Shay Engine Mount

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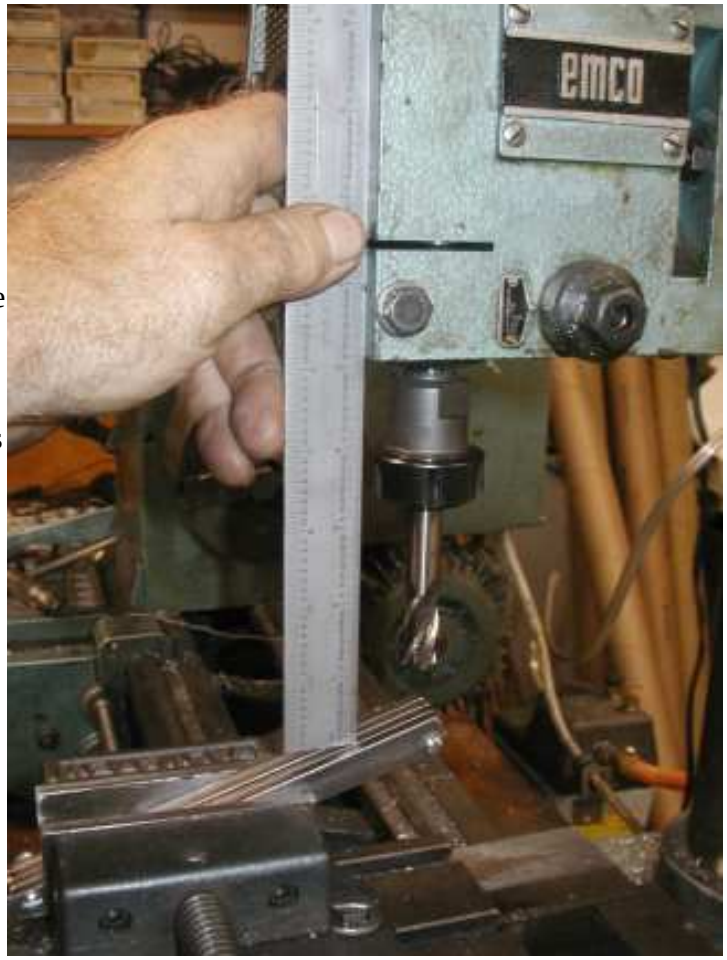
Note: The Engine Mount was fabricated after the frames were made, many months after the engine was put together.

While making the line shafts, drive shafts and universal joints I kept thinking I'd have to make that dreaded engine mount before the drive train could be tested. Mid way through the universal joint fabrication the lathe drive belt broke. It was going to take over a week to get a replacement belt. So, I was faced with lawn work or making the engine mount. That was a no brainer.

Kenneth welded the parts of his engine mount. My welds are unsightly and about the size of a scale brick so I chose to silver solder the parts of the mount. Sound silver soldering requires that the joint be heated through unlike a weld where the heat can be localized. Slow thorough heating also heats nearby clamps to the point where they go limp, so forget about clamping parts to be silver soldered. The parts should be pinned or screwed together. I prefer to screw the parts together because it permits everything to be checked out before the actual soldering.



The vertical bars were the most difficult to machine because there are non right angles on each end. The photo on the right show how I used the bottom of the milling head as a reference point. I merely moved the bars back and forth under the ruler while adjusting the angle of the bars until the difference in height of two reference points indicated that the bars were at the correct angle. (As we see later, I didn't get it exactly right --- the angles were off a degree or two.)

Note that all four of the bars are bolted together so that they all are milled in one operation insuring that the four are identical.

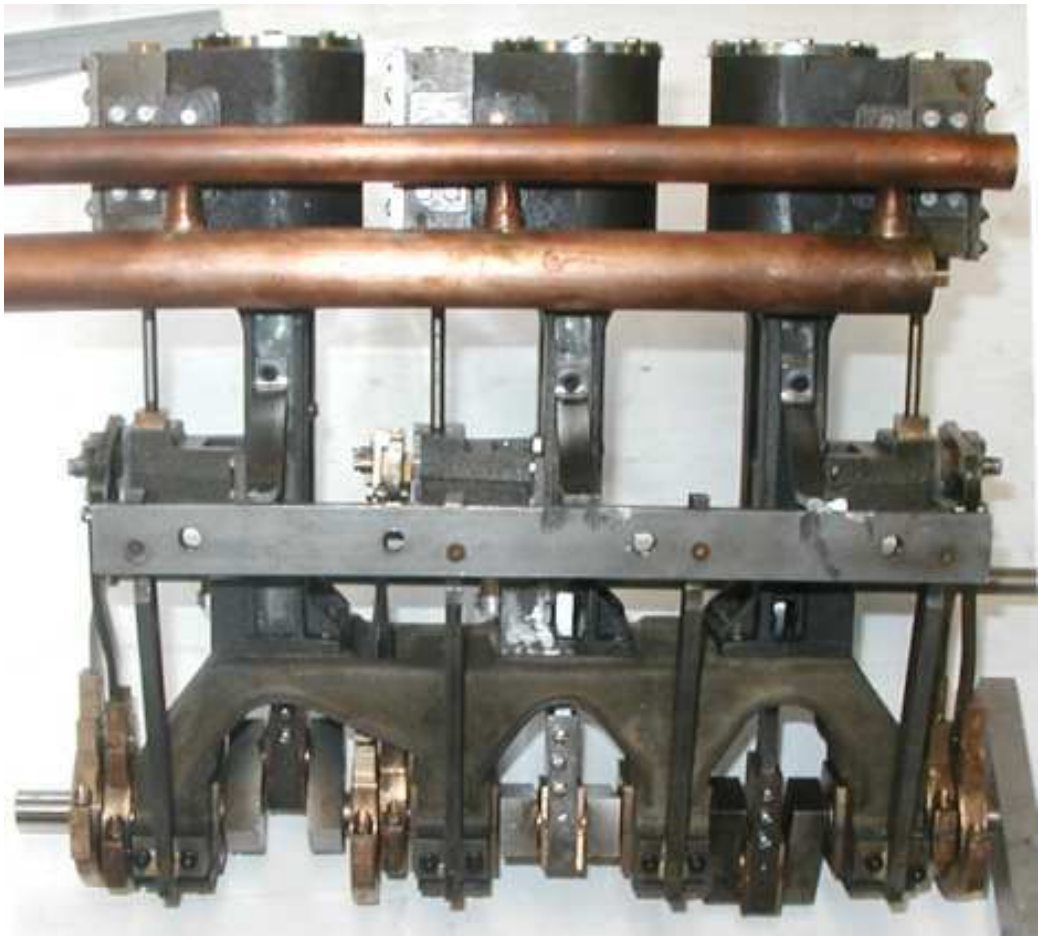
This shows the actual machining of the angled flats in the bars. After both ends were machined, screwed to the top and bottom bars and confirmed to be correct, the ends with the bolts were cut off.

The photo below shows the parts of the mount. (Note that one of the engine mounting holes in the bottom bar is out of line. This was done to avoid a hard spot in the crankcase casting.) The top and bottom bars were slotted and tabs were left on the vertical bars so that everything interlocked. This design made the mount sturdy when held together by the eight screws and kept everything straight during the soldering. The initial slots in the top and bottom bars were about 0.030" deep. After I screwed everything together I found the the bottom to stick out about 1/8" too far. (Slight error in the angles.) I corrected this by making the slots deeper. After everything checked out OK, I took it apart again, cleaned the joint areas, fluxed and then silver soldered everything together. I used very thin solder strips in the joints along with small pieces of solder at the edges of the joints.

The parts of the lower bar between the pads were sawed out after everything was soldered.

The finished mount is show on the right attached to the frame. When I checked the assembled mount earlier, I found the upper bar had to be in the lowest possible position on the frame channel to get the lower attachment point at the correct height. This in turn left a gap between the upper bar and the underside of the top of the frame **I** beam. This gap was sufficient to permit attaching the upper engine supports to the top of the upper bar rather than to the top of the frame **I** beam. This make the frame mount a single unit attached to the frame by four 1/4" bolts.

The completed engine mount is shown on the right. I decided to use an upper engine support on all three cylinders.



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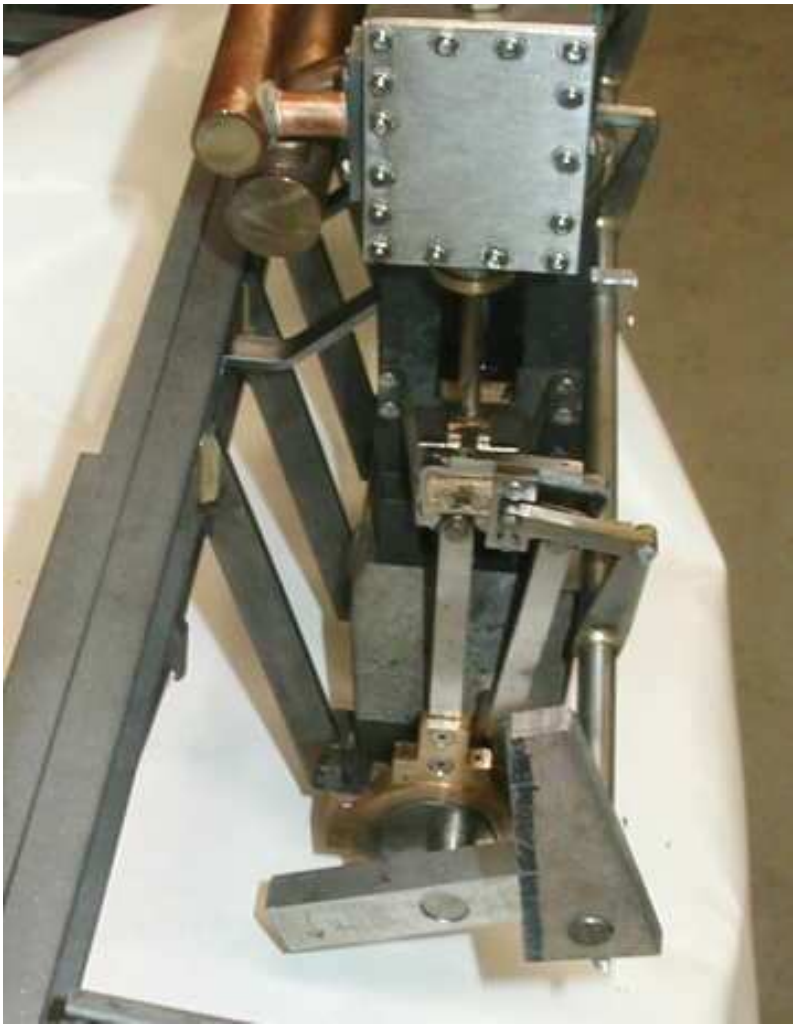
This is another view of the completed mount. It seems to be very sturdy and looks great. Sure beats yard work.

After pushing on the engine while holding the frame steady I feel the mound adequately secures the engine to the frame The frame is also rigid in the vertical direction. I

did note that it is possible to push the top of the engine from side to side slightly. The frame **I** beam flexes some by rotating around the long center axis. This will be reduced when the firebox area of the boiler is attached to the frame. Lima had a frame cross member between the **I** beams just in front of the firebox. I'll install a similar brace if I'm still uneasy about the frame rigidity after the boiler is installed.



Update 12/06/03: The mount as described above was attached to the frame with four 1/4" bolts. The bolts went through the frame from the inside into threaded holes in the mount. This worked fine except that the boiler must be removed to install or remove the mount. That turned out to be a poor design (it was really dumb!) So, changed design so that the bolts are installed from the outside through the mount and screw into the frame. Since the frame already had 1/4" holes, couldn't thread the holes for 1/4" bolts. Instead, installed E-Z LOK thin wall threaded inserts in the frame. The insets used were threaded 3/8-16 on the outside and 1/4-28 on the inside. Those 1/4" holes in the frame had to be enlarged (drilled) to 5/16" and then tapped 3/8-16 for the inserts. The following website has more detail on these inserts:
http://www.buckeyetriumphs.org/technical/EZLOK/EZLOK.htm

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