

# ASSEMBLY INSTRUCTIONS FOR #100830 USRA LIGHT MIKADO KIT

These instructions provide photographs of completed model, exploded-view drawings, diagrams, step-by-step instructions and an itemized parts list. If for any reason beyond our control, any shortage or faulty part is found, write directly to the manufacturer, including name of your dealer and date of purchase. Return any defective parts for exchange.

The builder should study the instructions and drawings to attain a working knowledge of proper procedure. Assembly work should be done in sequence outlined in this manual to assure proper construction.

We have included some extra parts in case you misplace or drop them on the floor.

Do not run the mechanism or engine upside down.

## TOOLS

This is a builders kit, you will need a few tools. You will find use for the following: small hammer, Assorted pattern files, jewelers screwdrivers, a 6" flat file with a fairly fine cut, knife pliers, flush cut nippers like Mascot #413 and tweezers.

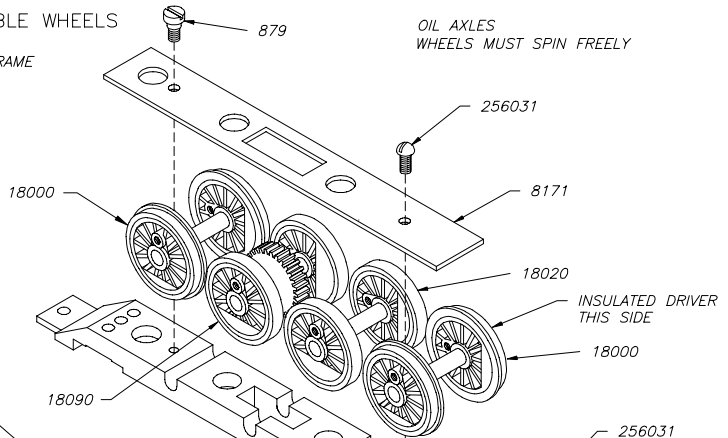
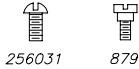
BEFORE YOU PAINT THE MODEL OR DETAIL THE BOILER, WE RECOMMEND THAT YOU BUILD THE COMPLETE MECHANISM, ATTACH THE UNDECORATED BODY AND THOROUGHLY TRACK TEST IT.

## STEP #1

### CLEAN CASTINGS AND ASSEMBLE WHEELS

NOTE: PAY ATTENTION TO SIDE OF FRAME INSULATED DRIVERS ASSEMBLE INTO

FULL SIZE PARTS DRAWINGS PARTS IN SUBKIT #100833, 100834



## STEP #2

### ASSEMBLE DRAWBAR

FULL SIZE PARTS DRAWINGS PARTS IN SUBKIT #100833



256101



27 BRASS



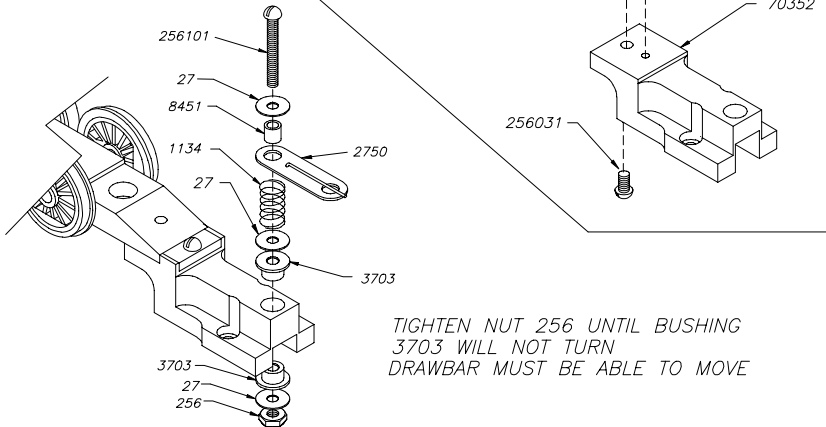
1134



8451



3703



### STEP #3

#### CLEAN CASTINGS AND ASSEMBLE WHEELS

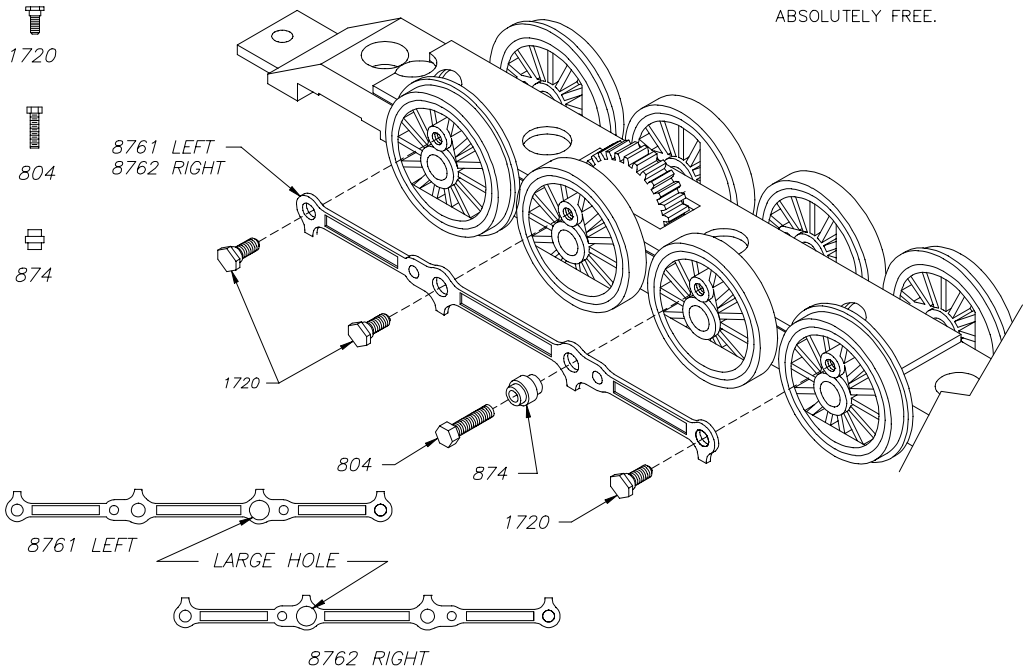
Check for binds by rolling back and forth on table.

If you feel a bind, check to be sure screw heads are not pinching side rods to wheels. If that happens file back side of side rod until it will move freely.

It may be necessary to enlarge screw holes with a round file. Be careful, do not strip threads.

DO NOT PROCEED UNTIL THIS PART OF MECHANISM RUNS ABSOLUTELY FREE.

FULL SIZE PARTS DRAWINGS  
PARTS IN SUBKIT #100831

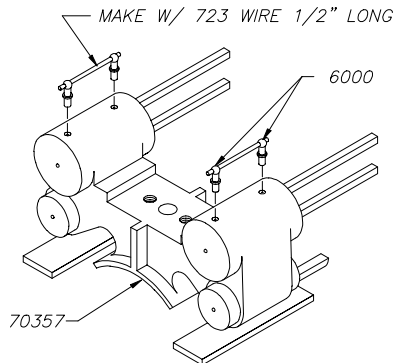


### STEP #4

#### CYLINDER PREPARATION

If brass guides come out, put a drop of glue in hole and tap into cylinder.

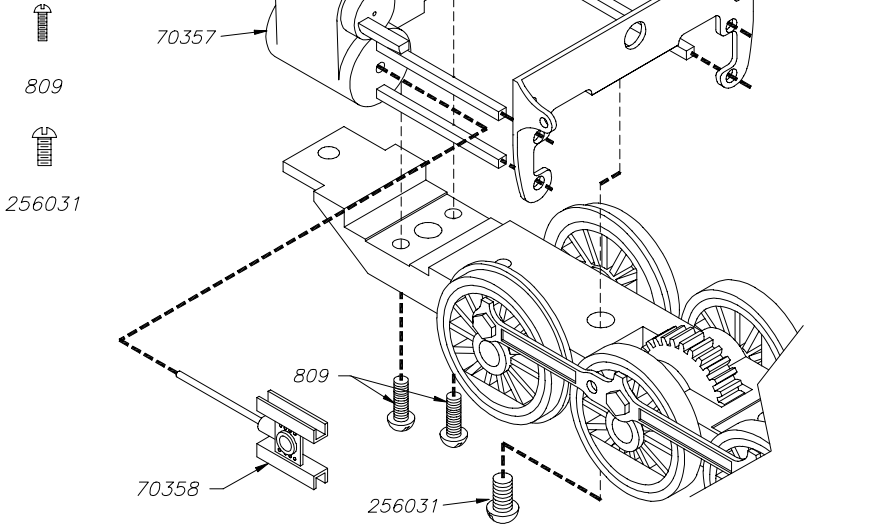
FULL SIZE  
PART DRAWING  
PARTS IN  
SUBKIT #100836



**STEP #5**  
**ASSEMBLE CYLINDER,  
 CROSSHEAD AND HANGER.**

Assemble crosshead to guides. Crosshead must slide freely. File slots if required. Install valve gear hanger on guides. Install cylinders and valve gear hanger to frame.

FULL SIZE PARTS DRAWINGS  
 PARTS IN SUBKIT #100831  
 & #100833

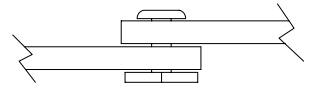
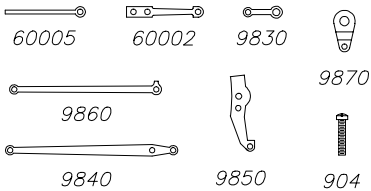


**STEP #6a**  
**ASSEMBLE VALVE GEAR**

All parts of each assembly should dangle freely. If they don't the rivets are too tight and must be replaced.

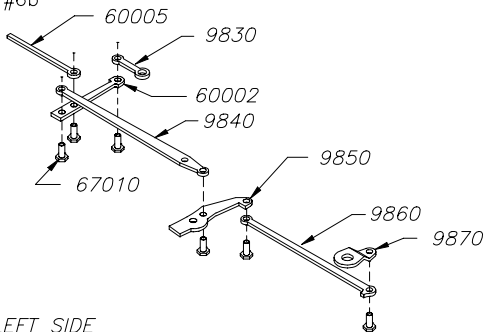
FULL SIZE PARTS DRAWINGS  
 PARTS IN SUBKIT #100835

SET RIVETOOL WITH CENTER POINT IN HOLE IN END OF RIVET. TAP WITH LIGHT HAMMER UNTIL RIVET IS PROPERLY FLARED. BE CAREFUL NOT TO MAKE JOINT TOO TIGHT.



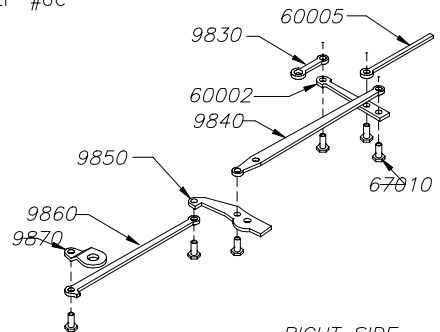
SIDE VIEW OF RIVET  
 SHOWN 10X SIZE  
 NOTE CLEARANCE

**STEP #6b**



LEFT SIDE

**STEP #6c**



RIGHT SIDE

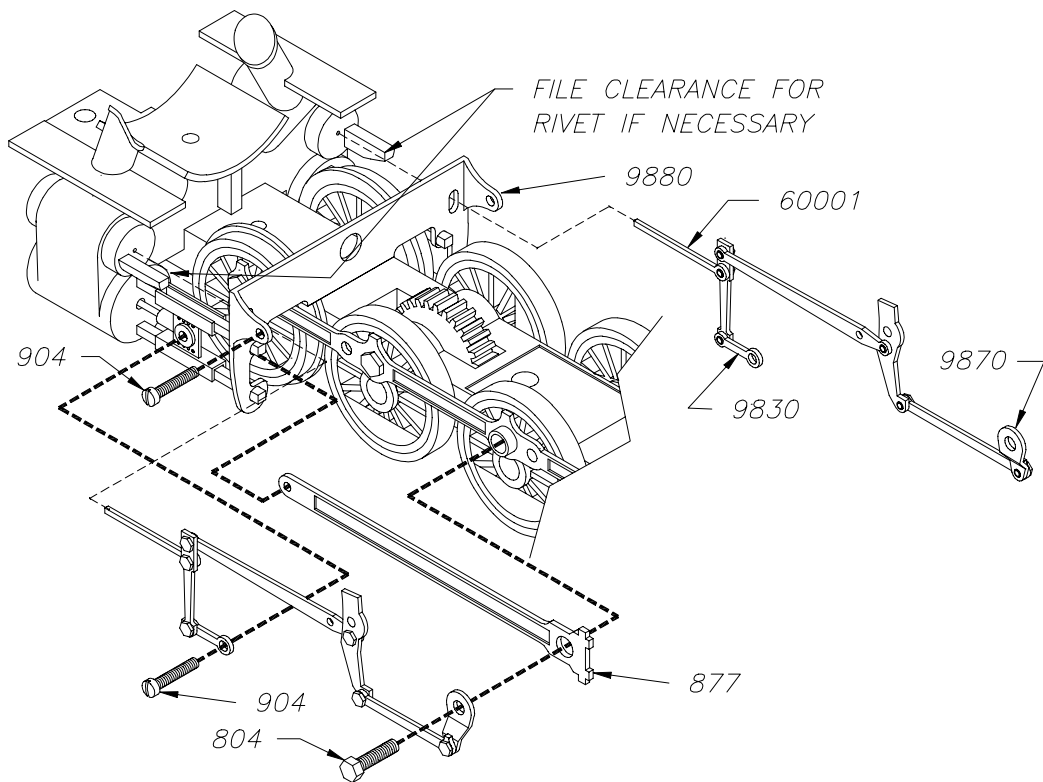
STEP #7

INSERT LINK 8830 THRU BACK OF HANGER 9880.  
 INSERT VALVE ROD 60005 INTO VALVE ON CYLINDER BLOCK (TOP HOLE).  
 INSTALL SCREW 904 THRU HANGER INTO RADIUS LINK 9850  
 DO NOT TIGHTEN SCREW TIGHT. LINK MUST BE FREE TO MOVE  
 INSTALL SCREW 904 THRU LINK 9830 & CROSSHEAD INTO MAIN ROD 877.  
 DO NOT ASSEMBLE TIGHT. ROD MUST BE FREE.  
 REMOVE 804 SCREW FROM MAIN DRIVER & INSERT THRU CRANK 9870  
 AND BACK INTO DRIVER. TIME VALVE GEAR AS SHOWN BELOW  
 CUT OFF (4) SCREWS 904 FLUSH WITH BACK OF PARTS &  
PUT A DROP OF GLUE ON THE THREADS TO KEEP FROM LOOSENING.

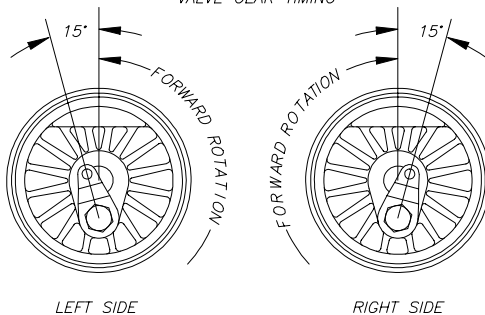
FULL SIZE PARTS DRAWINGS  
 PARTS IN SUBKIT #100831  
 #100833 & 100835



809



VALVE GEAR TIMING



MECHANISM MUST  
 ROLL FREELY

STEP #8

INSTALL VALVE GEAR TO MECHANISM

FULL SIZE PARTS DRAWINGS  
PARTS IN SUBKIT #100833



256031



440031



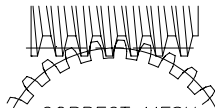
29



256



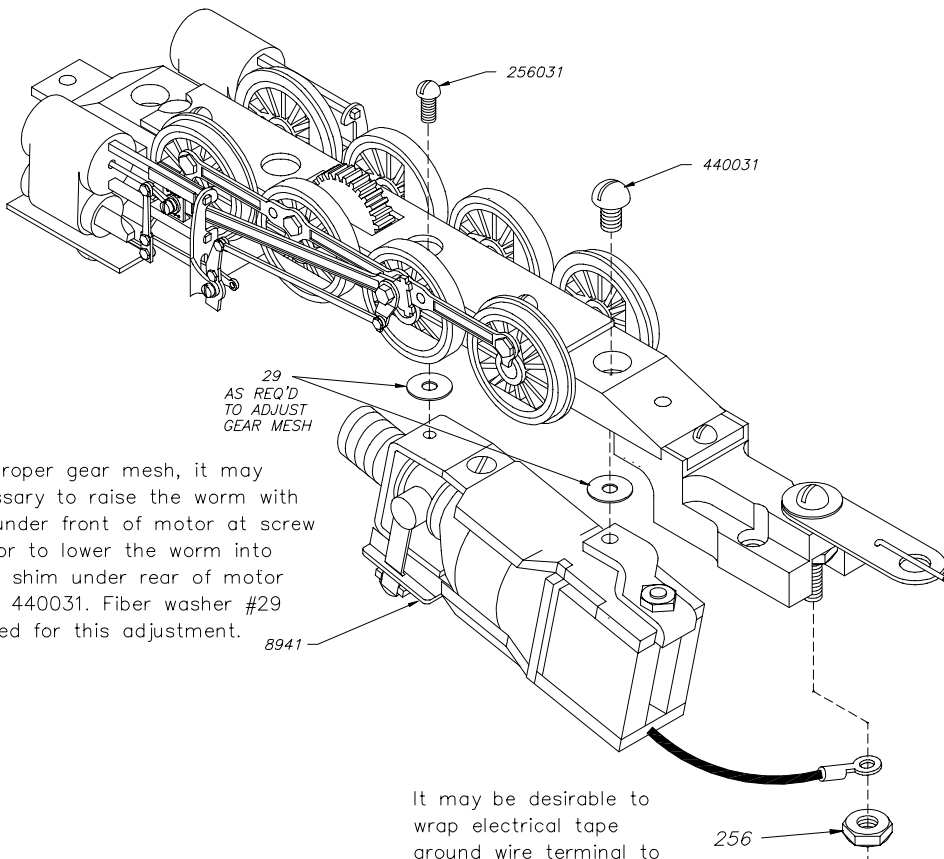
TOO TIGHT  
WORM BOTTOMS  
IN ROOT OF GEAR  
CAUSING EXCESSIVE  
DRAG ON GEARS.



CORRECT MESH  
SEVERAL TEETH  
IN CONTACT.



TOO LOOSE  
POOR TOOTH CONTACT  
CAUSING EXCESSIVE  
BACKLASH IN GEARS.



29  
AS REQ'D  
TO ADJUST  
GEAR MESH

To get proper gear mesh, it may be necessary to raise the worm with a shim under front of motor at screw 256031 or to lower the worm into gear use shim under rear of motor at screw 440031. Fiber washer #29 is provided for this adjustment.

It may be desirable to wrap electrical tape around wire terminal to prevent possible shorting.

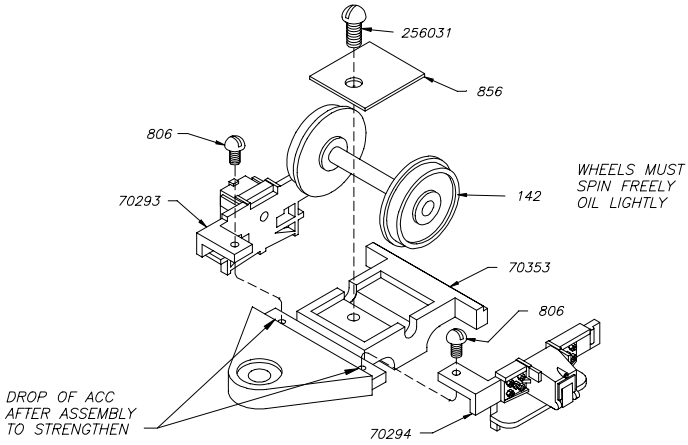
256

STEP #9  
ASSEMBLE TRAIL TRUCK

FULL SIZE PARTS DRAWINGS  
PARTS IN SUBKIT #100837

  
256031

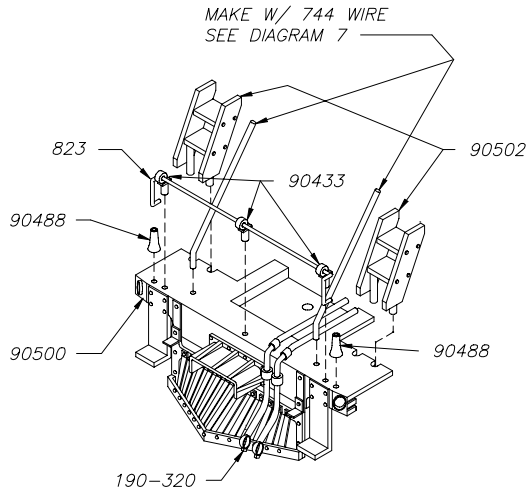
  
806



STEP #10

Assemble pilot details

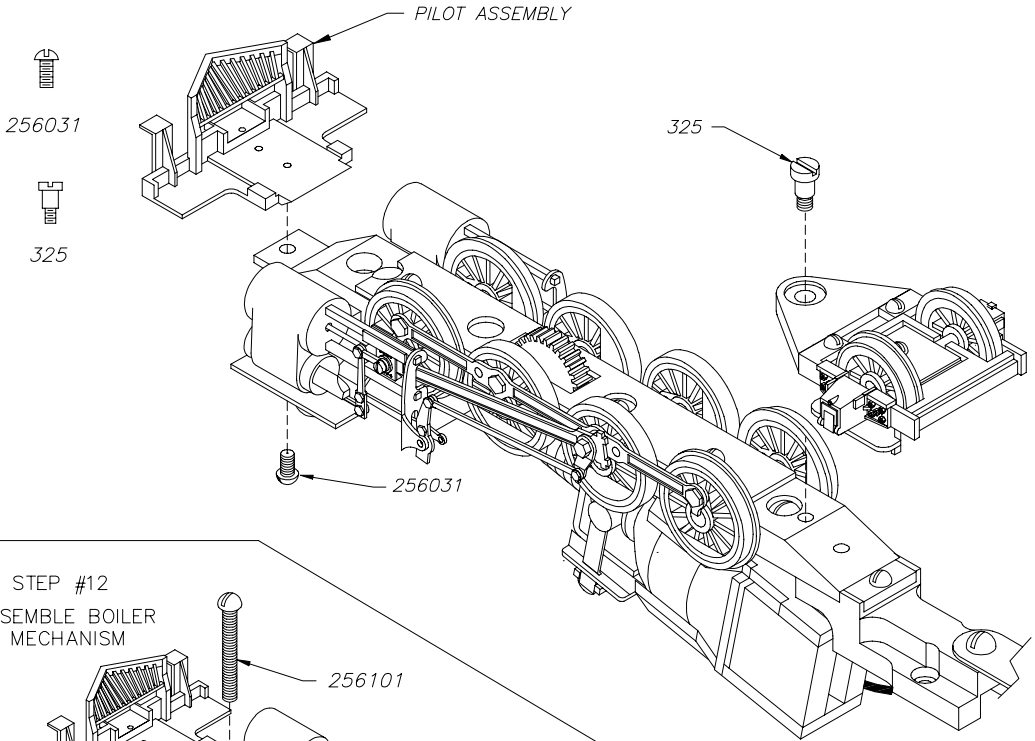
PARTS IN SUBKIT #100839, 100840



STEP #11

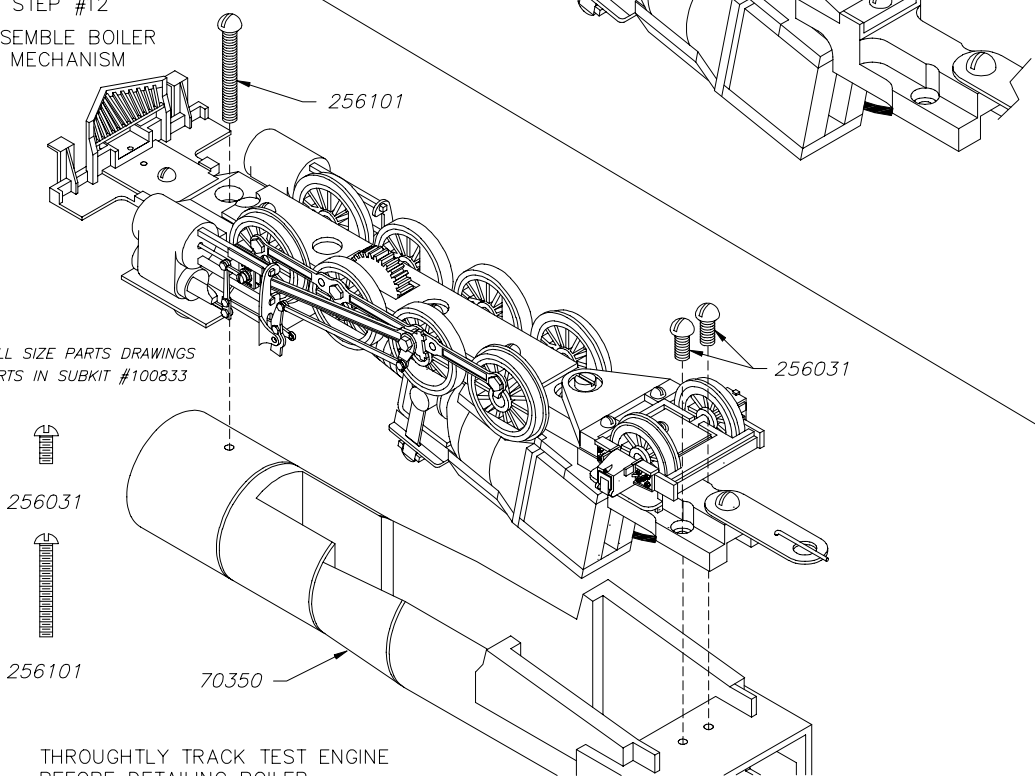
ASSEMBLE PILOT AND  
TRAIL TRUCK TO MECHANISM

FULL SIZE PARTS DRAWINGS  
PARTS IN SUBKIT #100836  
AND #100837



STEP #12  
ASSEMBLE BOILER  
TO MECHANISM

FULL SIZE PARTS DRAWINGS  
PARTS IN SUBKIT #100833



THROUGHTLY TRACK TEST ENGINE  
BEFORE DETAILING BOILER.

STEP #13

INSTALL LEAD TRUCK

FULL SIZE PARTS DRAWINGS  
PARTS IN SUBKIT #100834



879

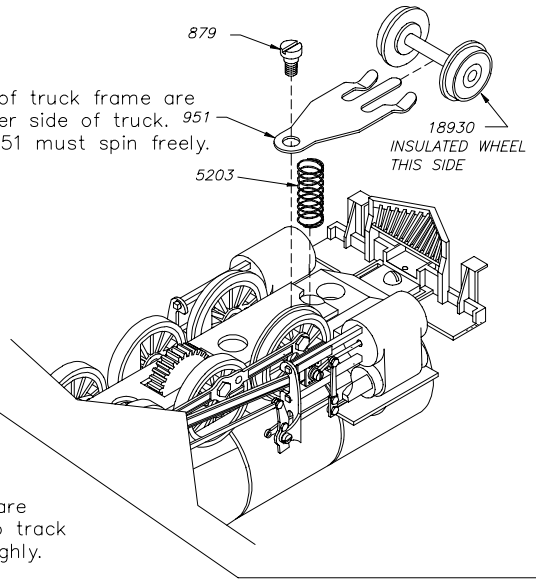
5203

Note (2) fingers of truck frame are positioned on lower side of truck. 951  
Wheels in truck 951 must spin freely.

879

5203

18930  
INSULATED WHEEL  
THIS SIDE



STEP #14

ASSEMBLE TENDER

FULL SIZE PARTS DRAWINGS  
PARTS IN SUBKIT #100259



256041

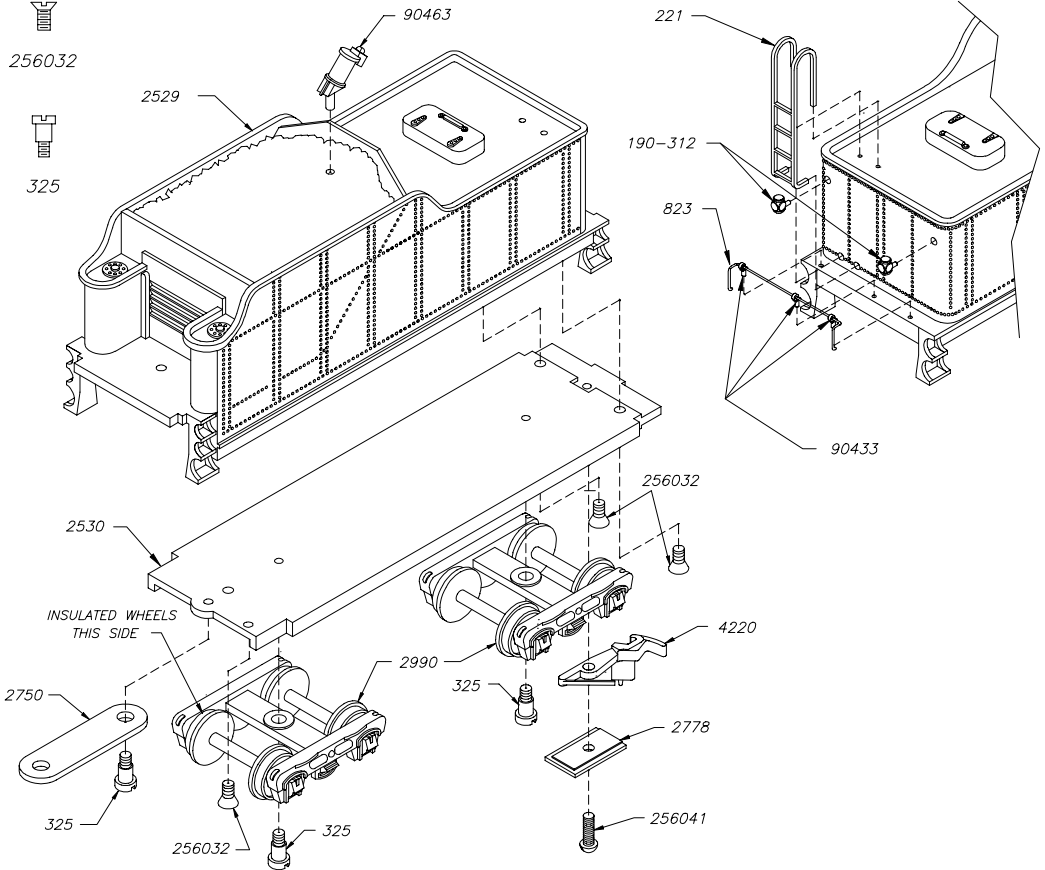


256032



325

After loco and tender are assembled it is time to track test. Track test thoroughly. Do not paint.



THOROUGHLY TRACK TEST ENGINE BEFORE DETAILING BOILER.





STEP #16  
 DETAILING BOILER

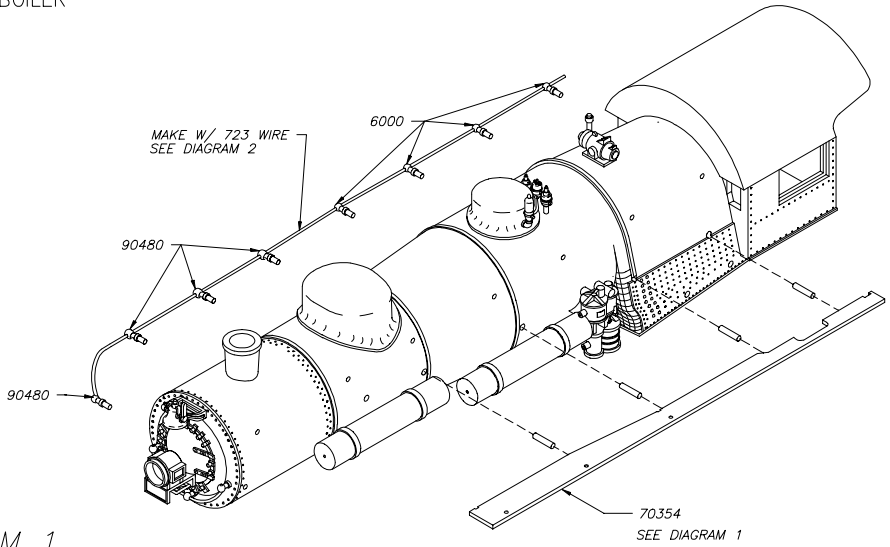


DIAGRAM 1

INSTALL .032 BRASS RODS FOR WALK SUPPORTS AND GLUE TO BOILER. INSTALL WALK ON RODS AND GLUE. CUT OFF RODS FLUSH AND AT ANGLE AND DEBURR.

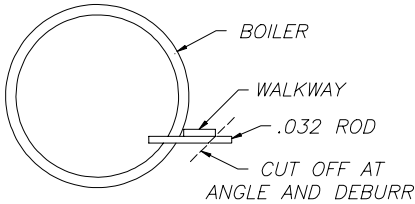
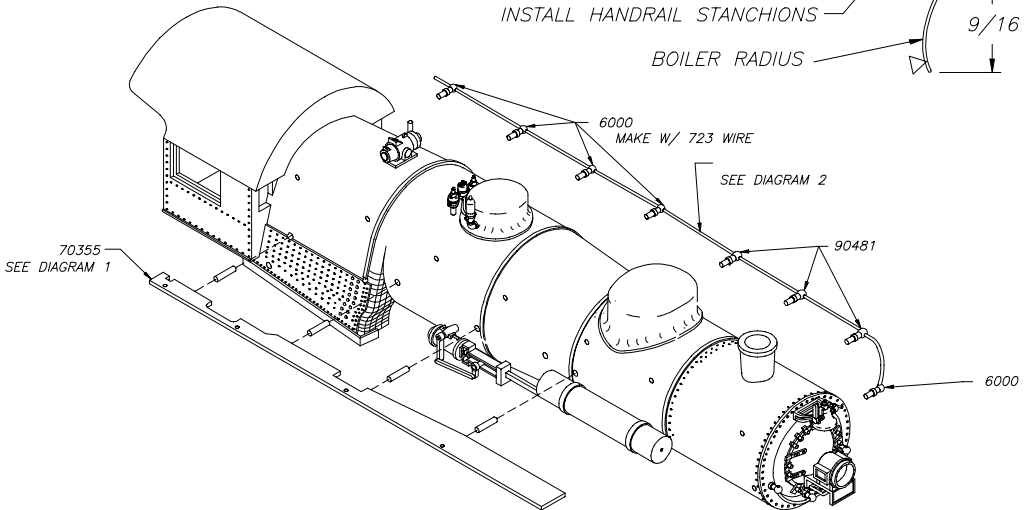
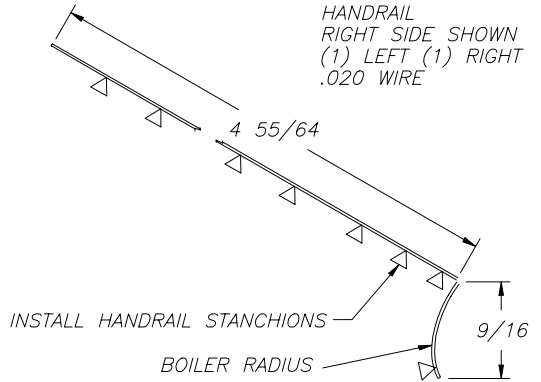


DIAGRAM 2

HANDRAIL  
 RIGHT SIDE SHOWN  
 (1) LEFT (1) RIGHT  
 .020 WIRE



STEP #17  
 DETAILING BOILER

FIRST STEP – INSTALL WALKS (SEE DIAGRAM 1 ON PAGE 11), COMPRESSOR, ASH PANS, POWER REVERSE AND (3) AIR TANKS. HANDRAILS AND STANCHIONS ARE LAST STEP!

PIPE HANGERS MUST BE INSTALLED ON WIRE BEFORE FINAL BENDS ARE MADE.

NOTE: ALL CAST PIPES: TURRET PIPES AND SANDER VALVE PIPES MUST BE ANNEALED BEFORE BENDING DO THIS BY HEATING UNTIL RED HOT AND QUENCH IN COLD WATER IMMEDIATELY. PIPE CASTING WILL BREAK IF THIS IS NOT DONE!

DIAGRAM 1

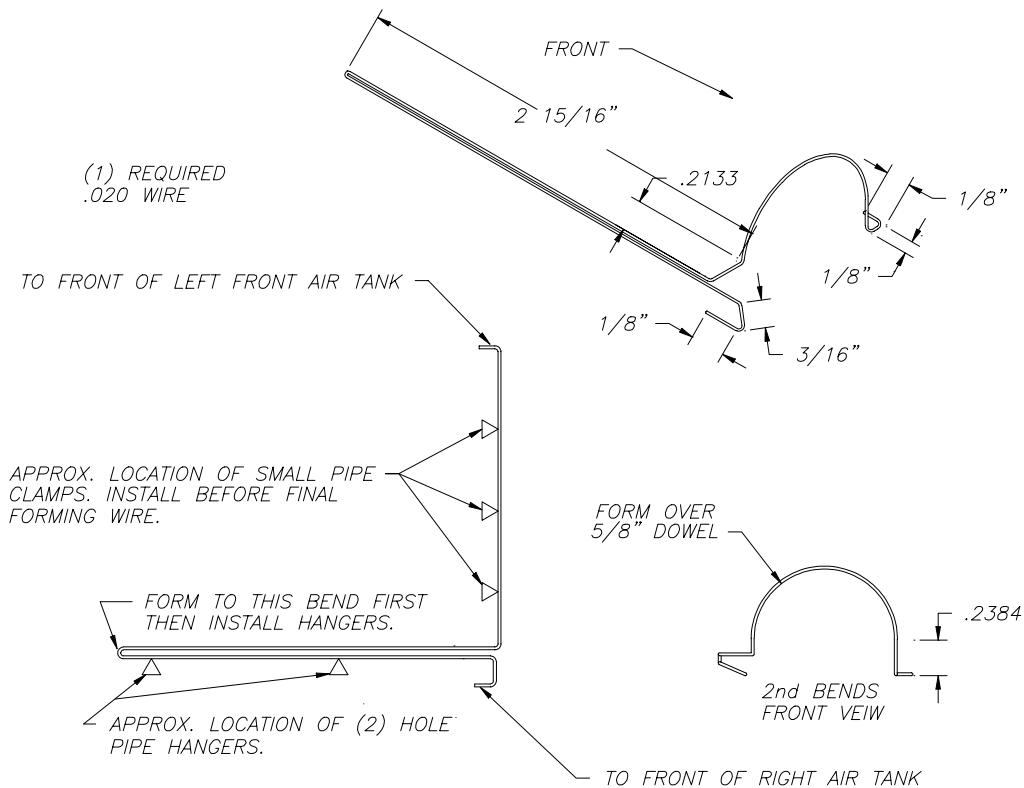
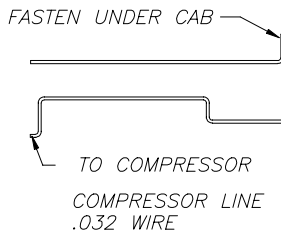


DIAGRAM 2



FORM OVER 3/8" DOWEL  
 .020 WIRE

DIAGRAM 3



STEP #17  
DETAILING BOILER

COMPRESSOR LINE  
(1) REQUIRED  
.020 WIRE  
SHOWN FULL SIZE

DIAGRAM 4

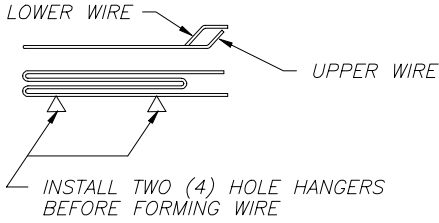


DIAGRAM 7

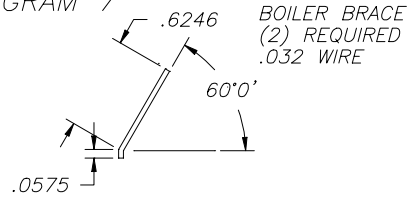


DIAGRAM 8

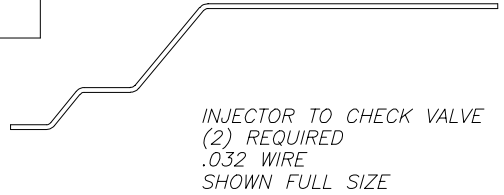


DIAGRAM 5

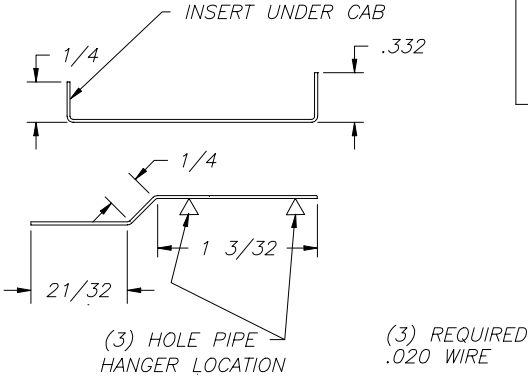


DIAGRAM 9

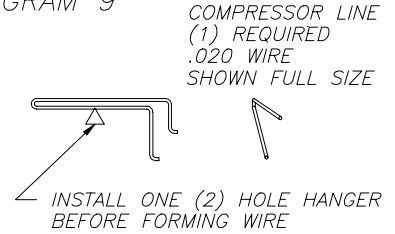


DIAGRAM 6

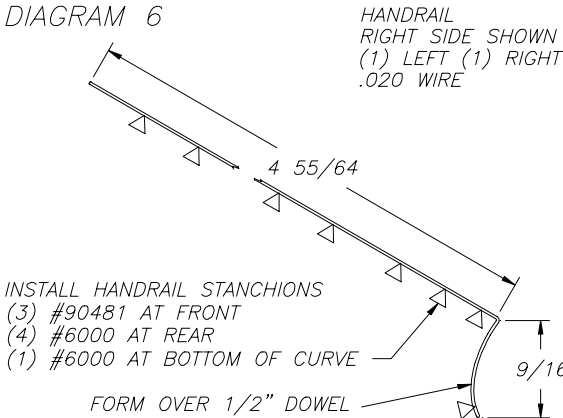
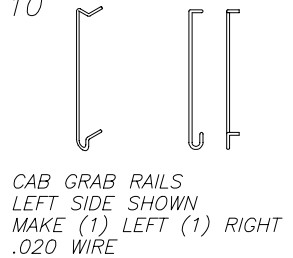


DIAGRAM 10



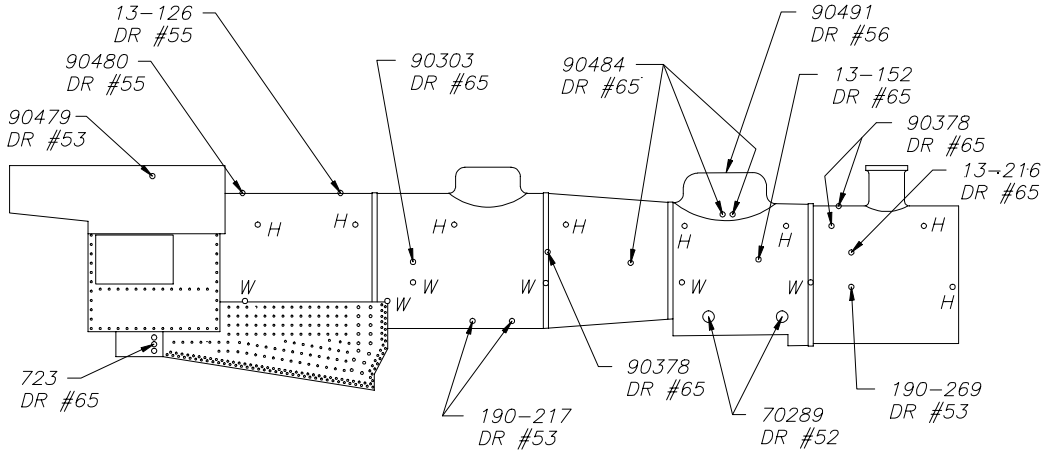
THIS SPACE INTENTIONALLY LEFT BLANK

# STEP #18 DETAILING BOILER

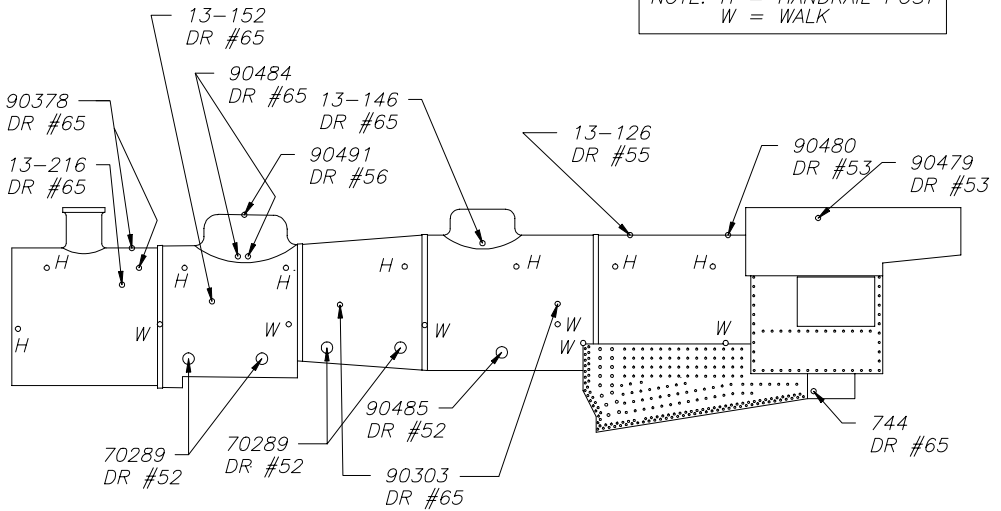
Review all drawings, piping diagrams, parts ID sheets and pictures before proceeding. Dry fit (no glue) all parts before installation. Glue all parts in place after you are satisfied with their fit.

## BOILER DETAILS PLACEMENT DRAWING

Subkit # 100836, 100839



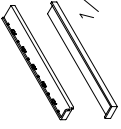
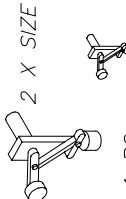

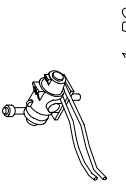
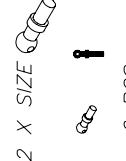





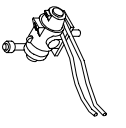
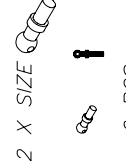

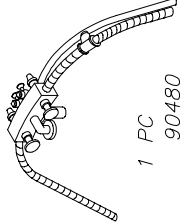
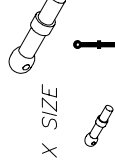
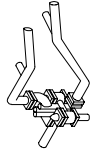

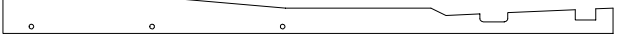
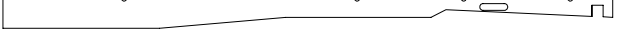
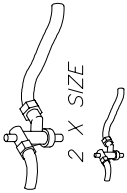
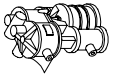
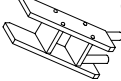


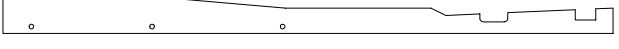
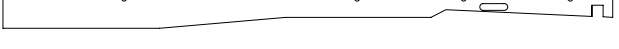









NOTE: H = HANDRAIL POST  
W = WALK



# PARTS IDENTIFICATION SHEET

## USRA LIGHT MIKADO 2-8-2

 1 PC 190-241	 2 X SIZE CLOSED OPEN 3 PCS 190-247	 1/2 SIZE 1 PR 190-249	 2 X SIZE 1 PC 13-146	 1 PR 13-152	 1 PC 190-216	 2 X SIZE 1 PR 13-217
 1 PC 90042	 2 X SIZE 4 PCS 90303	 2 X SIZE 3 PCS 90378	 2 X SIZE 6 PCS 90433	 2 X SIZE 2 PCS 90462	 1 PC 190-335	 2 X SIZE 6 PCS 6000
 2 X SIZE 3 PCS 90463	 1 PC 90480	 2 X SIZE 6 PCS 90481	 1 PC 90482	 1 PC 90483	 70354 LEFT WALK WALK	 70355 RIGHT WALK WALK
 2 X SIZE 4 PCS 90484	 1 PC 90485	 2 PCS 90487	 2 X SIZE 2 PCS 90488	 2 PCS 90491	 70354 LEFT WALK WALK	 70355 RIGHT WALK WALK
 2 PCS 90492	 1 PC 90499	 1 PC 90499	 1 PC 90499	 1 PC 90499	 1 PC 90499	 1 PC 90499

# Miscellaneous Building Tips

## TIP 1: Painting Metal

You may want to superdetail your loco before painting.

We suggest that you do not paint your loco until it is thoroughly track tested as disassembly and handling generally ruins a paint job. Take your locomotive apart so that the various parts may be painted without getting paint on moving parts.

Valve gear, side rods, bearings, pony truck, etc. will not operate properly if paint gets into the joints of moving parts.

Parts to be painted should be degreased with a solvent like paint thinner and pickled in acetic acid solution (vinegar) or oxalic acid solution (5%) for a few minutes before applying paint.

**DO NOT USE THIS VINEGAR FOR COOKING OR EATING.**

Rinse with clean water. Do not handle the surfaces to

be painted. CAUTION: Do not immerse wheels, underframe or cover plate in acid solution or cleaners. Brush cleaner and acid solutions on metal frames of lead and trailing trucks and on underframe surfaces to be painted (NOT ON WHEELS, AXLES OR BEARING SLOTS). Drivers are pre-blackened and can be touched up, after removing flash, without using cleaner or acid. I recommend a glossy paint be used (PRR locos were painted Brunswick Green). Apply a smooth, uniform coat of good grade model railroad paint. I like to spray paint my models. Work carefully to avoid piling up paint around small details.

Painting exposed surfaces of main frame will add to final appearance of model, but be careful not to get paint in any bearings.

## TIP 2: Hex Head Wrench (Cheap and Easy)

Go to your hardware store and buy Socket Head Cap Screws or Set Screws in many different sizes. They have the hex shape machined in the head and will work for tightening hex head screws.

## TIP 3: Soldering Tips

Wear Eye Protection

First be sure everything is clean.

Put flux on both parts. Hold together and place solder iron at joint. The solder will flow to the hot area. Solder should not form a ball. This indicates the area was not hot enough. To tin your soldering iron so that solder will stick to it.

When cold clean the tip with a file. Put a little flux on tip. Turn on iron and apply solder to the tip as soon as it gets hot.

If this does not work. Clean the tip while hot and dip tip in a drop of flux (while hot) and immediately put solder on tip.

## TIP 4: Cleaning A File When the Grooves Fill

When filing parts, the grooves in a file will fill with the metal you are filing.

This metal can be removed quickly by using a small piece of thin steel (1/16 to 1/8" thick) and sliding the steel on the file in the direction of the grooves. The chips that remain can be removed by sliding a sharp knife in each groove. This may take awhile to clean each groove. I do this only as a last resort. To keep most of the chips from sticking while you file, apply a thin oil to the file before filing.

## TIP 5: Drilling Small Holes

To drill metal with small drills it is best to use powered tools. Dremel tool or a small drill press. Hand drilling with a pin vise will work but is much slower. You must drill straight. Drills do not bend they break. Use a lubricant on the drill. Cutting oil is best, but you can use a bar of Ivory Soap. Put the lube on the drill before starting. I recommend peck drilling.

(Drill about 1 or 2 times the diameter of the drill and remove the drill from the hole. Clean off the chips. Lube the drill and repeat.)

Take your time. It is very important to clean the chips from the flutes of the drill. When the flutes fill with chips the drill will break.

The smaller the drill the more you need to peck drill.

## TIP 6: Tapping a Drilled Hole

First be sure your hole is the proper size.

00-90 Taps #60

0-80 Taps #55

2-56 Tap #49

4-40 Tap #43

These drill sizes are one size larger than the charts.

We feel they work very well for steel, brass and zinc.

You must tap straight. Taps do not bend they break.

Use a lubricant on the tap. Cutting oil is best but you can use a bar of Ivory Soap.

Put the lube on the tap before starting.

Turn in tap to get it started (1 or 2 turns). Back off 1/2 turn. This breaks the chips that form when tapping.

Repeat above. As the hole gets deeper you will have to back off the tap more often. If you are tapping a very deep hole you will have to back off the tap after as little as 1/2 turn