

Cut the following:

1 section of 3" x 12" x 1/2" plate

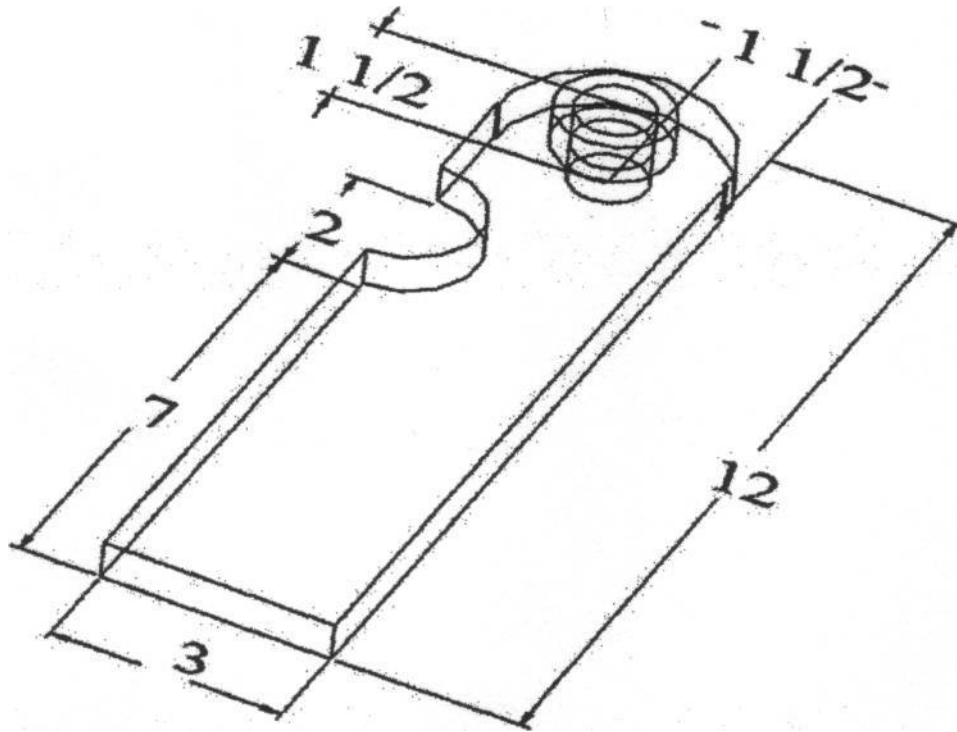
1 section of 1" ID mechanical tubing 1/2" long

As described before, punch a center point on one end that is 1-1/2" back from the end and on the 1-1/2" center of the plate. Scribe a 1-1/2" radius arc on the end and round off.

Drill a 1" hole through the plate on the center point.

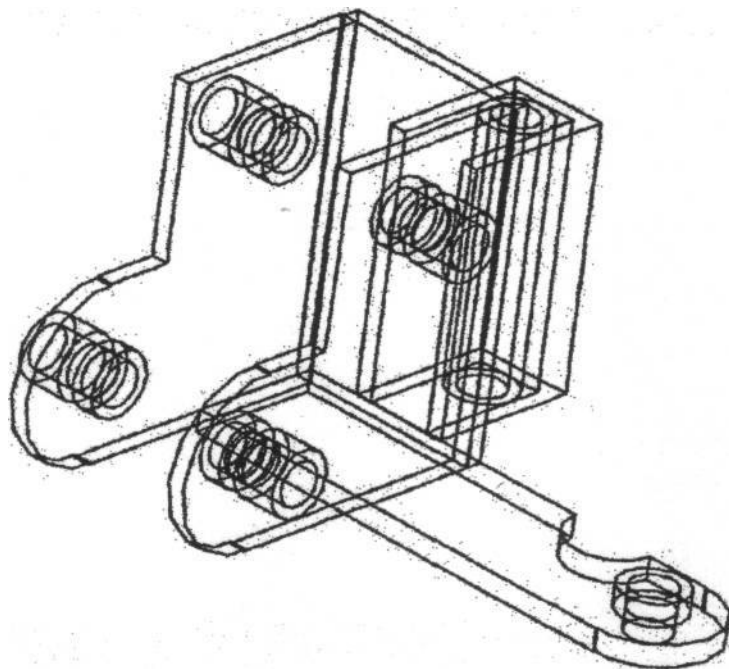
Notice the 2" section that is removed from one side. This is to allow the link end of the cylinder more travel for greater side-to-side swing. Scribe this arc with a 1" radius at a point that is 8" from the square end and flush with the edge. Cut out this arc and slightly round the corners.

Using a piece of 1" rod as a guide, weld the mechanical tubing in place. Refer to the diagram to make sure you weld it to the proper side.

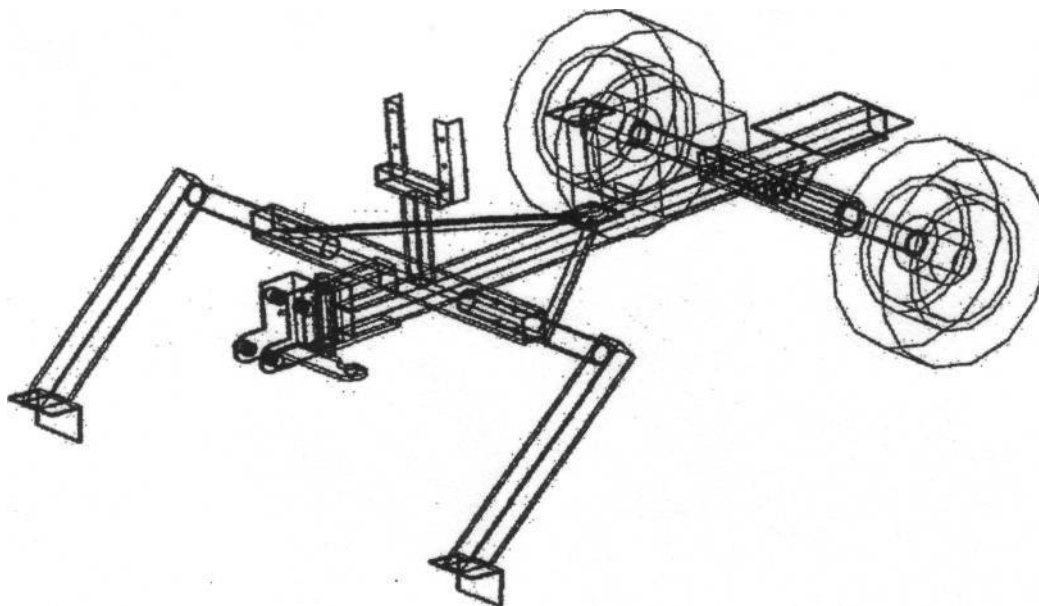


This plate is then welded to the bottom of the prior assemblies so that it projects from the left hand side (imagine you were sitting in the seat and facing the front end of the frame). The square end is flush with the right side, the rear edge is flush with the back of the larger assembly, the notch is pointing to the rear of the frame and the mechanical tubing is pointing upward.

Finish the boom swivel by welding 1/2" long sections of mechanical tubing to the insides of all four holes and welding 1" long sections of mechanical tubing to the outsides of all four holes. Use the 1" diameter rod lengths to guide placement



The completed boom swivel ready to mount



Here the boom swivel is pinned into place between the plates on the front of the frame. Go ahead and test fit for freedom of side-to-side movement. Grind off any obstructions now.

Now we will construct the boom arm.

Cut the following:

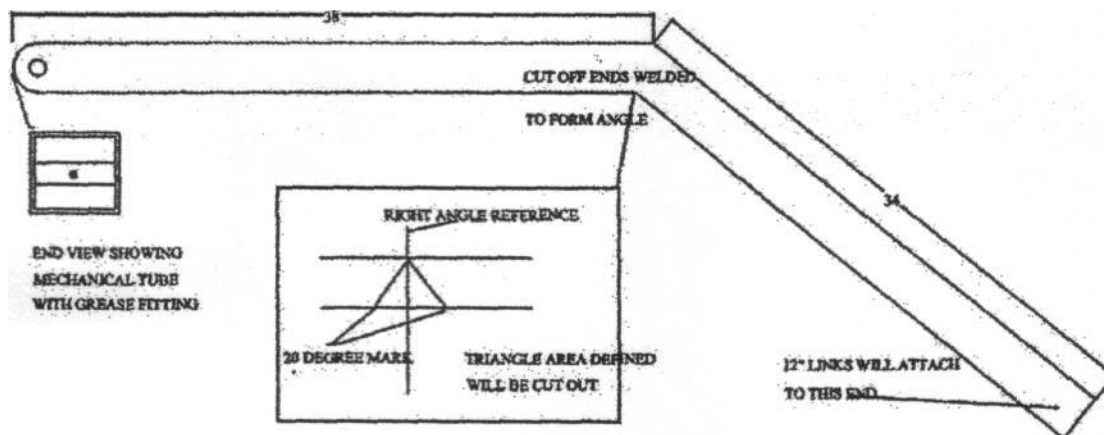
- 1 piece of 3" x 3" x 1/4" square tube 72" long
- 2 pieces of 3" x 12" x 1/2" plate
- 2 pieces of 1" ID mechanical tubing, 1" long
- 4 pieces of 3" x 4" x 1/2" plate
- 1 piece of 1" ID mechanical tubing 2-1/2" long

The 72" long piece of square tubing is placed on it's side. Using a square, scribe a line across the tube at a right angle that is 38" from one end. From this reference line scribe two lines that have an angle of 40 degrees, so that 20 degrees is to one side of the line and 20 degrees is to the other. Cut the tube into two pieces along the two lines. Weld the tube together joining the angle ends so that you create an angled boom arm.

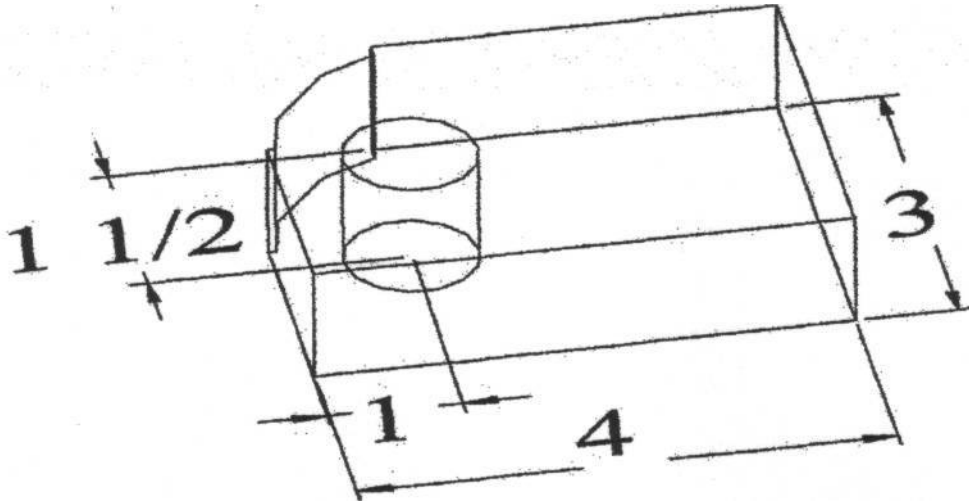
On the longer 38" end, punch a center point that is 1-1/2" from the edge and centered on the 1-1/2" mark of the tube. Scribe an arc across the end that has a radius of 1 5/8". Round off the end along the mark. Flip the tube 180 degrees and repeat the procedure to round off the entire end

Drill a 1" hole through the center mark completely through the tube. Using a 1" rod as a guide, weld a 2 1/4" length of 1" ID mechanical tubing inside the square tube that is aligned with the previously drilled holes.

Drill a hole from the open end of the square tube through the wall of the 1" mechanical tubing that is approximately centered. Tap this hole and insert a grease fitting.

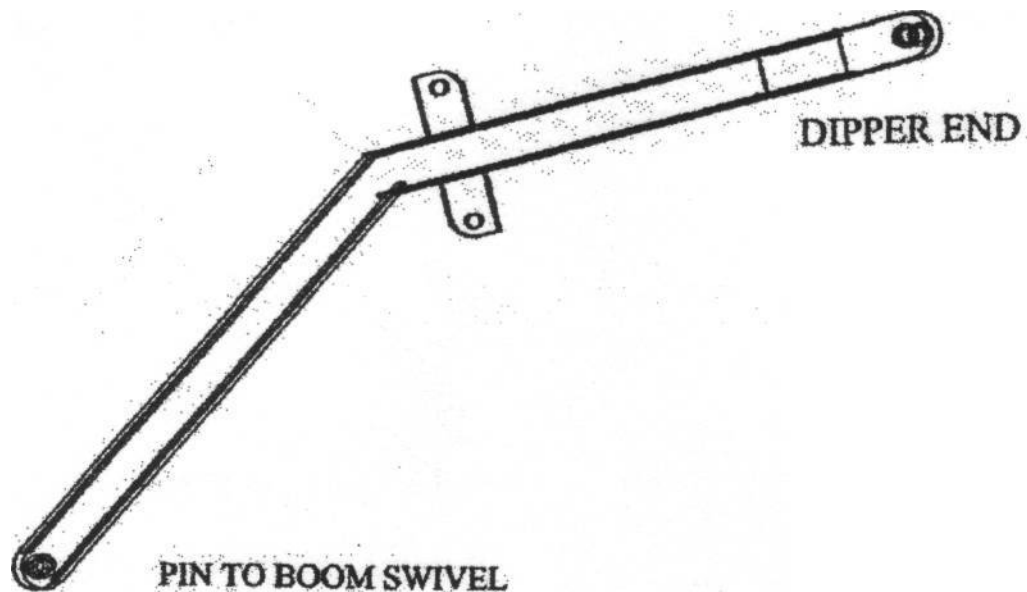


The cylinder ears are two pieces of 14" plate, welded together to form a 1" thick plate and are made in the same fashion as the cylinder ear on the main frame member with the exception of the length. The boom arm cylinder ears are only 4" long. Also note that the 1" hole is drilled on a new center point that is 1" back from the top edge and centered along the length of the cylinder ear.



This is the shorter version of the cylinder ears. You will need two for the boom arm and one more for the dipper arm.

The two ears are mounted to the shorter length of square tubing and are opposing on the top and bottom sides. Weld the top in place so that it is centered on the boom arm back and the front and rear edges fall on the 28" and 31" mark from the open end of the shorter tube section. The bottom cylinder ear will be mounted on the bottom of the boom arm in mirror position to the top ear. Be sure to place the rounded corners facing the appropriate direction. The top ear should face towards the dipper end and the bottom ear should face towards the pin end.



Cut the following:

- 1 piece of 3" x 3" x 1/4" square tube, 60" long
- 2 pieces of 3" x 4" x 1/2" plate
- 2 pieces of 1" ID mechanical tubing, 2-1/2" long
- 2 pieces of 1" ID mechanical tubing, 1" long
- 1 piece of 3/4" ID mechanical tubing, 3" long

One end of the square tube is rounded off exactly as the boom arm end was. Also, a 1" hole is drilled and a 2-1/2" length of 1" ID mechanical tubing is welded in place. The mechanical tubing is also drilled and tapped for a grease fitting.

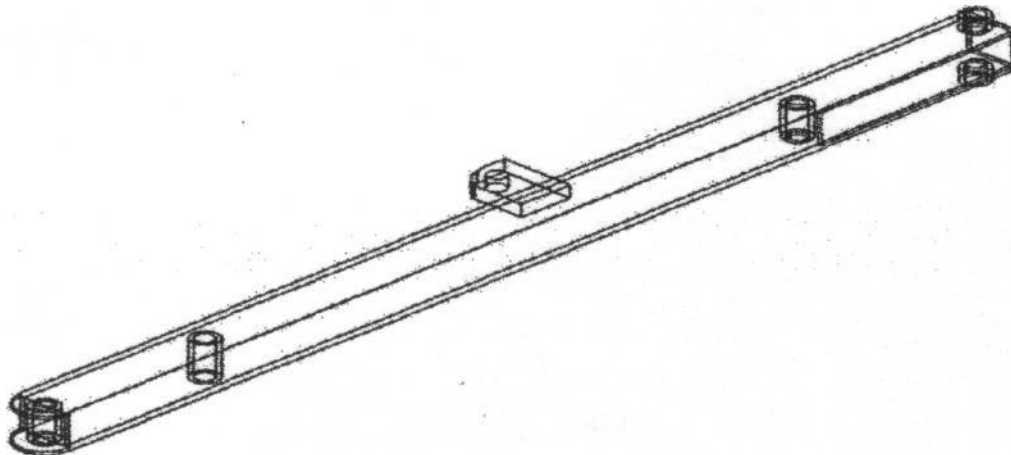
The opposite end of the dipper arm will be the end that links to the boom arm. The side that will face the boom arm needs to have a 2-1/2" x 12 section cut out. This is to allow the cylinder arm free travel.

With the dipper on it's side, drill the 1" holes through the entire tube at the specified locations. 1" from the top, 12" from the top, 1" from the bottom and 10-1/2" from the bottom. All holes are drilled on the center line of the dipper arm. *Where the top is the end with the cut out and the bottom is the end with the round off.*

The upper most holes will have 1" lengths of 1" ID mechanical tubing welded to the outside of each side.

The hole that is located at the bottom of the cut out will have a 2-1/2" length of 1" ID mechanical tubing inserted and welded in as best possible. You will only be able to weld around half the sides. Before welding in place it is highly recommended to drill and tap the grease fitting hole. Also, ensure the grease fitting hole is pointing toward the top of the dipper arm.

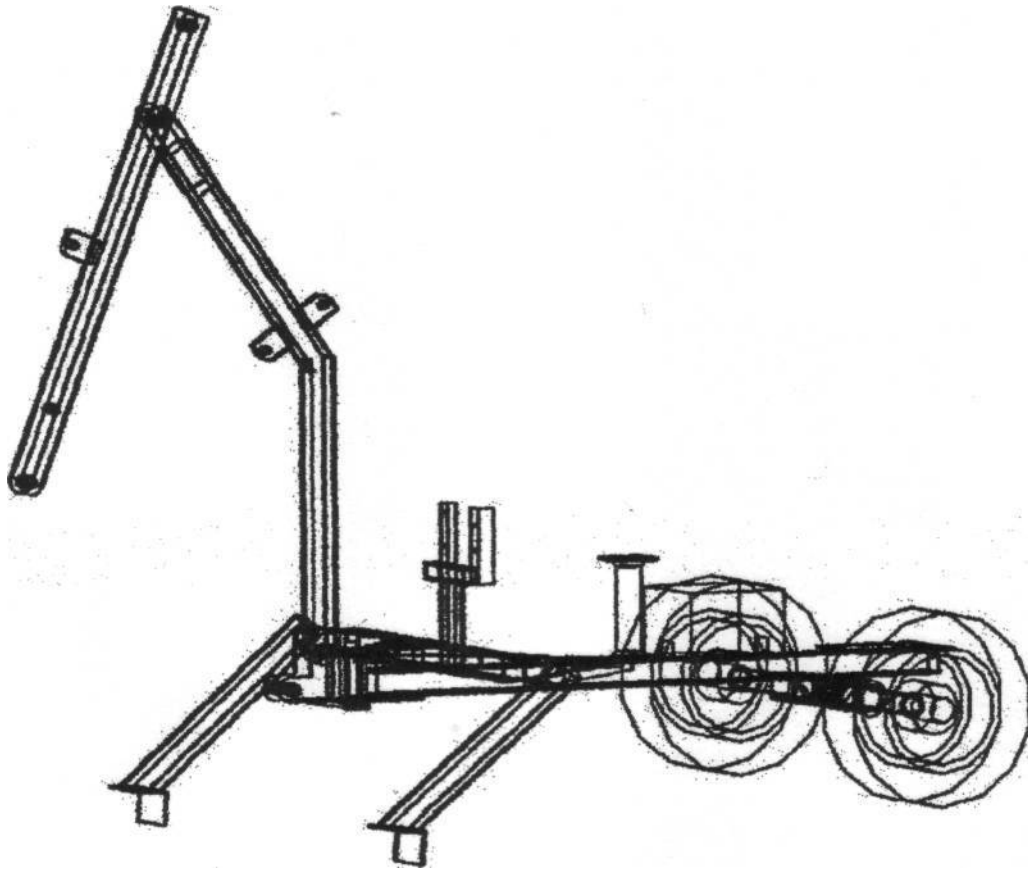
The hole located at 10-1/2" from the bottom of the dipper arm is a little tricky. You cannot possibly weld the tube in place. Therefore, you will need to drill a hole large enough so that a 3" length of 1" ID mechanical tubing can be inserted into the tube and welded in place. Chamfer the inside edges of the holes and the outside edges of the tube to form a v-channel for the weld to sit in. After welding in place, grind the surface even with the main 3" x 3" square tube. To grease this, you may drill a 1" hole through the dipper arm on the same side as the cut out is located and even with the mechanical tube. Through this hole you can drill, tap and insert a grease fitting.



Finish by creating the cylinder ear in the same manner as the cylinder ears for the boom arm were created. Weld two plates together, round off one corner, drill the 1" hole through and weld in place. It is welded in

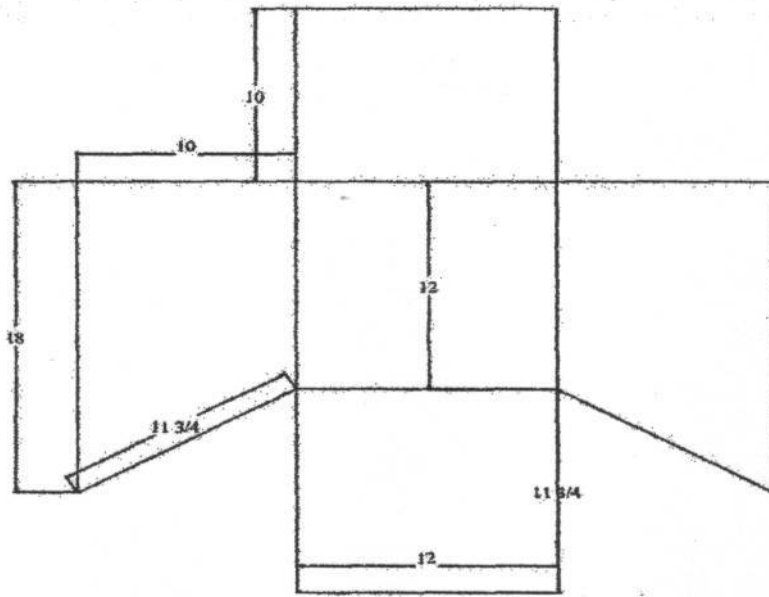
the center line of the dipper arm at a position 32" back from the rounded off end. Make sure the rounded edge of the cylinder ear points toward the rounded end of the dipper arm.

Now it is time to slide the dipper arm into place between the plates on the end of the boom arm. The hole at the bottom of the cutout will be the mounting holes. Secure with a 6" length of 1" rod and test for fit and freedom of movement. Grind off any obstructions.

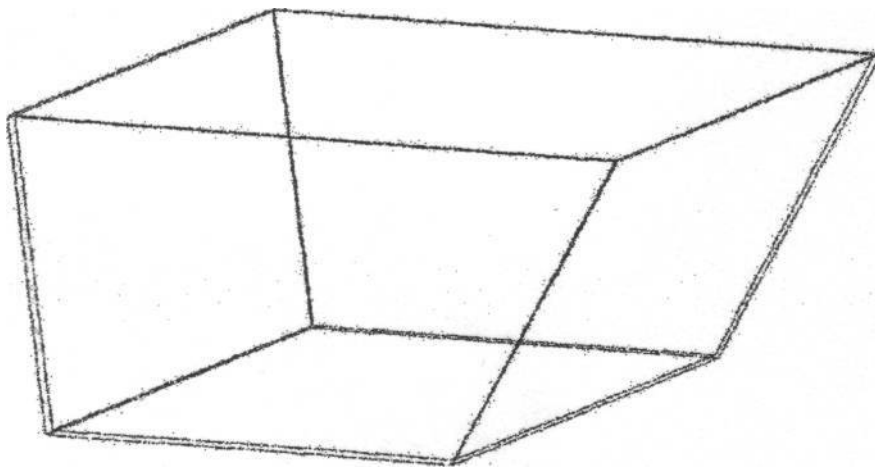


Now we will finish up construction with the bucket.

Start with the bucket by creating the shell. Refer to the diagrams to get a good idea of how the 1/8" sheet metal is formed into the bucket. You have two options: cut the pieces out separately and weld together at all seams. or, using the diagram below,



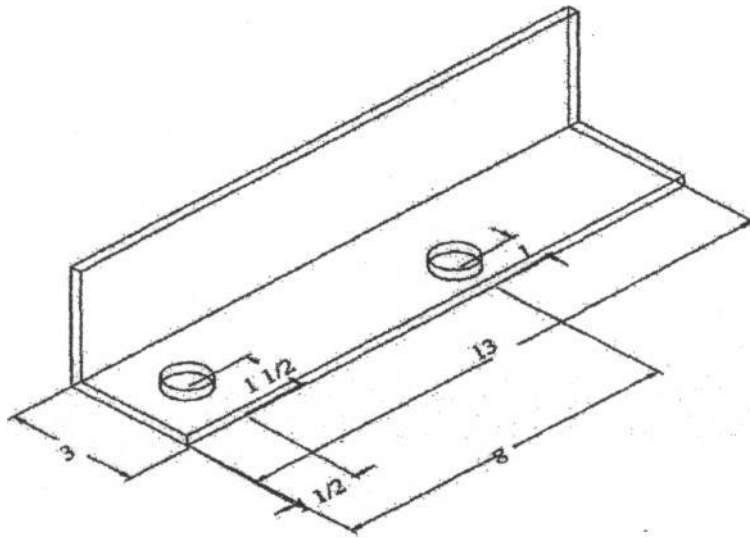
cut out the bucket as one piece and bend the sides, back and front up. Then weld the necessary seams. This is the preferred option if you have access to a sheet metal bender or brake. If you cannot do this, don't fret I built mine without the aid of a bender. I used scraps of angle iron to clamp the pieces into place and then welded them from the outside. Once the bucket was formed, I welded the inside seams. Your shell should look like the picture below.



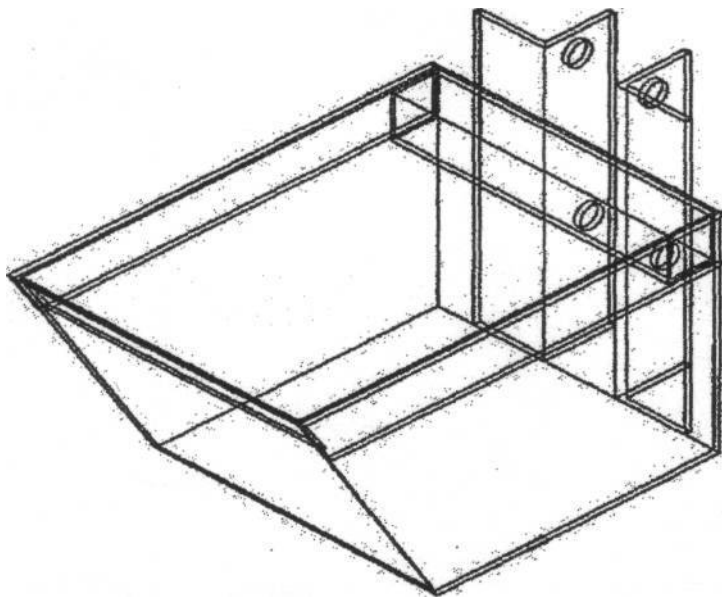
Now cut the following:

- 2 pieces of 3" x 3" x 1/4" angle iron, 13" long
- 1 piece of 2" x 2" x 3/16" square tube, 11-3/4" long
- 2 pieces of 2" x 18" x 1/8" flat plate
- 1 piece of 2" x 12" x 1/8" flat plate

The two pieces of 3" x 3" angle iron need 1" holes drilled through. These holes need to mirror each other so the bucket will travel in a straight line with the dipper arm. Clamp them together and punch the center points. The top hole is marked at 1" back from top edge and 1-1/2" from either edge (centered). The bottom hole is marked at 8" from top edge and 1" from the rear most side edge. Once drilled, weld them into place on the back of the bucket so that the bottom edges are flush, they are at right angles to the bottom, they overhang the bucket by 3" and are 3" apart.



The picture to the left shows the hole placement for the 3" x 3" angle iron. The hole to the farthest left is going to link directly to the dipper arm.



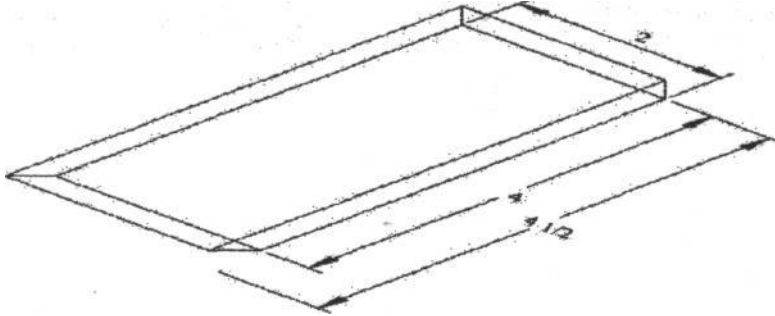
Here, the 3"x 3" angle iron is shown welded to the back of the bucket. There should be 3" space between the two pieces so the dipper arm will slide in between the two. Note the bottom edges are flush with the bottom of the bucket.

Weld in the 2" x 2" square tube as shown in the previous picture. This will add great structural support to the bucket.

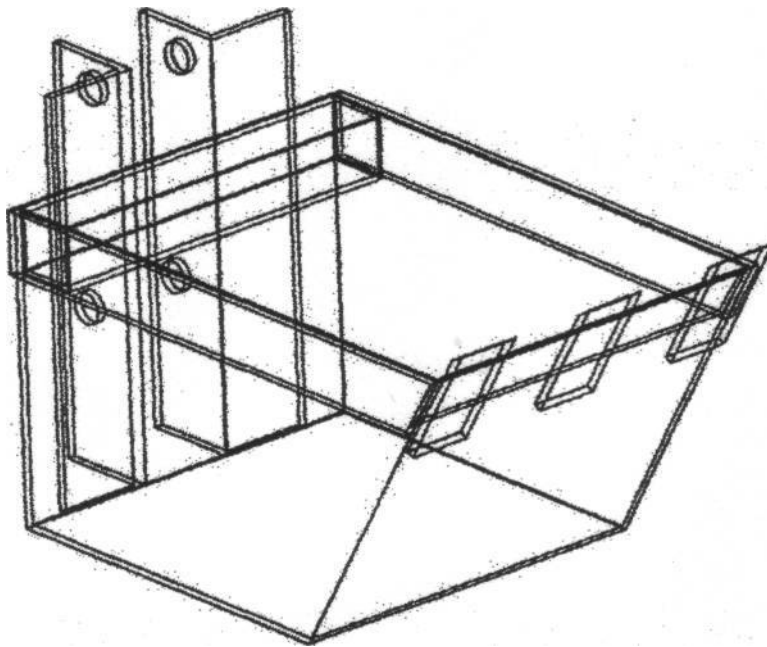
Weld the 2" x 1/8" flat pieces to the outside of both sides of the bucket. Cut the ends off to match the angle of the front of the bucket.

Weld the 2" x 1/8" flat piece to the front Up of the bucket on the inside.

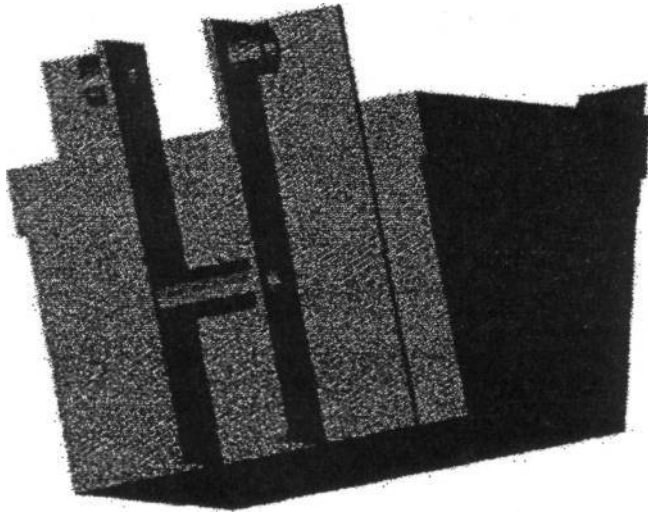
Cut three pieces of 2" wide x 3/8" thick plate to fashion the ripper teeth as shown below.



Weld the three pieces of 2" x 3/8" plate (ripper teeth) to the front of the bucket to form the teeth. The protruding edge is cut at a 45 degree angle to aid in cutting into the soil.



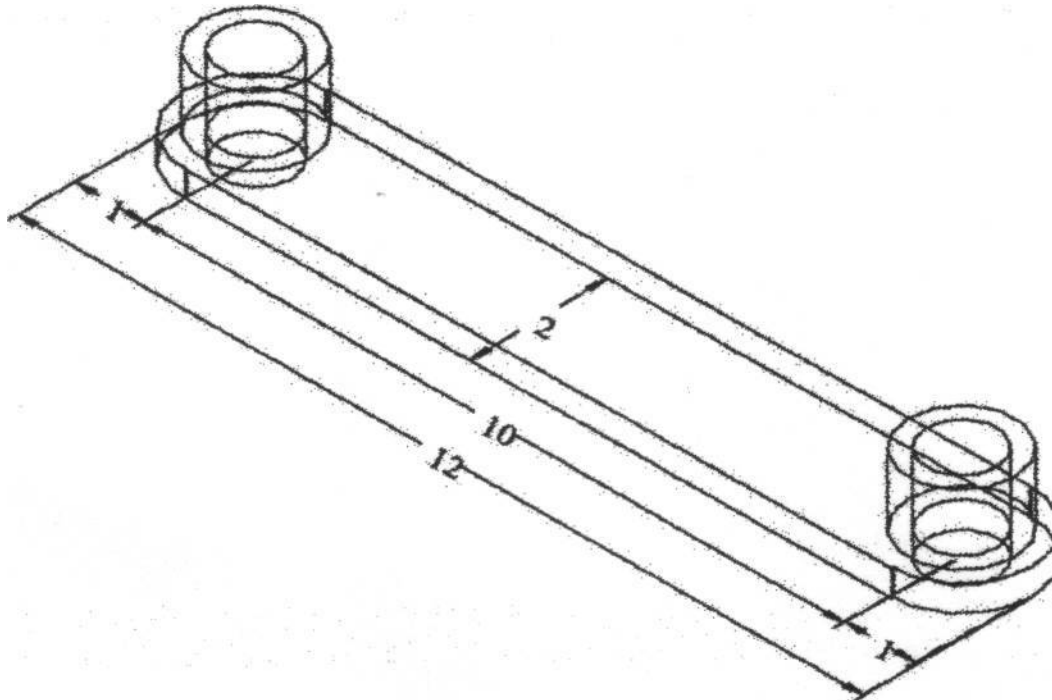
The last step to completing the bucket is to weld on the 1" ID mechanical tubing. On the top 1" holes, weld a 1" long piece of mechanical tubing to the OUTSIDES of the angle iron. On the lower holes (that fall approx. mid-line of the bucket), weld a 3" long piece between the two.



The 3" cross piece of mechanical tubing will need a grease fitting inserted
Drill and tap along the rear edge.

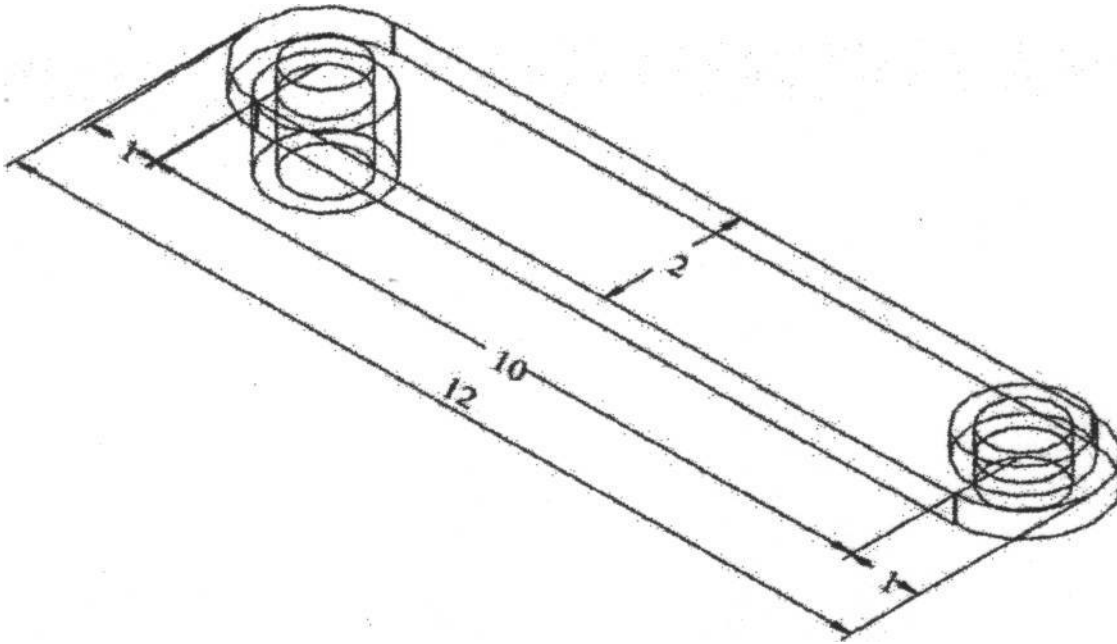
Next, cut 4 pieces of 2" x 3/8" flat bar 12" long. Punch a center point on each end of each bar that is centered along the width at 1" and is 1" back from the end. Scribe an arc across each end with a radius of 1" and round the ends off. Drill a 1" hole through each point.

Take two of the bars and weld 1" lengths of 1" ID mechanical tubing to one side to form the link shown below.

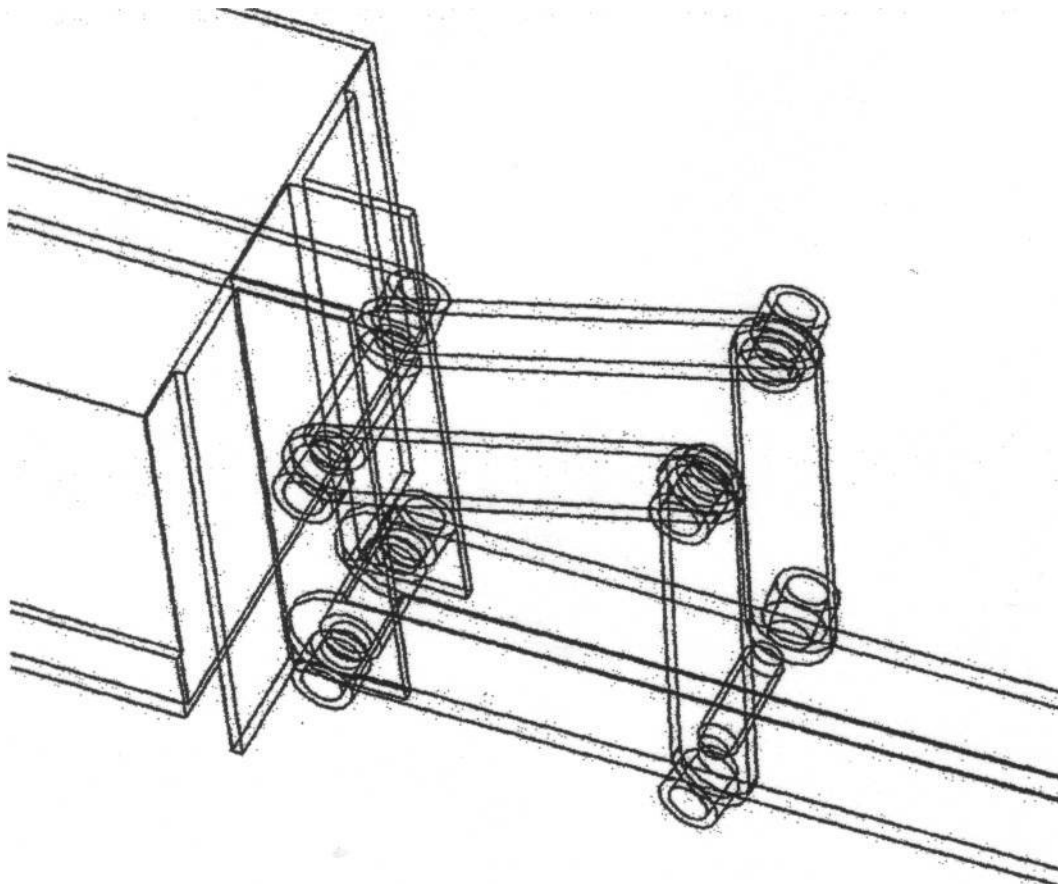


We'll call this the bottom bucket link since it will be pinned to the bucket at the lower holes.

Take the remaining two bars and weld a 1" length of 1" ID mechanical tubing to one side of the bar. Weld 1/4" lengths of 1" ID mechanical tubing to the opposite side of the remaining hole to form the link shown below.



We'll call this the top bucket link since it will be pinned to the dipper with the two longer stubs.



The previous picture shows how the links link the bucket to the dipper arm. The cylinder end will be pinned where the links intersect to form what looks like an elbow.

If you have not been cutting lengths of 1" rod to pin the parts together, you need to do so now. Insert the rods into the appropriate pin holes and double check everything for proper articulation.

The mechanical tubing that is welded to the outside of the various parts is where the pins will be fixed. To do this, you will need to drill a 3/32" (approx.) hole through the mechanical tubing and the rod. You can use either a cotter-pin or a hitch-pin to secure the tubing to the rod. The best way I found to do this is to drill a hole through one side of the mechanical tubing so that it marks the rod. Remove the rod and using a drill press drill the hole through the rod at a 90 degree angle. Return the rod to its location and complete the hole through the other side of the mechanical tubing.

With all parts pinned together and all areas fixed, recheck articulation one more time.

Congratulations!! You are now through with the fabrication part

Now is the time to disassemble all parts, grind welds and spatters smooth, prime and finish paint.

Once the paint is dry, you need to proceed with mounting the motor and pump, seat and valves. Plus, the parts should be reassembled and pinned in place.

Mount the motor on the motor mount and secure with bolts, nuts and lock washers.

The following 5 steps can be ignored if using a homemade pump bracket.

1. Slide on one half of the pump to motor coupling and secure to the motor.
2. Mount the pump to motor bracket.
3. Slide the other coupling half on the pump and mount the pump to the bracket
4. Slide the pump coupling back and place the flexible insert between the two couplings.
5. Slide the coupling snug against the flexible insert and secure to pump shaft.

Insert a SAE10 to 3/4" NPT fitting into each port on the pump and into the valve blocks in and out ports.

Insert a SAE 8 to 1/2" NPT right angle fitting into each of the 8 work ports on the valve block.

Insert a 1/2" NPT to 1/2" NPT right angle fitting into each of the 8 cylinder ports.

Thread the 3" male/male pipe coupling into the tanks 3/4" in port.

Thread the filter onto the free end of the 3" pipe coupling.

Thread the 1-1/2" to 3/4" reducing bushing into the tanks large out port.

Attach the hoses between all fittings as shown in the following diagram. Fill the tank with hydraulic fluid.

Remember to prime the pump before first start and to prime the cylinders before use.

Priming the pump involves removing the hose from the in side of the pump and pouring a few ounces of clean hydraulic fluid into the port. Then replace the hose and tighten securely.

To prime the cylinder, you will probably need an assistant. Most hydraulic cylinders come packed in the retracted position and full of hydraulic fluid. If you have left them in this state priming will be simple.

First, start the motor and have the assistant sit on the backhoe. Have appropriate wrenches on hand to loosen the fittings at the cylinders. Start with the extend port (usually the lower port) and loosen the fitting. Have the assistant slowly move the corresponding handle to send flow to the cylinder port you are working on. The fluid will push the air out in the hose out of the fitting. Please note that some hydraulic fluid may drip out of the fitting due to the fluid it comes shipped with. When the air stops hissing and fluid is steadily leaking from the fitting, tighten the fitting securely.

After priming a couple of cylinders, be sure to check the reservoir level. The fluid that is entering the cylinders will drop the level of your reserve fluid. If the fluid gets too low, air can be sucked into the system and cause oil foaming. This will defeat your priming efforts.

Repeat this procedure for each cylinders extension port

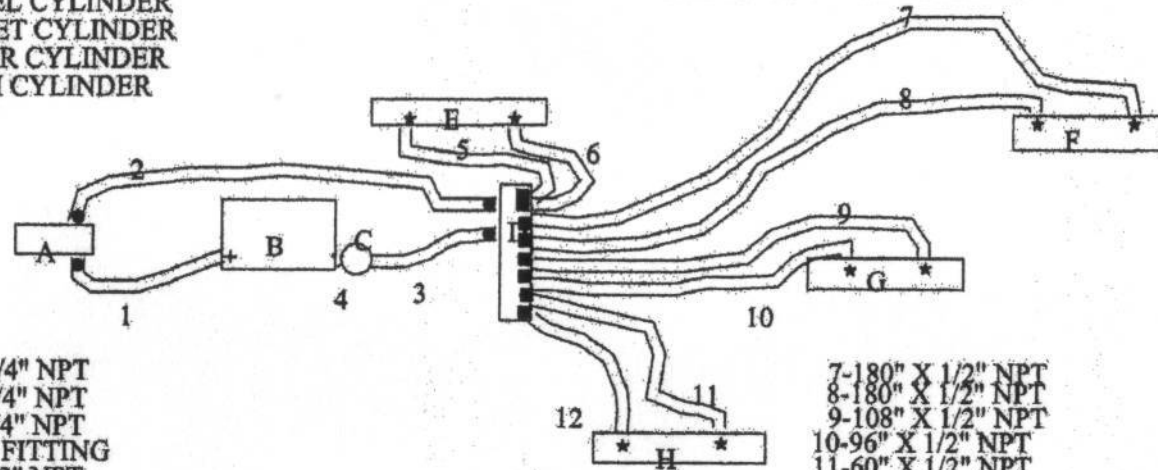
Once all the cylinders are primed to full extension, you will need to prime the retraction port in the same manner.

HYDRAULIC DIAGRAM

A-PUMP
B-TANK
C-FILTER
D-VALVE
E-SWIVEL CYLINDER
F-BUCKET CYLINDER
G-DIPPER CYLINDER
H-BOOM CYLINDER

- + 1 1/2" TO 3/4" BUSHING
- SAE 8 TO 1/2" NPT FITTING
- * 1/2" NPT TO 1/2" NPT RIGHT ANGLE FITTING
- SAE 10 TO 3/4" NPT FITTING

1-24" X 3/4" NPT
2-96" X 3/4" NPT
3-60" X 3/4" NPT
4-3" PIPE FITTING
5-60" X 1/2" NPT
6-48" X 1/2" NPT



7-180" X 1/2" NPT
8-180" X 1/2" NPT
9-108" X 1/2" NPT
10-96" X 1/2" NPT
11-60" X 1/2" NPT
12- 48" X 1/2" NPT