

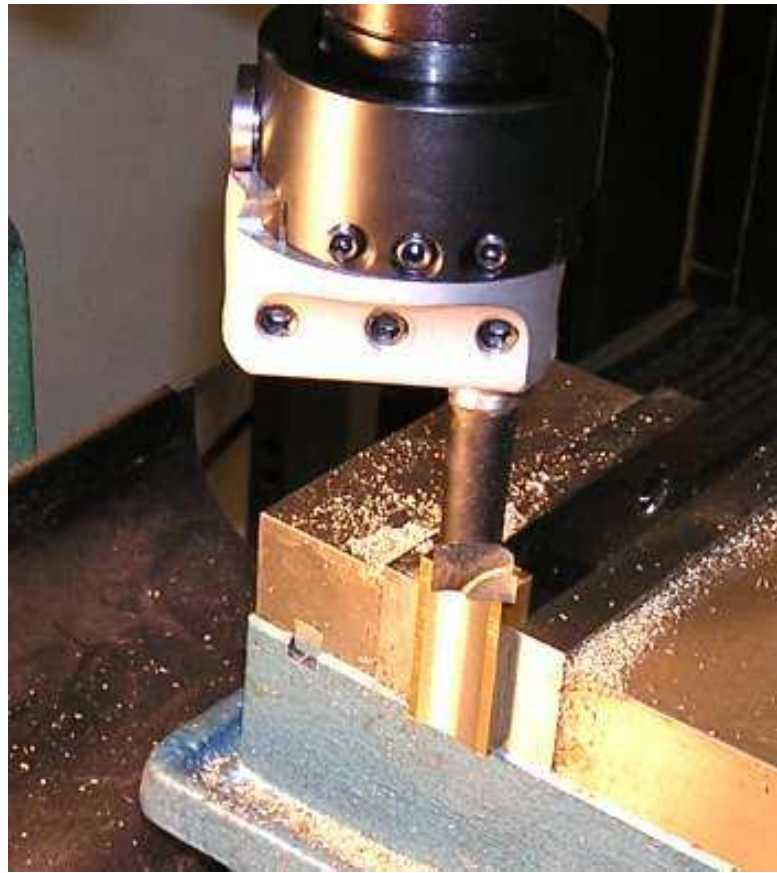
# Shay - Electrical System III - Headlamp Con't

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The headlamp was started in Part II. The numbers boards appeared to be a chore so the project was set aside for a couple days. We pick up here with making the number board bases and then the number board cover and finally the headlamp legs. The last part is the base that goes between the lamp and the smoke box or tender.

**Number Boards Bases:** The number board bases were made from 2" long pieces of 1/2" X 1" brass bar. A 3/8" thickness could also have been used. The first step was to machine a 1.125" radius on the bottom to match the outside of the case. The photo shows using a boring head for this operation. A fly cutter could also have been used. This was the first use of the new boring head ---- worked great.



The next step was to mill ~0.15" off the top surface. A 3/16" wide section on the one end was not milled. That section will become the hinges. This huge tool is a milling cutter that came with the mill/drill. I didn't think I'd use it so set it aside without cleaning the shipping grease. This is the second time I used it. The four individual tool bits can be removed for sharpening.



Two hinges were formed by milling a 1/2" slot in the end.



The outside of the hinges were then milled leaving 1/8" wide hinges.



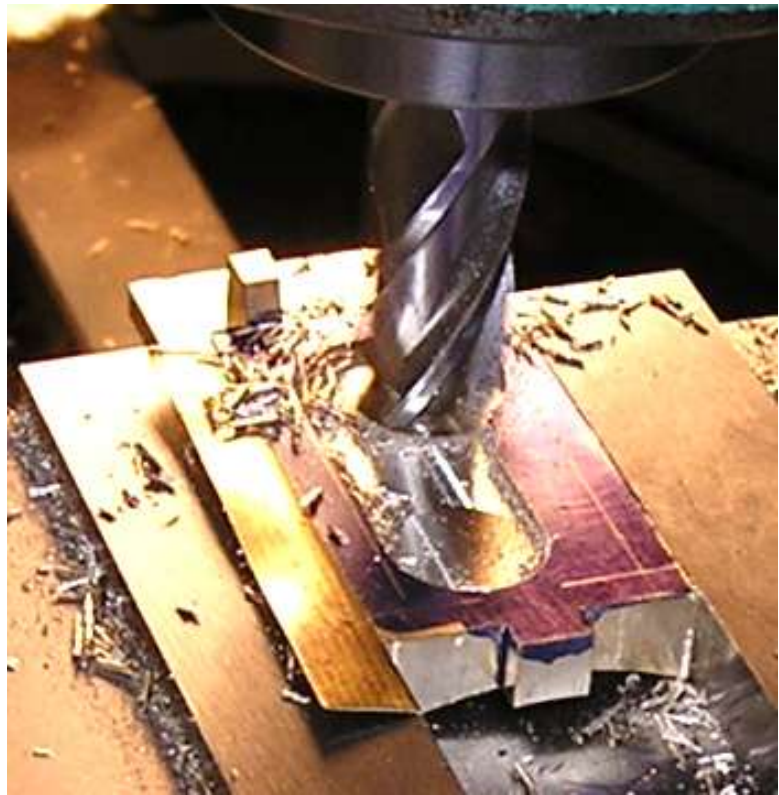
The bottom of the hinges were then milled to leave a gap between the hinges and the case.



The other end of the number board base was then milled on the sides leaving a 1/4" wide 1/8" long stub for the cover retaining screw.



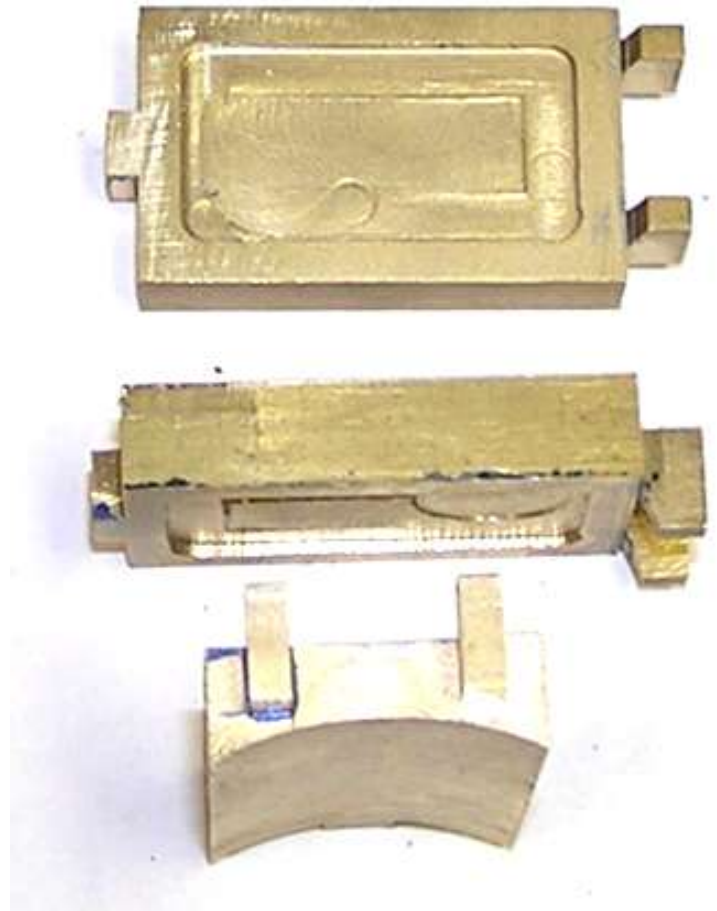
A ~ 0.050" deep recess was milled in the center of the number board base. A 1/8" lip was left on the top, bottom and back end. A ~ 3/16" lip was left on the hinge end. The recess was first rough milled with a 1/2" diameter mill.



The recess was finished with a 3/16" diameter mill. The surface of the recess need not be completely smooth. If one is going to have lighted number boards then the center of the recess must be drilled or milled all the way through, leaving a shoulder to retain the number panel. I plan to place the number panel in the recess and skip the back lighting



This shows 3 of the finished board bases.



**Covers:** The covers fit over the number board panel to retain the number panels. The cover was made from 0.040" brass sheet. The first step was to make strips 7/8" wide. The shop doesn't have a shear so the brass was cut with the band saw and then the edges squared in the mill as shown on the right.



The next step was to silver solder a 3/32" OD- 1/16" ID tube to the end of the strip.



The next step was to cut the hinge end to mate with the hinges on the base. A rough cut was made with an abrasive cutoff disk in the Dremel. The cut was finished with a file.



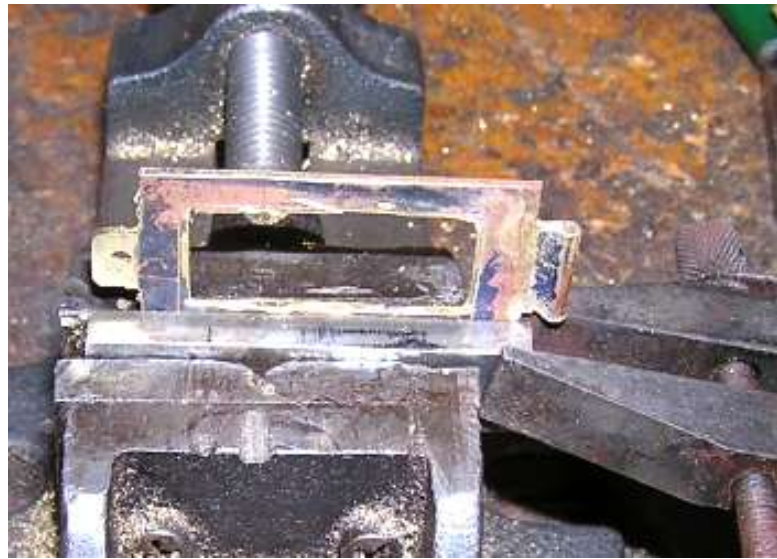
A 1/16" hole was drilled through one side of the hinge as close as possible to the center of the tube in the cover. The cover was then bent slightly as necessary to line up the tube with the hinge hole. A pin was inserted in the hinge hole & tube and the cover then aligned so it was straight. The cover was clamped to the base, the pin was then removed and the 1/16" drill run through the hinge hole & tube to drill the other hinge hole.



The retaining screw end was then trimmed and the screw hole drilled and tapped. The center hole was then rough cut with the Dremel cutoff disk.



A piece of CFS was aligned and clamped along one of the edges of the opening and then the steel and brass were clamped in the vise. The edge was then filed until it was even with the steel. The steel makes it a snap to file a straight edge in the brass. This process was repeated on the other three sides



The base and cover were then bead blasted. The number panel was made on the computer. Looks like the number could be a littler larger. The hinge pin is temporary. The cover will removed for painting.



**Assembling:** The number board bases were fastened to the case with brass screws through the center. The bases and the back were then silver soldered to the case. The center of the bases and the part of the case underneath can then be drilled/milled open to back light the number board if desired.





The next step was to make the lamp legs. I used 0.030" thick brass and bent the pieces in the vise ---- and bent again and again till the upper angle to look right. The legs were then clamped to a piece of sheet steel, the case set on top with soft solder paste in-between the joints. The joints were then heated to melt the solder. The soft solder held the legs in place while holes were drilled and tapped for four 0-80 screws on each side. The legs were then trimmed at the back end.



The base was made of 18 gauge steel. The base legs were cut from a scrap of 1/16" wall 3/4" square steel tube. The bottom of the legs were bent to match the curvature of the smoke box. The brass stiffening angles are for appearance only and match the prototype.



This shows the assembled and painted lamp. The lamp unit is retained by a #2 screw in the front bottom of the case. The number panel at this point is printed on plain paper. Photo paper or transparently paper will be used to make permanent boards.

At a break from track work at Mill Creek Central I mentioned that the headlamp would use LEDs. Ed Carl mentioned that some of the guys had trouble with incandescent bulb life in headlamps due to heat. They solved the problem by insulating the headlamp from the smoke box. Good point! The LEDs and plastic lens are probably even more heat sensitive. Teflon washers and inserts were considered but then I remembered some 0-80 nylon screws. Neoprene washers for #6 screws used to seal the bottom of the tender tank were placed between the lamp legs and the top of the base. The excess screw length will be trimmed if they don't melt first.



Since the lamp is insulated from the base, the ground must be picked up from the base. The photo shows that the wire from the back of the lamp runs down and under the base where the grounding lug is secured with a #4 screw. The ground lead connects to the resistor side of the lamp. There is a black grommet in the 1/4" wire hole in the back of the lamp. The 4.5 volt lead has a big knot inside the lamp to prevent it from being pulled out. Small wire nuts were used to connect the lamp pigtailed to the wires out the back.



The photos above show the Cass No 5 lamp beside my model. Close enough! (The little bumps on the model are water drops --- the shay had just been given a bath.) The photo below shows the lamp in a better perspective.



The lamp was tested in the dark and it seemed to provide plenty of light. However, a light for the water and pressure gauge are required to run at night. Then there is the problem of getting the wire from the headlamp to the cab --- maybe through a handrail. Then there's wiring for the tender headlamp. The intention was to make this the last of the electrical pages but have now decided to put the remaining items in Electrical IV.

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