# 2 Rail Conversions

By

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# Two Railing

- In the 21st Century two rail O Scale modelers have a wide choice of scale locomotives and rolling stock produced by various manufacturers for the 3 rail hobbyists that can be converted to 2 rail operation.

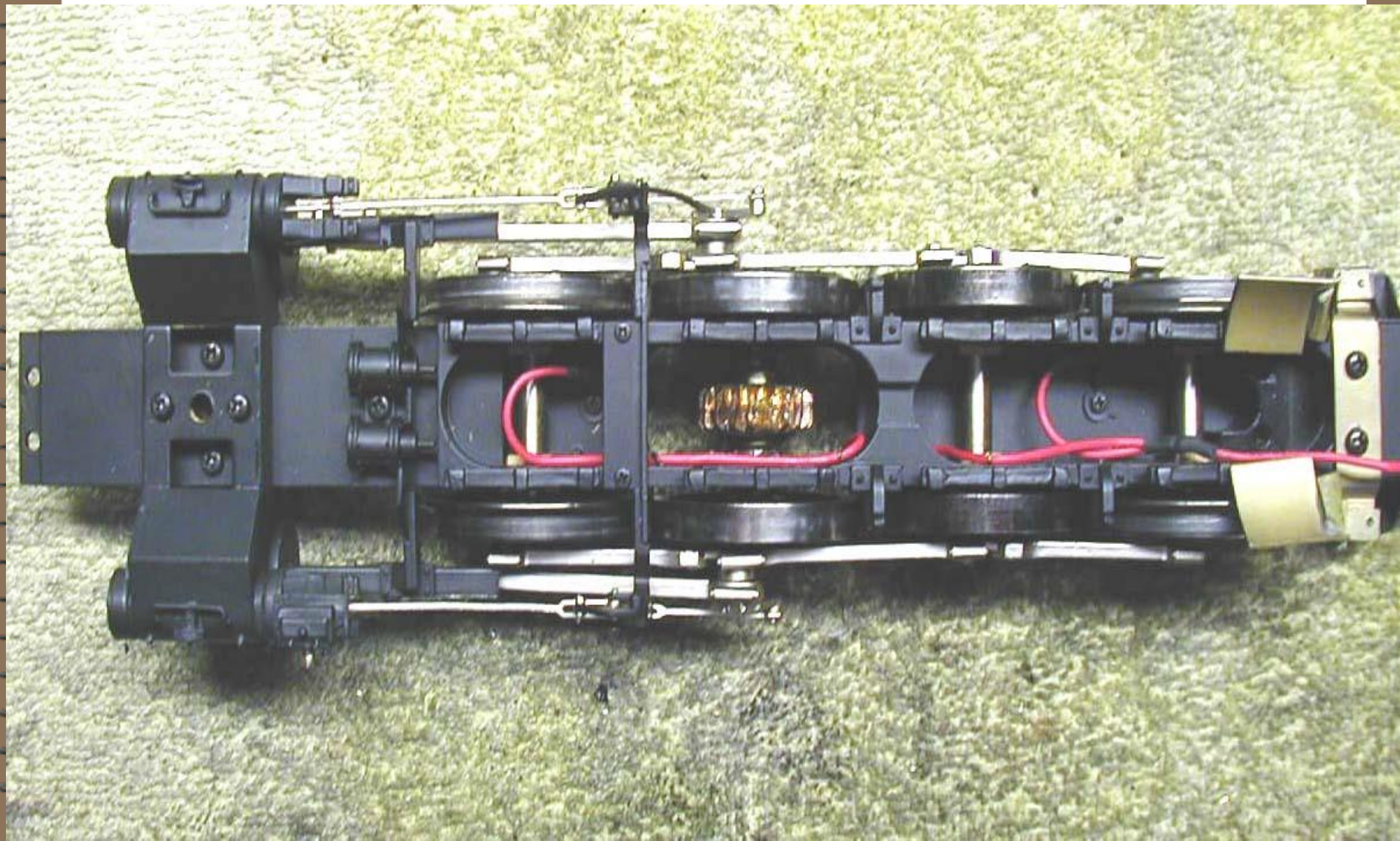
# Steam Locomotives

- Over the past 2 years, I have converted several 3 rail locomotives to 2 rail for various modelers.  Following are some photos showing the work done on some of these engines.  In all cases, except the Lionel 0-6-0t switcher, the original driver centers were utilized and new scale tires insulated for 2 rail operation were machined from steel bar stock.

# Sunset PRR M-1 Mechanism

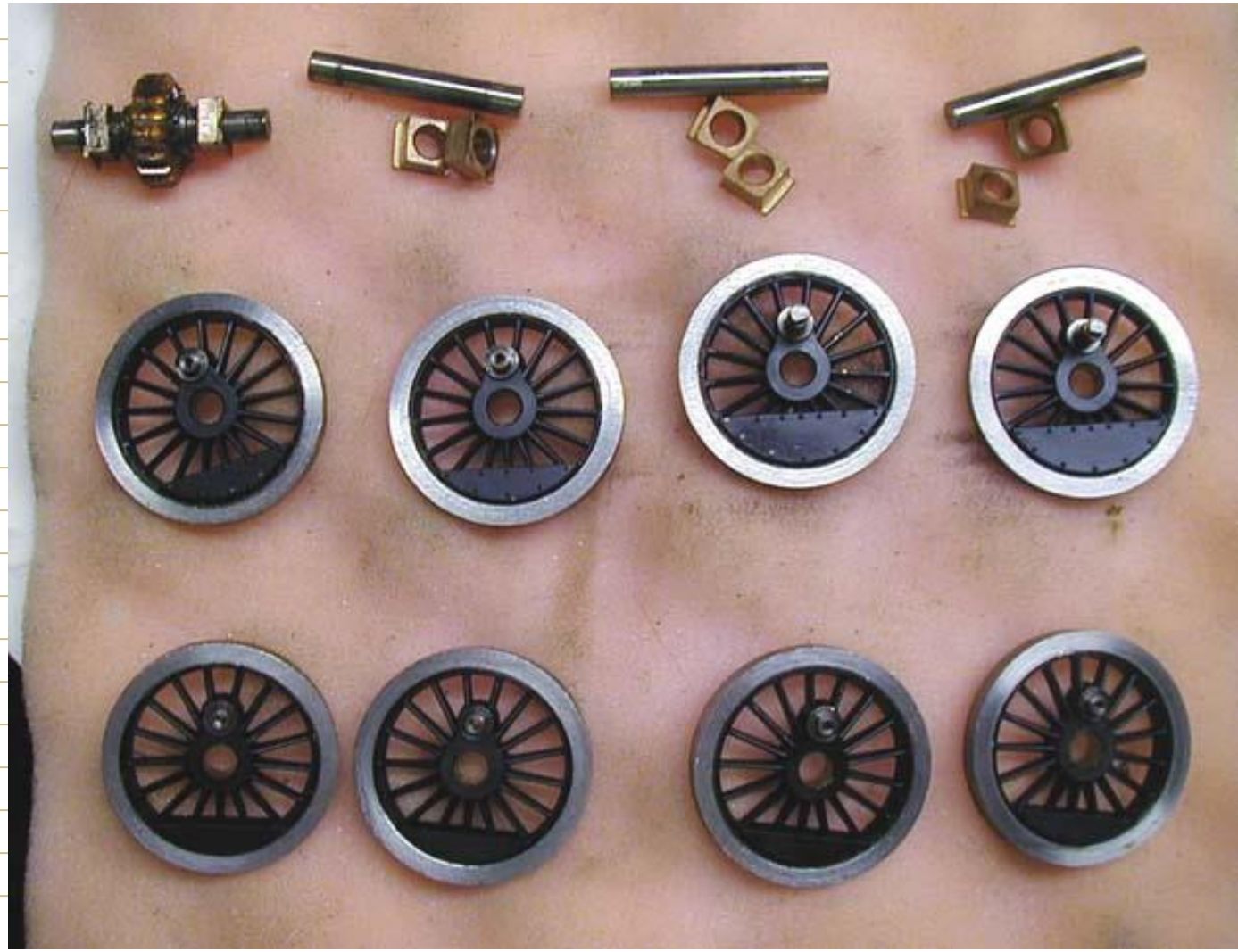
- The following slides show the steps in a typical driver conversion. This customer wanted blind center drivers. He did the rest of the conversion in his own shop.

# 3 Rail Mechanism



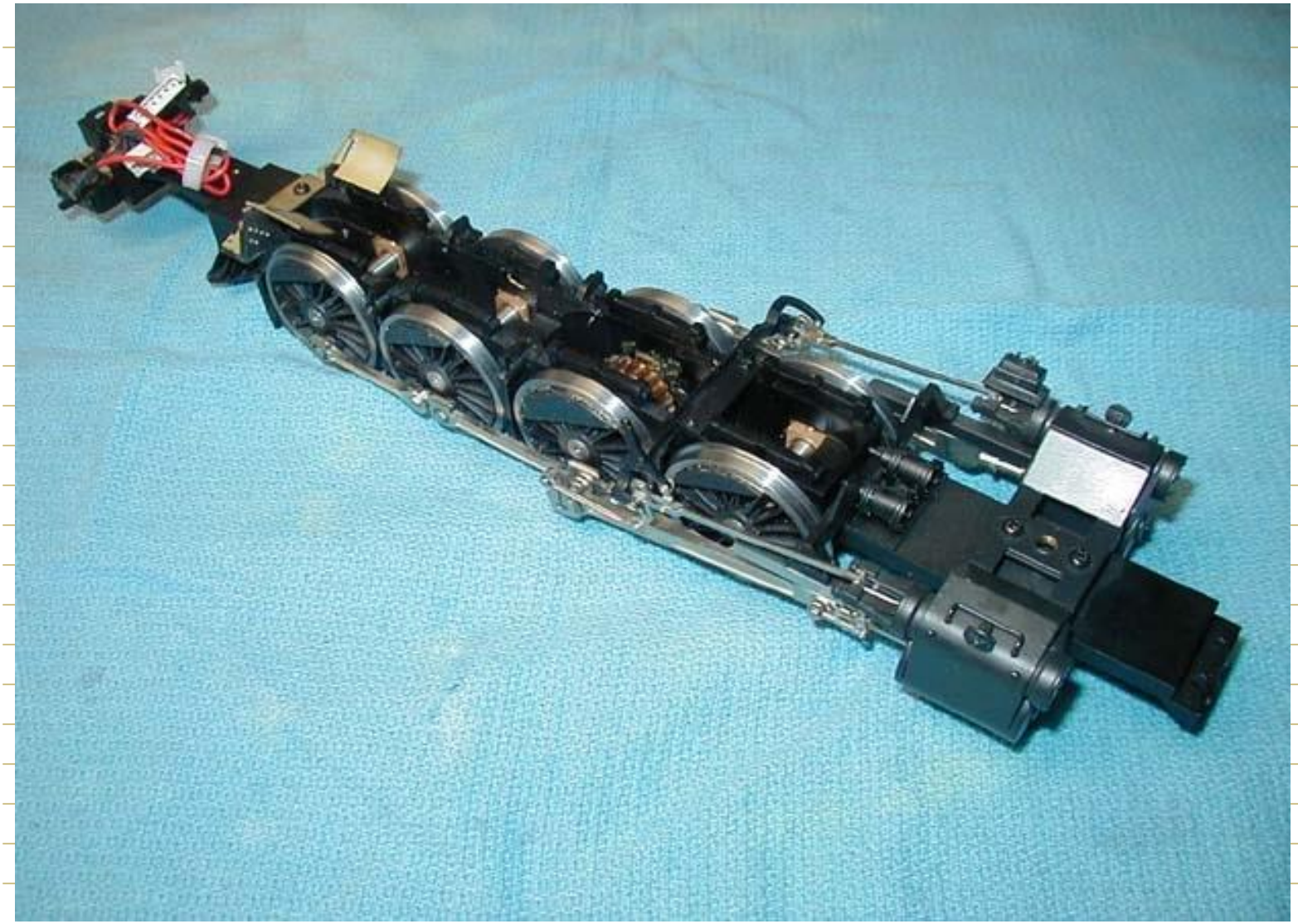
# 3 Rail Mech Disassembled

# Drivers with New Rough Tires



# Drivers w/Finished Tires

# Reassembled Mechanism



# Finished M-1a

- The M-1a model's owner sent me a photo of the reassembled and completed model. He did a nice job finishing it up and installed the TMCC boards back into it.

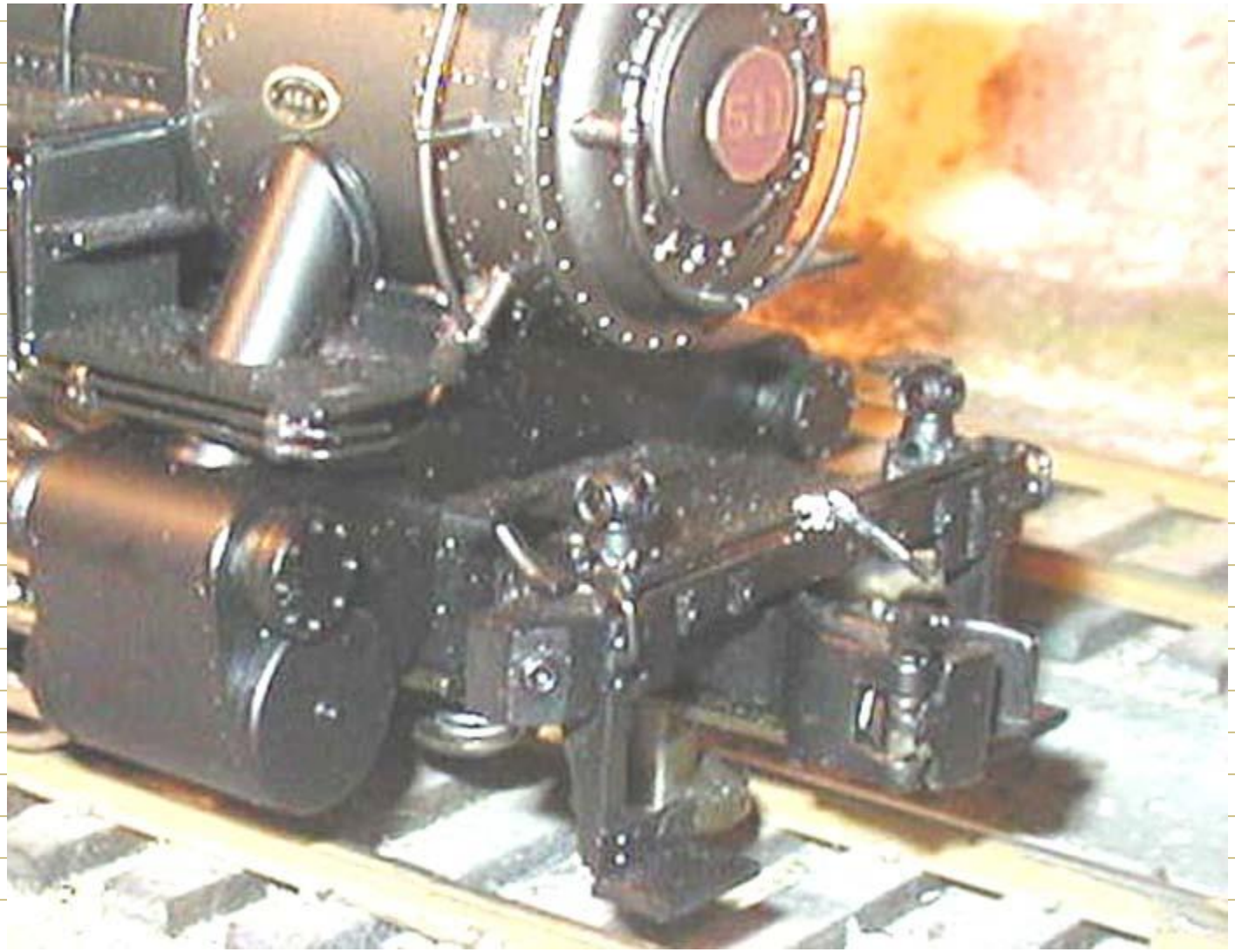
# Sunset M-1a Mountain

# Weaver PRR A-5s Switcher

- Weaver produced a lot more 3 rail versions of the A-5s than they did in a 2 rail configuration.  Here are some photos of one that I converted and added some detail to. The first photo shows the 3 rail locomotive

# 3 Rail PRR A-5s

# 3 Rail Pilot and Coupler



# 2 Rail Coupler & Pilot

# 3 Rail Tender Rear Beam

# Rear of Tender

- In addition to adding a Kadee coupler, rear footboards and coupler lift bar details were added to the tender beam giving the model a scale appearance.

# 2 Rail Tender Beam

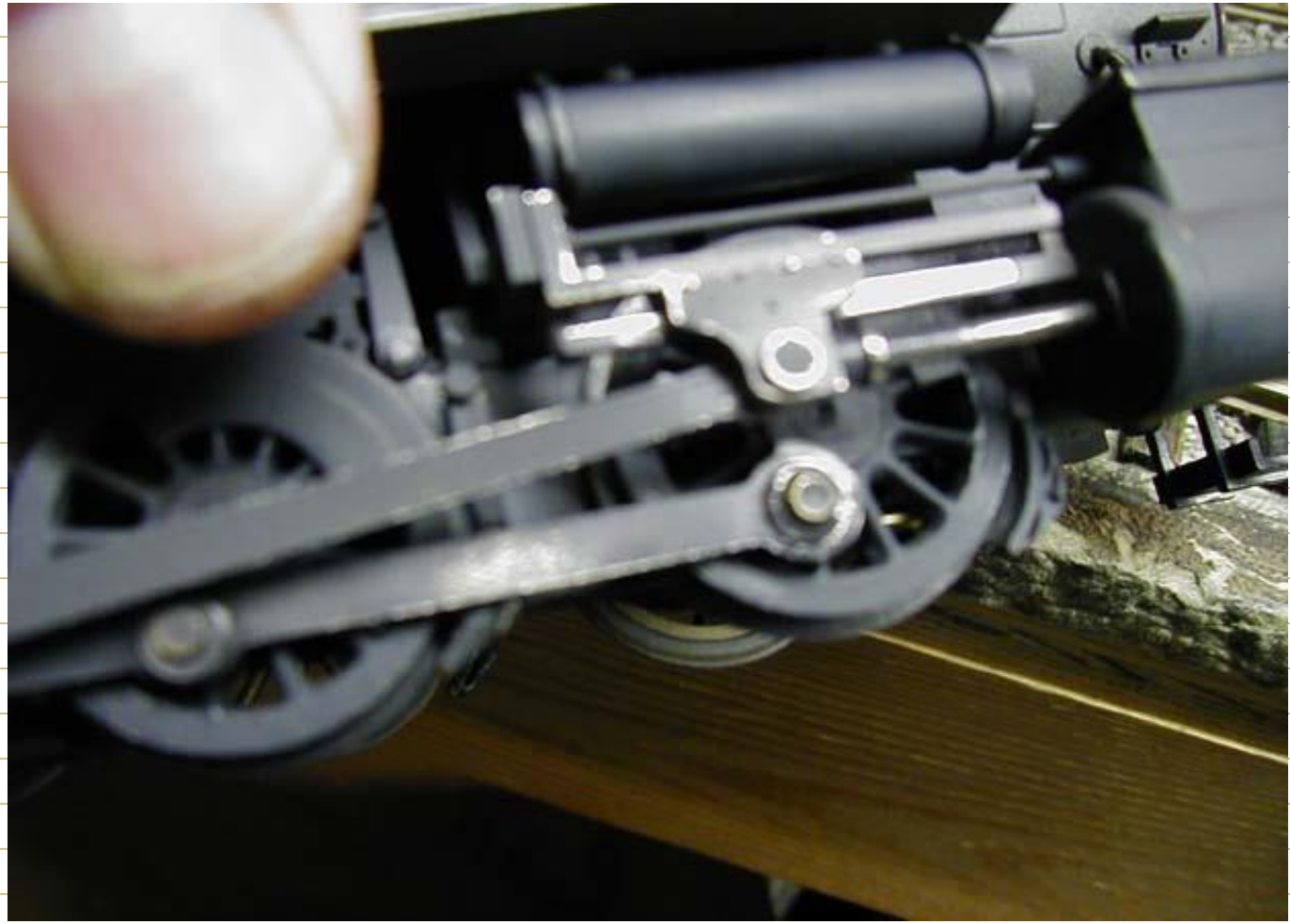
# Finished 2 Rail A-5s

# The Lionel 0-6-0t

- Lionel introduced their new 0-6-0t tank engine in mid-2004 and after examining it at the Fall TCA meet in York, I purchased one with the idea of converting it to 2 rail scale operation.  The following photos show what I have done to this model to make it into a unique little steam era switcher for a scale 2 rail layout.

# Basic Loco w/ PSC 48” Drivers

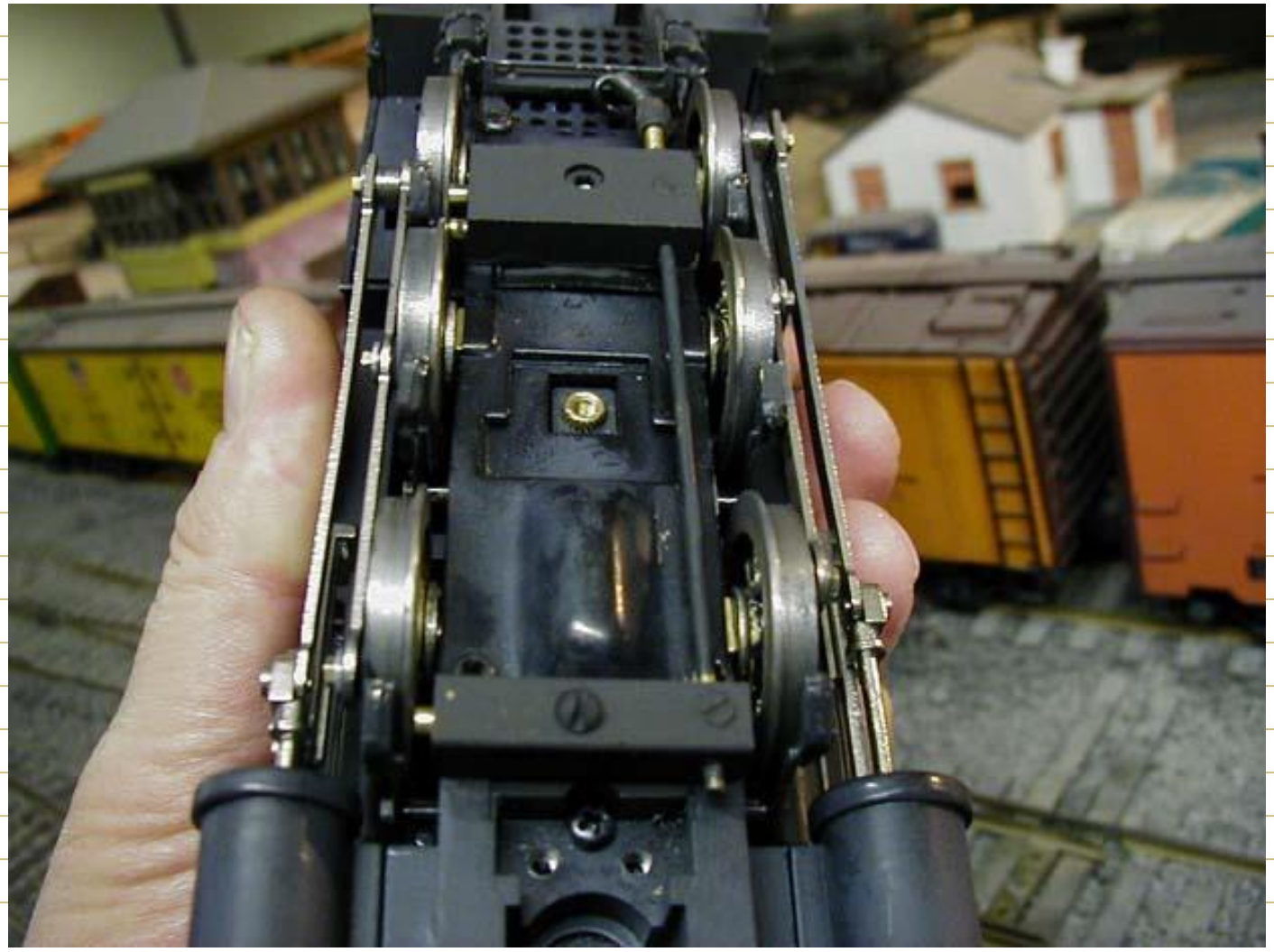
# Rods with New Crankpins



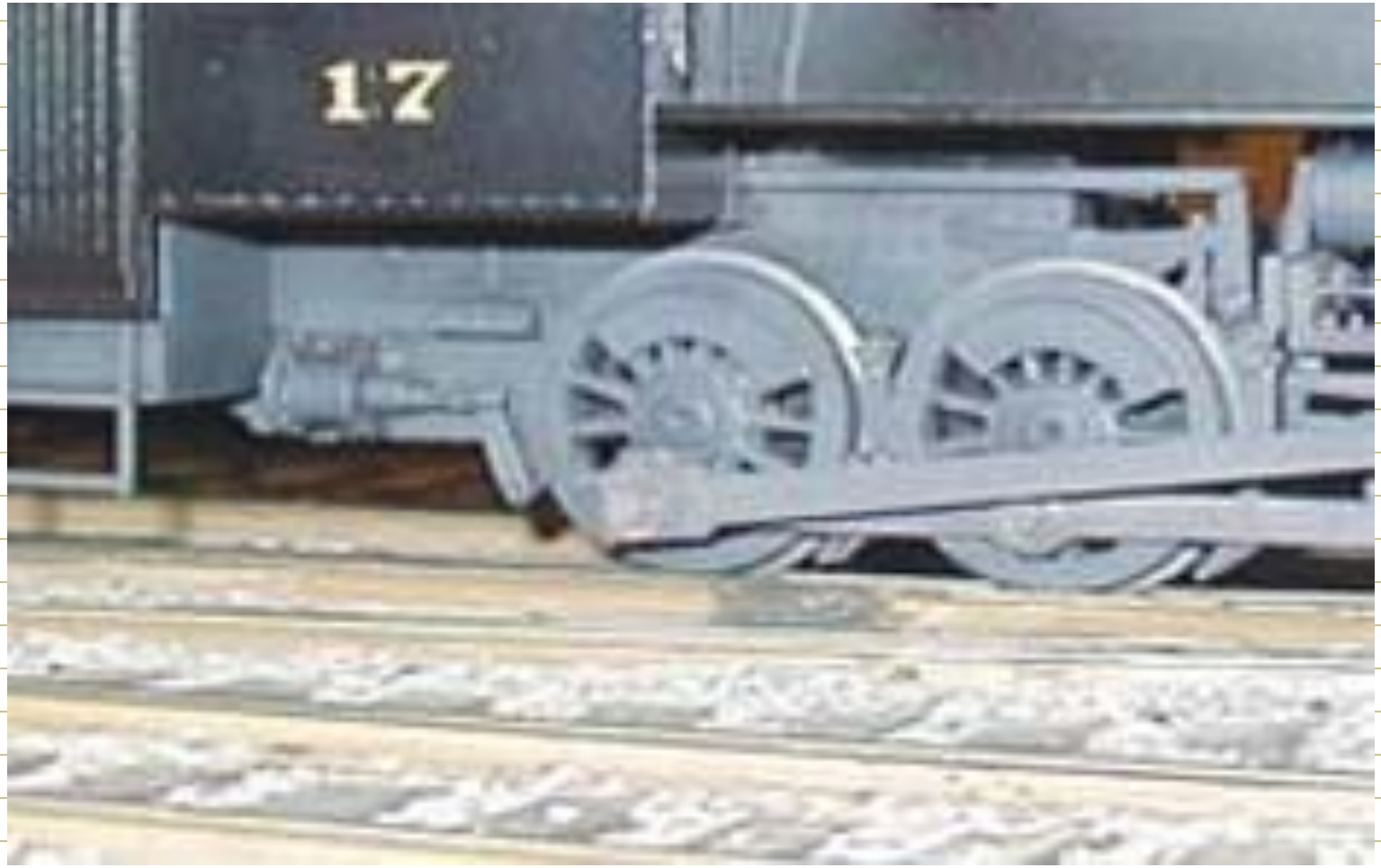
# Electrical Pickups

- I made my electrical pickups for the insulated tires on the left side of the loco by drilling 1/4” brass bar stock and inserting Kadee coupler springs and small brass plungers to contact the driver tires. The brass bar is insulated from the frame with 0.010 thick fish paper. A 2-56 nylon screw holds the front pickup in place. The double rear pickup attaches to the original 3rd rail shoe pickup point that is already insulated.

# 2 Rail Pick Ups



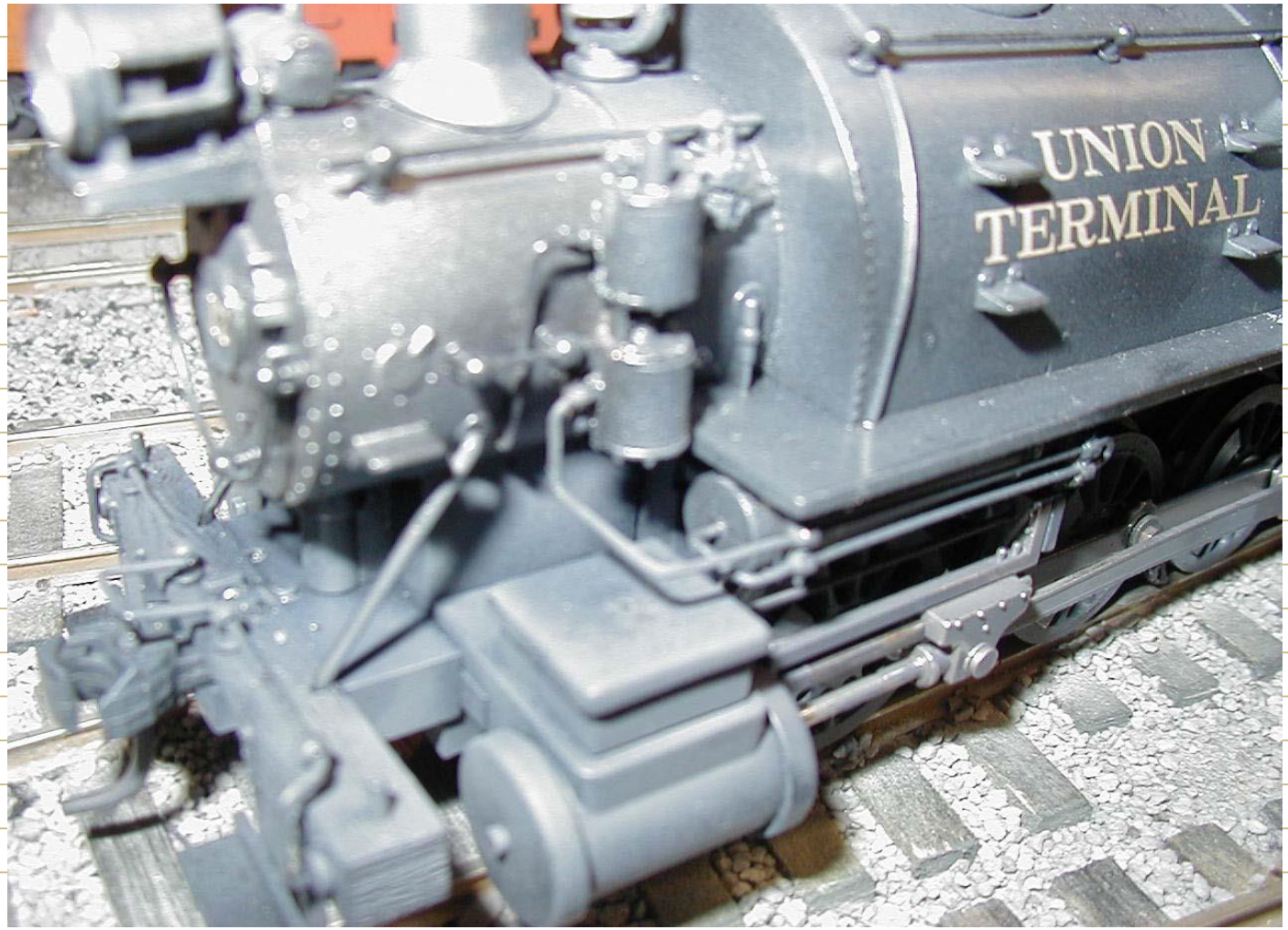
# PSC Brake Cylinder & Shoes



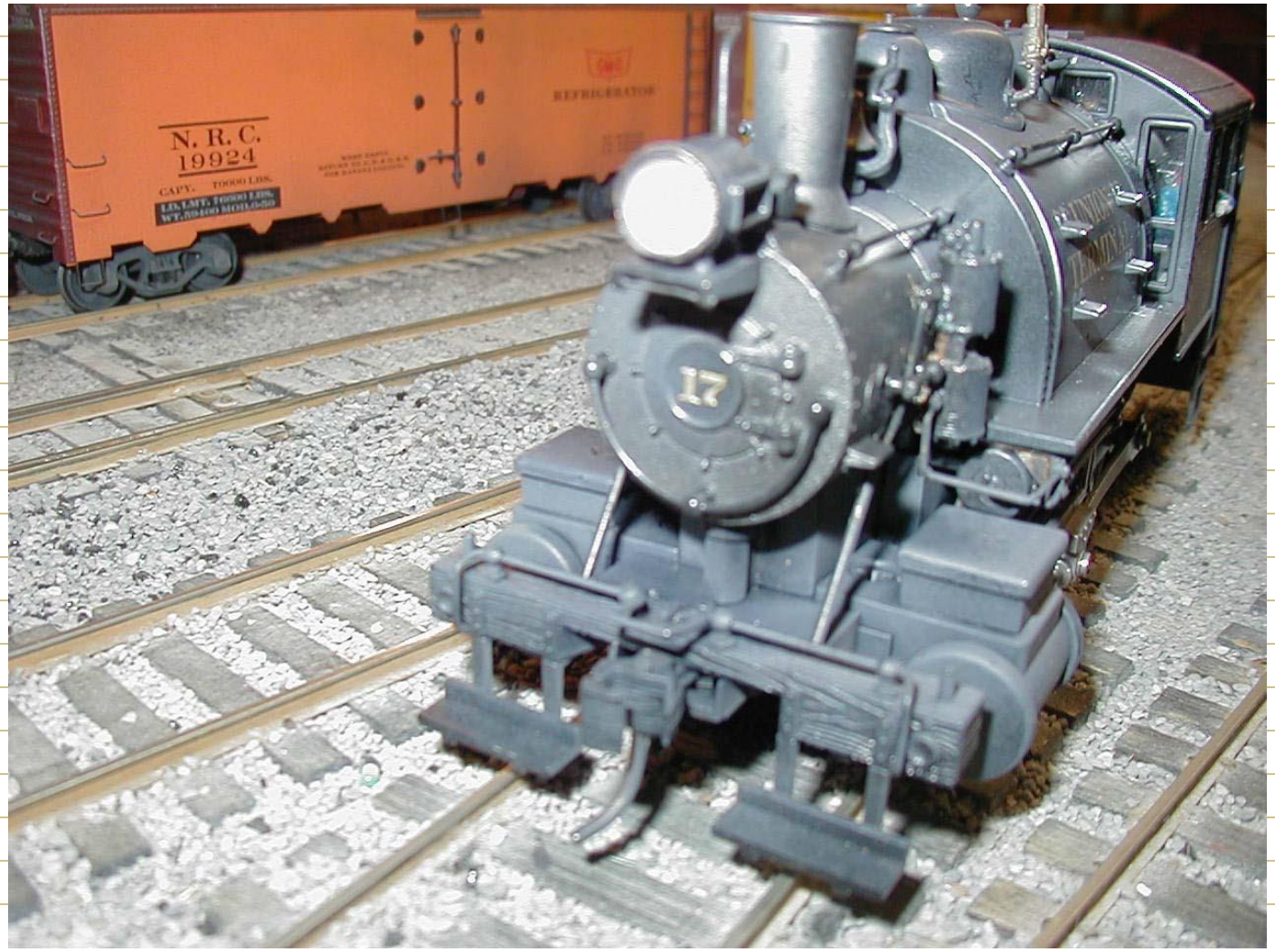
# Rear Foot Boards

# Whistle, Pops & Dome Lids

# Air Pump & Fittings



# Headlight, Generator & Numbers



# The Finished (almost) Loco

# Lionel B&M Mogul

- Lionel made a hit with their B&M Mogul. I have converted several of these models in my shop. Unlike most Lionel steam locomotives, this engine is made with a bottom retainer plate, making it simple to remove the drivers for machining.

# 2 Rail Lionel B&M Mogul

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# Moguls in the Conversion Shop

- 4 Moguls being converted to 2 rail

# Mogul Rear Tender Beam

# Tender Front

# Other Steam Conversions

- Here is a quick look at a couple of other 3 Rail “scale” locomotives converted to 2 rail in my shop.  In all cases the original driver castings were reused and all other wheel sets were replaced with NWSL products. The models have most of their drivers captured in the frame and must  be removed by driving the wheels off of the axles through the frame.

# Lionel 4-6-0 Camelback

# Lionel C&O H-7

- *A*

# Lionel N&W “A”

# MTH CNR 4-8-2

# Weaver CP Royal Hudson

- This is another Canadian prototype that turns out very nicely as a 2 rail model. I made new tender truck bolsters that are 1/8” narrower than the hi rail truck bolsters from 0.050 nickel silver plate. I also made brass inset bushings for the tender truck sideframes to accommodate the NWSL 36” wheel sets. I machined the spoked trailing wheel to NMRA wheel profile.


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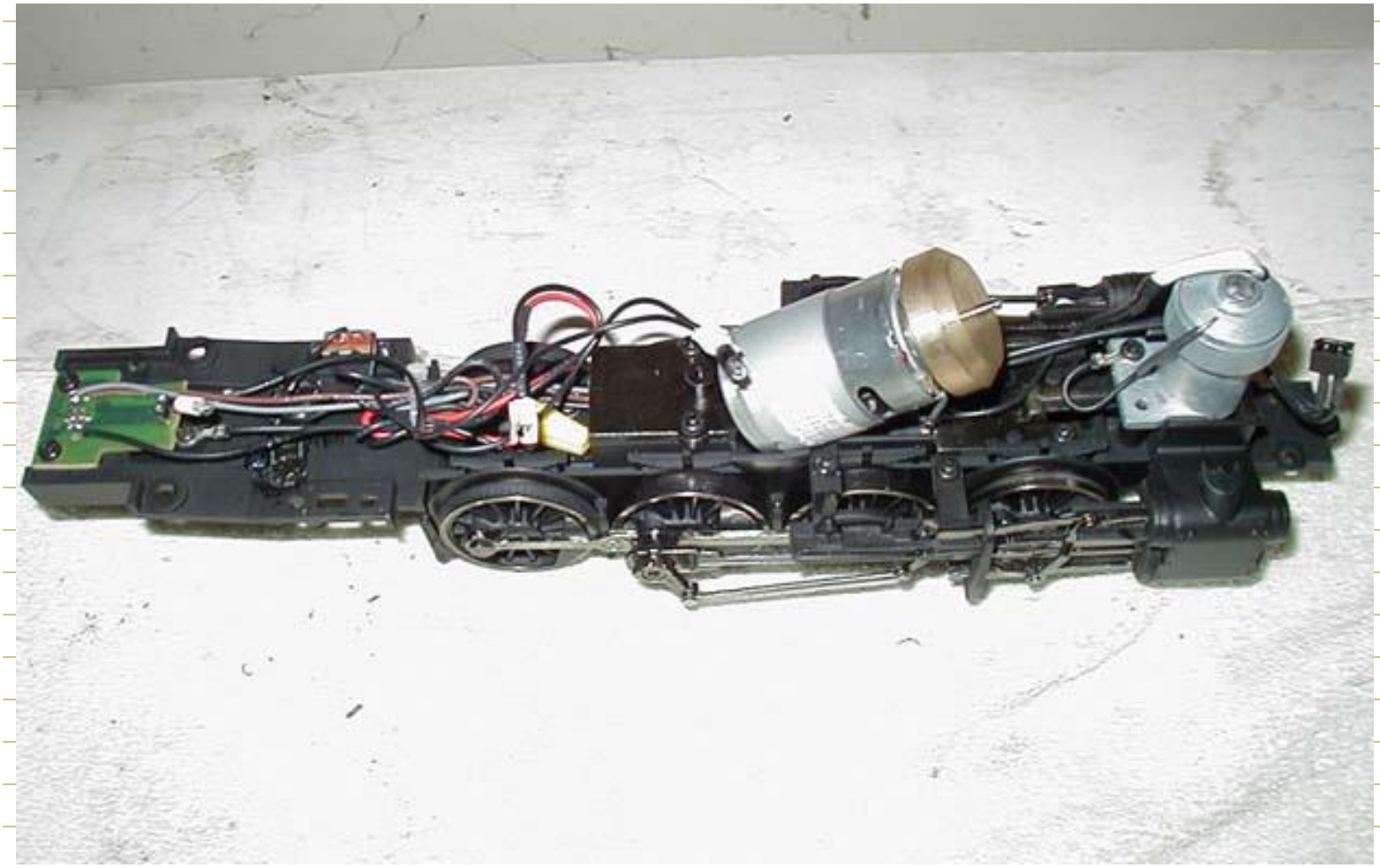
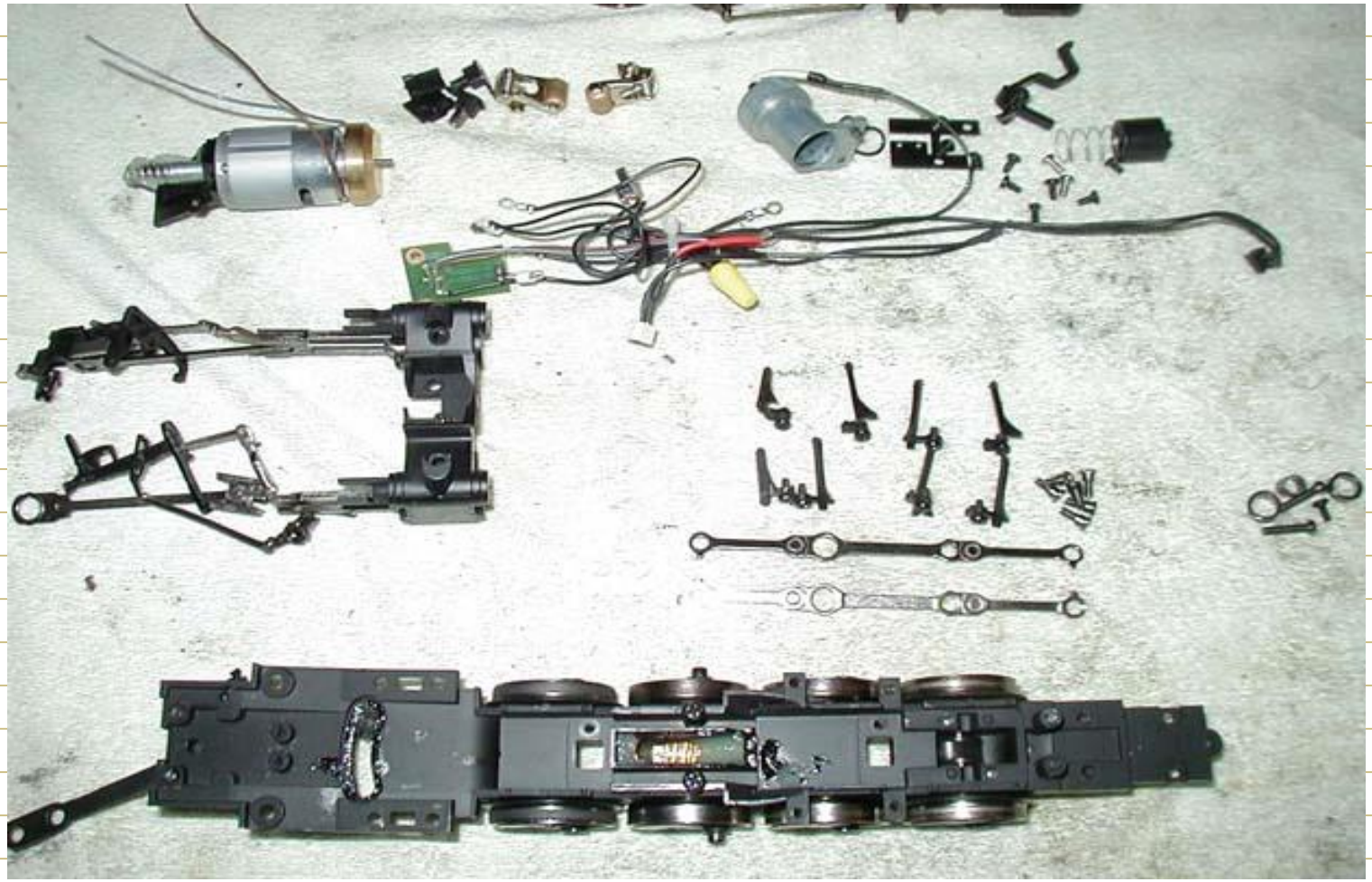
# K Line USRA 2-8-2

- Following photos shows a K Line USRA Mikado being converted to 2 rail. K Line locos do not have a frame plate that allows the drivers to be easily removed from the frame. Re-assembly and quartering of this type of mechanism is more difficult than working with an engine that the driver sets can be removed with the axles intact.

# Mikado 3 Rail Mechanism



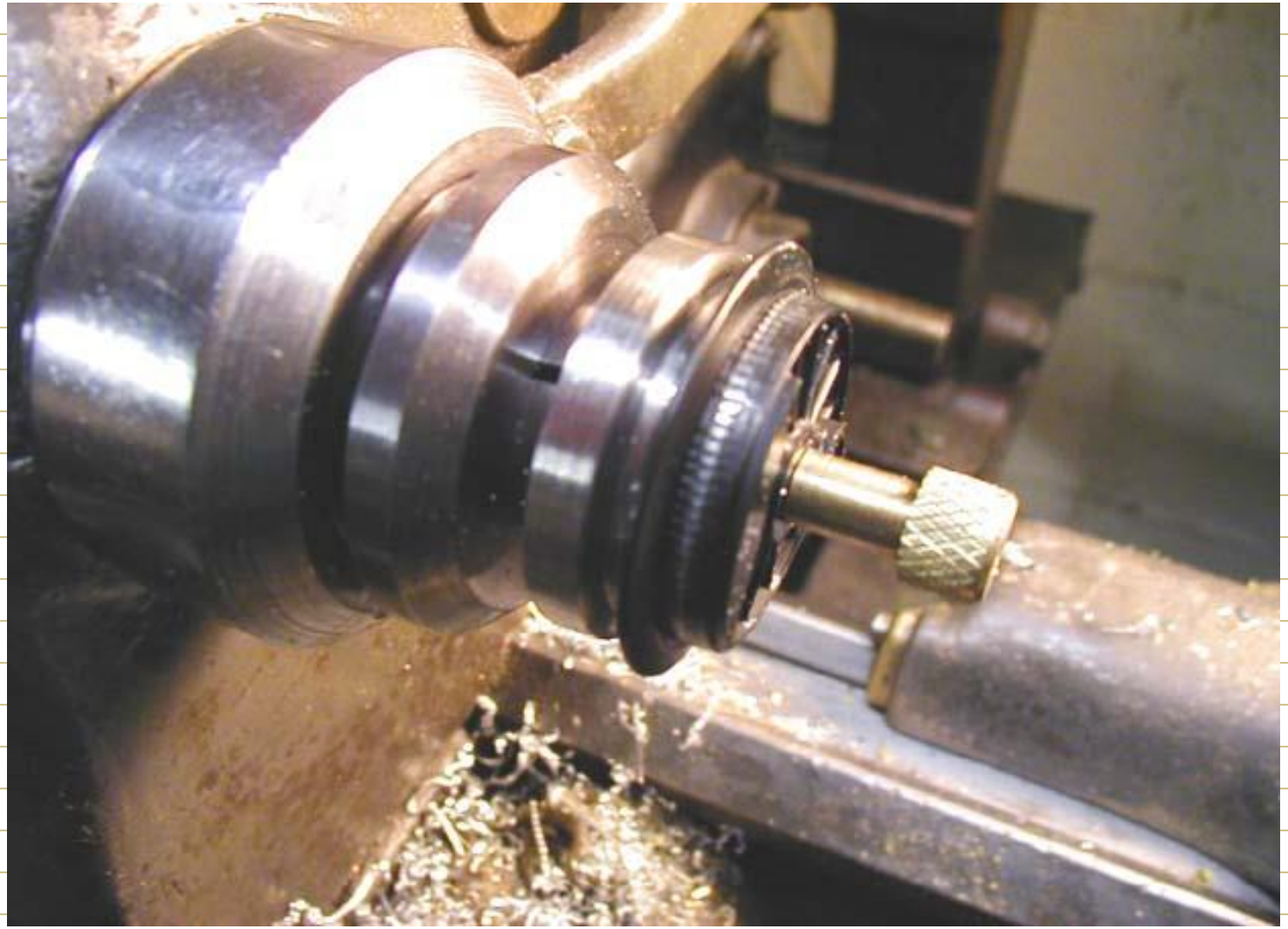
# Disassembled Mechanism



# Drivers Out

# Cutting the HiRail Tread

# Driver Center on Mandrel



# Turning the Center to Size

# Drivers Ready for New Tires

# Driver Machining

- For those of you interested in the entire driver machining process you can view my Power Point presentation on that topic on my Website.
- The url to my site is:
- http://mywebpages.comcast.net/omodeller/

# 2 Rail K Line USRA 2-8-2

# K Line NYC Hudson

- Another loco worth considering for conversion is the K Line NYC Hudson. Although there are many 2 rail Hudsons out there, this one is pretty nice for the money!

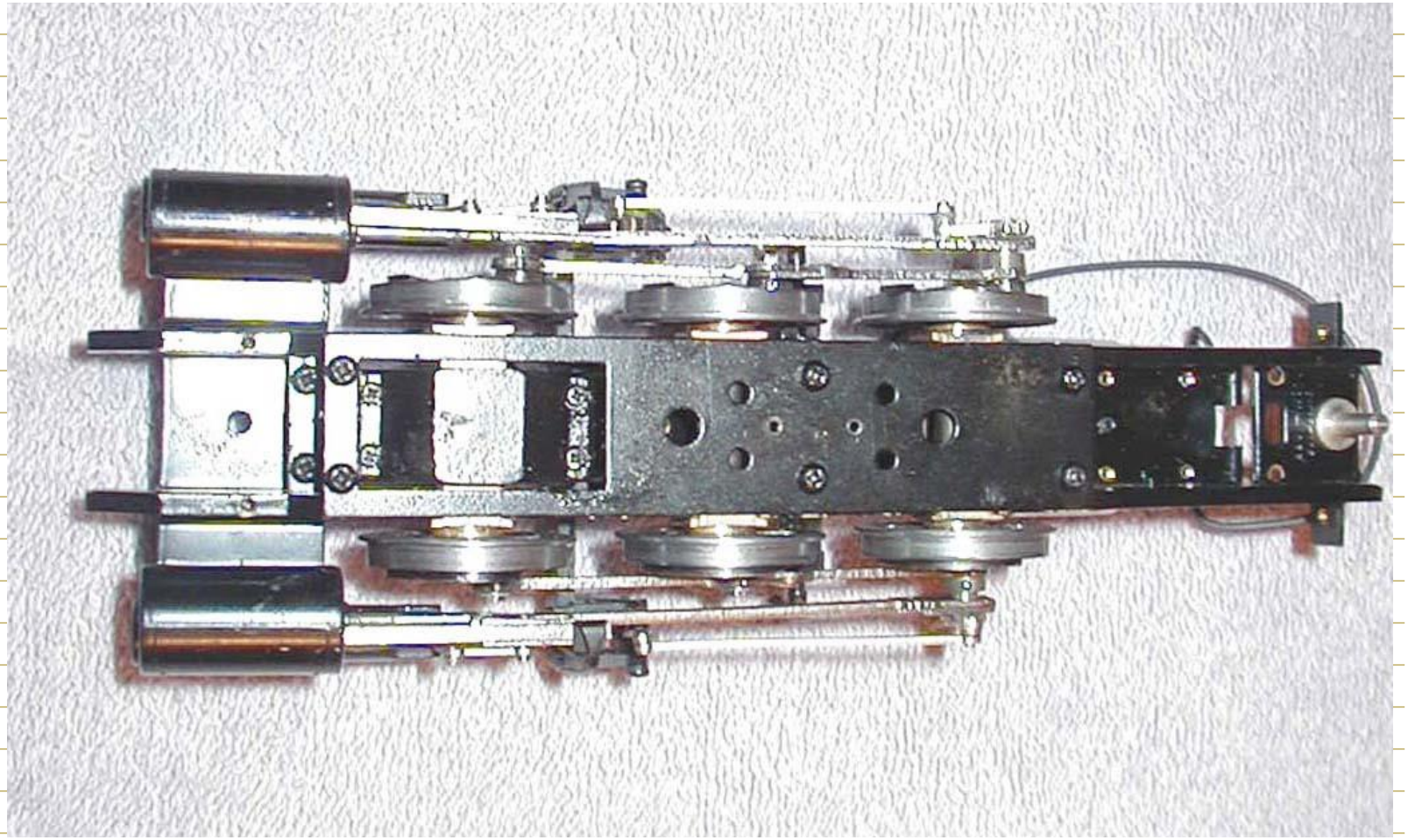
# NYC Hudson!

# 2 Rail Hudson Drivers

# Weaver USRA 0-6-0

- This is a relatively simple conversion to accomplish,  No pilot or trailing trucks to worry with, just 3 pairs of drivers and the tender trucks.  You will probably want to replace the pilot since Weaver cut it away for the hi-rail coupler.  A Backshop USRA pilot would be perfect for this location.  Photo shows mechanism from the bottom

# 0-6-0 Mechanism



# Weaver 0-6-0 Conversion

# Electric Locos

- Kline, MTH and Lionel have all produced scale models of some interesting electric locomotives.  As you will see, all of these are great candidates for conversion to 2 rail

# A Lionel NYC “S” Motor

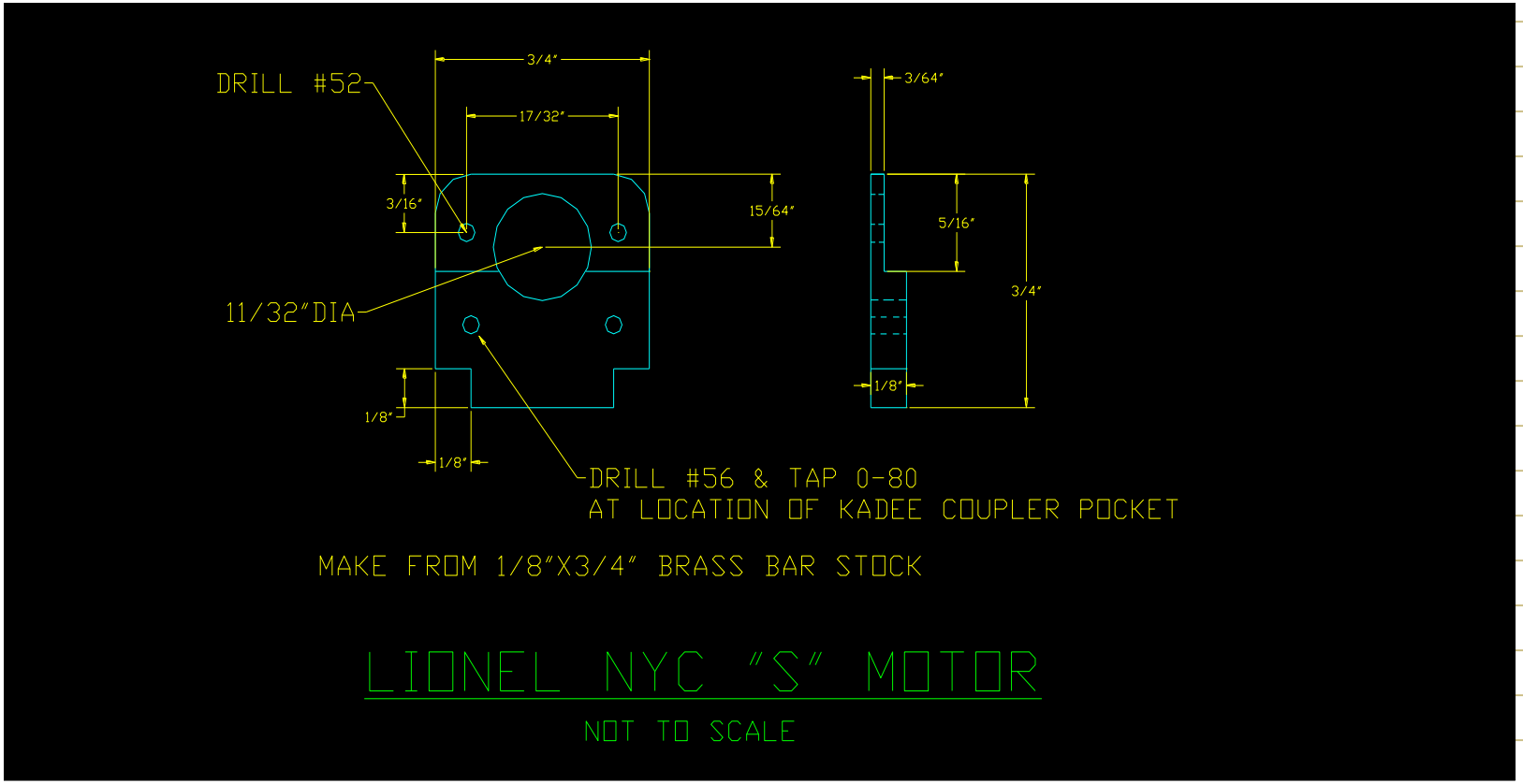
- Lionel did a terrific job on their model of the famous New York Central “S” Motor. This one was converted to 2 rail operation with NWSL 145 tread profile 42” wheels for the drivers. Pilot wheels are 33” NWSL. The pilot trucks are insulated from the frame and pickup power from one rail while the four drive wheels pickup on the other rail. You must also adjust the lost wax brake shoes to clear the 33” wheels.

# “S” Motor!

# “S” Motor Coupler Mounting

- The next slide is an Autocad drawing of the coupler mounting pads that I make for this locomotive. The hi-rail coupler stud is cut off with a razor saw and this adapter is fit over the stub of the original mount and attached to the stud crossbar with 1/4” x 0-80 screws. I use the Kadee 806 coupler on this model.

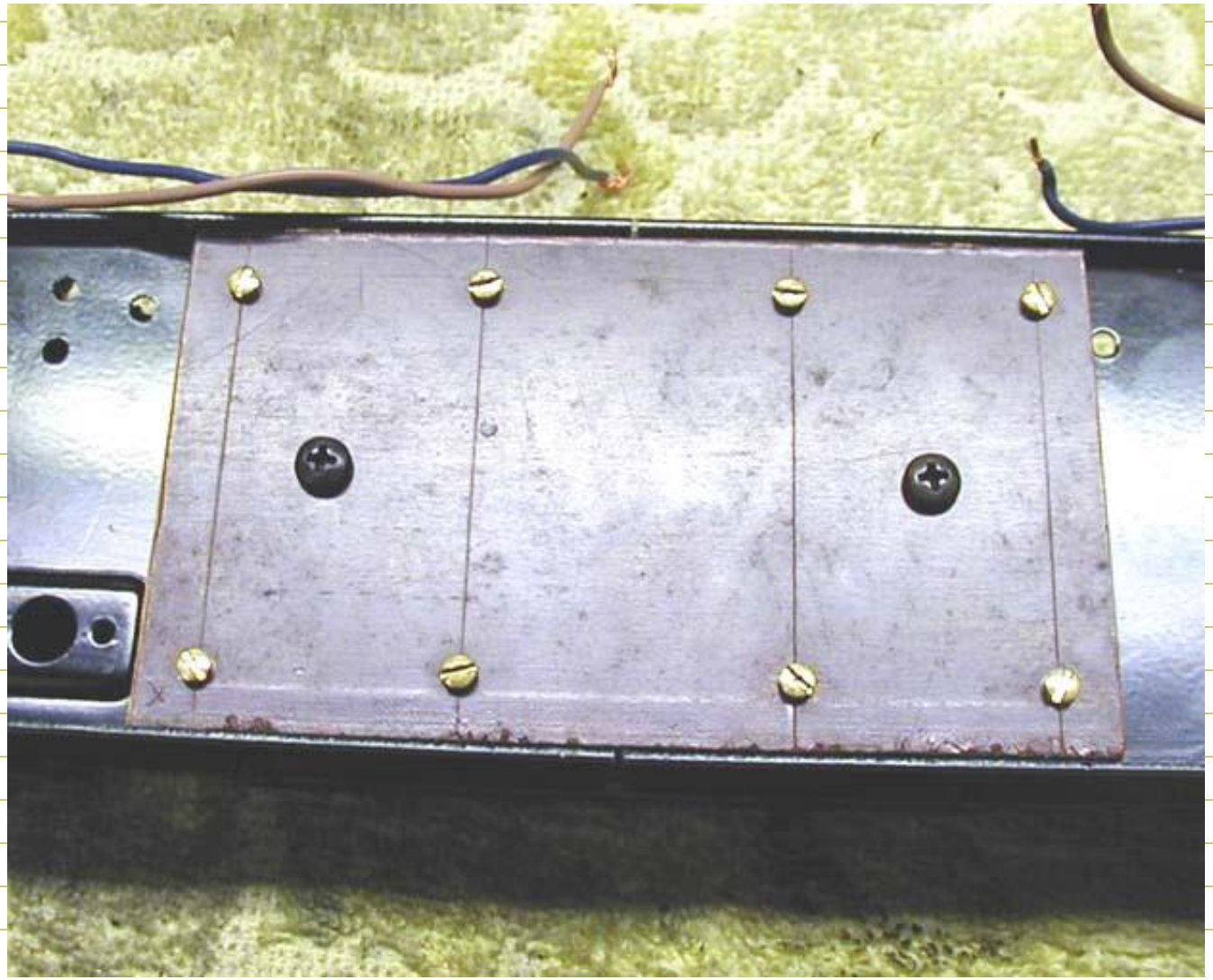
# “S” Motor Coupler Mount Pad



# K Line New Haven EP-5

- K Line did a nice job on this engine. It is fairly easy to convert. I used NWSL 40” 145 wheels and bored them out to 5/32”. The wheels on the insulated side of each truck are bushed with Micarta bushings machined on my lathe. Rather than make pickup shoes for this engine, I cut the frame in half and spliced it together with a piece of 1/4” thick plastic laminate. Works great!

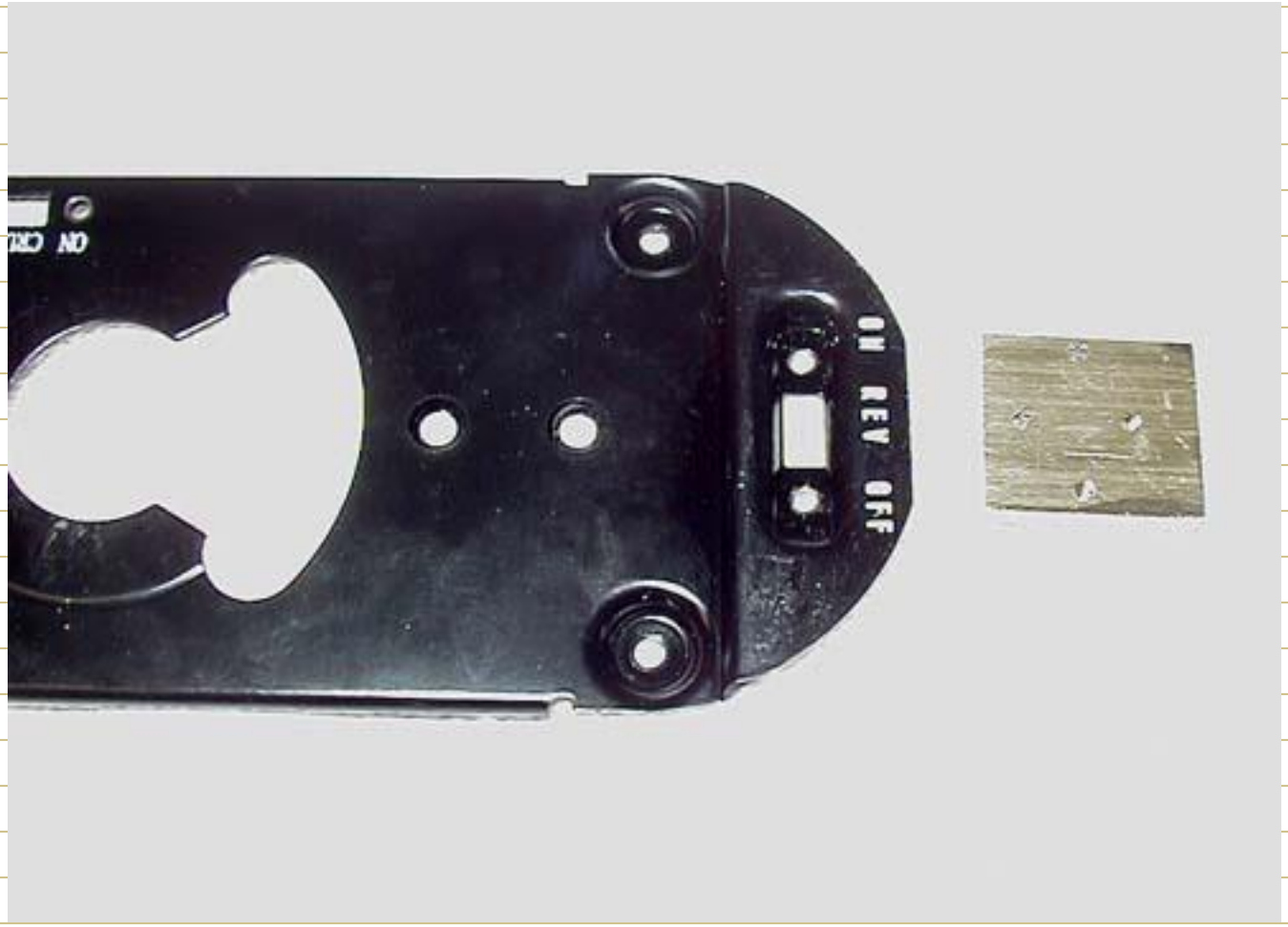
# K Line EP-5 Frame Splice



# K Line EP-5 Wiring

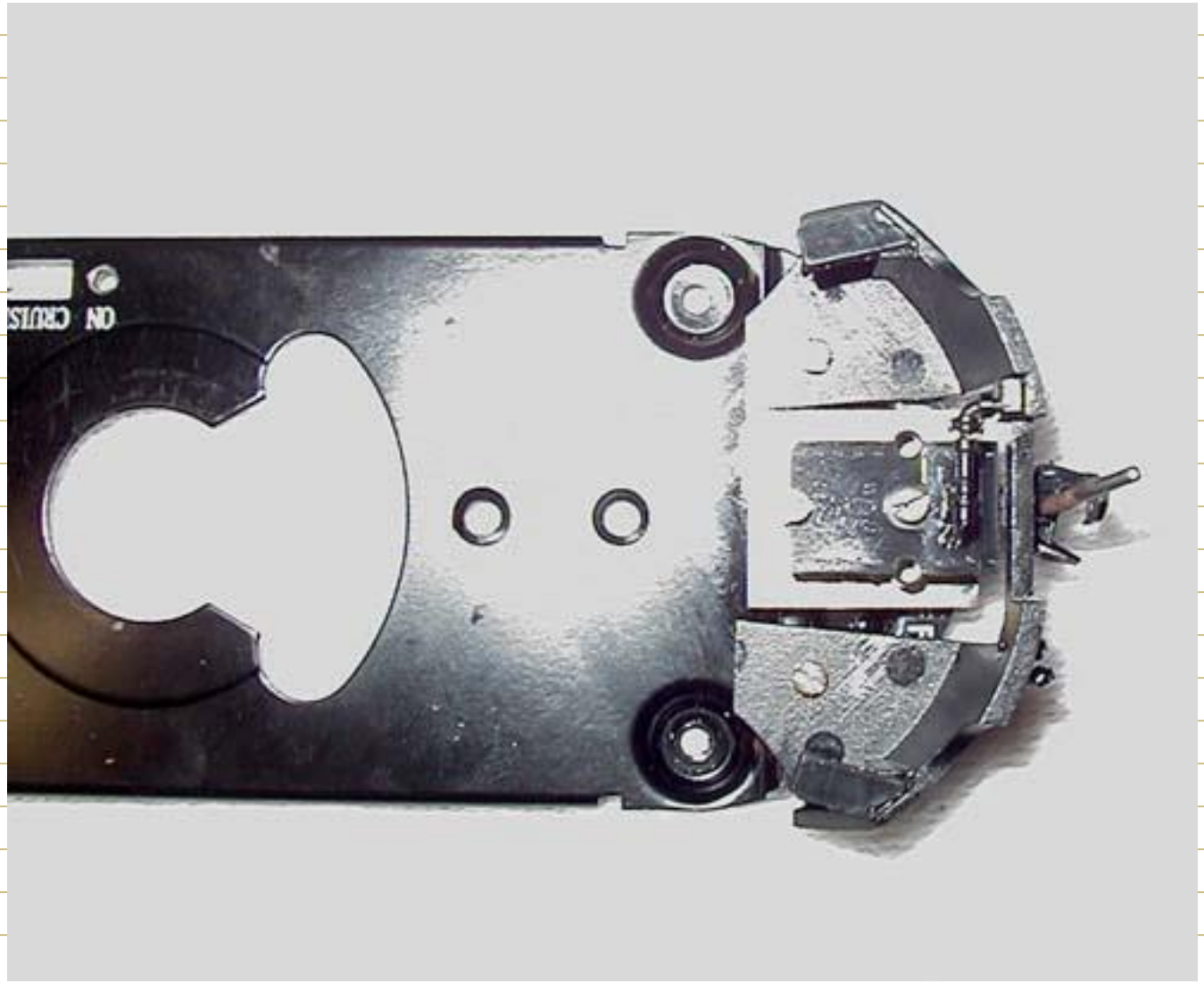
- With the frame spliced as shown, each truck picks up power on its geared side. This arrangement eliminates the need for contact wipers. I removed the pilots from the trucks, cut their truck mounts off and attached them to the frame with 2-56 screws. The Kadee couplers are mounted on a 3/4” x 7/8” x3/16” thick brass bar that is attached to the frame with 2-56 screws using the old slide switch mounting holes.

# Coupler Mount & Frame



# Attached to Frame

# Coupler & Pilot Mounted



# K Line EP-5 Locomotive

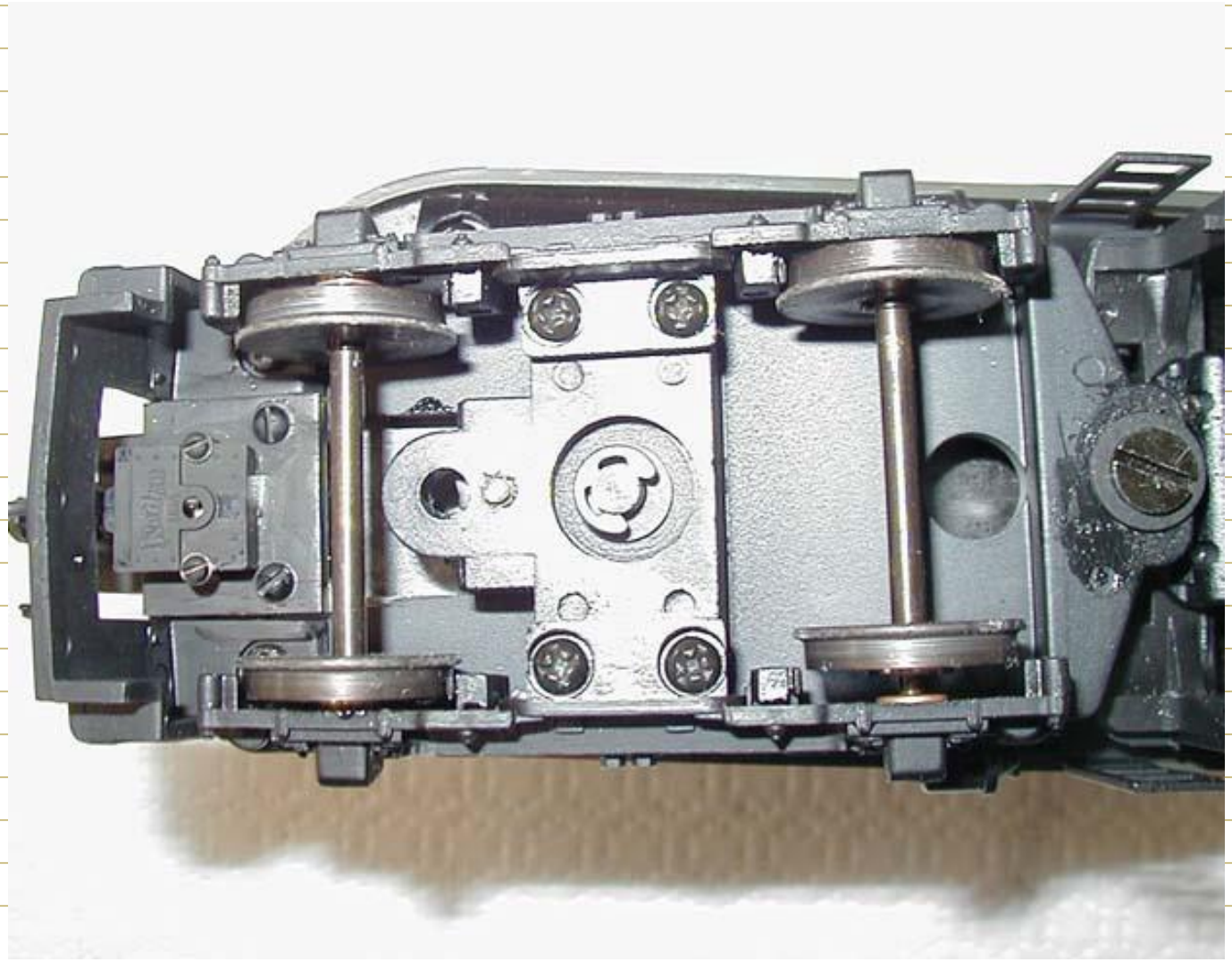
# MTH New Haven EF-3b

- Here's another electric loco candidate for conversion. This locomotive has a diecast body so I could not splice the frame for insulation between the trucks. In this case, I insulated the pilot trucks from the frame and the drivers pick up on one rail and the pilot trucks pick up on the other. Pilot wheels are NWSL 36" 145 wheel profile.

# NH EF-3b Couplers

- The Kadee couplers are attached to the pilot trucks by fabricating an adapter from a piece of 3/4” x 7/8” x 1/8” brass. The adapter is held to the truck frame with 2-56 x 1/4” long screws. The Kadee is attached to the adapter with 0-80 x 3/8” long screws.
- I used Kadee 806 couplers on this model.

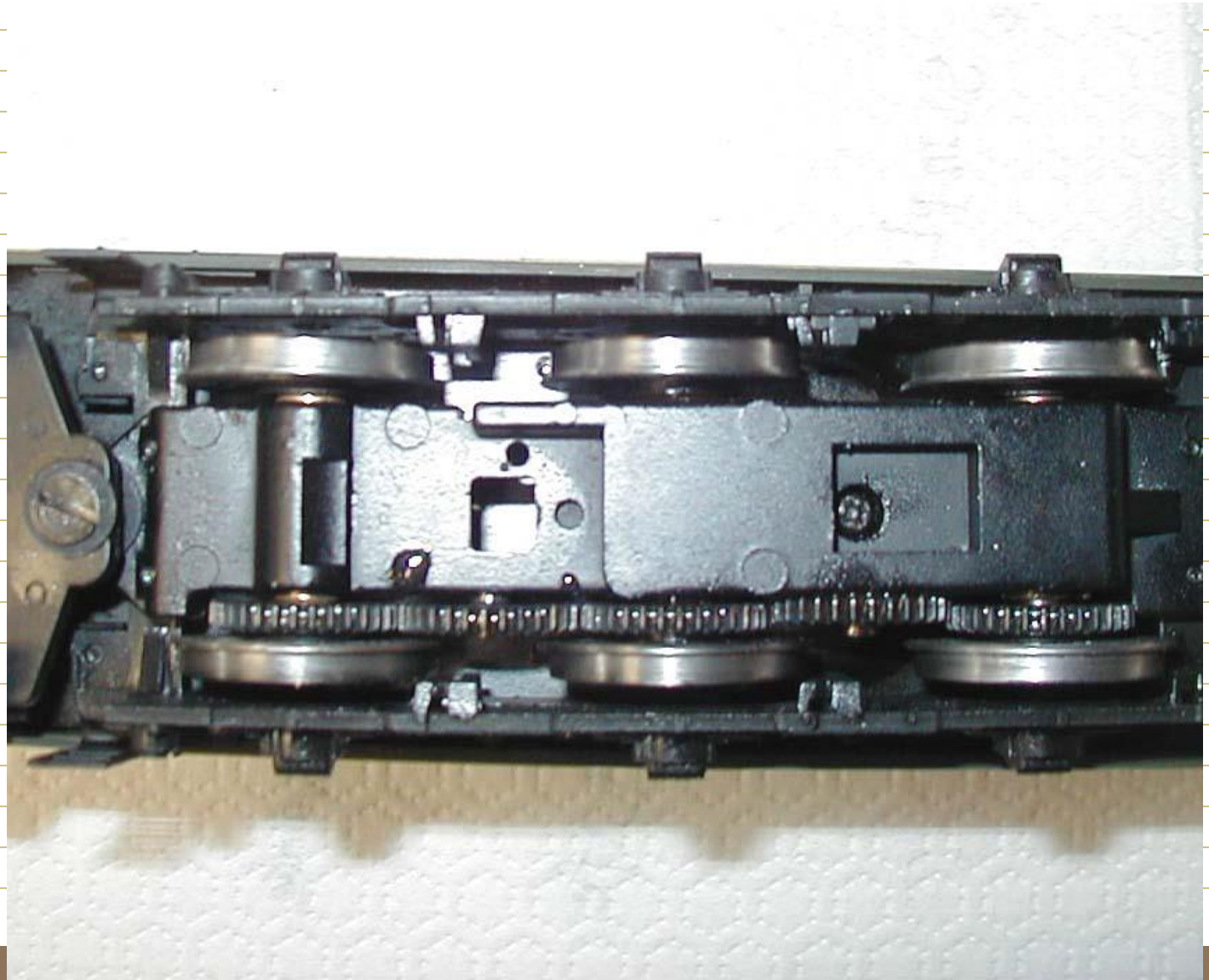
# NH EF-3b Pilot Truck



# NH EF-3b Drivers

- Although I have sometimes used brass House of Duddy GG-1 drivers for this type of conversion, on this model, I machined the original diecast quill driver castings insulating them at the rim with 0.010 fish paper per steam driver practice.

# NH EF-3b Drivers



# Finished EF-3b

# MTH New Haven EP-3

- I really like this boxcab.  Conversion is similar to the EF-3b.  I machined steel tires for the diecast drivers, insulated all drivers on one side and used the pilot trucks to pick up power from the other rail.

# MTH New Haven EP-3

# MTH PRR - L5

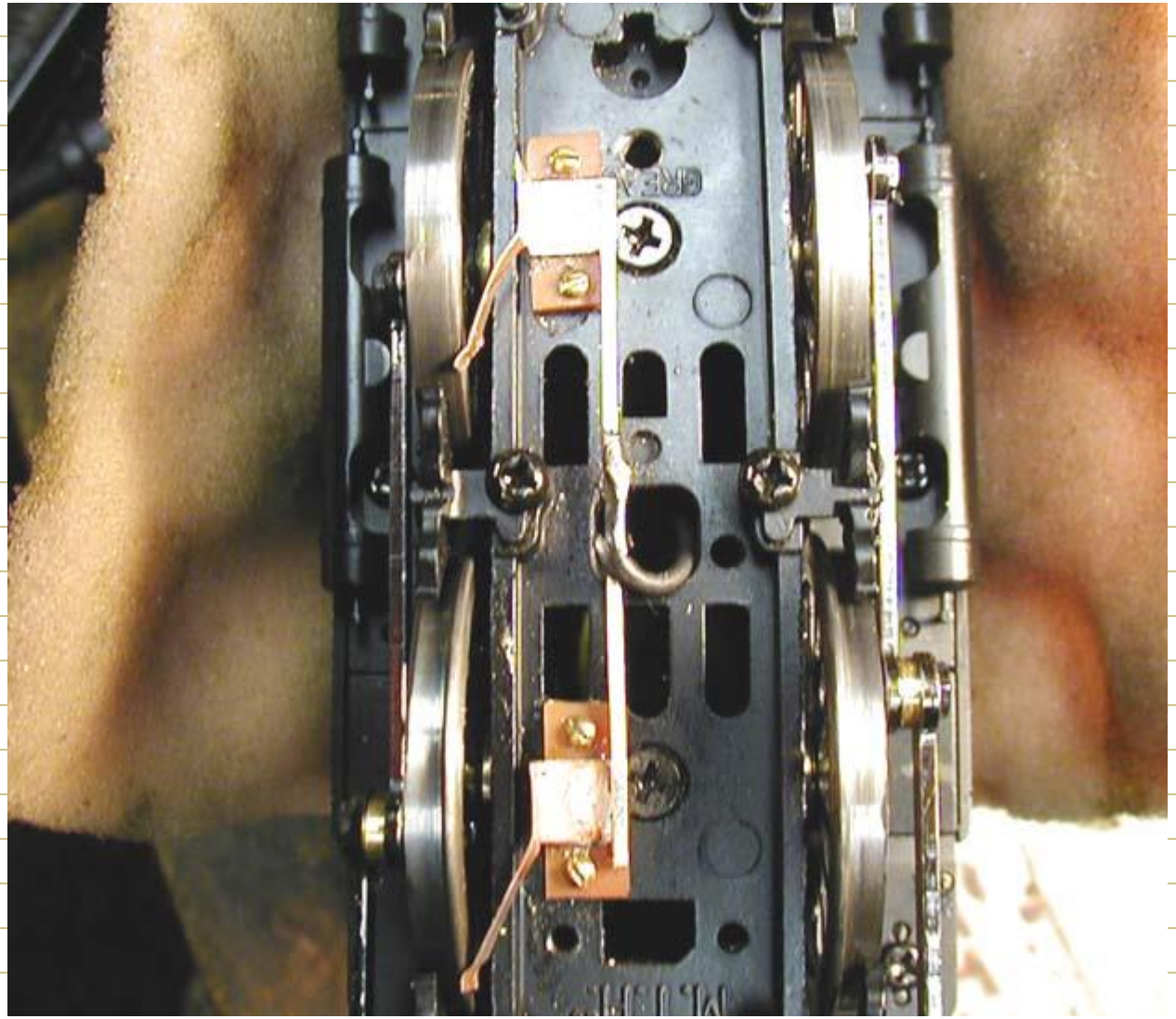
- The most unusual model that has been converted to 2 rail in my shop has been MTH's model of the PRR L-5 1-D-1 side rod electric. The real locomotives were built in the mid-1920s and lasted to about the start of WWII. Most of us therefore have never seen a real one. Their design is a blend of steam and early electric locomotive technology.

# PRR L-5 Electric

# PRR-L5 Electric

- The MTH model incorporates a diecast metal superstructure so I could not use my split frame approach to convert this engine. The steam loco style drivers were machined with blind center drivers as they were on the real engines. All insulated drivers were installed on one side of the mechanism and I fabricated phosphor bronze shoes to contact the insulated wheel rims.

# PRR L-5 Pickup Shoes



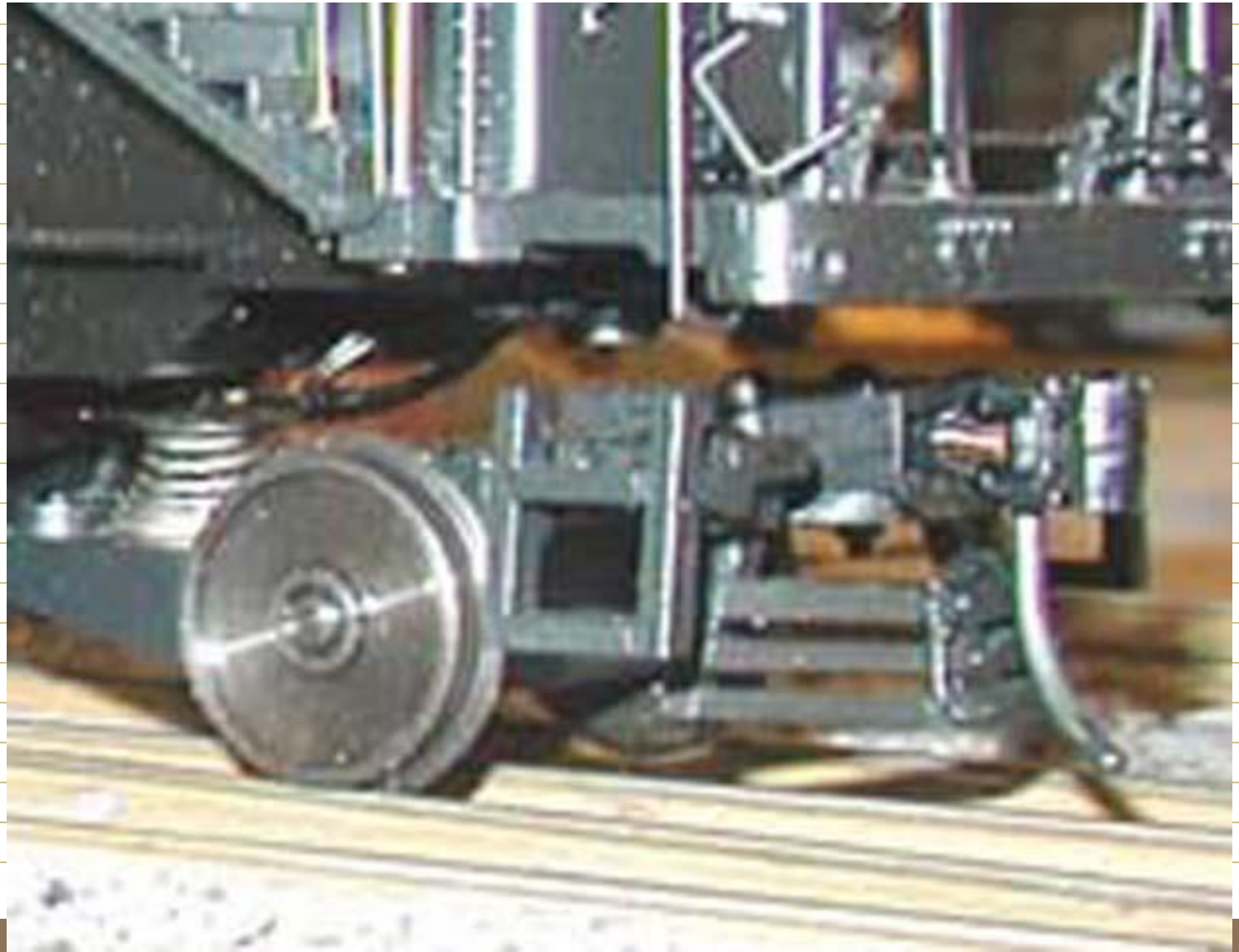
# PRR L-5

- If you are going to attempt this conversion, when the drivers are machined to a scale width, they will be considerably thinner than the original hi-rail wheel profile. On steam locos this is not a problem but on this engine that is driven by main rods connected to the eccentrics, you must extend the main crankpins out to about 0.180” and install a spacer washer to keep the main rods from scraping the eccentrics.

# PRR L-5

- One last note…I installed Kadee couplers and NWSL 33” 145 tread wheels on the pilot trucks. I machined 0.120” off of the top and 0.070” off of the front of the hi rail coupler mounts and installed the Kadees with their boxes upside down. You have to modify the Kadee boxes to accommodate this change. Although a departure from the prototype, this works out fine on the model.

# PRR L-5 Pilot

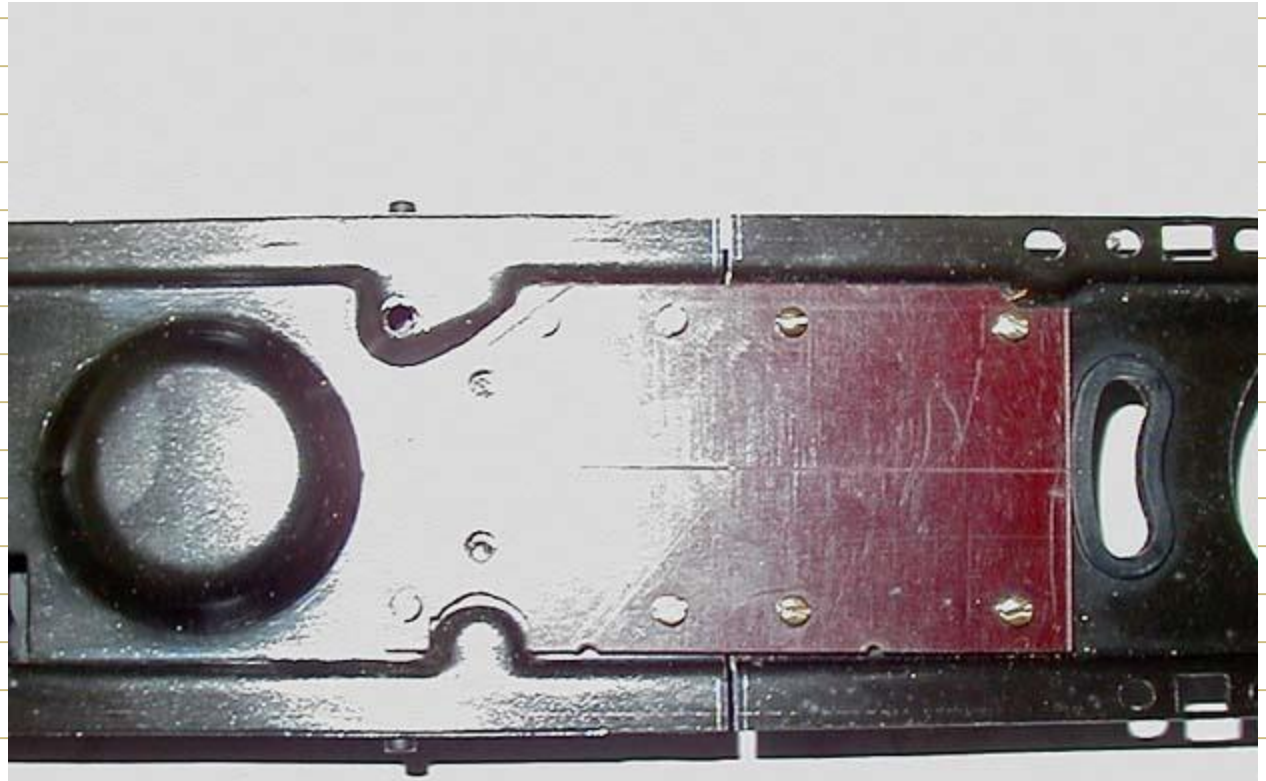


# K Line FM Trainmaster

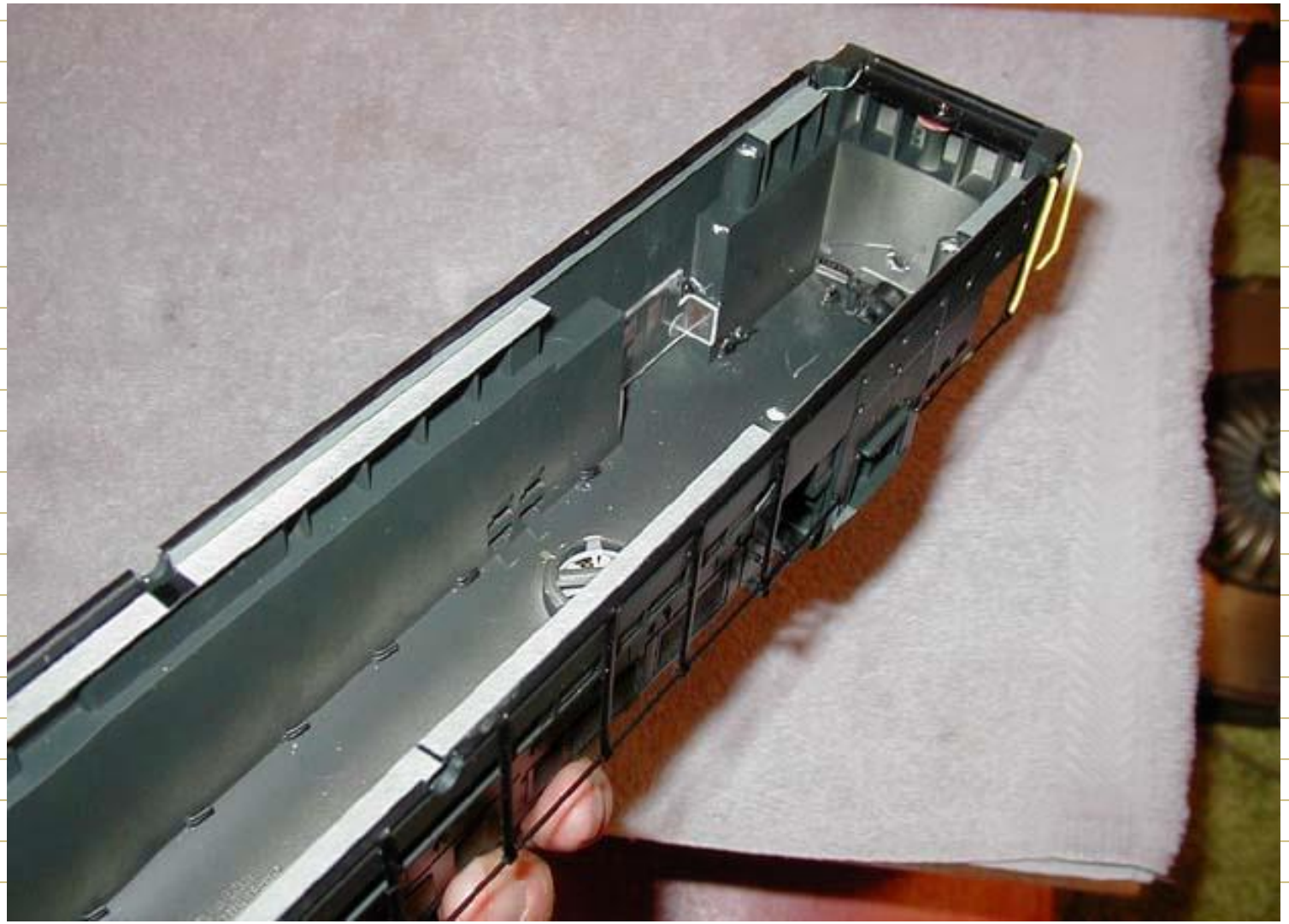
- When I saw this model in a hobby shop for $150.00 I had to buy it and convert it to two rail. The conversion is similar to the K Line EP-5 with the additional requirement of insulating the handrails from the engine frame with 0.005” thick fishpaper. Frame is split off center past the fuel and air tank casting.

# K LINE FM Frame

# FM Frame Splice

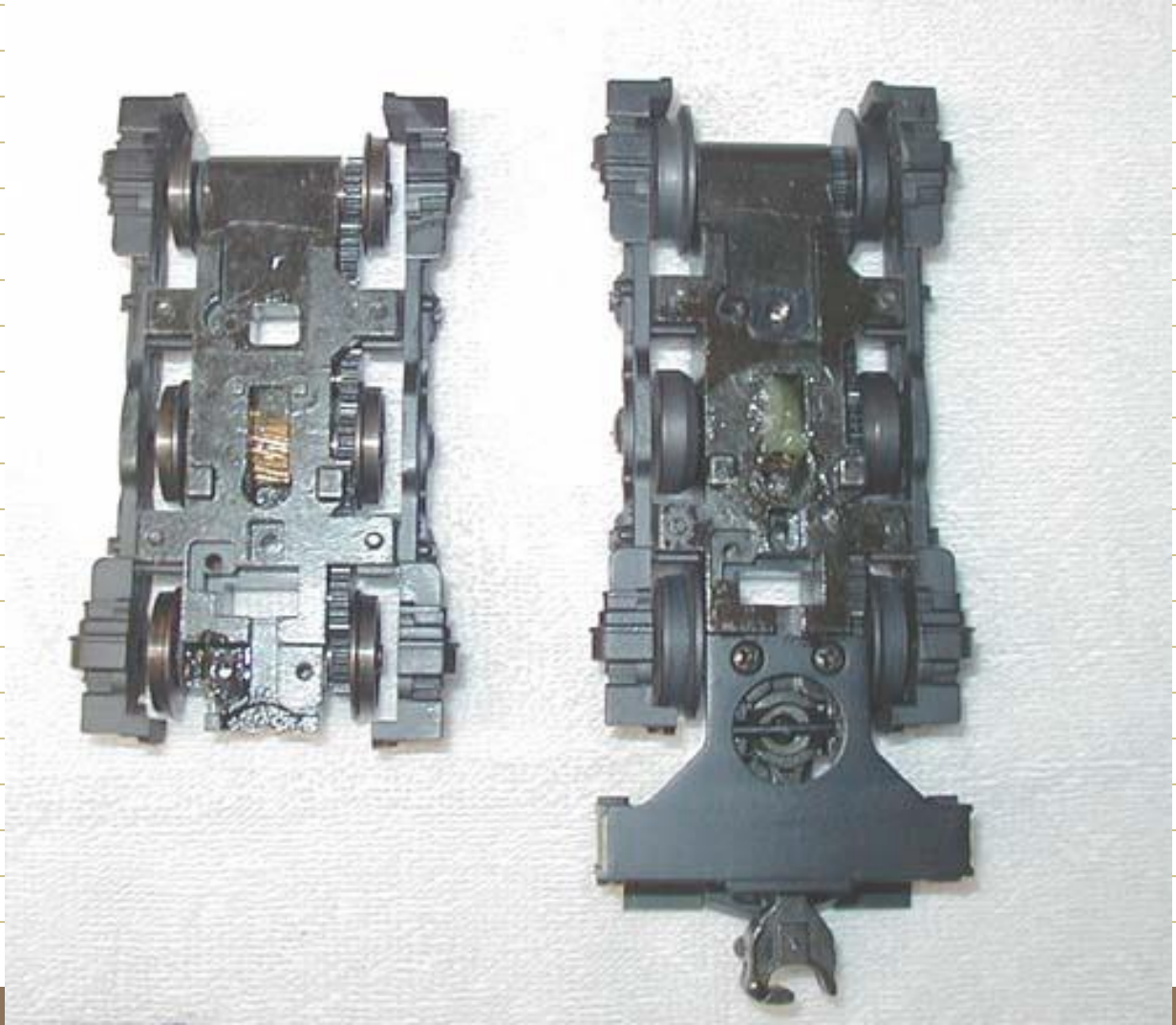


# Insulation for Handrails



# Removing Hi Rail Wheels

# Comparison of FM Trucks w/Hi Rail & Scale Wheels



# 2 Rail FM Trainmaster

# Other Diesel Conversions

- Here are some photos of other Hi Rail diesel models converted to 2 rail in my shop.  In all cases, NWSL wheels were used for conversion.  However, I do not use the NWSL conversion kits as I do not like the insulation material they use on their axles for hub insulation.  I make my own insulating bushings from paper phenolic rod.

# Lionel Alco Switcher

# Lionel A-B-A F3 Units

# MTH Lima Transfer Loco

# Freight & Other Cars

- I was asked to include some of my freight car conversions for you to consider. I do these for my own rolling stock and do not generally perform this work for others. For the most part, these conversions can be performed by most modelers with basic tools, although a small drill press will come in handy.

# Car Conversions

- Sometimes I use the original trucks with scale wheel sets installed and sometimes I replace the trucks entirely.  I tend to make parts like truck bolster adapters on my lathe from brass bar stock, so you may have to come up with some other method of attaching trucks if you don’t use the ones that come with the car

# MTH Cement Container Gon

- When I saw this car, I purchased it immediately…What a nice addition to the freight car fleet!  I shortened the containers on the bottom about 0.20” so they sat at the correct height in the car.  As they come the thick floor of the gondola makes them sit too high.  Here is the way I converted this car to 2 rail operation

# The 3 Rail Car

# Disassemble the Car

- Remove the 8 Phillips head screws from the bottom of the car.  This allows you to remove the frame assembly and then the trucks from the frame.  The trucks are screwed on from the top of the frame so you have to remove the frame to remove the trucks.

# Disassembled Car

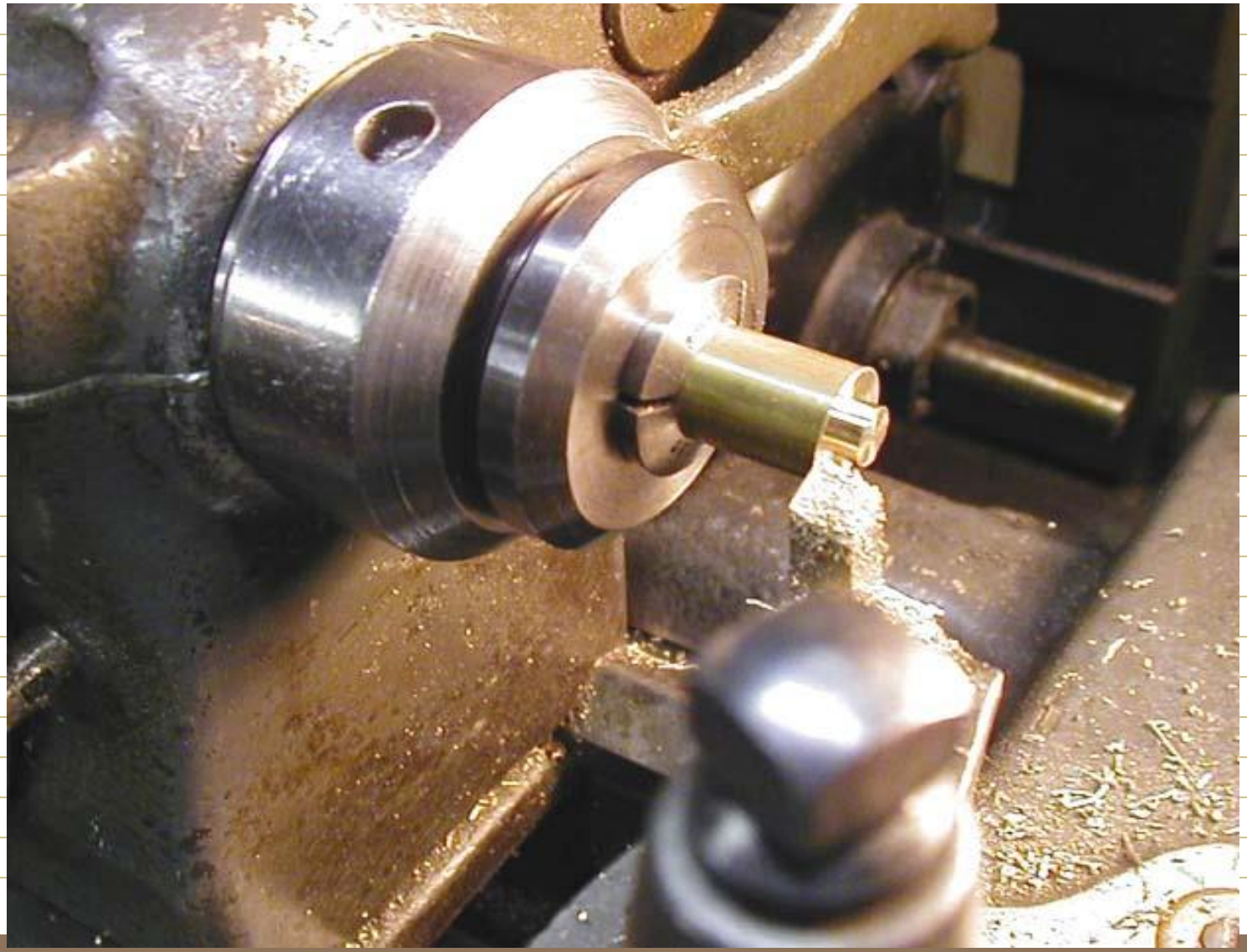
# Trucks

- I decided to replace the MTH truck/ hi rail coupler assemblies with All Nation trucks. You can remove the hi rail couplers from the MTH trucks and install NWSL wheel sets in the MTH trucks. NWSL makes wheel sets specifically to fit the MTH trucks but I opted to replace the trucks and sell the MTH assemblies on ebay! However, if you don't have a way to adapt new trucks the NWSL wheel sets would be the way to go.

# Truck Adapters

- The following slides show the steps I take on the lathe to make truck adapters for the All Nation trucks. I made the adapters from 1/2” brass bar stock in the lathe. Chuck about a 6” length of stock in your chuck or collet and machine a shoulder about 0.10” long and 0.250 diameter on each end of the brass bar. This way you can make two parts at one time.

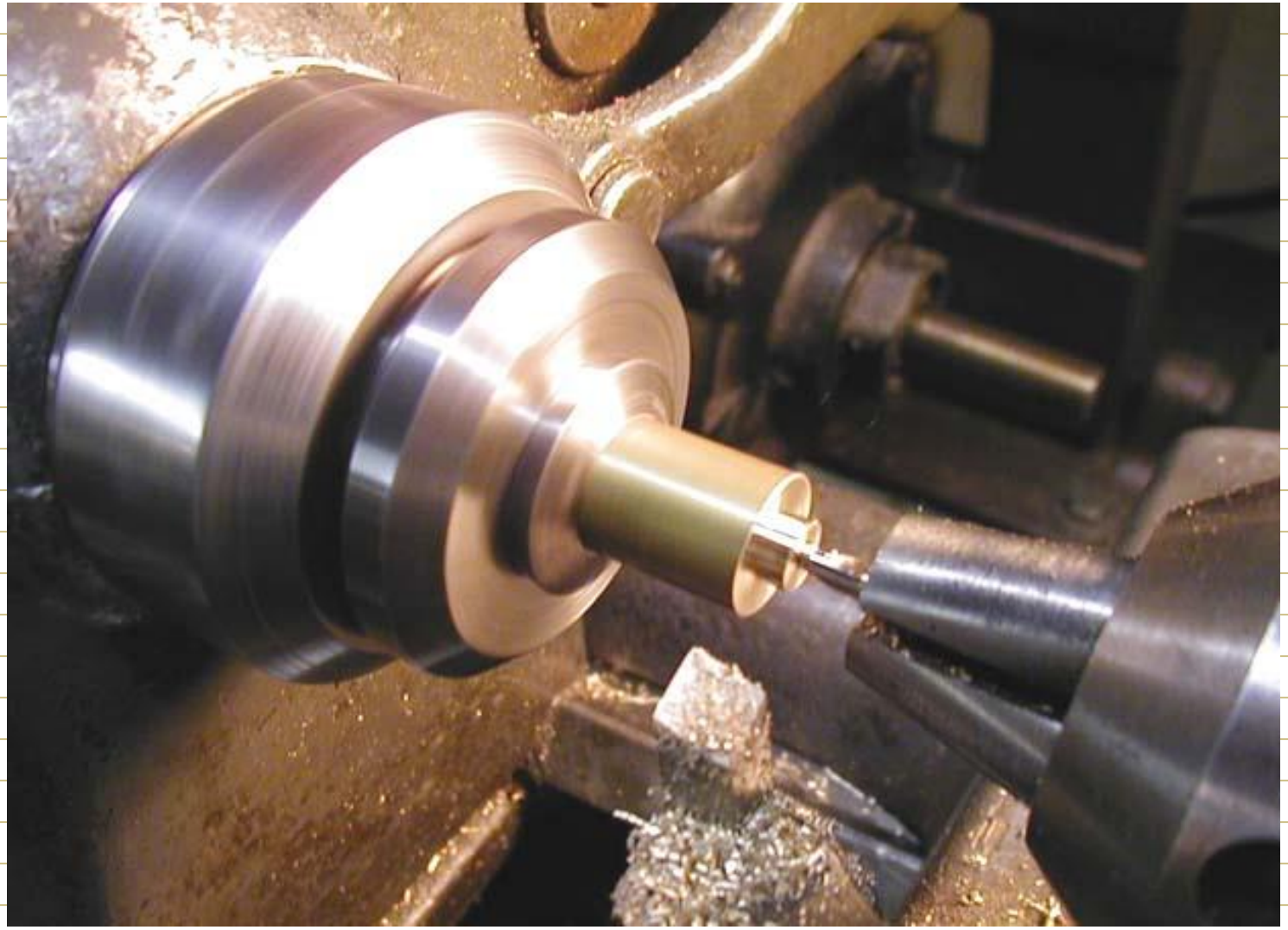
# Machining the Shoulder



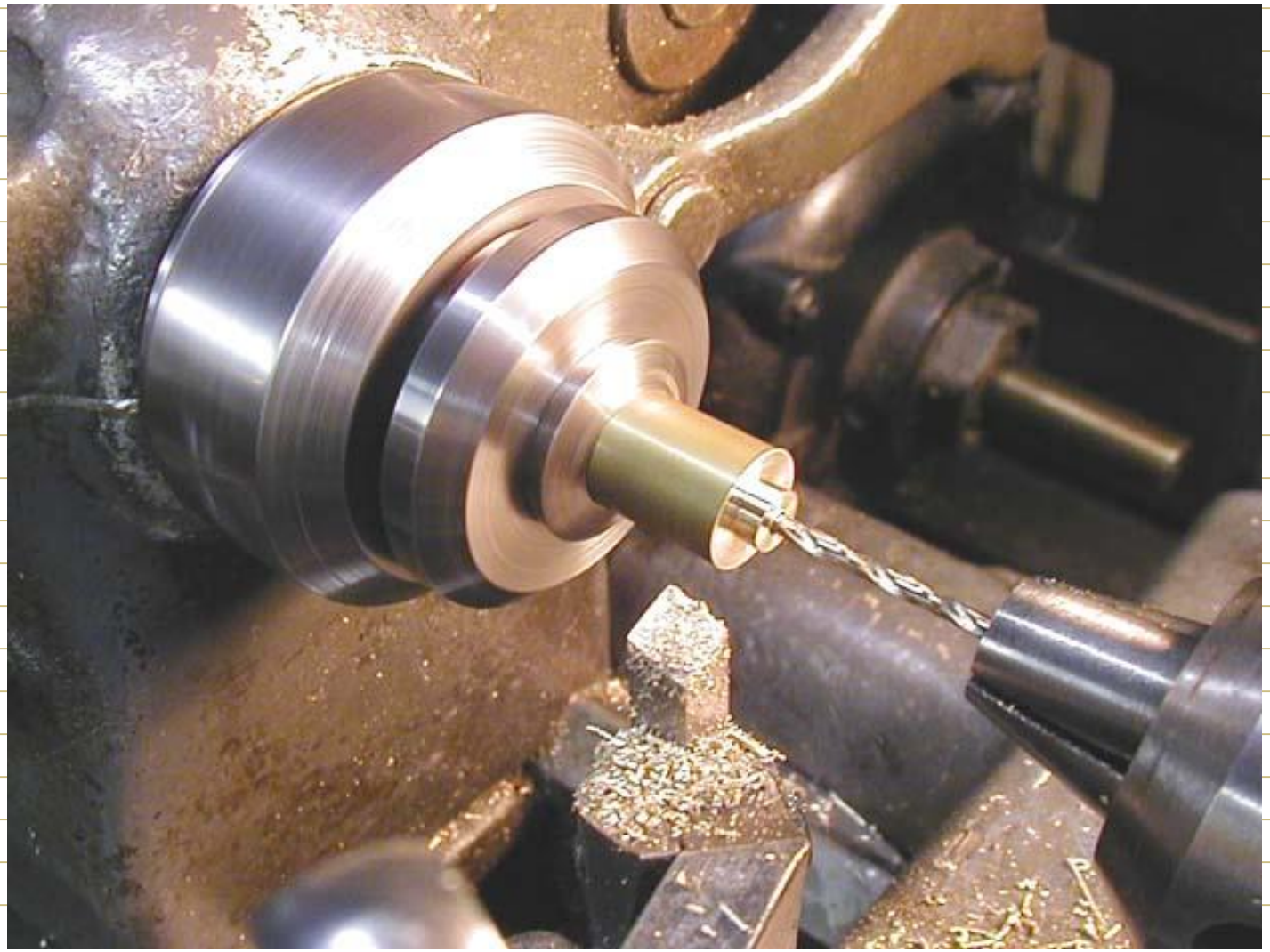
# Drilling the adapter

- Use a # 0 center drill and drill a pilot hole in each end of the bar and then drill a hole with a No 43 (4-40 tap drill) about 1/2” deep in each end of the bar.

# Center Drilling



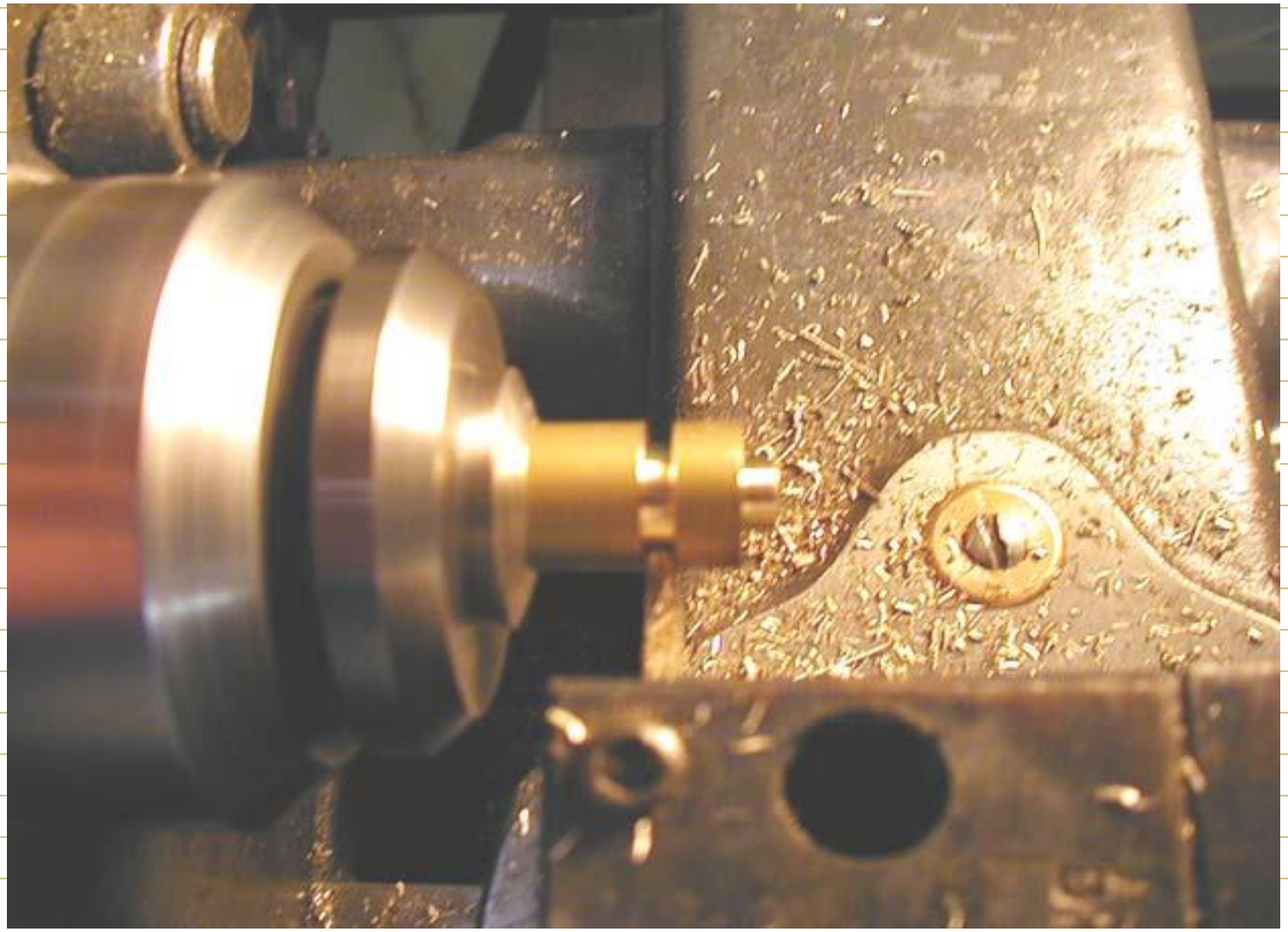
# Final Drilling



# Cutting Off the Adapters

- Using your cutoff tool, cut the adapters off of each end of the 1/2” rod to allow about 3/16” of stock length that is still 1/2” diameter.

# Cut Off Operation



# Final Sizing

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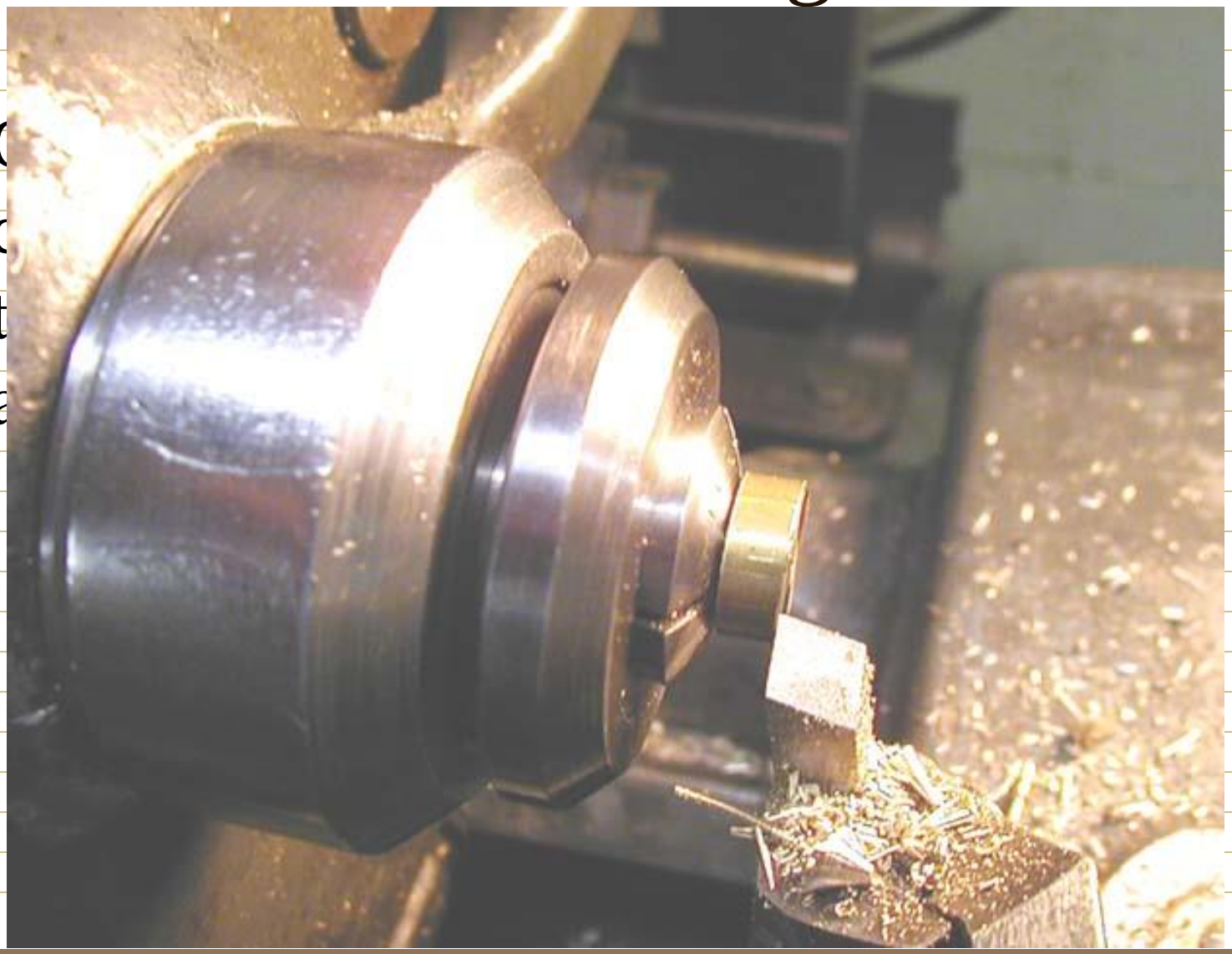
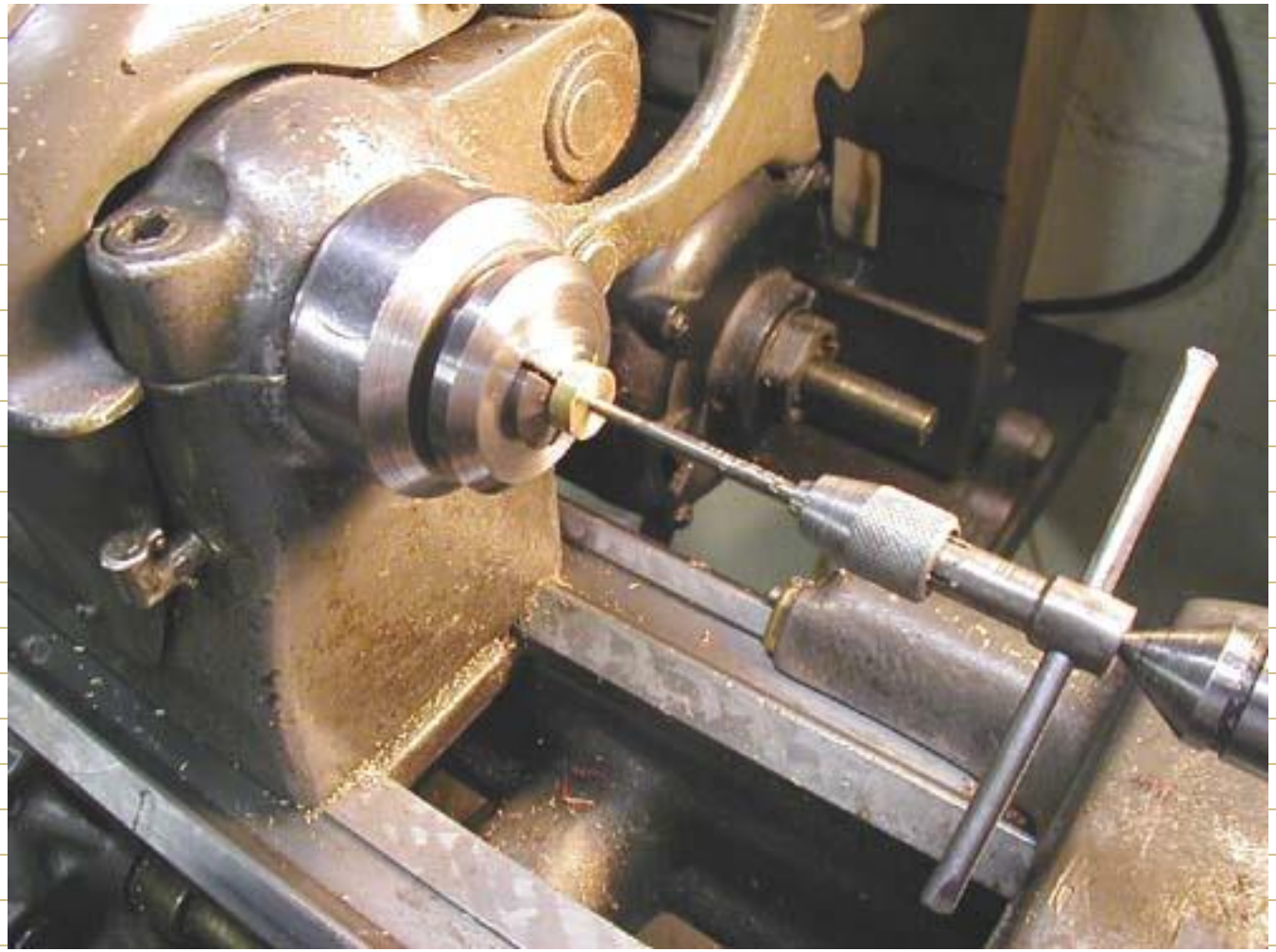


# Tapping

- Tap the holes in the adapters with a 4-40 tap running the tap all the way through the adapter.  I have power tapped holes like this in the lathe but usually just hand feed the tap in.  It is not fun to break a tap off in the adapter after you have gotten this far!

# Tapping the Adapters



# The Adapters and the Frame

- Using five minute epoxy or whatever your favorite cement is, glue the adapters into the frame from the bottom.  If you measured everything right, when you attach the AN trucks with 4-40 screws the car should sit at the correct height.  You can check the height of the car prior to cementing the adapters to the frame if you are not sure!

# Coupler Adapters

- I made the coupler adapters for this car from 1/2” wide by 1/8” thick brass bar. The bar is drilled to clear a 2-56 screw and matching holes are drilled in each end of the plastic car frame. The screw holes are located by the Kadee 805 coupler box, The screws nestle into a recess that conveniently exists in the top end of the frame. Put the frame in the car body to register the Kadee box so that you account for the car end.

# Adapters in the Frame

# Drilling the Coupler Mount's First Hole

# Drilling 2nd Hole

# Couplers Mounted

# Installing Trucks

- I used 4-40 x 5/16” long brass screws to attach the All Nation equalized trucks to the bolster adapters. A little removable Loctite in the screw holes and the basic 2 rail conversion is completed. Now you can add details and weather the model to your taste.

# 2 Railed Cement Gondola

# Erie Cement Gondola

- Here's a photo of another one of these cars that I converted and weathered.  Looks a lot more realistic with some crud on it!

# MTH Erie Cement Container Gondola

# MTH 50Ft Covered Gondola

- Here's a photo of another neat car from MTH converted in the same manner as the Cement Gondola.  You can see how much a little subtle weathering improves the appearance of a plastic hi rail car.  You could carry this conversion further by replacing the stirrup steps but I don't mind the bullet proof ones on operating models.

# 2 Railed 50 Ft Covered Gondola

# MTH 125 Ton Steam Crane

- This car filled a great void in O scale…finally an inexpensive wreck crane. You can find these for $50.00 or less. Conversion is similar to the other MTH freight cars. I used Athearn Andrews trucks on this one.

# 2 Railed Steam Crane

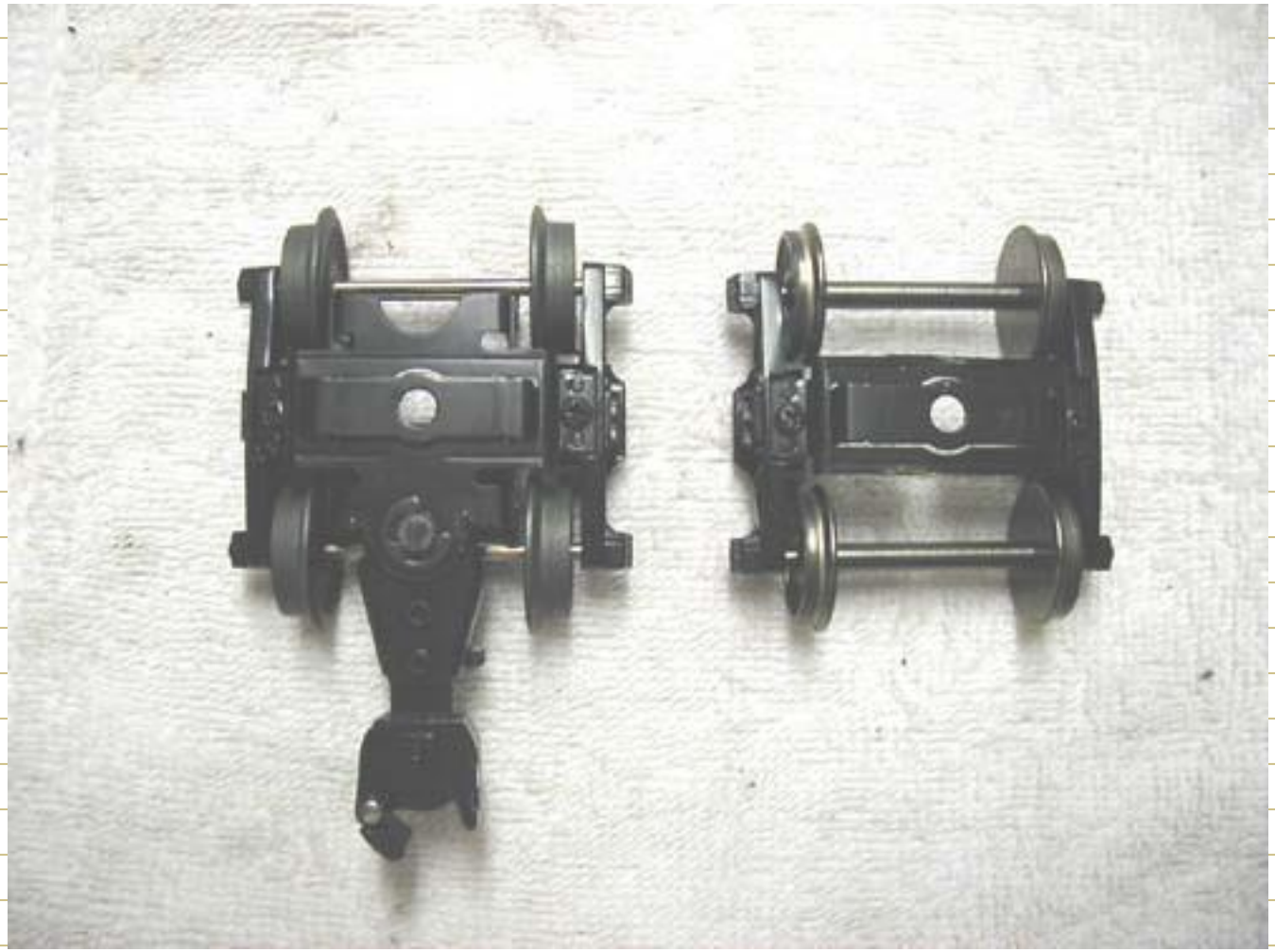
# MTH 2 Rail Conversion Trucks

- Since the photos showing the fabrication of the truck adapters were taken, I have leraned that MTH is now offering 2 rail conversion trucks in Bettendorf and Roller Bearing styles that make the fabrication of the truck adapters unnecessary (unless you want to use another brand or style of trucks). If you use the MTH trucks all you need to do is fabricate the coupler mounts and you have a two rail car.

# Lionel Trailer Flatcar

- Lionel made several versions of this car with what appeared to me to be prototypically correct trailers for each railroad.  I modified the Lionel trucks on this one and installed Intermountain pointed axle wheel sets.  I am pretty sure NWSL wheel sets would also work

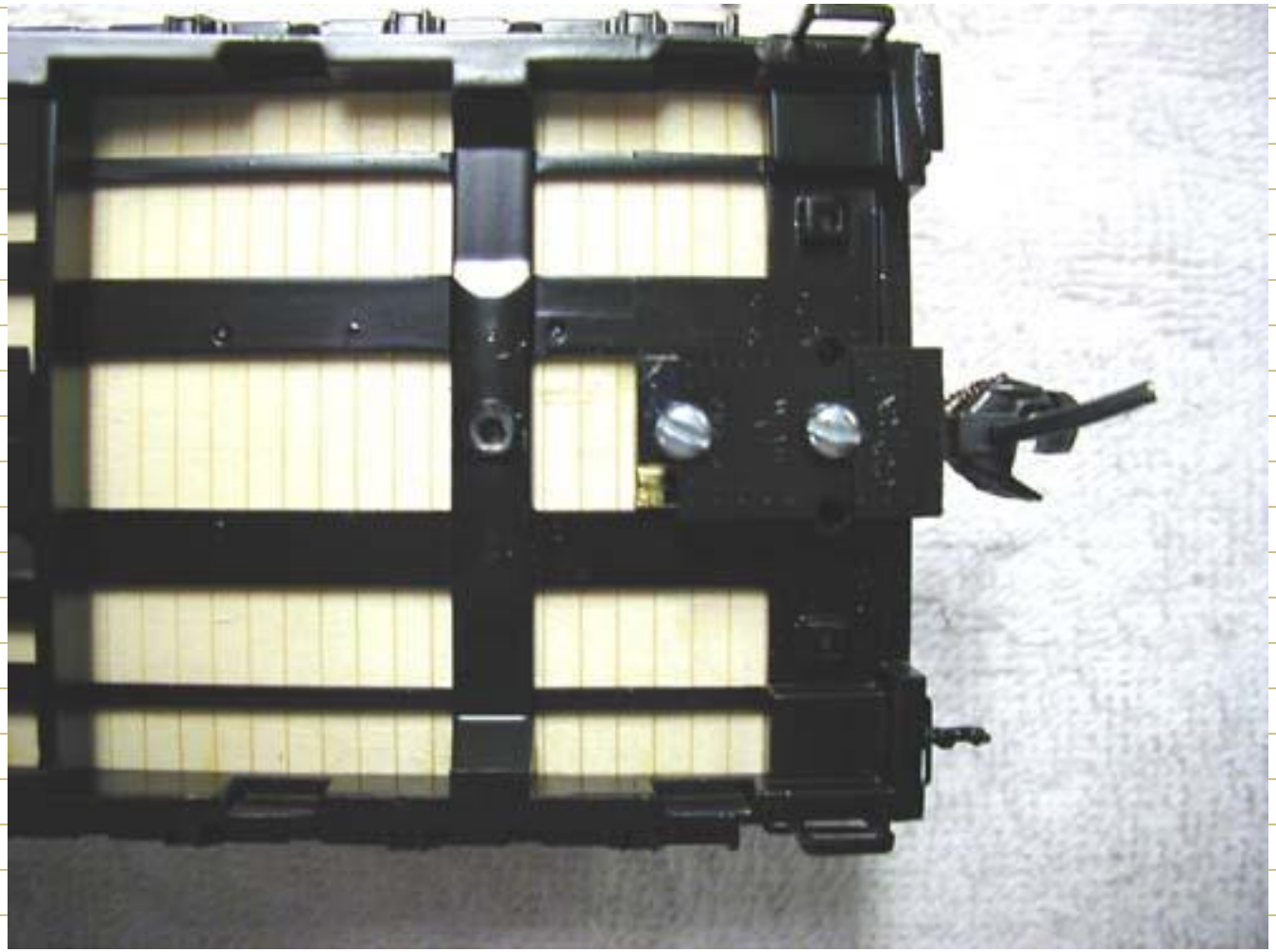
# Lionel Truck Modification



# Coupler Pads

- I used some more 1/8” thick by 1/2” wide brass stock cut to 3/4” length to make the coupler pads. The 1/2” width must be filed down to fit in between the plastic stringers on one end of the car frame. I drilled and tapped them 2-56 for the Kadee boxes, allowing for the width of the car end.and then used epoxy to attach the adapters to the wood car floor.

# Kadee Mounting



# Finishing the Car

- This car comes with a real wood floor that is the color of a piece of basswood (which it is!)  I washed the deck with some standard ebony wood stain to give it a weathered look.

# 2 Rail Lionel Trailer Flatcar

# Conclusion

- I hope this presentation gives you some idea of the work done at Baldwin Forge & Machine and spurs you on to doing some conversion work yourself. There are lots of models out there to work on! Please contact me with any questions you may have.

- Thanks….

- Joe Fochrkolb