

Construction of a Water Pump

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Bill of Materials

Quantity	Item	Size
2	Sheet iron	4' x 8' x W
1	Solid shaft CR 1018	20' x 2"
1	Square tubing	4" x 4" x 40' x Vt"
1	Square tubing	4" x 4" x 22' x A"
1	Pipe	16" x 15' x W
1	Sheet iron	19" x 19" x W
1	Strap iron	6' x 6" x 1/4"
1	Strap iron	15' x 4" x %"
1	Sheet iron	3' x 16" x %"
2	Tires	15"
1	Strap iron	14" x 2" x 1"
1	Pipe keyed	6" x 2" I.D.
1	Key stock	6" x W
3	Flange bearings	2" I.D.
2	Water bearings	3" O.D. 2" I.D.
1	Pipe	3" I.D. x 16" x W
2	Axles	5 lug to fit 15" rims
12	Bolts with nuts	2" x %"
6	Bolts with nuts	2" x W
1	Gallon paint	
1	Gallon primer	
1	Gallon paint thinner	
1	Gallon degreaser	

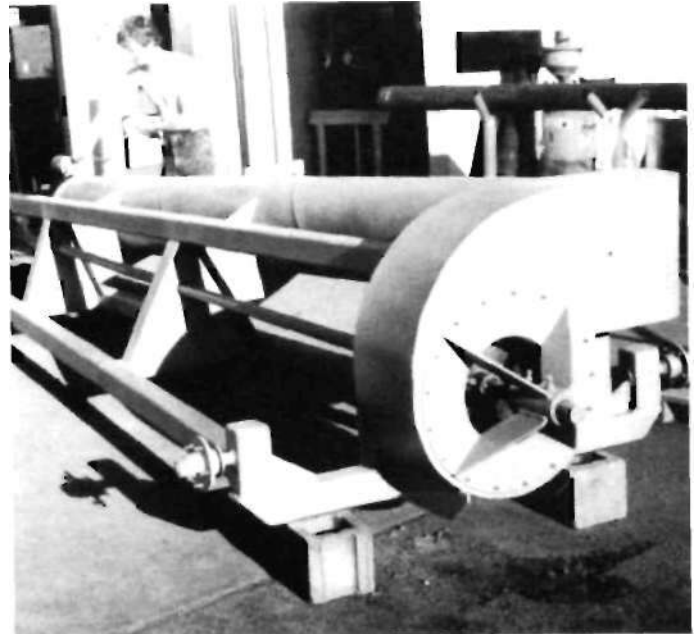


Photo 1

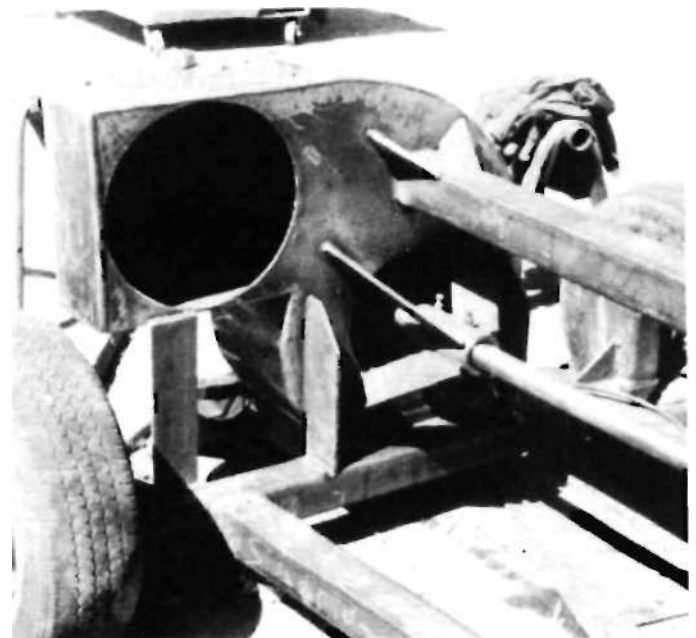


Photo 2

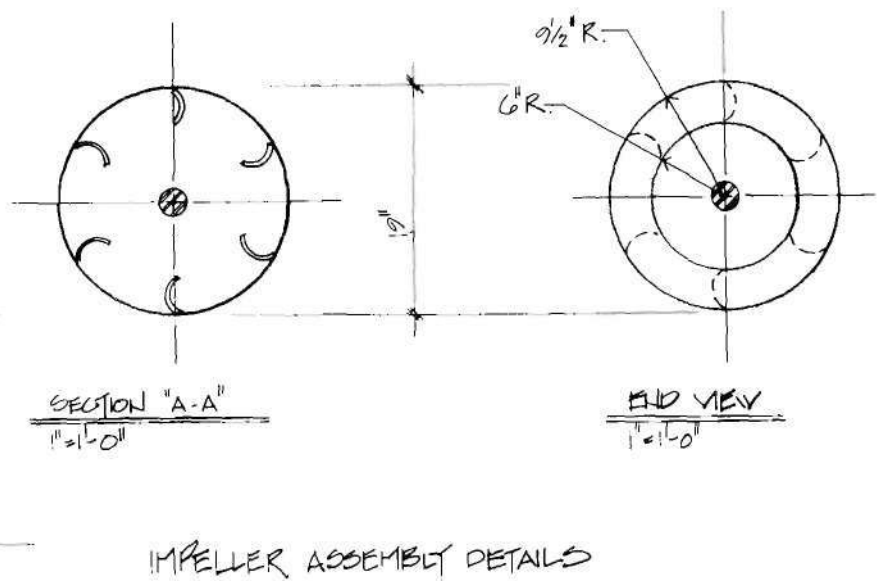
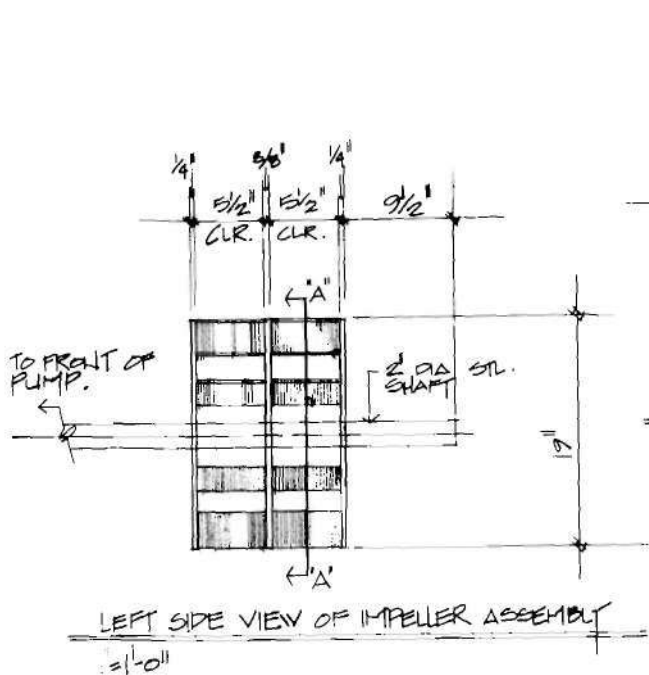
Bowl Assembly

Step 1.) Cut out the two sides to the bowl out of $\frac{1}{4}$ inch plate. The front side is 40 inches wide and 34 inches tall. The back piece is 56 inches wide and 34 inches tall. When the pieces are cut out with a center punch, punch a hole in the center of the back of each side to facilitate the use of a hand circle cutting attachment. Cut the two holes in the sides. The front hole is 1 foot diameter and the back hole is 21 inches in diameter.

Step 2.) Cut a plate 23 $\frac{1}{2}$ inches by $\frac{1}{2}$ inch to fit on the back of the bowl. Cut a 1 foot hole in the middle of the plate to match the one on the front of the bowl.

Drill 17 holes $\frac{1}{2}$ inch in diameter all the way around the plate and the bowl. When the holes are drilled, insert the bolts in the holes so the heads of the bolts were on the inside. Weld the bolt heads to the bowl, solid from the inside.

Step 3.) Using scrap pieces of square tubing, cut and tack weld to the inside of the bowl. The tubing welded on the inside will be used as supports while bending a metal strip around the bowl.



IMPELLER ASSEMBLY DETAILS

Step 4.) Cut out a strip of sheet metal $12\frac{1}{2}$ inches by 8 feet by V^* inch to fit around the front and back pieces of the bowl. The strip of sheet metal should be tack welded to the underside corner. Heat is applied to the strip of metal before bending it around the bowl.

Step 5.) Bend the front side of the bowl around to meet the back piece. Weld all around the $12\frac{1}{2}$ inch by 8 feet by $\frac{1}{4}$ inch strip, connecting it to the side pieces.

Step 6.) Cut out the braces inside the bowl.

Step 7.) Cut out one flat piece of sheet metal, 20 inches by $12\frac{1}{2}$ inch by $\frac{1}{4}$ inch, and weld it under the bowl on the left side.

Impeller Assembly

The impeller is one of the most important parts of the pump because of the fact that it controls the water flow.

Step 1.) Cut out 13 blades out of $\frac{1}{4}$ inch plate. Use one as a pattern. Reinforce the piece to be used for a pattern, so it will have the strength needed when bending the rest of them over it.

Step 2.) Cut two circles, 19 inches in diameter, out of the $\frac{1}{4}$ inch sheet metal. Cut out of the 19 inch circles another 1 foot circle.

Step 3.) Cut a 19 inch diameter circle out of a piece of $\frac{3}{8}$ inch sheet metal. Cut a 3 inch hole in the middle of that for a piece of keyed pipe 6 inches long with a heavy wall thickness, and a 2 inch inside diameter, to be welded into the $\frac{3}{8}$ inch plate.

Step 4.) Tack weld 6 fins to one side of the $\frac{3}{8}$ inch plate in a circular motion with $6V^*$ inch spacings. Tack weld the $\frac{1}{4}$ inch plate on top of the fins, turn the assembly over and follow the same procedure. When it is all tack welded together, fasten it to an "Acorn Table" to prevent any distortion that might occur while welding.

Frame Assembly

The frame consists of three major parts: the two sides and the back.

Step 1.) Cut two pieces of 4 inch by 4 inch square tubing, 17

feet and 2 inches long, along with a piece of square tubing 5 feet long for the back. Bevel each end to a 45 degree angle. Cap the 45 degree cut with a piece of $\frac{1}{4}$ inch scrap metal.

Step 2.) Weld the two 17 feet, 2 inch pieces of square tubing to the 5 foot piece on the back, leaving a 1 foot space on the right end of the back and a 6 inch space on the left side. Weld the frame so it angles toward the front.

Tongue Assembly

Step 1.) Cut a piece of 4 inch by 4 inch square tubing, 3 feet 7 inches long. Cap one end with a scrap piece of 1 inch plate.

Step 2.) Cut two pieces of 1 inch plate 2 inch by 6 inches. Drill 1 inch holes in each end of the pieces, and weld them to the capped end of the square tubing, with 2 inch spacings between the two.

Step 3.) Cut two pieces of $\frac{3}{8}$ inch plate, $7\frac{1}{2}$ inches by 6 inches, and weld one on top and one on the bottom for a tongue support.

Step 4.) Weld the tongue to the frame. Connect with a piece of 4 inches by 7 inches by $\frac{1}{4}$ inch plate.

Bearing Carrier Assembly

Step 1.) Cut the bearing carriers out of $\frac{1}{4}$ inch sheet metal with the front carrier measuring 4 inches across the top, $21\frac{1}{4}$ inches tall, 15 inches wide at the bottom, with a 2 inch hole 11 inches from the bottom. The second carrier measures 4 inches across the top, 20 inches tall and $15\frac{1}{4}$ inches wide at the bottom, with a 2 inch hole $10\frac{1}{2}$ inches from the bottom. The third carrier measures 4 inches across the top, 22 inches tall, and $24\frac{1}{2}$ inches wide at the bottom, with a 2 inch hole 10 inches from the bottom.

Wheel Assembly

Step 1.) Cut two pieces of 4 inch by 4 inch square tubing each 7 inches long. Weld a $\frac{1}{4}$ inch plug on the end of each. Cut a hole in each piece $1\frac{1}{4}$ inches in diameter and 3 inches from the end that was plugged.

Step 2.) Weld the axle into the 1 1/2 inch hole that was made in the square tubing.

Shaft and Bowl Supports

Step 1.) Cut eight pieces of flat iron 13 inches by 4 inches by 1/8 inch and cut a 45 degree angle on each end of the shaft braces. (See photo 2)

Step 2.) Cut two pieces of flat iron 12 1/4 inches by 4 inches by 3/8 inch for the underneath bowl supports. Cut one more support, 15 inches by 4 inches by 1/8 inch for the end of the bowl. (See photo 3)

Assembly

Step 1.) Weld the two underneath bowl supports to the frame. The first support is welded 18 1/2 inches on the left side and 2 feet on the right side. The end bowl support is welded 8 inches in from the right side. Lift the bowl onto the supports, tilt back 2 1/2 degrees, and tack weld to the supports.

Step 2.) Weld the front bearing carrier to the frame.

Step 3.) Insert the 20 foot by 2 inch shaft through the bearings and the bearing carriers. Bolt the bearings to the bearing carriers.

Step 4.) Cut two pieces of 3 inch inside diameter pipe, each 8 inches long. Install one of them over the shaft, along with the water bearing, which fits inside of the pipe, followed by the impeller.

Step 5.) Block the shaft up so that it is 12 inches higher in the front than in the back. The reason for this is to make it high enough in the front to reach the power take-off on the tractor, and yet low enough in the back to set low in the water. When it is leveled out and centered in the bowl, weld the shaft braces onto the pipe which holds the shaft up.

Step 6.) Weld the bearing carriers to the frame, spacing the front 5 feet 7 inches from the middle, and 5 feet 7 inches from the middle to the back bearing carrier. When all the bearing carriers, shaft braces, and bowl braces are welded solid, cut the top piece of 4 inch by 4 inch square tubing 17 feet, 6 inches. Weld it to the tops of the bearing carriers, and to the bowl where two gussets are welded for supports. (See photos 2 and 4)

Step 7.) Weld the axle assembly to the frame, using gussets for supports.

Step 8.) Cut a 16 inch hole in the front right hand corner of the bowl. Butt the pipe onto the hole, allowing no "stick in" because of cutting water flow down, and weld it allowing the end to drop 6 inches lower at the front of the pump. Weld braces to the middle two bearing carriers which hold up the 16 inch pipe.

Step 9.) Weld a piece of 2 inch by 1/4 inch strap metal around the end of the pipe to keep the water pressure from pulling the hose off.

Step 10.) Grind all the weld spatter from the metal, and degrease it. Apply one coat of primer, let it dry and apply 3 coats of kelly green paint. (See photo 1)



Photo 3



Photo 4