

Shay Truck Machining I - RH Journal Box

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I mentioned elsewhere that my limited machining skills are self taught. This leads me to frequently do things the hard way. Often I use a cumbersome technique that I'm pretty sure I can do rather than trying a new way. This reminds me of a comment by a friend after I was critical of people using a much less than optimal software tool because they understood that tool. My friend observed that if your only tool is a hammer, most your tasks begin to look like nails. Please view my techniques from this perspective.

The truck castings consisted of two pedestals, four journal boxes and four wheels. Rather than describe how I machined each type of casting, I decided to discuss the RH Journal Boxes and the Wheels in detail and skip the rest. This note deals with the Journal Boxes. The wheels are discussed in a separate note.

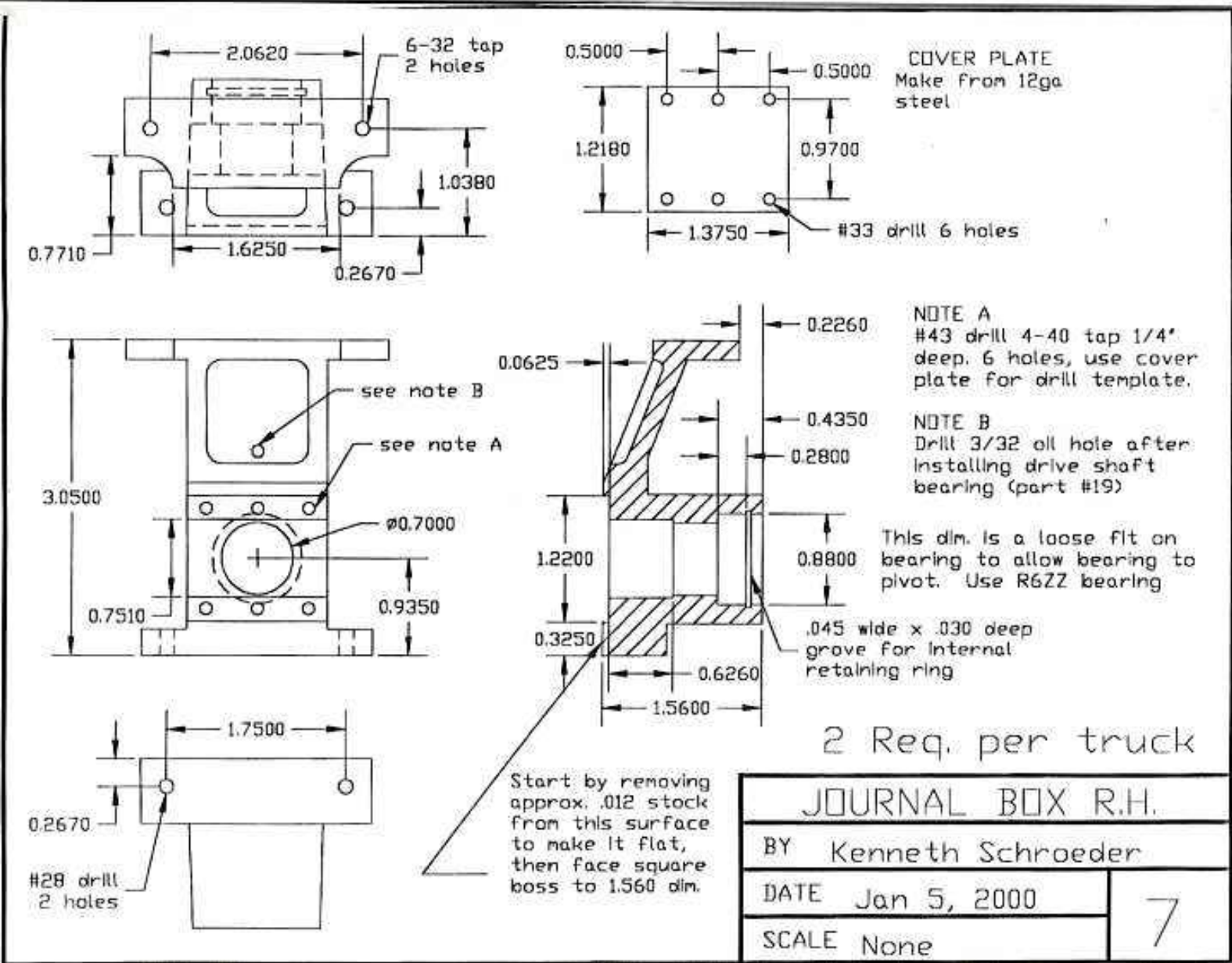
Journal Box Castings: The RH Journal Box casting is shown on the right. This is exactly as I received the casting from Kenneth except that the sprue has been sawed off. (The dark rectangle on the top is where the sprue was sawed off.)



The three photos below show the finished Journal Box. The left photo is a rear view and shows the axel bearing installed and retained by an internal retaining ring. The middle photo shows the front of the Journal Box; the rectangular recess will contain a bronze line shaft bearing. The right photo shows the front with the cover that retains the line shaft bearing in place.



.So how did I get from the rough casting to the finished casting? Well, I following the instructions in the drawing below. This is one of the 85 drawings that Kenneth makes available to show how the castings should be machined. I bought the drawing set that also includes three pages of photos before I bought the castings. This enabled me to judge whether I could actually do the machining before I laid out the big bucks. The drawing is presented here with Kenneth's permission.



The first thing I did was to examine the rough casting and the drawing and try to visualize where material had to be removed from the casting. In spite of fooling around with it for at least 30 minutes spread over a couple days, I didn't notice the curved recesses in the top until I was ready to mount the castings to the side frames. These recesses are clearly shown in the view in the upper left corner of the drawing. Fortunately, I didn't overlook anything that caused me to remove material where I shouldn't have.

The first thing I did to the Journal Boxes was to take a very fine cut on the bottom as shown on the left and a very fine cut to the top as shown on the right. The rough cast front and back surfaces were used as the reference. These fine cuts provided smooth reference surfaces for future measurements. These cuts were made on all 6 Journal Boxes before moving on to the next step.



The next thing was to take a light cut on the front face as suggested in the drawing above. This is shown on the left. I used a fly cutter. This cut was made on all six Journal boxes.

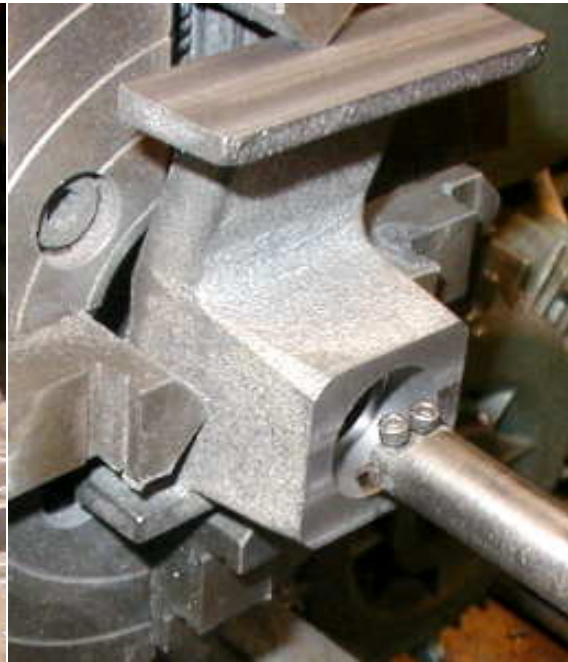
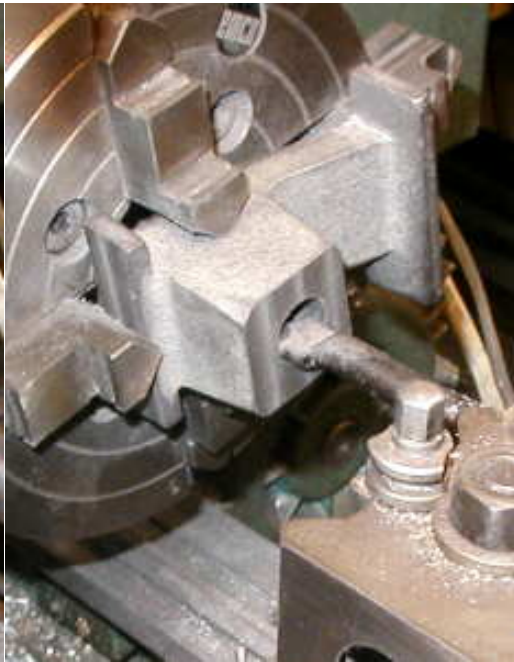
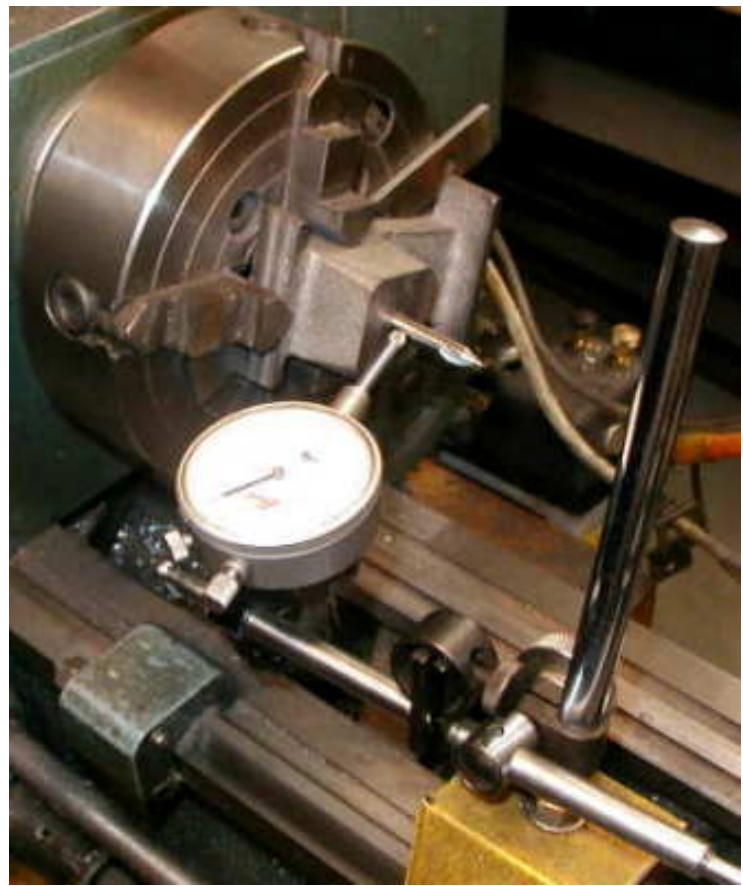
The cut was then taken on the back to achieve the 1.56" dimension. Once the correct cutter height was set on the first box it was very easy to do the other five boxes.



At this point the top, bottom, front and back of each box was smooth. The overall height was still too large and would be adjusted later. Each box was examined to determine the center of the square boss and relate it to the height of the centerline through the bearing. It was found that the bearing center line could be in the middle of the square boss and material could be removed later from the base to achieve the correct bearing centerline height. A hole was then drilled through the center square boss of each Journal Box. This hole was the same size as a large center drill. The center drill was then inserted in the hole and used to align the box in the four-jaw lathe chuck such that the hole was on the lathe center as shown on the right.

The hole through the box was then enlarged with a 5/8" drill (Silver & Deming) as shown on the left below. The hole was then bored to the correct stepped diameter as shown in the center photo below. The bearing was tested for a loose fit in the larger diameter hole. The last step was to cut the groove for internal retaining ring using a boring bar with a very narrow tool bit as shown on the right below. All these operations were completed on each box before it

was removed from the chuck.





The bottom of each each Box was then trimmed as required to achieve the correct bearing centerline height as shown on the left. Note how the angle fixture is used to insure that the base is perpendicular to the front. Once all the bases were correct the top of each box was trimmed as necessary to achieve the correct height as shown on the right.



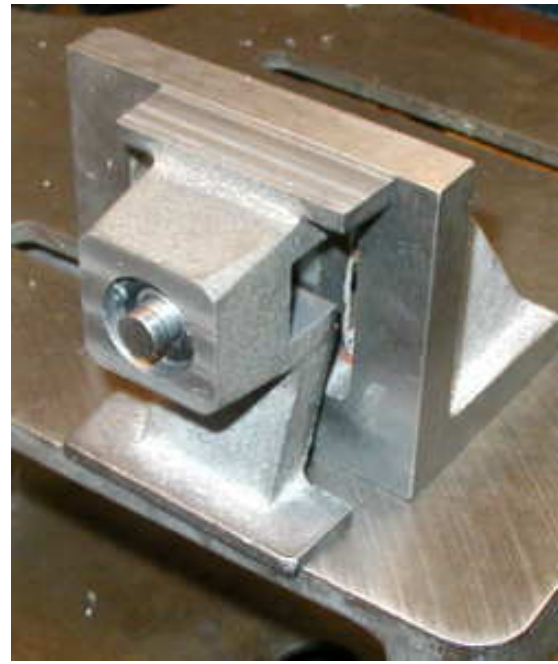
The next step was to machine the front surface. The left photo shows machining the recess for the cover plate. The right photo show milling out the deep recess for the line shaft bearing.



The next problem was to determine the locations of the mounting holes in the top and bottom. These holes are centered on the bearing centerline. To accomplish this a dummy axel was turned and mounted to an angle plate as shown on the left. The location of this axel in relation to one of the vertical edges of the angle was then measured. Each box was then slid onto the dummy axel and the position of the axel used to mark off the correct location of the



mounting holes.



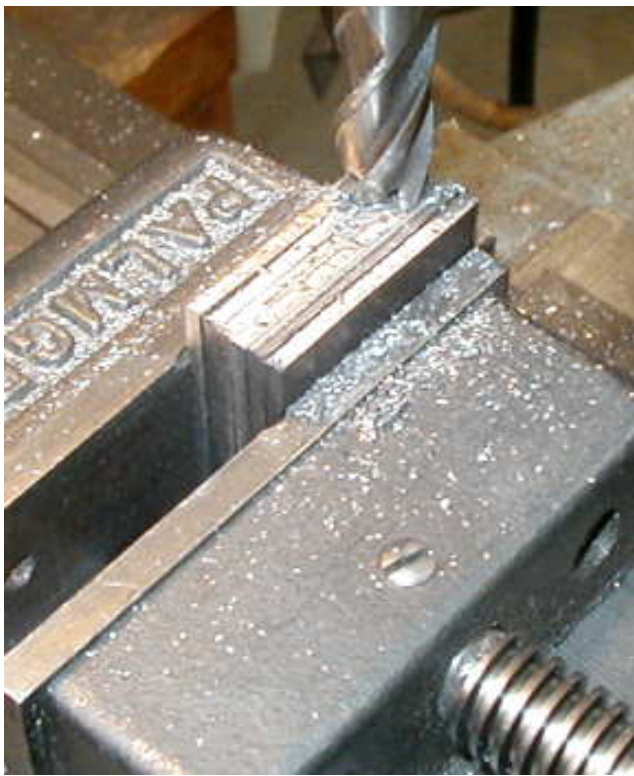
The photo on the above right shows a box in position to mark the base. Once all six bases were marked, the dummy axel was repositioned and the mounting holes in the six tops marked off. The drilling of the mounting holes was deferred until the Journal Boxes were test positioned in the side frames.

As mentioned previously, when fitting the Journal Boxes to the side frames I discovered that one more machining operation was required on the top. The photo on the right shows this operation.



Cover Plates: When I started to write this note I discover that I didn't have photos dealing with the cover plates for the RH Journal Boxes but did have some for the LH Journal Boxes so decided to use them. The same technique was used on both sides.

I've always had trouble making square plates with straight edges. The technique that works for me is to saw the plates a little oversize and square them up in the mill as shown in the left photo below. I next very carefully marked off and drilled the holes in one of the plates. This plate was then used as a pattern to drill the holes in the other five plates. Each plate was then used as a pattern to drill the holes in the Journal Boxes. I carefully positioned a plate on a journal box and drilled one hole as shown in right photo below. I then tapped that hole and used a screw to secure the plate. Once secured, the plate was used as a pattern to drill the other five holes.



This wraps up the Journal Boxes. The machining of the wheels are discussed in the next note.

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