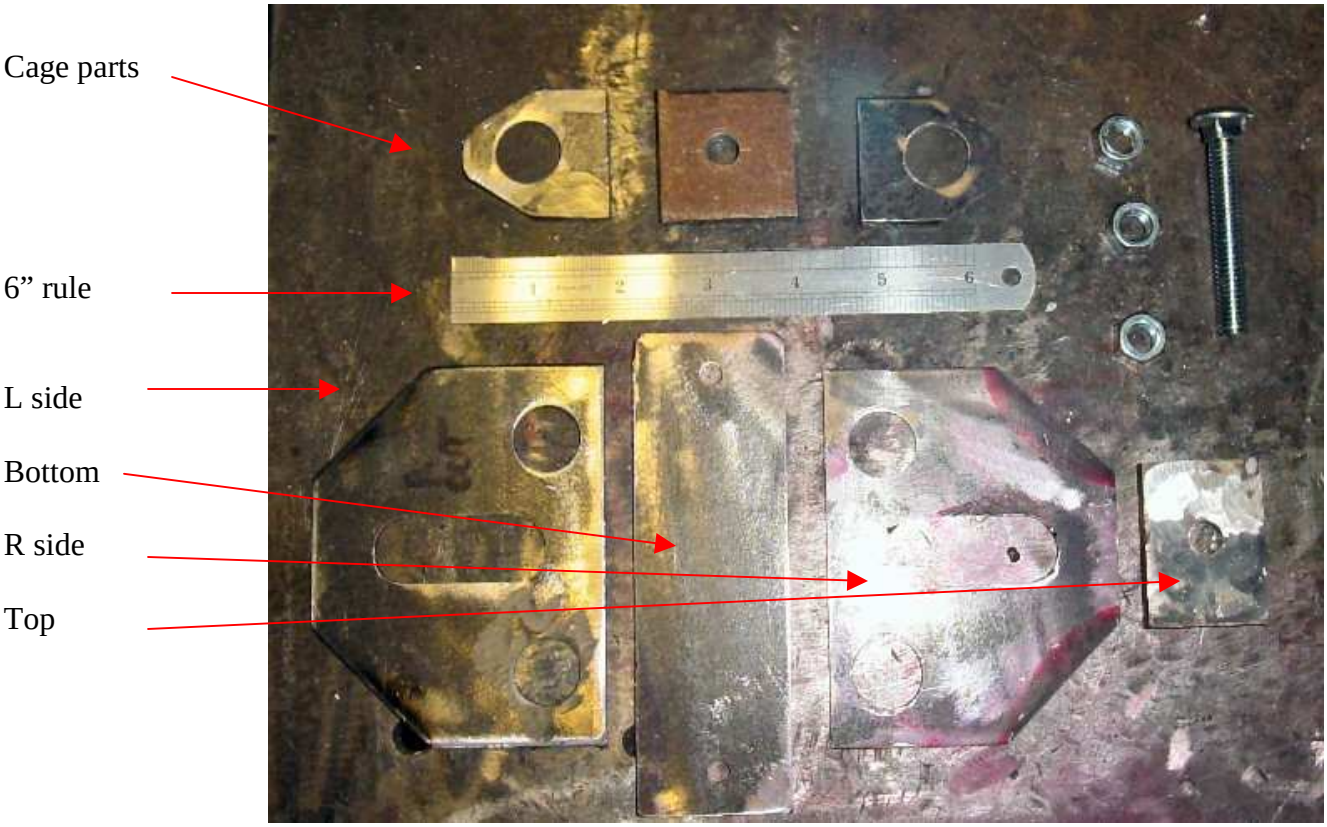
Here are some results. At the top is some 5/16” rod with a slight curve. This rod is too stiff to work well in this ring roller. Underneath it is 1” wide by 1/8” thick bar in an 7 1/2” circle.



Note the flat part at the end of the circle. This is an inherent problem with ring rollers and you have to build in to your cutting calculations about 2” of flat bar.

PARTS

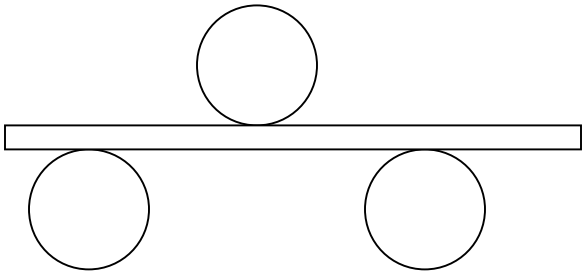
These are all of the parts except for the rollers and the two rods. They are all cut from 1/8 plate steel except for two small pieces made from ¼" plate – 1/8" probably would have been sufficient. At the top are the three parts that form a cage holding the movable roller. Next is a ruler to show rough measurements. At the bottom from left to right is the left side, bottom, right side, and top. All the roller holes are ¾". The bolt holes are 3/8".



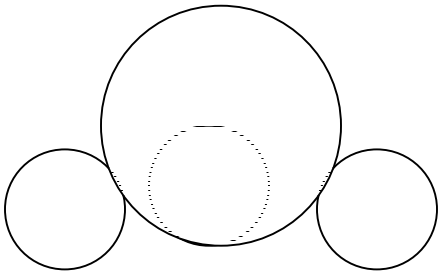
I made the slots by drilling the holes and then using a jigsaw. If you do not have a jigsaw you could drill a hole at the top and at the bottom of the slot, and use a hack saw or an abrasive cutter to cut the rest of the slot. If you only had a chop saw you could just drill the bottom hole, and then cut the sides all the way to the top.

The only critical dimensions are the relationships of the three rollers. The slot holding the middle roller has to extend below the two fixed rollers and be long enough so that the movable roller can be raised above the top of the fixed rollers.

Top position with material inserted



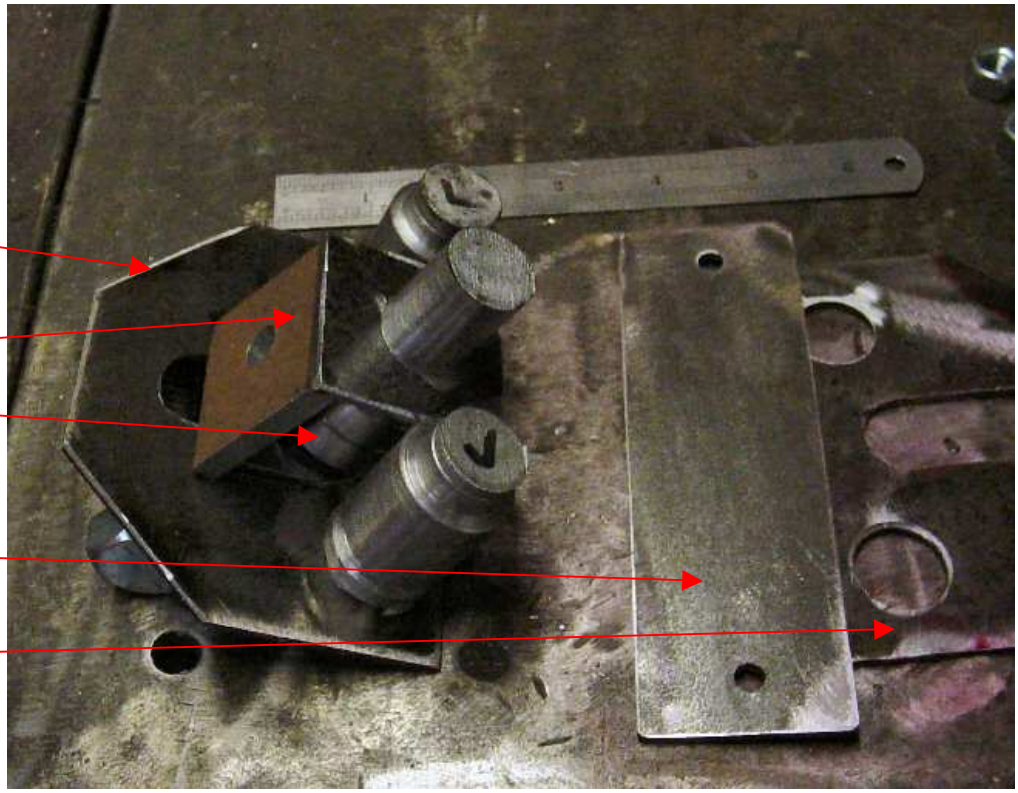
Bottom position with material bent



This photo shows how the pieces fit together. The fixed rollers are long enough to fit through both sides; i.e. the width of the bottom piece plus ½" or so. The movable roller in the middle has to be even longer so the rod that turns it will not hit against the movable rollers. You can see the cage holding the movable roller with the ¼" plate at the top and the two 1/8" plates holding the roller.

These rollers are 1" steel and I used the lathe to turn the ends down to ¾". My original design did not require a lathe and used clevis or cotter pins to hold them in place.

NOTE: The assembly sequence is important and the following pictures are used to show how the pieces fit together. Do not weld anything at this point!



Here is a picture looking down at the top of the cage.

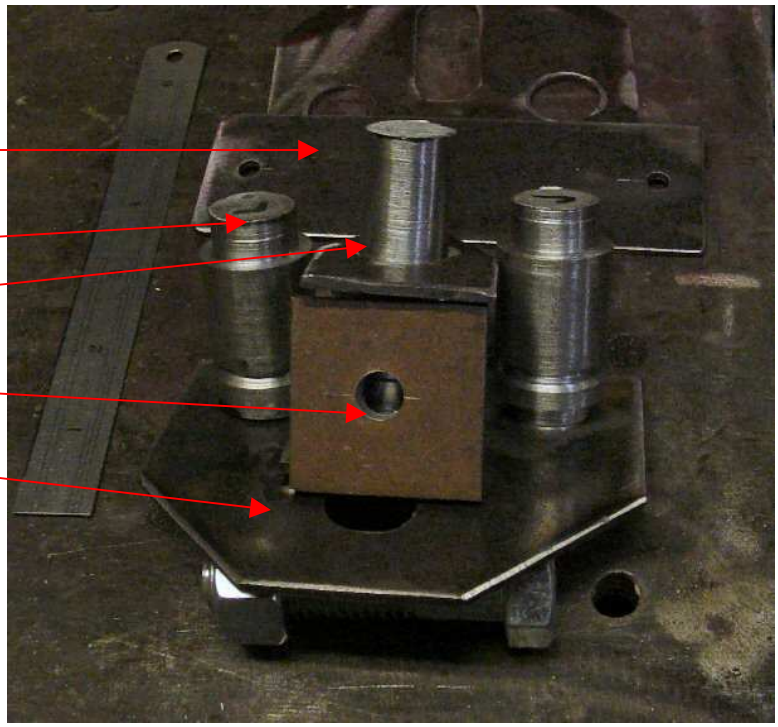
Bottom

Fixed roller

Movable roller in cage

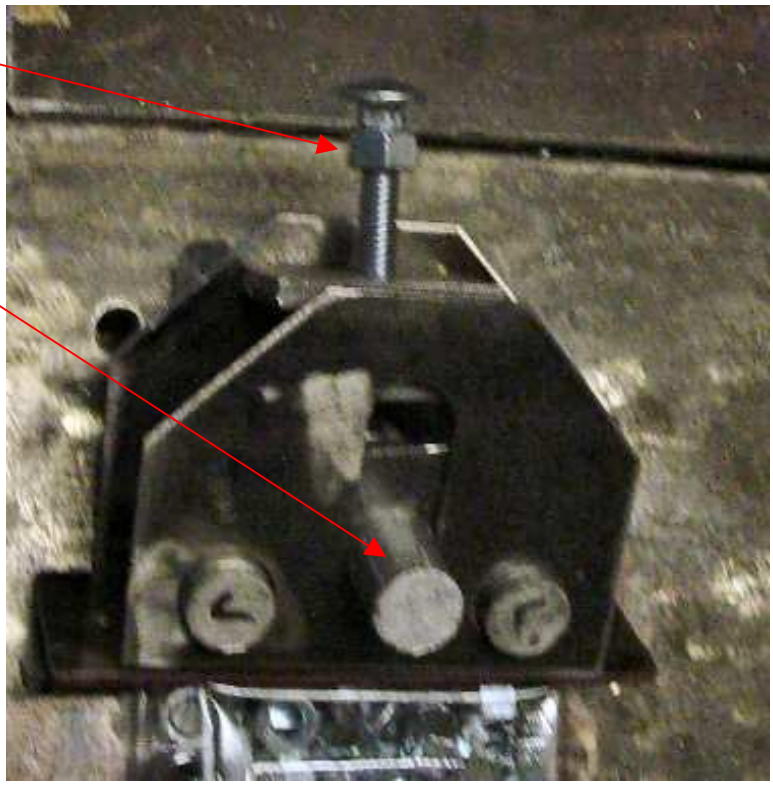
Hole for adjusting screw

Left plate



This is a picture from the side showing the machine screw attached to the cage.

The middle roller is at the bottom position of the slot.



ASSEMBLY

The following sequence shows the assembly. It begins with the adjuster. This is a machine screw that moves the center roller up and down in the slot.

The parts from left to right are a small tank valve wheel I found that just fit the 3/8" machine bolt. This was a mistake since it did not provide enough leverage to bend the steel and it was eventually discarded. Next is a 3/8" nut welded to the top piece. Next is another 3/8" nut, a washer, the top of the cage, and a final 3/8" nut. These bottom two nuts are slightly loose since they have to allow the bolt to turn within the cage assembly.

First weld one side of the cage to the top of the cage. Next weld one nut to the top piece, Assemble as shown and then do a small weld of the screw to the bottom most nut. Do not weld this nut or the machine screw to the cage.

Insert the middle roller, fit the other side of the cage, and weld it to the cage top. Here is the finished cage assembly upside down.

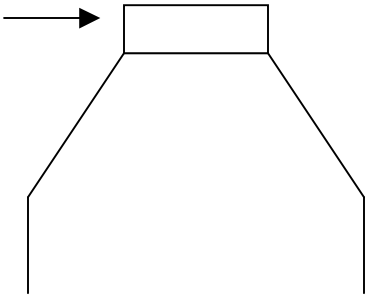
Note that there is hole drilled through middle roller for the rod handle.

Here is another picture right side up. Note the groove in the middle roller. This was cut on the lathe so round rod would not wobble all over in the bender.

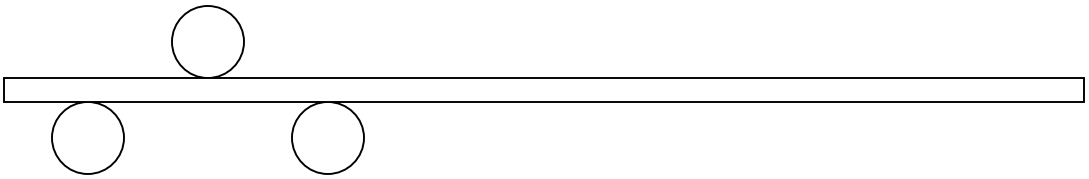
Now assemble the rest of the roller. Weld one side to the bottom, insert the two fixed rollers and the cage, and then weld the other side. Finally weld the top. This photo was taken before welding the cage so the parts are loose but it shows how everything fits.

To finish the top I welded a piece of ½" rod to the machine screw and drilled a ¼" hole in it for the turning lever rod. This turning lever is loose because you may need to remove it when bending a tight circle.

Sharp eyes may also note that the final roller sticks up ½" . The roller side looks like the drawing below.



The reason for this change is my design did not take into consideration the thickness of the nuts. When the movable roller is screwed up to the topmost position there has to be enough room for whatever is being bent to fit between the fixed rollers and the movable rollers



While the slot was long enough the nut prevented the movable roller from going to the full height. This was discovered after everything was welded. The solution was to cut off the top, and extend the height by adding ½" to each side, and then weld the top back.

How it works

Raise the movable roller to the top. Insert the material to be bent so it touches both fixed rollers. Screw down the movable roller until it meets the material, and then give it another turn to slightly bend the material. Then roll the material through, screw it down another turn, and roll it back. Repeat until you have the curve or circle that is desired.

I had never used a ring roller so I did not know what to expect. Bending the material can take some force – the 5/16" rod was very difficult however the 1/8" flat was fairly easy. I also did not know how much force would be needed for the rod that turns the middle lever. It turned out that a single ¼" thick rod about a foot long worked well.

Sometimes the material will not roll and has to be pushed as the roller turns. Sometimes it goes at an angle and has to be straightened out. This is not a precision instrument.

In short – the roller is far superior to bending material around a pipe or a trash can lid (my previous methods). It makes nice curves and circles and is suitable for one-offs. It would not be a good tool for making quantities of circles.

Design improvements

Apart from the issue with the nuts there are two improvements. First, I would knurl the rollers so they would grip better. Next, I suspect case hardening the rollers will be an improvement – time and use will tell. Finally, the basic design does not work for small rings. Any circle less than 6" or so will run into the machine screw. You can make a small curve but cannot make a complete circle.

Another approach is to have the rollers stick out beyond the frame, and bend the material *outside* the frame rather than *inside* it. This means the forces will be unbalanced, pushing down on one side of the frame and pushing up on the other. However it will allow small rings to be made and easily allow material to be taken off the roller.