

# Down to Details

By Chuck Steffens

This month for the "Down To Details" segment I thought I would go down a different path and show you how I build a simple "steerable" axle. The reason I put steerable in quotations may be odd to some and a dead ringer to others who like myself have went through all of the work of building an axle, whether it's a front axle for a pulling tractor or a front axle for a wagon running gear, have found out after it was all finished that it ended up being soldered into one solid "nonsteerable" axle.

To start the project off, I headed to



Brass and aluminum stock for the project.



Center beam cut to length and tapered.



Spindle tubes fitted to the center beam.

my local Ace hardware store to pick up some brass and aluminum tubes and rods. To keep things simple I am going to use a 3/16-by-3/8 brass rectangular tube for the main frame. I then picked up a 3/16-by-.014 brass tube, 5/32-by-.014 aluminum tube, 1/8 brass rod, 3/32-by-.014 round tube, 1/4-by-.062 flat stock brass, and also two .080 bolts, washers and nuts that can be bought through Walthers, Micro Fasteners and many hobby stores. The key to this axle being steerable is that 5/32 aluminum tube. It acts like an insulator between the 3/16 brass tube and the 1/8 brass rod.

With all of the materials on hand, the first task in building the axle is to determine the width. For the project I am wanting the main beam to be 2 inches wide. I start by cutting the 3/16-by-3/8 rectangle tube slightly longer than 2 inches. I do this so I can cut a taper on this tube for additional wheel clearance when mounting the rim and tire. After I have the desired width and taper, I use my Dremel to then cut a semicircle in the beam to match the 3/16 brass tube. With this done I like to do some preassembly to see how things look. Also by keeping



Steering knuckles bent tight in the vise.



Aluminum insulator tubes installed in axle tubes.

the 3/16 tube extra long before soldering it gives you a good chance to make sure the angles match on both sides of the beam. If all looks well...solder them together.

Now with the axle tube soldered to the center beam it is time to trim the 3/16 tubes to the length you want, for my project I want to keep them as short as possible so I use my Dremel with the cut-off wheel, this time to trim the 3/16 tube flush with the bottom of the center beam. Next will be installing the aluminum tube into the 3/16 brass tube and cutting its length to match the 3/16 brass tube.

If all is going well the 1/8 brass rod should now fit snug inside of the aluminum sleeve. With this out of the way, it's time to build the steering knuckle. How I go about this is to use the 1/8 rod and clamp it into the vise. Once clamped I bend the rod 90 degrees by hand then use a hammer to make it a nice tight 90, then once this is accomplished grab the rod by hand and bend it back by hand to match the angle of the taper you have in the center beam. By doing this it will give the axle a much "cleaner"



Test-fitting the steering knuckles in the axle tubes.



Tie rod ends being readied for shaping.



Tie rod end drilled and taped.

look and will allow the rim and tire to fit in a tighter fit to the axle. I always make sure I cut the knuckle extra long so I have some room to trim to size later on. With the knuckle bent and cut extra long it is time to test-fit them into the axle tubes. If all goes well when you set the axle up the knuckles should be parallel to the beam, if not some slight bending/adjusting may be done to the knuckle to achieve this.

Okay the steering knuckle is fitting nice and tight and is parallel to the beam. Next task is the steering arms. What I like to use is the 1/4-by-.062 flat stock and drilling a 1/8 hole into the knuckle end and a .060 hole into the tie rod end. Most times I will make a mark down the middle of the flat stock for a center line. Then make the knuckle end



Tie rods being mounted to the steering arms.

1/8 of an inch from the end of the stock and the .060 hole .400 from the same end. By making everything first you should be able to make both sides match. Once the holes are drilled, I will cut the flat stock off a little past the .060 hole on the tie rod side. I will then install a 1/8 rod into the two pieces of flat stock to keep them lined up and then use a vise grip to hold the flat stock in place. With the flat stock held tightly in place I start to shape the pieces into a friendly-looking steering arm shape.

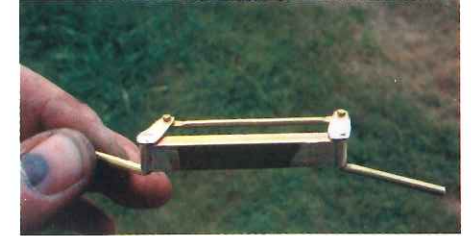
With the steering arms trimmed to shape, I will test-fit them onto the steering knuckles to give it one last fit. If this is right, the next step in the process will be to mount the axle into the vise and ready it for the tie rod. By mounting the axle in the vise it gives you the knowledge of knowing the steering knuckles are parallel with each other and that the knuckles are up tight into the beam. You will not want



An axle mounted under a tractor.



An axle mounted under a tractor.



A "steerable" axle.

to solder the steering arm to the knuckle just yet. By leaving these free it gives you a little tolerance with the tie rod.

On to the tie rod...what I like to do for the tie rod is use the 3/32 tube and crush the end flat in the vise. I will do this to one end and then drill a .052 hole right in the center of the flat. Once drilled, I will tap the hole with a .080 tap. Now that one side is done, I will use a .080 bolt through the steering arm then a flat washer and bolt the tie rod on and tighten it up. With one side mounted, I will then set my steering arms at the angle they need to be at, this way I can use this to determine the length of the tie rod. One quick mark then remove the tie rod, cut to length, crush, drill, tap and mount using a washer between the tie rod and steering arm again to allow clearance for paint.

Now that the tie rod is installed and with the axle still in the vise, give everything one last look-over. If you are satisfied with what you have, solder the steering arms to the steering knuckles. After a little cool-down period remove the axle from the vise and if every thing went as planned it should steer with ease and can be used as the beginning of a pulling tractor front axle, wagon running gear or whatever you would like to steer.

Just don't forget that aluminum insulator tube!!

Enjoy, Chucky. TF