# Shay Trucks

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The starting point for the trucks was the castings purchased from Kenneth Schroeder. The photo below shows the castings for one of the three trucks. Not show are the castings for the brake system which I plan to discuss in a separate part. **Note: Later, when I made the line shafts and universals I decided to change the trucks slightly. This change is included at the end.**

The upper left two castings are the LH Journal Boxes. The upper right two castings are the RH Journal Boxes. The two castings in the middle of the upper row are the Pedestals. The four castings in the bottom row are, of course, the wheels.

The first thing I did was to machine all the castings to the correct dimensions. The next thing was to cut, drill, thread and shape the many required flat pieces. The final step was to assemble everything. I'm going to concentrate on the various parts and how they all fit together in this note. There is information on the machining and fabrication of the various parts in the accompanying Shay Truck Machining notes.

**Side Frames:** The parts for the two side frames of one truck are shown on the right. The upper group is for the left side frame and the lower group is for the right side frame. The two sides are different because the drive shaft and gears between the drive shaft and axels are on the right side. The Journal Box castings have been machined at this point. The remaining parts are made from steel sheet, bar and angle stock. The blocks that hold the bearings in the LH Journal Boxes (upper part of photo) are machined from aluminum stock

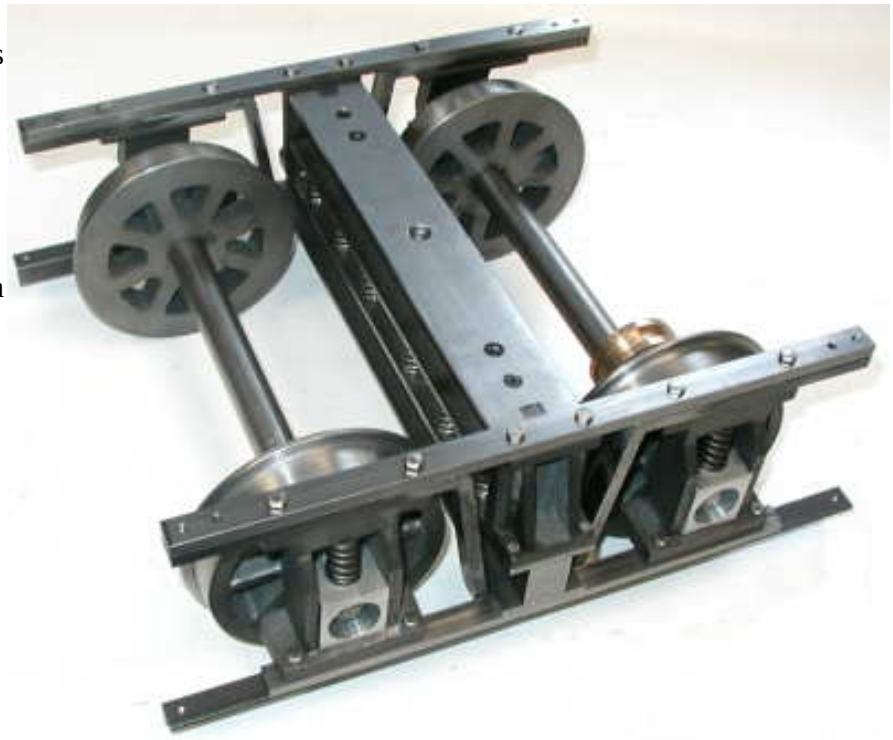
The assembled side frames are shown below. I was a little too close when I took these two photos which caused the bars to appear distorted. As you will see in the later photos, those pieces of angle are not curved.

**Wheels & Axels:** The machined wheels are shown in photo on the right. The right side wheels have bevel gears attached that will mesh with pinion gears on the line shafts. The axels were made from cold finished steel bar. The bronze disk is an eccentric used to drive a pump that feeds water from the tender to the boiler. This eccentric is provided on only one axel.

The assembled axels are shown in the lower left photo and the assembled axel - side frames are shown on the lower right. There is a ball bearing in each Journal Box. The nuts on each end of the axel hold the axel in the bearings.

**Spring Planks:** The trucks are sprung just like the prototype as shown in photo below. The part below the springs is the bottom spring plank. The pedestal castings on each end are attached to the bottom spring plank. The top spring plank is above the springs and free to move up and down between the pedestals. The springs push the top plank up. There are two screws from the top plank to the bottom plank that limit the the upward motion of the top spring plank. One of these screws is visible to the right of the left most two springs. The screw at the other end is partially hidden by a spring.

The photo on right shows the spring planks in position on the truck. The bottom spring plank and the pedestals are attached to the side frames The top spring plank is free to move up and down against the springs. The locomotive frame rests on the top spring plank.

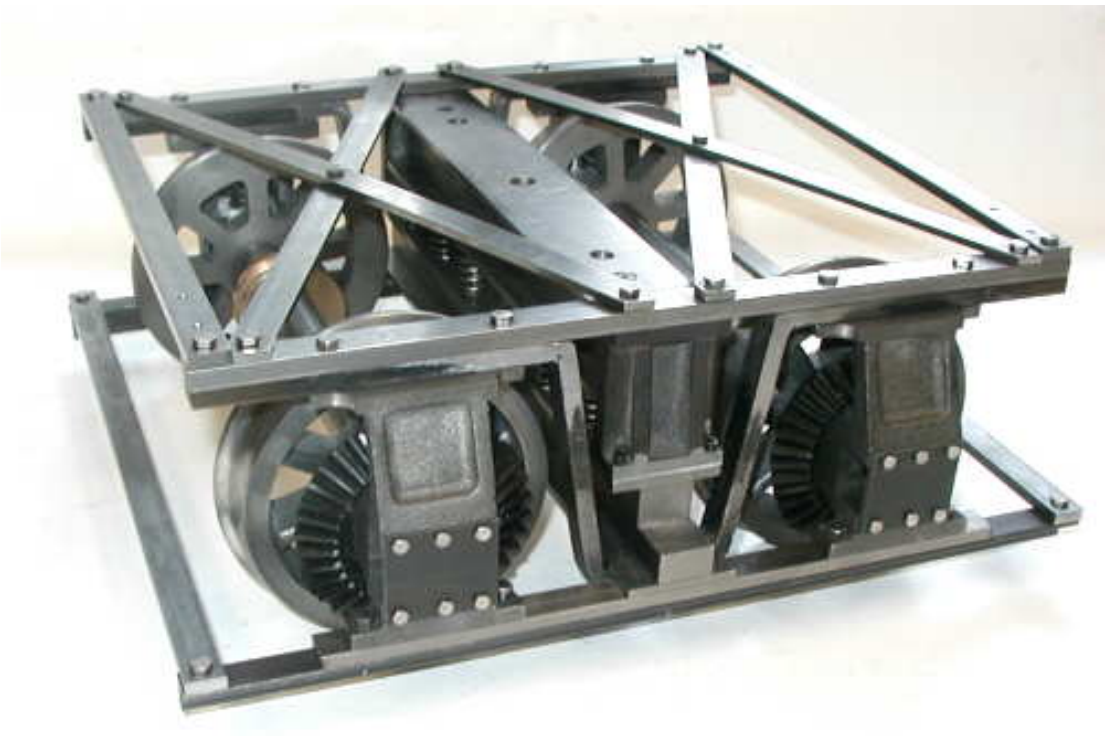


Note: I deviated from Kenneth's design of the spring planks. He made the planks by welding two channels and two flat bars together. I screwed two flat bars and a rectangular bar together. The exterior dimensions of the two designs are identical.

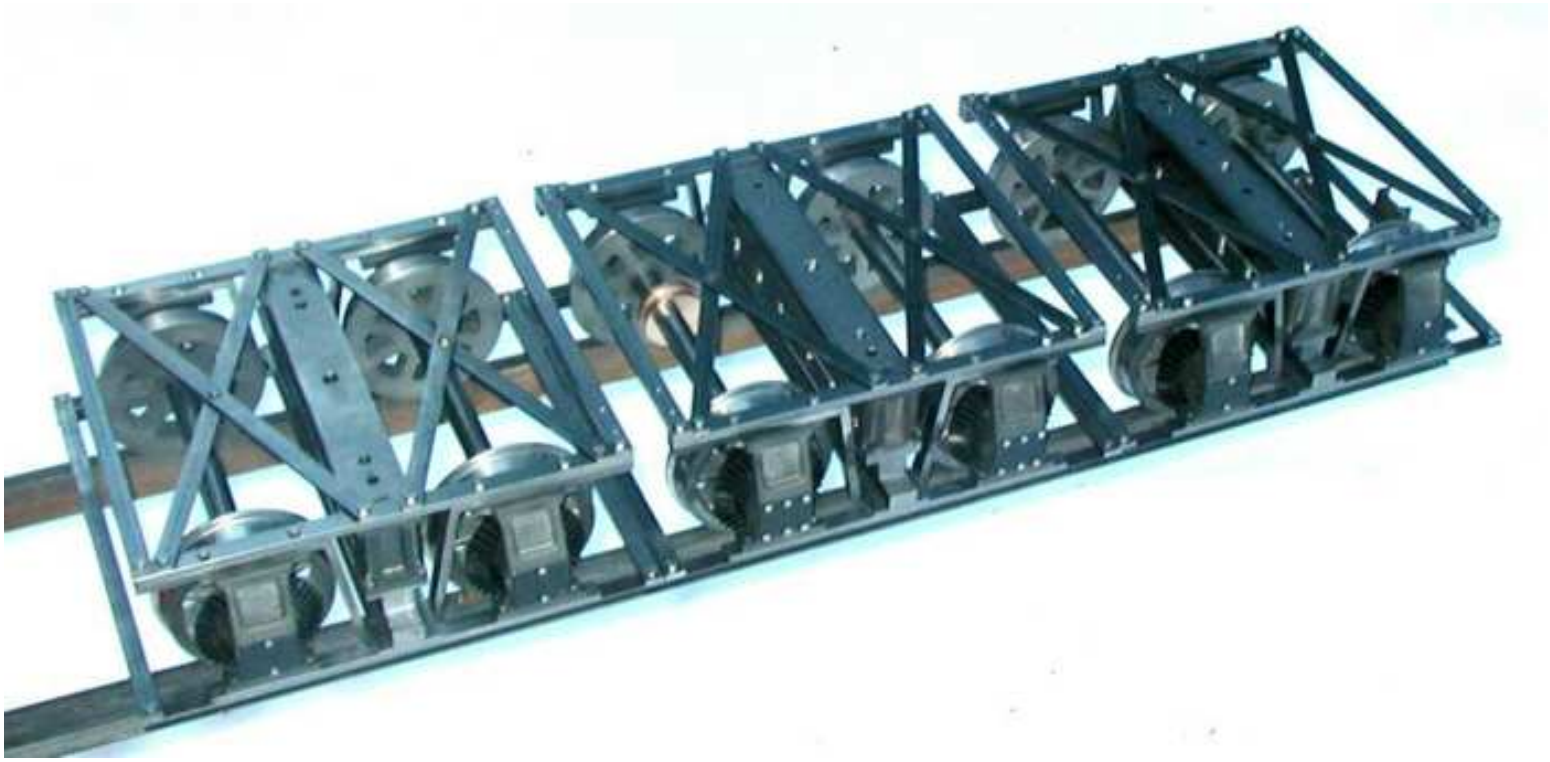
**Braces:** The photo at right shows the completed basic truck with the eight braces between the side frames. These braces make the truck very rigid.

**Left Side:** This is a shot of the left side with the journal box covers in place.  The bearings on this side are sprung with a very stiff spring. .

**Right Side:** This is the right side of the truck. The journal box plates cover the recess for the line shaft and line shaft bearing.



This is the completed set of three trucks.



**What's missing?** I decided to call the trucks finished at this stage, clean up the workshop and move on to the next part of the project. The following four areas will be completed later:

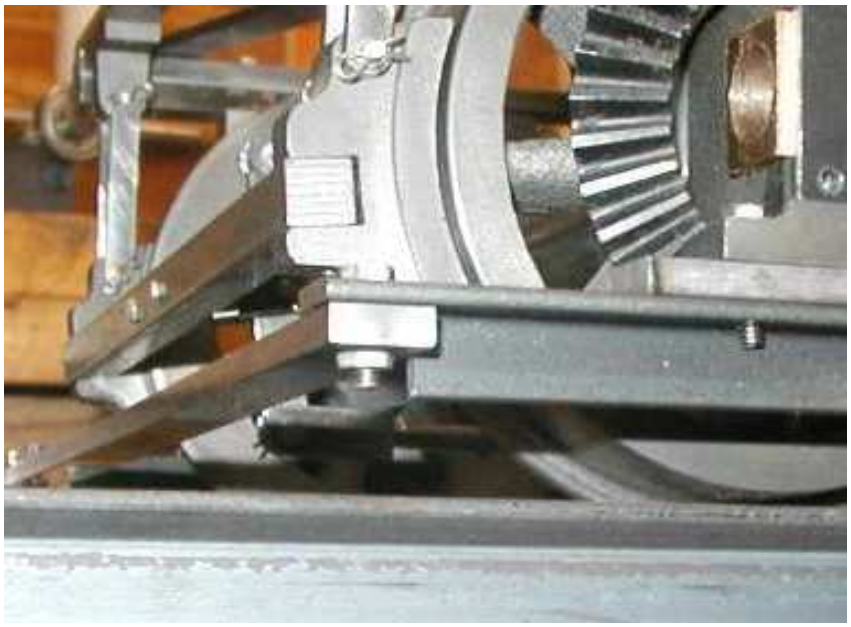
1. **Water Pump:** The water pump must be built and installed on the middle truck. That will be done with the rest of the feed water system.
2. **Pivot Block & Rollers:** The connection between the frame and trucks is via a pivot block mounted to the top spring plank. The frame is stabilized by rollers also mounted on the top spring plank. The pivot block and rollers will be fabricated when the frame is constructed.
3. **Line Shaft and Pinion Gears:** As mentioned previously, the line shaft and pinion gears are mounted to the right journal

boxes. These will be constructed as part of the drive shaft - universal - line shaft system.

4. **Brakes:** The brakes are also mounted to the trucks and are operated by a steam driven brake cylinder mounted to the frame. I had intended to put off the brakes until everything else had been built and, running. However, after observing how easily the the trucks roll, even with considerable load and recognizing that my track will have over 5% grades, I decided brakes are a necessity. I plan to build the brake system after the frame is finished and mounted on the trucks.

The trucks weigh 27 pounds each at this point. When all the missing pieces are installed, the weight will likely increase to about 30 pounds.

**Modification:** Some months after making the trucks I added the line shafts and universals. I decided to use a slightly larger diameter universal ring than specified by Kenneth. This in turn caused interference with the lower tie bar. To eliminate the interference I moved all the lower tie bars from above the angles to below the angles as shown on the right. I had to cut out a section of the vertical side of the angle as seen in the photo. The tie bars had already been drilled for a clearance hole so a nut was required on the attachment screws. (Maybe some day I'll make new tie bars with tapped holes.) A flat head screw is used in locations directly under the universal rings to provide additional clearance.



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