

--- KIT INSTRUCTIONS FOR ---

USRA LIGHT MIKES (2-8-2) (PARTS CODE 'M')

Nickel Plate H-6-b (611-#615), used 2 Wheel Commonwealth Delta Trailing Trucks New York Central (#5150-5194), they must have liked these engines! Louisville & Nashville (#1510-1514)

Also many used by B&O, C&A, CCSL, C&E, CGW, GT, GTW, KO&G, MC, MONON, PM, P&NV, RI, RUT, SAL, SLSF, SOU, UP, SP, NP and many, many other roads. About every road had them.

USRA HEAVY MIKES (2-8-2) (Parts Code 'I')

Also CNJ, Erie, F&W, L&N, Milw, W&LE, WP and many others, in fact about every major road in the country used Light and Heavy Mikes, or some minor to major change after WWI. You can easily make these changes with our other parts up to a very modern engines quite different looking than these USRA's.

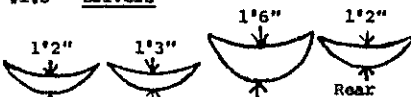
Before startin work, re-read "Soft Soldering" in Parts Catalog, page 14. Also note the "Carbon Rod Resistance Soldering". This method makes torch soldering as obsolete as the torch made the soldering iron, especially if you expect to make a couple engines. It can be made for about \$45.00 at this writing. The 6 volt(non-shocking) 16 or more amp. transformer to the biggest cost, about \$35.00, the rest is cheap.

The dimensions herein are the same for each engine unless otherwise noted. The "Parts Installation Booklet" is the main part of this "Kit Instruction", so be sure you read it for each part installed, at least for the first engine you build. The "Kit Instructions" is mostly for the order of assembly, so follow it for your first engine, then your next one you will have the basic knowledge, and building will be much easier. Any difference with the "Parts Installation Booklet" will be noted here in the "Kit Instructions". Thus when you have built one engine you will not have to read complete engine building instructions for each engine. Then the plans will show where the part goes

BASIC RUNNING GEAR

#3.5 Counterbalances--can be installed now or any time.

#1.3 Drivers



#18.32 Frame

#12.4 Motor--Can be fitted now and then removed

#13.1 Flywheel--Same as above.

#14 Crank Pins--Screws with sleeves over them.

#16.6 Side Rods--Bottom Oilers removed. Besure the straight pins are cut as short to the Side Rod as your dikes will and pean this pin over DO NOT allow the pin to bend over which effectively shortens or lengthens that section much too much.

#25.5 Steam Chest--Remove the little square fittings just in front of the large vertical pipes and one of two nuts on either side of it, the inner one. After filing off the gating, you may have to grind and file to re-contour the cylinder barrel. Large vertical pipes may need bending inware or outward with protected hammer.

RUNNING GEAR DETAILS

Engine screws--Screws in envelope are for:
1-2-56 x 3/4 brass round head,
Thru Beam-Deck, Steam Chest

and into Boiler

1-2-56 x 3/16 brass flat or round head.
Rear end Frame and into Cab-Frame angle mount.

1 2-56 x 5/8 brass round head & long sleeve and washer. Trailing Truck.

1 2-56 x 3/8 brass round head and short sleeve. Pilot Truck.

1 2-56 x 3/8 round or filister head.
Hold Valve Gear to Frame.

1 6-32 x 1/2 steel or brass round head.
Screw Steam Chest to Frame.

Some screws may be a bit longer.

Small diameter screws 2-56, slight-longer 4-40 and largest 6-32.

#78.7 & .8 Boiler--Your Boiler is assembled, but do not torch parts on from inside Boiler as the sand cast Boilers. Boiler needs front and rear mountings. There is a 1/16" brass plate in the front bottom of the Smoke Box. On outside bottom of Smoke Box are engraved locations to drill #50 hole and tap 2-56 .400"(3/8") back from the front for the Light Mike or .500"(1/2") back for Heavy Mike. Try to drill this hole as straight as possible, then tap it 2-56. Or less desirable, drill the hole #43 and use 2-56 nut inside Smoke Box, or solder it there. Assemble with Steam Chest and Beam-Deck below.

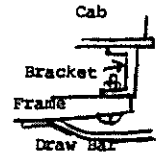
#54.2 Beam-Deck--With tin shears, cut off rear portion of Deck 6 1/2" to rear of notch, leaving 6 1/2". Lay Pilot Deck under front protruding lip of Steam Chest, up against the Frame. Extend the lead of a lead pencil and stick it down into the Steam Chest lip hole to mark where a nes #42 hole has to be drilled. Now a long 2-56 screw is put up thru this hole up thru the Steam Chest and screwed into the Smoke Box. Notice that Beam-Deck is above rail as on drawing. If it has to be raised, bottom of Steam Chest lip can be filed thinner. Or if it is to be lowered, use some scrap stock to shim between it an Steam Chest.

#124.5 Cab, USRA--Assemble Cab and install on Boiler. Differently than Cast Boiler, it is torched more than the Cab, stray heat will be enough on the Boiler, with wet swabs around on the Boiler except where soldering, to prevent Boiler section coming unsoldered. Cab is best soldered on Boiler by soldering just several spots. If spots are small enough and solder has flowed well between Cab and Boiler and Cab fits well to Boiler these spots are all that is needed. Install Cab Floor with cut out for

motor. See last paragraph in "Parts Installation Booklet" on page 14.

Rear Cab-Frame Mount--

Make a bracket from scrap brass about 1/4" wide and about .025" thick, to a length to elevate CL of Boiler proper distance above rail. Drill #43 hole and solder a 2-56 nut to the inside as shown above. This bracket and end of Frame should be forward of rear of Cab floor about 1/16" so as to give room to install Baffle Plate later. Put swabs in corners of Cab sides and floor. Pre-tin top of bracket, screw bracket to the frame, put thick SIP(Solder In Paste) on bracket. Be sure Frame is in center of Cab, then torch Bracket in place. Of course removing this screw releases the Boiler from the Frame.



#56.1 Flagstaffs--

#57.1 Uncoupler Brackets--

#60.3 Pilot--

#62.1 Beam End Steps--

Coupler not with kit. See #54.1. Note height of shank CL above rail.

#20.1 Leaf Springs--

#64.6 Pilot Truck--You may have to grind off rear of Pilot Beam to clear 33" wheel's swing.

#65.13 Trailing Truck--Hodges for L. Mike and Cole for H. Mike. Later engines used #65.7 2 wheel Commonwealth Delta. Use 43" wheels, spoked.

#26.1 Valve Guides--File to contour of Steam Chest.

#32.3 Walcherts, long, Valve Gear--}Both

#34.2 Outside Yoke--

installed together. Remove top pin on back of Yoke and file remaining pins to half diameter from the outside only to fit into Valve Gear. After Yoke and Valve Gear Frame are soldered together according to instructions, install, screw Valve Gear in the second hole of the frame from the front. The Yoke should then be 6" behind the Steam Chest body and outer sides of the Gear Frame 11 1/4" appart.

#36.4 Crosshead Guides, Alligator--

#37.8 Crossheads, Alligator--

#30.1 Union Link & Combination Lever--The minute location of Valve Gear is determined by the Valve Rod of the set, from #26.1 Valve Guide to Valve Gear.

#40.7 Main Rods--Oilers only on top.

#41.1 Eccentric Cranks--

#42.2 Eccentric Rods--Oiler only on top for L. Mike, both on for H. Mike. Use non-fluted side.

straighten up as the solder melts. Start piping in the Tanks so soldering on them will be done before other piping gets in the way. Start with front of right Tank, and over top of Smoke Box and into front of left Tank. Before this piping goes over the Smoke Box we terminated it inside of the forward Pipe Clamp, in the middle of it, and starting another 1" piping here, both soldered here, then continued over the top. Then put in the remainder of the right side piping, all 1" piping. You will not be able to run all piping its full length with one piece of piping, so go as far as you can and terminate inside a clamp and go on with another piece, as you did above. Some loop back to Cooling Coil Clamps like a hair pin, you can do exactly that, make a hair pin shape for that end, and other short lengths.

With the right side done, go on left side in similar fashion, putting in short lengths at a time makes a tough looking piping job simple. Start with Tanks

If you are using piano wire and you get it red hot, it will warp, and there is not a need for it. Wire should be pre-bent for the location and heated only enough to solder with "Solder In Paste".

Put "Solder In Paste", when done, in the front of the Pipe Clamps and back and torch solder until the piano wire turns black or blue and the solder shines. This does not have to be done with all the Clamps, usually the front and rear one of several in a row and where you have terminated piping in the center of a Clamp and continued out the other side. Use a small torch flame for this. Sometimes you will not have to solder the piping in the Tanks, it will stay there itself. It would be good to plan it that way, so a short length from last mooring will hold it there and avoid the more difficult Tank soldering.

- #134.1 Old Handrails can now be cut out, by cutting them between each Handrail Post, then installing new ones. Put a drop of SIP on each Post and Handrail and torch as on piping. This will make the Handrail Posts very sturdy.

TENDER

- #211.4 Tender Frame, USRA type--
 #200.5 Wrapper, USRA type--
 #209.1 Deck, Coal Chute & false bottom
 #234.3 4 Wheel Andrews sprung Truck--
 #212.1 Bolster Pins(screws)--
 #216.1 Bunker Doors--Use only horizontal door, not furnished.
 #225.1 Bunker Ladder--Located in middle of Tender from side to side.
 #217.2 Tender Hatch--Located on rear of Deck.
 #224.3 Tender Ladder--medium length
 #222.1 Strap Steps--Two in back
 #222.2 Cast Steps--Two in front
 #231.2 Brake Rigging, 9 wheel--Mount the Brake Cylinder on the Frame on the left side of center and midway from front and back.
 #214.1 Draw Bar--

Couplers of your choice--Not furnished, for obvious reasons.

Now your engine is done, and aren't you proud of it? Not brought home from a store and put on the tracks, but you put it together yourself. If you want to, and you are intitled to, to show it off to your friends---who took theirs out of a box. Naturally if you were to make it again, you would do it differently---you are not in a class by yourself, the "Master Builders" are never quite satisfied, and would make changes on the next one---this is human nature to not be quite satisfied, always moving upward.

You can help some to help appearance by removing some of the excess solder around parts with a small file and the small chisel you made earlier to scrape and push solder away, including in corners. Some darkening from flux and handling can be removed by brushing down with thin paste of washing detergent and an old tooth brush or small ten cent store paste brush.

Now that you are happy with this engine, would you like to build another but still look very different? Well these engines were modernized thru the years little at a time until the end of steam they looked quite different, even tho basically they were the same. Various roads added some or all of the following; #65.7 or .8 Commonwealth Delta Trailing Trucks, #45.2 dual Compressors on the Pilot Deck(Beam-Deck), different Pilots, Shields in front of the Beam Compressors, Different Valve Gears, 2 large #108.5 or .6 Sand Domes, #100.3 Elasco Feedwater Heater on the front top of the Boiler at the Boiler Front or mounted right out on the Boiler Front, Vanderbilt Tender etc., etc.

Lastly you could no doubt sell the engine at a profit and build another you may like better.

Hope you enjoyed your engine building an your layout.

NOTE # 1

The Handrail Post locations are located on your Boiler by small engraved circles for easy drill starting. Install as PIB, drill holes a drill size undersize, then re-drill right size when ready to install Handrail Posts.

The Washout Plug locations are also engraved on your Boiler, the larger circles. Again drill undersize, then re-drill right size when ready to install. Try installing them, re-drilling man not be necessary, if your drill should need sharpening or not ground accurately. If solder is put on from the inside, the solder will not show when torched, but you will want to try each one to be sure they are tight.

Back to the Handrail Posts. Some of the holes may not be perfectly in line, but is not important, as the Handrail Posts can be bent to align straight Handrails. But if these holes are over 1/8" out of alignment, they should not be drilled, but relocated and then drilled. Lay a straight edge along the holes to determine that they are close enough in alignment.

-----NOTES-----

#74 for .026 wire

BASIC	RUNNING	GEAR	LIGHT MIKE	HEAVY MIKE	LIGHT PACIFIC	HEAVY PACIFIC
Quartered Drivers-----			63"-4	same	72"-2	79"-3
Counterbalances-----			3.5	same	3.16	3.23
DC Motor-----			12.4	same	same	same
Flywheel-----			13.1	same	same	same
Crank Pins-----			14 4 pr.	same	14 3 pr.	same
Side Rods-----			16.6	same	16.12	16.19
Frame-----			18.3	same	18.52	18.83
Steam Chest-----			25.5	same	same	same
All engine screws-----			Set	same	same	same
"Parts Installation Booklet"			250.1	same	same	same
Kit Booklet-----			L. Mike	H. Mike	L. Pacific	H. Pacific
Engine Plans-----			L. Mike	H. Mike	L. Pacific	H. Pacific
Check List-----			1	1	1	1

Running Gear Details

Leaf Springs-----	20.1 4 pr.	same	20.1 3 pr.	20.1 3 pr.
Valve Guides-----	26.1	same	same	same
Union Links & Combination Lev	30.1	same	same	same
Valve Gear-----	32.3	same	32.2	same
Yoke-----	34.2	same	34.3	same
Crosshead Guides, Alligator-	36.4	same	same	same
Crossheads, Alligator-----	37.8	same	same	same
Main Rods-----	40.7	same	40.8	40.7
Eccentric Cranks-----	41.1	same	same	same
Eccentric Rods-----	42.2	same	same	42.1
Beam-Deck w/o Knees-----	54.2	same	same	same
Flagstuffs-----	56.1	same	same	same
Uncoupler Brachets, Eng.& Ten	57.1 2pr.	same	same	same
Pilot-----	60.3	same	same	same
Beam End Steps-----	62.1	same	same	same
Front Steps-----	62.8	same	same	same
Pilot Truck. USRA-----	64.6 2 wheel	same	64.8 4 wheel	same
Wheel Sets, spindless-----	240.6 1-33"	same	240.6 2-33"	241.6 2-36"
Hodges-Cole Trailing Truck--	65.13 Hodges	65.13 Cole	65.13 Cole	65.13 Cole
Wheel Sets-----	243.5 43"	Same	Same	243.6 51"

BOILER SECTION

Cross Compound Air Pump-----	45.1	same	same	same
Engine weights-----	75.1 2	same	same	same
Resivoir Tank Studs-----	138.30 3 pr.	same	2 pr.	same
Grab Irons & Posts-----	52.1	same	same	same
Boiler-----	72.8	72.7	72.6	72.5
Boiler Front-----	78.7	78.6	78.8	78.7
Bell In Frame-----	80.2	same	same	same
Classification Lamps-----	84.1	same	same	same
Headlight-----	86.8	same	same	same
Boiler Steps & 1 Boiler Front	94.1	same	same	same
short plugs, 6 -----	92.2	same	same	same
uilders Plates-----	Any	American	same	Amer. or Baldwin
Owner's Plate-----	1	1	1	1
Smoke Stack-----	102.3	102.1	102.3	102.1
Sand Dome, USRA-----	108.6	108.5	108.6	108.5
Sanders-----	110.2	same	109.3	same
Steam Dome-----	112.1	112.2	112.1	112.2
Whistle, Chime-----	114.2	same	same	same
Pop Valve Units 2 -----	116.6	same	same	same
Generator-----	122.1	122.2	same	same
Cab, USRA-----	124.5	same	same	same

S Scale Locomotive & Supply

7120 Ocean Dr. St. Louis, Mo. 63121

SMALL RECTANGULAR TENDER, 25'8" LONG SHELL, FOR CONSOLIDATIONS(2-8-0), 0-8-0 & 0-6-0 SWITCHERS

CHECK LIST	MoPac	C&O	B&O	NKP	NYC	P&M	Switchers
#200.8 Tender Wrapper, Deck, Coal Chute & False Bottom	1	1	1	1	1	1	1
#211.6 Tender Frame, Small	1	1	1	1	1	1	1
#212.1 Truck Bolster Pins	pr.	pr.	pr.	pr.	pr.	pr.	pr.
#214.1 Draw Bar Kit, Wireless	1	1	1	1	1	1	1
#57.1 Uncoupler Bar Brackets	1	1	1	1	1	1	1
#62.2 Center Beam Steps	pr.	pr.	pr.	pr.	pr.	pr.	pr.
#217.2 Hatch, USRA	1	1	1	1	1	1	1
#222.1 Strap Steps	pr.	pr.	pr.	--	pr.	pr.	pr.
#222.2 Cast Steps	pr.	pr.	pr.	2 pr.	pr.	pr.	pr.
#224.2 Ladder, Medium Length	1	1	1	1	1	1	1
#227.1 Tool Chest	1	1	--	--	--	--	--
#86.3 Headlight only, Pyle National	1	--	--	1	--	--	--
#86.7 " " Sunbeam #4414	--	--	1	--	1	--	1
#234.3 Andrews Leaf Spring Trucks	1	1	1	1	1	1	1
#240 33" Wheel Sets	4	4	4	4	4	4	4
#60.5 Step Type Pilot for Switchers(not furnished)	--	--	--	--	--	--	1
#229.1 Coal Pushers for Switchers	--	--	--	--	--	--	1
#231.2 8 Wheel Brake,(not furnished)	1	1	1	1	1	1	1
2-56 x 3/8" flat head screws for wrapper-frame assembly	2	2	2	2	2	2	2
6" .025" Brass Rod for Grab Irons	1	1	1	1	1	1	1
Scrap for Cubicle	1	1	1	1	1	1	1
#260.1 "Parts Installation Booklet"	1	1	1	1	1	1	1
Kit Booklet, this booklet, suppliment	1	1	1	1	1	1	1

Some of the above parts you will not need for your Tender, so they may be returned on your next order for credit.

Before starting work, read the "Soft Soldering For Engines" in our parts catalog, currently on page 16. Take your time putting this kit together, it will be well worth it. You are not going to get it together today anyway, probably not tomorrow either. It is strongly suggested that you read the whole instructions before starting to work, "Parts Instruction Booklet" and "Kit Booklet", suppliment. This will give you the whole picture of building the Tender and remove any thought that we may have forgotten something. Then as you build, read each section thoroughly before starting work on it. Keep representative sampler of scrap, as they may come in handy, or for later projects, that you have it and in many cases just the right size. A torch will be used mostly as it does not leave solder tracks as does a soldering iron, which does not look well on brass if it is not to be painted or blobs of solder to be filed away. These instructions will be as the you do not want to paint you model.

PROPANE TORCH--Get this from the hardware store. Usually the tank is about 8-9" long. The blue flame is varible from about 1" down to about 1/4" long for piping and Handrails and otherwise about 3/4" used mostly to 1/2". This and wet swabs will be the back bone of your Tender and engine building. When soldering small parts on large parts where normal torching would heat the small part too much, such as Uncoupler Bar Brackets on the large cast Sill, pre heat the large part with Solder In Paste on it to know when it is heated enough, then set the small part in place with tweezers, continuing the torching only a little bit to be enough to solder the small part in place. In these cases it is helpful to have a medicine dropper of water handy at your torch hand, so you can set down the torch and squirt water on the joint to set the solder quicker. Sometimes you can have the effect of having an extra hand by leaning the torch against the bench with it's base in your lap and hold the part to be soldered with one or both hands. Or you can lay the torch on the bench with torch nozzle sticking out the side.

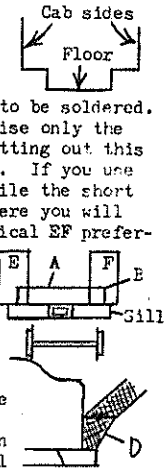
PROPS--An ordinary house brick as described on page 20, #13 of our current catalog is useful to set engines and Tenders at varying elevations while working on them. While not particularly used on this Tender, small pieces of metal or wood can be laid against the Tender or engine, on each side to hold it still while soldering, or a wadded up old terry cloth towel. The Tender can then be laid on it in any position or angle. Sometimes you will want to lay an old piece of sheet stock(tin can stock) or asbestos paper behind the Tender, between it and the towel, so the towel is not burned.

SWABS--You can use cotton soaked in water, which holds water better than paper tissue, tho the tissue, such as hand towel or toilet or hand tissue will contour to the parts better and will readily hold upside down, which sometimes comes in handy. When they are on a part, it is almost impossible to unsolder them while soldering even 1/8" away from the joint. Have an old cup or low wide-mouth jar of water handy with an old eye dropper. When swabs start to get dry, apply more water to the swabs, or if the assembly is getting hot to the fingers in some cases, squirt water on the joint to quickly set the solder so you can let go of the assembly. If swabs get completely dry, it is more difficult for swabs to be re-wetted. You will not always have to re-water swabs,--seldom. Use swabs generously, when indoubt, use them.

SOLDER IN PASTE--Abbreviated as SIP. Our part #612.1. This is a powdered solder in the flux that turns black when the solder melts. This type solder should be used, where ever you get it. We have packaged this so you can get a small quantity at a reasonable price and so you can mix what ever thickness you want in the lid, which here will always be thick unless otherwise stated. So rather than mixing it all, we let it stay settled, hold the bottle to one side so the flux runs to one side, then with a probe push more of the flux to one side from over the sediment, then scoop out a drop of the sediment with the probe, which still will usually have enough flux with it. Place this in the lid, to be taken a little at a time with the probe to put on your parts. If you want it thinner for tinning etc., you can add a bit of the flux and re-mix. With it thinned or flux only can be used in places where you want to add a bead of solder to do a lot of filling. To keep the flux from evaporating while the bottle is open and using from the lid, put a small piece of paper or flat sheet stock on top of the bottle. You could mix the drop in another container and close close the bottle, but generally you will not use up what you have mixed, so it will dry out and be wasted, while if in the lid, you can use the balance next time and not be wasted. If flux in the bottle does get thick, it can be thinned with water, but after several additions the flux will no longer work well and solder acts like there is grit in it, which is another reason for us re-packaging it in smaller quantities, so you will not have to pay for a large quantity and have to throw away 1/2 to 3/4th. The maker says not to apply torch directly on the SIP. This is because the liquid flux evaporating so quickly pops off with the solder, so apply the very tip of the yellow flame of the torch at first, slowly to dry the flux, then come in closer to melt the solder, such as Handrail. Posts or tinning or any where that you are torching directly on the SIP. When torching a small part to a large one, sometimes the flux will turn black on the small one but not on the large one, so continue torching 2-3 seconds more until it turns black on the large one too. When thru soldering or tinning, wipe off the black flux with damp cloth. Develop the habit of when using an eye dropper, as explained above, to refill it with water and lay it at the torch hand again, so when you need it quickly it is ready, lay down the torch and pick up the eyedropper. Sometimes you can prevent solder from spreading to unwanted areas by heavy solid pencil lines from a soft pencil lead. Other methods may work better, such as lacquer in the area----oil will flow into the soldering area. If you use quite a bit of SIP it will sometimes flow over the pencilmarks any way, usually not as bad.

The curved portion can be shaped with edge of COD. Should you ruin this piece, one can be made from scrap, tread not essential.

Put Frame back on with Trucks on. Now we come to some variance. 0-8-0 and 0-6-0 switchers and some others have a low floor in the Cab as drawn, while some have the floor not dropped as drawn here but, are at the bottom of the Cab sides and straight across, as for our Consolidations MoPac, B&O and B&M. For NYC and NKP like the switchers. In any case however, you have the Cab floor installed, so install platform in the Tender level with the Cab floor. Mark the inside of the Tender side at the level where the platform is to be soldered. In case it is important to you, the tall engraved door is for a platform that is low as for switchers, otherwise only the bottom half is used---the sort of curved cutout is the bottom of the door, so cut out this portion. When cutting out this door from the stock, leave the drawing lines on the sides, to later be fitted and probably remove these lines. If you use the full length door, the top of the door will be at about the height of the very top of the Tender sides, while the short doors will go just to the top of the cubical---door way in front. Their location will somewhat determine where you will want locate the platform. With platform A held in the marked position, mark A at B at about the center of cubical EF preferably so B will be bent down about 6-8" inward from the Sill edge and resting on the top of the Sill, cutting off any excess. Now cut off vertical portion of platform at an angle D to be even with the front of the Sill. Put swabs in corners of false bottom and door way, put thick SIP underneath platform and door way (so as not to show) corners along with small bead of solder and torch in place. If not well soldered, repeat. We found it easiest to hold the torch between our legs, holding the Tender upside down with left hand and probe in the right hand to spread the solder.



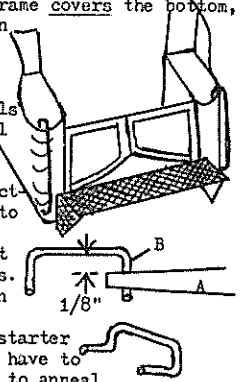
COAL CHUTE FLOOR--Fit the floor portion of the Chute-floor as described in the PIB, except the front of the floor need only just meet the back of the tread of the platform, instead of 1'6" past front of Tender---make a shade long here at first and very long at the back, end of Chute and trim as fitted. The shaded area noted in the PIB are the 2 square corners--shading was missed putting on the drawing. When cutting out these pencil marks on the floor, do not forget to cut a bit to the outside of pencil marks, as marks will be to the inside of actual cutting point. With this fitted, measure the distance X between front of floor and angled rivet line extended down to floor level. Measure this off on Chute-floor material, a little long in front and back and bend rear portion up about 45°. This measurement not at all critical. Now fit this down into the Tender so the rear portion, Chute, rests on top of the vertical section of the Deck. For 0-8-0 and 0-6-0 USRA switchers, the Chute is flat on top, level with top of Tender side. Some others and our Consolidations are oval on top. Various Tenders have different oval shape. Fit this in ready to solder in place. It is best, if you can, to bend floor-Chute and Tender sides so all will fit close together without pressure to hold them together while soldering, so if later you are soldering in these areas for something else the joints will not come apart without again holding them together. We would suggest soldering only between front portion of the floor to rear portion of platform, where solder will not show and solder inward from the edges so it will not flow out and show. Then put thick SIP between the edges of the vertical Deck and the Chute. We do not see any reason to solder all along the side of the Chute and the Tender side, which will show a lot of solder. Put swabs in all nearby corners and torch in place. When torching the floor to the platform, it will be well soldered when the yellow brass turns a light orange, ----since you have no solder showing to indicate when the joint is well soldered. If need be, when soldering the Chute to the Deck to get them close together, you can place a doubled up cloth on the inside of the Chute and press it with the fingers against the Deck and torch from the back.

FRONT CUBICALS EF--Install as noted in PIB. Exceptions are USRA switchers have C extended 5" above Coal Boards. Of course when soldering these in, put swabs at appropriate places. It is easier soldering A in first, which takes a little doing, then EF can be fitted and sit on top of C and front. A can be a bit long at corner at A and filed flush here when cubical is all done. We found it easiest to install A between the side and C, right on down past the floor, which is open here, down to or near the Frame. Thus it will stay in place while soldering to the side and C, also you can use SIP as a flux down inside cubical where it will not show, then use a small 50 watt soldering iron. Fit FE in place fairly close and flat. Put SIP around top of Cubical, set F&E in place, swabs in proper places and torch. Then with side of COD you can shape it to the cubical shape, or better shape later.

ENGRAVED DOOR--You have already cut this out, so fit between cubicals, removing side lines as needed to get a light force fit between cubicals. The height of these doors were described in the middle of the top paragraph. They are located back in the door way between the cubicals just where the roundness of the cubicals stops---location not critical. Put swabs in the proper places and solder with SIP in the inside corners and a torch or use a small iron as you did A.

#217.2 HATCH, USRA TYPE--Locate in center of Deck, cross wise, with Hinges to the front and about 3'6" from back of Tender between the row of rivets here. Put heavy swabs all around the Deck-side joints. Put SIP around the inner hole edge only so solder will not run out when melted, set in place and torch, possibly using a probe to hold it down from moving while torching.

GRAB IRONS--See PIB #200.1 "Tender Fine Details". Instead of piano wire, we have furnished .025" brass rod. On the back of the Tender there are 2 vertical ones on each corner already etched for you to drill out and a horizontal pair. On these Tenders the corner ones are not on the corner, so should be relocated to the corner using starter holes. These will be corrected on later Tenders. Drill all 6 of these holes .028", #70, for .025" rod (or .022", #74 for .020" rod). File off remaining etched ridge. With a pencil mark around the Frame on the false bottom, then remove the Frame. Where the Frame covers the bottom, drill some holes close together with about #42 drill, then re-drill them about #25, then file between these holes to make a large hole so you can get a small soldering iron up to the Grab Iron holes, so they will have to be pretty near the back. They can also be used to thread wires to Headlights on the back of the Tender if you want to illuminate them. We just used an old long dental burr to rout out these holes. Your dentist throws these away so will be happy to save some for you. The Handrails just soldered in will not hold, so they will be bent in the following manner and soldered so they will hold. Bend the Handrails so they will go into their respective holes, but leave about 1/4" too long at each end. Hold the end of Handrail with long nosed pliers A, and press point B down against the work bench to give this sort of bend, viewed from the end. These end bends must be in the same direction in order to slide both of them in the holes. Push these into their holes, so the ends lay next to the wrapper, add very thick SIP well over the ends and wrapper with a wire or probe, on the inside. Put swabs along whole length of Grab Iron to 1/16" of the end, so it is not annealed and easily bent from handling and torch from the outside, with swabs also on false bottom and Deck and the sides. Better yet, if you can get a small 50 watt soldering iron inside the holes made to solder the ends on the inside, in which case you could dispense with all swabs. Be sure they are well soldered, repeat if necessary. The front Grabare located on the corner of the round of the cubical as drawn. Make starter holes at these spots and drill as above. Since there is not the room to install as above, they will have to be installed in the conventional manner by pre-tinning the tips of the Handrails carefully so as not to anneal, then push them into the holes with long nosed pliers, cover the Handrails as above with swabs around top of cubical and sides and false bottom and sides and torch in place. Before pushing the Handrail into the holes, put SIP on the ends of the Handrails. Work each of these with tweezers to be sure they are well soldered.



#224.3 MEDIUM LADDER--See PIB. Grind gating from bottom Ladder strap(riser), then bend bottom strap slightly upwards with long nosed pliers. Similarly bend the top 2 straps slightly downward. This is located on the back of the Tender on the left side half way from the side to the center, with the bottom resting down against the Frame and top looped Grab Rail down on the Deck. The above bending should make this possible. If not, you may have to grind the bent straps a bit narrower. With a pencil, mark the Tender where the Ladder is located, then file off the rivets and beading that would be under the Ladder straps. Put swabs along top and bottom Tender corners on both sides of Ladder location and well over each Handrail. Pre-tin Ladder straps, prop Tender up vertically on front end and add more SIP to straps, hold Ladder in place with probe and torch in place. Test with tweezers to be sure it is well soldered.

<u>BASIC</u>	<u>RUNNING</u>	<u>GEAR</u>	<u>LIGHT MIKE</u>	<u>HEAVY MIKE</u>	<u>LIGHT PACIFIC</u>	<u>HEAVY PACIFIC</u>
Quartered Drivers-----	63"-4		same		72"-2	79"-3
Counterbalances-----	3.5		same		3.16	3.23
DC Motor-----	12.4		same		same	same
Flywheel-----	13.1		same		same	same
Crank Pins-----	14 4 pr.		same		14 3 pr.	same
Side Rods-----	16.6		same		16.12	16.19
Frame-----	18.3		same		18.52	18.83
Steam Chest-----	25.5		same		same	same
All engine screws-----	Set		same		same	same
"Parts Installation Booklet"	250.1		same		same	same
Kit Booklet-----	L. Mike		H. Mike		L. Pacific	H. Pacific
Engine Plans-----	L. Mike		H. Mike		L. Pacific	H. Pacific
Check List-----	1		1		1	1

Running Gear Details

Leaf Springs-----	20.1 4 pr.	same		20.1 3 pr.	20.1 3 pr.
Valve Guides-----	26.1	same		same	same
Union Links & Combination Lev	30.1	same		same	same
Valve Gear-----	32.3	same		32.2	same
Yoke-----	34.2	same		34.3	same
Crosshead Guides, Alligator-	36.4	same		same	same
Crossheads, Alligator-----	37.8	same		same	same
Main Rods-----	40.7	same		40.8	40.7
Eccentric Cranks-----	41.1	same		same	same
Eccentric Rods-----	42.2	same		same	42.1
Beam-Deck w/o Knees-----	54.2	same		same	same
Flagstuffs-----	56.1	same		same	same
Uncoupler Brachets, Eng.& Ten	57.1 2pr.	same		same	same
Pilot-----	60.3	same		same	same
Beam End Steps-----	62.1	same		same	same
Front Steps-----	62.8	same		same	same
Pilot Truck. USRA-----	64.6 2 wheel	same		64.8 4 wheel	same
Wheel Sets, spindless-----	240.6 1-33"	same		240.6 2-33"	241.6 2-36"
Hodges-Cole Trailing Truck--	65.13 Hodges	65.13 Cole		65.13 Cole	65.13 Cole
Wheel Sets-----	243.5 43"	Same		Same	243.6 51"

BOILER SECTION

Cross Compound Air Pump-----	45.1	same		same	same
Engine weights-----	75.1 2	same		same	same
Resivoir Tank Studs-----	138.30 3 pr.	same		2 pr.	same
Grab Irons & Posts-----	52.1	same		same	same
Boiler-----	72.8	72.7		72.6	72.5
Boiler Front-----	78.7	78.6		78.8	78.7
Bell In Frame-----	80.2	same		same	same
Classification Lamps-----	84.1	same		same	same
Headlight-----	86.8	same		same	same
Boiler Steps & 1 Boiler Front	94.1	same		same	same
short plugs, 6 -----	92.2	same		same	same
uilders Plates-----	Any	American		same	Amer. or Baldwin
Owner's Plate-----	1	1		1	1
Smoke Stack-----	102.3	102.1		102.3	102.1
Sand Dome, USRA-----	108.6	108.5		108.6	108.5
Sanders-----	110.2	same		109.3	same
Steam Dome-----	112.1	112.2		112.1	112.2
Whistle, Chime-----	114.2	same		same	same
Pop Valve Units 2 -----	116.6	same		same	same
Generator-----	122.1	122.2		same	same
Cab, USRA-----	124.5	same		same	same

S Scale Locomotive & Supply

7120 Orion Dr. St. Louis, Mo. 63121

SMALL RECTANGULAR TENDER, 25"8" LONG SHELL, FOR CONSOLIDATIONS (2-8-0), 0-8-0 & 0-6-0 SWITCHERS

CHECK LIST	MoPac	C&O	B&O	NKP	NYC	P&M	Switchers
#200.8 Tender Wrapper, Deck, Coal Chute & False Bottom	1	1	1	1	1	1	1
#211.6 Tender Frame, Small	1	1	1	1	1	1	1
#212.1 Truck Bolster Pins	pr.	pr.	pr.	pr.	pr.	pr.	pr.
#214.1 Draw Bar Kit, Wireless	1	1	1	1	1	1	1
#57.1 Uncoupler Bar Brackets	1	1	1	1	1	1	1
#62.2 Center Beam Steps	pr.	pr.	pr.	pr.	pr.	pr.	pr.
#217.2 Hatch, USRA	1	1	1	1	1	1	1
#222.1 Strap Steps	pr.	pr.	pr.	--	pr.	pr.	pr.
#222.2 Cast Steps	pr.	pr.	pr.	2 pr.	pr.	pr.	pr.
#224.2 Ladder, Medium Length	1	1	1	1	1	1	1
#227.1 Tool Chest	1	1	--	--	--	--	--
#86.3 Headlight only, Pyle National	1	--	--	1	--	--	--
#86.7 " " Sunbeam #4414	--	--	1	--	1	--	1
#234.3 Andrews Leaf Spring Trucks	1	1	1	1	1	1	1
#240 33" Wheel Sets	4	4	4	4	4	4	4
#60.5 Step Type Pilot for Switchers(not furnished)	--	--	--	--	--	--	1
#229.1 Coal Pushers for Switchers	--	--	--	--	--	--	1
#231.2 8 Wheel Brake,(not furnished)	1	1	1	1	1	1	1
2-56 x 3/8" flat head screws for wrapper-frame assembly	2	2	2	2	2	2	2
6" .025" Brass Rod for Grab Irons	1	1	1	1	1	1	1
Scrap for Cubicle	1	1	1	1	1	1	1
#260.1 "Parts Installation Booklet"	1	1	1	1	1	1	1
Kit Booklet, this booklet, suppliment	1	1	1	1	1	1	1

Some of the above parts you will not need for your Tender, so they may be returned on your next order for credit.

Before starting work, read the "Soft Soldering For Engines" in our parts catalog, currently on page 16. Take your time putting this kit together, it will be well worth it. You are not going to get it together today anyway, probably not tomorrow either. It is strongly suggested that you read the whole instructions before starting to work, "Parts Instruction Booklet" and "Kit Booklet", suppliment. This will give you the whole picture of building the Tender and remove any thought that we may have forgotten something. Then as you build, read each section thoroughly before starting work on it. Keep representative sampler of scrap, as they may come in handy, or for later projects, that you have it and in many cases just the right size. A torch will be used mostly as it does not leave solder tracks as does a soldering iron, which does not look well on brass if it is not to be painted or blobs of solder to be filed away. These instructions will be as the you do not want to paint you model.

PROPANE TORCH--Get this from the hardware store. Usually the tank is about 8-9" long. The blue flame is varible from about 1" down to about 1/4" long for piping and Handrails and otherwise about 3/4" used mostly to 1/2". This and wet swabs will be the back bone of your Tender and engine building. When soldering small parts on large parts where normal torching would heat the small part too much, such as Uncoupler Bar Brackets on the large cast Sill, pre heat the large part with Solder In Paste on it to know when it is heated enough, then set the small part in place with tweezers, continuing the torching only a little bit to be enough to solder the small part in place. In these cases it is helpful to have a medicine dropper of water handy at your torch hand, so you can set down the torch and squirt water on the joint to set the solder quicker. Sometimes you can have the effect of having an extra hand by leaning the torch against the bench with it's base in your lap and hold the part to be soldered with one or both hands. Or you can lay the torch on the bench with torch nozzle sticking out the side.

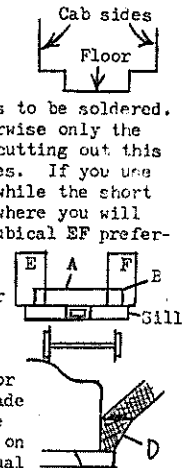
PROPS--An ordinary house brick as described on page 20, #13 of our current catalog is useful to set engines and Tenders at varying elevations while working on them. While not particularly used on this Tender, small pieces of metal or wood can be laid against the Tender or engine, on each side to hold it still while soldering, or a wadded up old terry cloth towel. The Tender can then be laid on it in any position or angle. Sometimes you will want to lay an old piece of sheet stock(tin can stock) or asbestos paper behind the Tender, between it and the towel, so the towel is not burned.

SWABS--You can use cotton soaked in water, which holds water better than paper tissue, tho the tissue, such as hand towel or toilet or hand tissue will contour to the parts better and will readily hold upside down, which sometimes comes in handy. When they are on a part, it is almost impossible to unsolder them while soldering even 1/8" away from the joint. Have an old cup or low wide mouth jar of water handy with an old eye dropper. When swabs start to get dry, apply more water to the swabs, or if the assembly is getting hot to the fingers in some cases, squirt water on the joint to quickly set the solder so you can let go of the assembly. If swabs get completely dry, it is more difficult for swabs to be re-wetted. You will not always have to re-water swabs,--seldom. Use swabs generously, when indoubt, use them.

SOLDER IN PASTE--Abbreviated as SIP. Our part #612.1. This is a powdered solder in the flux that turns black when the solder melts. This type solder should be used, where ever you get it. We have packaged this so you can get a small quantity at a reasonable price and so you can mix what ever thickness you want in the lid, which here will always be thick unless otherwise stated. So rather than mixing it all, we let it stay settled, hold the bottle to one side so the flux runs to one side, then with a probe push more of the flux to one side from over the sediment, then scoop out a drop of the sediment with the probe, which still will usually have enough flux with it. Place this in the lid, to be taken a little at a time with the probe to put on your parts. If you want it thinner for tinning etc., you can add a bit of the flux and re-mix. With it thinned or flux only can be used in places where you want to add a bead of solder to do a lot of filling. To keep the flux from evaporating while the bottle is open and using from the lid, put a small piece of paper or flat sheet stock on top of the bottle. You could mix the drop in another container and close close the bottle, but generally you will not use up what you have mixed, so it will dry out and be wasted, while if in the lid, you can use the balance next time and not be wasted. If flux in the bottle does get thick, it can be thinned with water, but after several additions the flux will no longer work well and solder acts like there is grit in it, which is another reason for us re-packaging it in smaller quantities, so you will not have to pay for a large quantity and have to throw away 1/2 to 3/4th. The maker says not to apply torch directly on the SIP. This is because the liquid flux evaporating so quickly pops off with the solder, so apply the very tip of the yellow flame of the torch at first, slowly to dry the flux, then come in closer to melt the solder, such as Handrail. Posts or tinning or any where that you are torching directly on the SIP. When torching a small part to a large one, sometimes the flux will turn black on the small one but not on the large one, so continue torching 2-3 seconds more until it turns black on the large one too. When thru soldering or tinning, wipe off the black flux with damp cloth. Develop the habit of when using an eye dropper, as explained above, to refill it with water and lay it at the torch hand again, so when you need it quickly it is ready, lay down the torch and pick up the eyedropper. Sometimes you can prevent solder from spreading to unwanted areas by heavy solid pencil lines from a soft pencil lead. Other methods may work better, such as lacquer in the area----oil will flow into the soldering area. If you use quite a bit of SIP it will sometimes flow over the pencilmarks any way, usually not as bad.

The curved portion can be shaped with edge of COD. Should you ruin this piece, one can be made from scrap, tread not essential.

Put Frame back on with Trucks on. Now we come to some variance. 0-8-0 and 0-6-0 switchers and some others have a low floor in the Cab as drawn, while some have the floor not dropped as drawn here but, are at the bottom of the Cab sides and straight across, as for our Consolidations MoPac, B&O and B&M. For NYC and NKP like the switchers. In any case however, you have the Cab floor installed, so install platform in the Tender level with the Cab floor. Mark the inside of the Tender side at the level where the platform is to be soldered. In case it is important to you, the tall engraved door is for a platform that is low as for switchers, otherwise only the bottom half is used---the sort of curved cutout is the bottom of the door, so cut out this portion. When cutting out this door from the stock, leave the drawing lines on the sides, to later be fitted and probably remove these lines. If you use the full length door, the top of the door will be at about the height of the very top of the Tender sides, while the short doors will go just to the top of the cubical---door way in front. Their location will somewhat determine where you will want locate the platform. With platform A held in the marked position, mark A at B at about the center of cubical EF preferably so B will be bent down about 6-8" inward from the Sill edge and resting on the top of the Sill, cutting off any excess. Now cut off vertical portion of platform at an angle D to be even with the front of the Sill. Put swabs in corners of false bottom and door way, put thick SIP underneath platform and door way (so as not to show) corners along with small bead of solder and torch in place. If not well soldered, repeat. We found it easiest to hold the torch between our legs, holding the Tender upside down with left hand and probe in the right hand to spread the solder.



COAL CHUTE FLOOR--Fit the floor portion of the Chute-floor as described in the PIB, except the front of the floor need only just meet the back of the tread of the platform, instead of 1'6" past front of Tender---make a shade long here at first and very long at the back, end of Chute and trim as fitted. The shaded area noted in the PIB are the 2 square corners--shading was missed putting on the drawing. When cutting out these pencil marks on the floor, do not forget to cut a bit to the outside of pencil marks, as marks will be to the inside of actual cutting point. With this fitted, measure the distance X between front of floor and angled rivet line extended down to floor level. Measure this off on Chute-floor material, a little long in front and back and bend rear portion up about 45°. This measurement not at all critical. Now fit this down into the Tender so the rear portion, Chute, rests on top of the vertical section of the Deck. For 0-8-0 and 0-6-0 USRA switchers, the Chute is flat on top, level with top of Tender side. Some others and our Consolidations are oval on top. Various Tenders have different oval shape. Fit this in ready to solder in place. It is best, if you can, to bend floor-Chute and Tender sides so all will fit close together without pressure to hold them together while soldering, so if later you are soldering in these areas for something else the joints will not come apart without again holding them together. We would suggest soldering only between front portion of the floor to rear portion of platform, where solder will not show and solder inward from the edges so it will not flow out and show. Then put thick SIP between the edges of the vertical Deck and the Chute. We do not see any reason to solder all along the side of the Chute and the Tender side, which will show a lot of solder. Put swabs in all nearby corners and torch in place. When torching the floor to the platform, it will be well soldered when the yellow brass turns a light orange, ---since you have no solder showing to indicate when the joint is well soldered. If need be, when soldering the Chute to the Deck to get them close together, you can place a doubled up cloth on the inside of the Chute and press it with the fingers against the Deck and torch from the back.

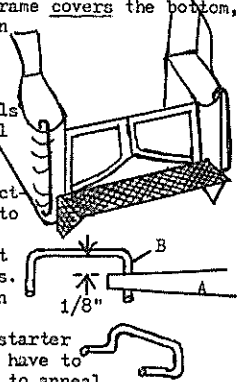
(Use soft brass sheet)

FRONT CUBICALS EF--Install as noted in PIB. Exceptions are USRA switchers have C extended 5" above Coal Boards. Of course when soldering these in, put swabs at appropriate places. It is easier soldering A in first, which takes a little doing, then EF can be fitted and sit on top of C and front. A can be a bit long at corner at A and filed flush here when cubical is all done. We found it easiest to install A between the side and C, right on down past the floor, which is open here, down to or near the Frame. Thus it will stay in place while soldering to the side and C, also you can use SIP as a flux down inside cubical where it will not show, then use a small 50 watt soldering iron. Fit EF in place fairly close and flat. Put SIP around top of Cubical, set F&E in place, swabs in proper places and torch. Then with side of COD you can shape it to the cubical shape, or better shape later.

ENGRAVED DOOR--You have already cut this out, so fit between cubicals, removing side lines as needed to get a light force fit between cubicals. The height of these doors were described in the middle of the top paragraph. They are located back in the door way between the cubicals just where the roundness of the cubicals stops---location not critical. Put swabs in the proper places and solder with SIP in the inside corners and a torch or use a small iron as you did A.

#217.2 HATCH, USRA TYPE--Locate in center of Deck, cross wise, with Hinges to the front and about 3'6" from back of Tender between the row of rivets here. Put heavy swabs all around the Deck-side joints. Put SIP around the inner hole edge only so solder will not run out when melted, set in place and torch, possibly using a probe to hold it down from moving while torching

GRAB IRONS--See PIB #200.1 "Tender Fine Details". Instead of piano wire, we have furnished .025" brass rod. On the back of the Tender there are 2 vertical ones on each corner already etched for you to drill out and a horizontal pair. On these Tenders the corner ones are not on the corner, so should be relocated to the corner using starter holes. These will be corrected on later Tenders. Drill all 6 of these holes .028", #70, for .025" rod (or .022", #74 for .020" rod). File off remaining etched ridge. With a pencil mark around the Frame on the false bottom, then remove the Frame. Where the Frame covers the bottom, drill some holes close together with about #42 drill, then re-drill them about #25, then file between these holes to make a large hole so you can get a small soldering iron up to the Grab Iron holes, so they will have to be pretty near the back. They can also be used to thread wires to Headlights on the back of the Tender if you want to illuminate them. We just used an old long dental burr to rout out these holes. Your dentist throws these away so will be happy to save some for you. The Handrails just soldered in will not hold, so they will be bent in the following manner and soldered so they will hold. Bend the Handrails so they will go into their respective holes, but leave about 1/4" too long at each end. Hold the end of Handrail with long nosed pliers A, and press point B down against the work bench to give this sort of bend, viewed from the end. These end bends must be in the same direction in order to slide both of them in the holes. Push these into their holes, so the ends lay next to the wrapper, add very thick SIP well over the ends and wrapper with a wire or probe, on the inside. Put swabs along whole length of Grab Iron to 1/16" of the end, so it is not annealed and easily bent from handling and torch from the outside, with swabs also on false bottom and Deck and the sides. Better yet, if you can get a small 50 watt soldering iron inside the holes made to solder the ends on the inside, in which case you could dispense with all swabs. Be sure they are well soldered, repeat if necessary. The front Grab Irons are located on the corner of the round of the cubical as drawn. Make starter holes at these spots and drill as above. Since there is not the room to install as above, they will have to be installed in the conventional manner by pre-tinning the tips of the Handrails carefully so as not to anneal, then push them into the holes with long nosed pliers, cover the Handrails as above with swabs and solder around top of cubical and sides and false bottom and sides and torch in place. Before pushing the Handrail into the holes, put SIP on the ends of the Handrails. Work each of these with tweezers to be sure they are well soldered.



#224.3 MEDIUM LADDER--See PIB. Grind gating from bottom Ladder strap (riser), then bend bottom strap slightly upwards with long nosed pliers. Similarly bend the top 2 straps slightly downward. This is located on the back of the Tender on the left side half way from the side to the center, with the bottom resting down against the Frame and top looped Grab Rail down on the Deck. The above bending should make this possible. If not, you may have to grind the bent straps a bit narrower. With a pencil, mark the Tender where the Ladder is located, then file off the rivets and beading that would be under the Ladder straps. Put swabs along top and bottom Tender corners on both sides of Ladder location and well over each Handrail. Pre-tin Ladder straps, prop Tender up vertically on front end and add more SIP to straps, hold Ladder in place with probe and torch in place. Test with tweezers to be sure it is well soldered.

<u>BASIC</u>	<u>RUNNING</u>	<u>GEAR</u>	<u>LIGHT MIKE</u>	<u>HEAVY MIKE</u>	<u>LIGHT PACIFIC</u>	<u>HEAVY PACIFIC</u>
Quartered Drivers-----	63"-4		same		72"-3	79"-3
Counterbalances-----	3.5		same		3.16	3.23
DC Motor-----	12.4		same		same	same
Flywheel-----	13.1		same		same	same
Crank Pins-----	14 4 pr.		same		14 3 pr.	same
Side Rods-----	16.6		same		16.12	16.19
Frame-----	18.3		same		18.52	18.83
Steam Chest-----	25.5		same		same	same
All engine screws-----	Set		same		same	same
"Parts Installation Booklet"	250.1		same		same	same
Kit Booklet-----	L. Mike		H. Mike		L. Pacific	H. Pacific
Engine Plans-----	L. Mike		H. Mike		L. Pacific	H. Pacific
Check List-----	1		1		1	1

Running Gear Details

Leaf Springs-----	20.1 4 pr.	same		20.1 3 pr.	20.1 3 pr.
Valve Guides-----	26.1	same		same	same
Union Links & Combination Lev	30.1	same		same	same
Valve Gear-----	32.3	same		32.2	same
Yoke-----	34.2	same		34.3	same
Crosshead Guides, Alligator-	36.4	same		same	same
Crossheads, Alligator-----	37.8	same		same	same
Main Rods-----	40.7	same		40.8	40.7
Eccentric Cranks-----	41.1	same		same	same
Eccentric Rods-----	42.2	same		same	42.1
Beam-Deck w/o Knees-----	54.2	same		same	same
Flagstuffs-----	56.1	same		same	same
Uncoupler Brachets, Eng.& Ten	57.1 2pr.	same		same	same
Pilot-----	60.3	same		same	same
Beam End Steps-----	62.1	same		same	same
Front Steps-----	62.8	same		same	same
Pilot Truck. USRA-----	64.6 2 wheel	same		64.8 4 wheel	same
Wheel Sets, spindless-----	240.6 1-33"	same		240.6 2-33"	241.6 2-36"
Hodges-Cole Trailing Truck--	65.13 Hodges	65.13 Cole		65.13 Cole	65.13 Cole
Wheel Sets-----	243.5 43"	Same		Same	243.6 51"

BOILER SECTION

Cross Compound Air Pump-----	45.1	same		same	same
Engine weights-----	75.1 2	same		same	same
Resivoir Tank Studs-----	138.30 3 pr.	same		2 pr.	same
Grab Irons & Posts-----	52.1	same		same	same
Boiler-----	72.8	72.7		72.6	72.5
Boiler Front-----	78.7	78.6		78.8	78.7
Bell In Frame-----	80.2	same		same	same
Classification Lamps-----	84.1	same		same	same
Headlight-----	86.8	same		same	same
Boiler Steps & 1 Boiler Front	94.1	same		same	same
shout plugs, 6 -----	92.2	same		same	same
uilders Plates-----	Any	American		same	Amer. or Baldwin
Owner's Plate-----	1	1		1	1
Smoke Stack-----	102.3	102.1		102.3	102.1
Sand Dome, USRA-----	108.6	108.5		108.6	108.5
Sanders-----	110.2	same		109.3	same
Steam Dome-----	112.1	112.2		112.1	112.2
Whistle, Chime-----	114.2	same		same	same
Pop Valve Units 2 -----	116.6	same		same	same
Generator-----	122.1	122.2		same	same
Cab, USRA-----	124.5	same		same	same

	<u>Light Mike</u>	<u>Heavy Mike</u>	<u>Light Pacific</u>	<u>Heavy Pacific</u>
Turret, Open-----	126.4	same	same	same
Check Valves-----	130.1	same	same	same
Inspection Doors pr-----	132.1	same	same	same
Handrail Posts-----	134.1	same	same	same
Running Boards, 1 straight, 2 tapered	136	same	same	same
Reservoir Tanks-----	138.6 3	same	138.23 2	same
Power Reverse, Alco-----	142.1	same	same	same
Stoker Engine, single-----	148.2	same	same	same
Injector, Non-lifting, right & left-----	154.2 & .3	same	same	same
Cooling Coil Clamps-----	162.1 9	7	9	9
Piping, soft 1"-----	1 foot	same	same	same
Piping, soft 2"-----	2 feet	same	1 foot	same

TENDER

Tender wrapper, Deck, Chute & False Bot.	200.5	same	same	same
Tender Frame-----	211.4	same	same	same
Bolster Screws(pins)-----	212.2	same	same	same
Draw Bar Kit-----	214.1	same	same	same
Hatch, USRA-----	217.2	same	same	same
Steps, Strap pr-----	222.1	same	same	same
Steps, Cast pr-----	222.2	same	same	same
Ladder, Medium Length-----	224.3	same	same	same
Bunker Ladder-----	225.1	same	same	same
8 Wheel Brake System-----	232.2	same	same	same
Trucks, Andrews-----	234.3	same	same	same
4 33" Wheel sets-----	240.3	same	same	same

S Scale Locomotive 3 Supply

7120 Ocean Dr. St. Louis, Mo. 63121

SMALL RECTANGULAR TENDER, 25'8" LONG SHELL, FOR CONSOLIDATIONS (2-8-0), 0-8-0 & 0-6-0 SWITCHERS

CHECK LIST	MoPac	C&O	B&O	NKP	NYC	P&M	Switchers
#200.8 Tender Wrapper, Deck, Coal Chute & False Bottom	1	1	1	1	1	1	1
#211.6 Tender Frame, Small	1	1	1	1	1	1	1
#212.1 Truck Bolster Pins	pr.	pr.	pr.	pr.	pr.	pr.	pr.
#214.1 Draw Bar Kit, Wireless	1	1	1	1	1	1	1
#57.1 Uncoupler Bar Brackets	1	1	1	1	1	1	1
#62.2 Center Beam Steps	pr.	pr.	pr.	pr.	pr.	pr.	pr.
#217.2 Hatch, USRA	1	1	1	1	1	1	1
#222.1 Strap Steps	pr.	pr.	pr.	--	pr.	pr.	pr.
#222.2 Cast Steps	pr.	pr.	pr.	2 pr.	pr.	pr.	pr.
#224.2 Ladder, Medium Length	1	1	1	1	1	1	1
#227.1 Tool Chest	1	1	--	--	--	--	--
#86.3 Headlight only, Pyre National	1	--	--	1	--	--	--
#86.7 " " Sunbeam #4414	--	--	1	--	1	--	1
#234.3 Andrews Leaf Spring Trucks	1	1	1	1	1	1	1
#240 33" Wheel Sets	4	4	4	4	4	4	4
#60.5 Step Type Pilot for Switchers(not furnished)	--	--	--	--	--	--	1
#229.1 Coal Pushers for Switchers	--	--	--	--	--	--	1
#231.2 8 Wheel Brake,(not furnished)	1	1	1	1	1	1	1
2-56 x 3/8" flat head screws for wrapper-Frame assembly	2	2	2	2	2	2	2
6" .025" Brass Rod for Grab Irons	1	1	1	1	1	1	1
Scrap for Cubicle	1	1	1	1	1	1	1
#260.1 "Parts Installation Booklet"	1	1	1	1	1	1	1
Kit Booklet, this booklet, suppliment	1	1	1	1	1	1	1

Some of the above parts you will not need for your Tender, so they may be returned on your next order for credit.

Before starting work, read the "Soft Soldering For Engines" in our parts catalog, currently on page 16. Take your time putting this kit together, it will be well worth it. You are not going to get it together today anyway, probably not tomorrow either. It is strongly suggested that you read the whole instructions before starting to work, "Parts Instruction Booklet" and "Kit Booklet", suppliment. This will give you the whole picture of building the Tender and remove any thought that we may have forgotten something. Then as you build, read each section thoroughly before starting work on it. Keep representative sampler of scrap, as they may come in handy, or for later projects, that you have it and in many cases just the right size. A torch will be used mostly as it does not leave solder tracks as does a soldering iron, which does not look well on brass if it is not to be painted or blobs of solder to be filed away. These instructions will be as the you do not want to paint you model.

PROPANE TORCH--Get this from the hardware store. Usually the tank is about 8-9" long. The blue flame is varible from about 1" down to about 1/4" long for piping and Handrails and otherwise about 3/4" used mostly to 1/2". This and wet swabs will be the back bone of your Tender and engine building. When soldering small parts on large parts where normal torching would heat the small part too much, such as Uncoupler Bar Brackets on the large cast Sill, pre heat the large part with Solder In Paste on it to know when it is heated enough, then set the small part in place with tweezers, continuing the torching only a little bit to be enough to solder the small part in place. In these cases it is helpful to have a medicine dropper of water handy at your torch hand, so you can set down the torch and squirt water on the joint to set the solder quicker. Sometimes you can have the effect of having an extra hand by leaning the torch against the bench with it's base in your lap and hold the part to be soldered with one or both hands. Or you can lay the torch on the bench with torch nozzle sticking out the side.

PROPS--An ordinary house brick as discribed on page 20, #13 of our current catalog is useful to set engines and Tenders at varying elevations while working on them. While not particularly used on this Tender, small pieces of metal or wood can be laid against the Tender or engine, on each side to hold it still while soldering, or a wadded up old terry cloth towel. The Tender can then be laid on it in any position or angle. Sometimes you will want to lay an old piece of sheet stock(tin can stock) or asbestos paper behind the Tender, between it and the towel, so the towel is not burned.

SWABS--You can use cotton soaked in water, which holds water better than paper tissue, tho the tissue, such as hand towel or toilet or hand tissue will contour to the parts better and will readily hold upside down, which sometimes comes in handy. When they are on a part, it is almost impossible to unsolder them while soldering even 1/8" away from the joint. Have an old cup or low wide mouth jar of water handy with an old eye dropper. When swabs start to get dry, apply more water to the swabs, or if the assembly is getting hot to the fingers in some cases, squirt water on the joint to quickly set the solder so you can let go of the assembly. If swabs get completely dry, it is more difficult for swabs to be re-wetted. You will not always have to re-water swabs,--seldom. Use swabs generously, when indoubt, use them.

SOLDER IN PASTE--Abbreviated as SIP. Our part #612.1. This is a powered solder in the flux that turns black when the solder melts. This type solder should be used, where ever you get it. We have packaged this so you can get a small quantity at a reasonable price and so you can mix what ever thickness you want in the lid, which here will always be thick unless otherwise stated. So rather than mixing it all, we let it stay settled, hold the bottle to one side so the flux runs to one side, then with a probe push more of the flux to one side from over the sediment, then scoop out a drop of the sediment with the probe, which still will usually have enough flux with it. Place this in the lid, to be taken a little at a time with the probe to put on your parts. If you want it thinner for tinning etc., you can add a bit of the flux and re-mix. With it thinned or flux only can be used in places where you want to add a bead of solder to do a lot of filling. To keep the flux from evaporating while the bottle is open and using from the lid, put a small piece of paper or flat sheet stock on top of the bottle. You could mix the drop in another container and close close the bottle, but generally you will not use up what you have mixed, so it will dry out and be wasted, while if in the lid, you can use the balance next time and not be wasted. If flux in the bottle does get thick, it can be thinned with water, but after several additions the flux will no longer work well and solder acts like there is grit in it, which is another reason for us re-packaging it in smaller quanties, so you will not have to pay for a large quantity and have to throw away 1/2 to 3/4th. The maker says not to apply torch directly on the SIP. This is because the liquid flux evaporating so quickly pops off with the solder, so apply the very tip of the yellow flame of the torch at first, slowly to dry the flux, then come in closer to melt the solder, such as Handrail. Posts or tinning or any where that you are torching directly on the SIP. When torching a small part to a large one, sometimes the flux will turn black on the small one but not on the large one, so continue torching 2-3 seconds more until it turns black on the large one too. When thru soldering or tinning, wipe off the black flux with damp cloth. Develope the habit of when using an eye dropper, as explained above, to refill it with water and lay it at the torch hand again, so when you need it quickly it is ready, lay down the torch and pick up the eyedropper. Sometimes you can prevent solder from spreading to unwanted areas by heavy solid pencil lines from a soft pencil lead. Other methods may work better, such as lacquer in the area----oil will flow into the soldering area. If you use quite a bit of SIP it will sometimes flow over the pencilmarks any way, usually not as bad.

PROBE--Any pointed tool or rod used to apply small amount of SIP just where you want it and hold pieces in place while soldering or re-positioning a part. We like an old dental probe that your dentist has broken and will throw away, or an ice pick, or about a 1/8" diameter steel rod about 6-9" long, old scribe, or an old small diameter screw driver ground to about 1/8" in diameter back about 2" from the point and about 1/16" diameter near the point, all ground to a point. We like ours bent at a 45° angle back about 1/4" from the point. This one will always have some solder on it from the above operations. So if used to hold a part while soldering it in place, it will probably leave a solder spot on the part, so we like to have a 2nd probe for this purpose. The first probe can also be used to help make solder flow when it does not want to. Another 3rd probe is sometimes helpful to flow solder as it is brass and always has solder on it. It would be about a 1/8" wide strip of about .015"-.030" thick brass strip and about 4-6" long. Being flat on the end, it can also be used to apply soldering paste(when used), even SIP where you want to tin a large area and push bead of solder along a crack or corner.

CUT OFF DISC--Abbreviated as COD. These are 3/4" diameter and about 1/32" thick disc of very fast cutting rigid abrasive available at your hobby dealer. They are used on a mandrel in a hand grinder such as a Dremel. The edges will cut extremely rapid, the side to smooth up rough cuts. This and the hand grinder is one of the most important tools in your shop for all phases of modeling and well worth the money to save hours of filing with just minutes with the COD---a good exchange. Can also be used to cut rail, drill, light milling in the hand using old dental burs, etc, etc,. Your dentist will be glad to save various sizes and shapes for you as he throws them away. Rather than the long ones that they seem to use most, we like the small conal, cylindrical and spherical ones best. The long ones can be used, but they are more difficult to keep the burr on the spot you want, they keep jumping off, tho they can be used for roughing work. These will not be needed on this Tender, unless you have large blobs of solder to be removed, tho a small 1/16" wide chisel can be made for this purpose from an old broken drill. COD's are easily broken, which you will learn to use and are perfectly safe, but when they break, the pieces fly. Tho you will scarcely feel them hit your face, you should wear glasses to protect the eyes from damage. The COD could be used in an electric hand drill but, because of the size would be extremely clumsy and really not enough RPM. Hardware stores carry a cheap model Dremel that heats up quickly if used for a few minutes under load but, would be satisfactory for most modelers who use it usually for a very short time. Should you be so lucky to use a disc until it is down to a very small diameter, save it for some future time when you want to get in a tight space.

PROTECTED HAMMER--Usually a steel hammer can be used if only light tapping is needed. Other wise use either a plastic, lead, brass hammer or the back of a wood or plastic screw driver used as a hammer. Or a steel hammer with tape over the head. A wood, brass or plastic dowel can be hit with a hammer in lieu of a hammer.

SMALL TOOLS--Tweezers will often be used, especially stainless steel, which solder will not stick to, to hold something while soldering or putting something in place. These will also resist heat much better than steel ones, not bend when heated. The best kind are lock tweezers, from your hobby dealer, as you will often have times to lock onto a part, or lock a part in place. It is useful to get from your hardware store about a 5" square and about 1/4" thick asbestos pad, very cheap, for when you want to torch down toward the work bench. Some times you may want asbestos paper to put between Tender or engine and towel you have them on, so the towel does not burn----if not heated too long, old tin stock can be used, scrap. Sometimes a small chisel 1/16" wide and narrower is useful to hand chisel(no hammer) or scrape corners more square, or remove solder around parts or rivets. Make from an old broken drill with chisel flat on one side and about a 45° angle on the other side. Grind slowly so it does not turn blue, indication that some or all of the temper has been removed from excess-heat. Then it can be sharpened better with a knife sharpening stone. A center drill for those small drills around .020" range can be made for your hand grinder or drill press by taking an old broken small drill or dental burr and grind a triangular or rectangular point on it. Then with this turning in your hand grinder notice that the point turns about on center---you will notice this best as the hand grinder just starts turning or is slowing down. If not turning on center, you will have to re-grind one side. A scribe can have it's point similarly ground also for when you want to start a hole at some odd place where you will drill a hole with the hand grinder, or just locate by hand under the drill press to drill. The scribe will be used like an awl, turning it back and forth to get a hole started. With either of these tools, they will just remove enough indentation to start a small drill, so the drill does not run off and possibly break. For lack of a better word, later we will refer to these as "starter holes". If when using the scribe to start a hole and you do not get the hole exactly where you want it, it can be moved slightly by holding the scribe at an angle, with the point in the direction that you want to move the hole to and use as an awl again. Of course if the hole has to be moved more than this will do, you will just start another hole.

PARTS INSTRUCTION BOOKLET--Abbreviated as PIB. This will contain the bulk of the instructions of building this Tender.

#200.8 TENDER WRAPPER FOR 2-8-0, 0-8-0, 0-6-0 AND OTHER SMALL TENDERS--This Tender is assembled the same as #200.5 USRA in the PIB, with the following exceptions and some repetitions, so read the #200.5 first, then this, then start work after reading each section first.

This is a more expensive photoengraved wrapper than our others, which we made the dies and stamped them far cheaper than if some one else had to make them. Being an engraving, the top line all across the top of the wrapper acts as a beading, so with COD or file, file material down just to this line, which we left for you to finish to save you cost. Then with a file round the beading on the inside and outside. Bend the wrapper as straight as possible.

#209.1 DECK--Round the corners at the back of the Deck where the 2 holes are punched thru, to fit down into the wrapper and it's contour here. First you will have to cut off some of the sides of the Deck along the lengthwise rivets, so they will well show, which should make the Deck close to 10'2" wide. When it fits in well, cut the false bottom, the longest sheet that will be the full length of the wrapper, exactly the same width as the Deck, a bit long at first. Similarly cut the Chute-Floor the same width. Set these aside for now. From rear of Deck measure 12" forward and draw a line across Deck. Place this in a vise and bend rear section straight up 90°. This vertical section should be about 2'8"-3' high and will support back of Coal Chute later. Tack in the Deck in place about 3" below top of rear section of the wrapper as in PIB #200.5. We used a 25 watt electronics soldering iron, which was a bit light so a 50 watt should do well.

FALSE BOTTOM--Now fit the false bottom in the very bottom of the Tender, the full length, rounded in rear corners like the Deck and fitted in the bottom of the cubicals A, cut off between the cubicals to the shape at the right. Soldered in with a soldering iron as you did the Deck, flush with the bottom of the wrapper.

The longest sheet



FALSE BOTTOM-#211.6 FRAME--The Frame should be flat across the top, so false bottom will sit flat on it, so may need some filing with large course file. These are cast to give good weight for good pick up, brass to solder to and sand cast to lower cost of lost wax---if they could even be lost wax cast. The prototype was also sand cast of a course sand, so do not file these frames down perfectly smooth like machining, but leave some texture. The square holes will have to be touched up as well as the flange along the side and the Sills. The top rear Sill can be filed smooth. The 2 outer holes on the Frame are for the Trucks, while the 2 inner holes are to assemble the Frame to false bottom. To assemble the Frame on the false bottom(wrapper), lay the Frame on the bottom of the wrapper square, with the rear Sill sticking out to the back of the wrapper 9", stick a long pencil lead or metal rod thru the hole in the Frame hole under the deck to mark the false bottom. Make a starter hole on this spot and drill it out with about a #54 drill, then re-drill it #42. When putting the wood dowel in the nut as noted in the PIB, it is helpful to put a little oil on it to help prevent solder getting in the nut threads. When torching this nut in place, have swabs in all corners of Deck and false bottom and the sides. With this nut soldered in place, assemble the Frame on the false bottom with this nut, then drill the other assembly hole thru the Frame and into the forward false bottom place. Solder that nut in similarly. Of course flat head screws are used here. When Tender is completely done, you can cover these screws with putty or a poor mix of plastic wood(so it can be scratched out later if need be) and paint over them.

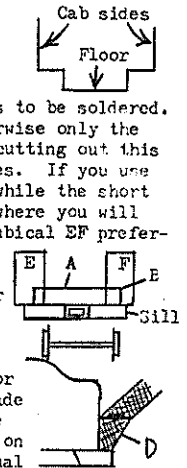
#234.3 ANDREWS LEAF SPRING TRUCKS---Assemble and install the trucks, pick-up on left side when finished.

TENDER PLATFORM D--Before installing Chute-Floor, cut out the platform D, removing engraved lines. With Tender off of the Frame, lay this platform under bottom of Tender as drawn, shaded part. Draw front contour of Tender door way on this platform, heavy lines, including curved portion. Then cut out the platform just inward of the cubical nearer the dotted line location, then fit it in between the cubical for a good fit.



The curved portion can be shaped with edge of COD. Should you ruin this piece, one can be made from scrap, tread not essential.

Put Frame back on with Trucks on. Now we come to some variance. 0-8-0 and 0-6-0 switchers and some others have a low floor in the Cab as drawn, while some have the floor not dropped as drawn here but, are at the bottom of the Cab sides and straight across, as for our Consolidations MoPac, B&O and B&M. For NYC and NKP like the switchers. In any case however, you have the Cab floor installed, so install platform in the Tender level with the Cab floor. Mark the inside of the Tender side at the level where the platform is to be soldered. In case it is important to you, the tall engraved door is for a platform that is low as for switchers, otherwise only the bottom half is used---the sort of curved cutout is the bottom of the door, so cut out this portion. When cutting out this door from the stock, leave the drawing lines on the sides, to later be fitted and probably remove these lines. If you use the full length door, the top of the door will be at about the height of the very top of the Tender sides, while the short doors will go just to the top of the cubical---door way in front. Their location will somewhat determine where you will want locate the platform. With platform A held in the marked position, mark A at B at about the center of cubical EF preferably so B will be bent down about 6-8" inward from the Sill edge and resting on the top of the Sill, cutting off any excess. Now cut off vertical portion of platform at an angle D to be even with the front of the Sill. Put swabs in corners of false bottom and door way, put thick SIP underneath platform and door way (so as not to show) corners along with small bead of solder and torch in place. If not well soldered, repeat. We found it easiest to hold the torch between our legs, holding the Tender upside down with left hand and probe in the right hand to spread the solder.



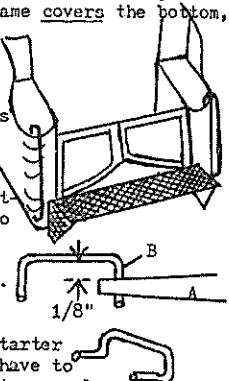
COAL CHUTE FLOOR--Fit the floor portion of the Chute-floor as described in the PIB, except the front of the floor need only just meet the back of the tread of the platform, instead of 1'6" past front of Tender---make a shade long here at first and very long at the back, end of Chute and trim as fitted. The shaded area noted in the PIB are the 2 square corners--shading was missed putting on the drawing. When cutting out these pencil marks on the floor, do not forget to cut a bit to the outside of pencil marks, as marks will be to the inside of actual cutting point. With this fitted, measure the distance X between front of floor and angled rivet line extended down to floor level. Measure this off on Chute-floor material, a little long in front and back and bend rear portion up about 45°. This measurement not at all critical. Now fit this down into the Tender so the rear portion, Chute, rests on top of the vertical section of the Deck. For 0-8-0 and 0-6-0 USRA switchers, the Chute is flat on top, level with top of Tender side. Some others and our Consolidations are oval on top. Various Tenders have different oval shape. Fit this in ready to solder in place. It is best, if you can, to bend floor-Chute and Tender sides so all will fit close together without pressure to hold them together while soldering, so if later you are soldering in these areas for something else the joints will not come apart without again holding them together. We would suggest soldering only between front portion of the floor to rear portion of platform, where solder will not show and solder inward from the edges so it will not flow out and show. Then put thick SIP between the edges of the vertical Deck and the Chute. We do not see any reason to solder all along the side of the Chute and the Tender side, which will show a lot of solder. Put swabs in all nearby corners and torch in place. When torching the floor to the platform, it will be well soldered when the yellow brass turns a light orange, ---since you have no solder showing to indicate when the joint is well soldered. If need be, when soldering the Chute to the Deck to get them close together, you can place a doubled up cloth on the inside of the Chute and press it with the fingers against the Deck and torch from the back.

FRONT CUBICALS EF--Install as noted in PIB. Exceptions are USRA switchers have C extended 5" above Coal Boards. Of course when soldering these in, put swabs at appropriate places. It is easier soldering A in first, which takes a little doing, then EF can be fitted and sit on top of C and front. A can be a bit long at corner at A and filed flush here when cubical is all done. We found it easiest to install A between the side and C, right on down past the floor, which is open here, down to or near the Frame. Thus it will stay in place while soldering to the side and C, also you can use SIP as a flux down inside cubical where it will not show, then use a small 50 watt soldering iron. Fit FE in place fairly close and flat. Put SIP around top of Cubical, set F&E in place, swabs in proper places and torch. Then with side of COD you can shape it to the cubical shape, or better shape later.

ENGRAVED DOOR--You have already cut this out, so fit between cubicals, removing side lines as needed to get a light force fit between cubicals. The height of these doors were described in the middle of the top paragraph. They are located back in the door way between the cubicals just where the roundness of the cubicals stops---location not critical. Put swabs in the proper places and solder with SIP in the inside corners and a torch or use a small iron as you did A.

#217.2 HATCH, USRA TYPE--Locate in center of Deck, cross wise, with Hinges to the front and about 3'6" from back of Tender between the row of rivets here. Put heavy swabs all around the Deck-side joints. Put SIP around the inner hole edge only so solder will not run out when melted, set in place and torch, possibly using a probe to hold it down from moving while torching.

GRAB IRONS--See PIB #200.1 "Tender Fine Details". Instead of piano wire, we have furnished .025" brass rod. On the back of the Tender there are 2 vertical ones on each corner already etched for you to drill out and a horizontal pair. On these Tenders the corner ones are not on the corner, so should be relocated to the corner using starter holes. These will be corrected on later Tenders. Drill all 6 of these holes .028", #70, for .025" rod (or .022", #74 for .020" rod). File off remaining etched ridge. With a pencil mark around the Frame on the false bottom, then remove the Frame. Where the Frame covers the bottom, drill some holes close together with about #42 drill, then re-drill them about #25, then file between these holes to make a large hole so you can get a small soldering iron up to the Grab Iron holes, so they will have to be pretty near the back. They can also be used to thread wires to Headlights on the back of the Tender if you want to illuminate them. We just used an old long dental burr to rout out these holes. Your dentist throws these away so will be happy to save some for you. The Handrails just soldered in will not hold, so they will be bent in the following manner and soldered so they will hold. Bend the Handrails so they will go into their respective holes, but leave about 1/4" too long at each end. Hold the end of Handrail with long nosed pliers A, and press point B down against the work bench to give this sort of bend, viewed from the end. These end bends must be in the same direction in order to slide both of them in the holes. Push these into their holes, so the ends lay next to the wrapper, add very thick SIP well over the ends and wrapper with a wire or probe, on the inside. Put swabs along whole length of Grab Iron to 1/16" of the end, so it is not annealed and easily bent from handling and torch from the outside, with swabs also on false bottom and Deck and the sides. Better yet, if you can get a small 50 watt soldering iron inside the holes made to solder the ends on the inside, in which case you could dispense with all swabs. Be sure they are well soldered, repeat if necessary. The front Grabs are located on the corner of the round of the cubical as drawn. Make starter holes at these spots and drill as above. Since there is not the room to install as above, they will have to be installed in the conventional manner by pre-tinning the tips of the Handrails carefully so as not to anneal, then push them into the holes with long nosed pliers, cover the Handrails as above with swabs and swabs around top of cubical and sides and false bottom and sides and torch in place. Before pushing the Handrail into the holes, put SIP on the ends of the Handrails. Work each of these with tweezers to be sure they are well soldered.



#224.3 MEDIUM LADDER--See PIB. Grind gating from bottom Ladder strap (riser), then bend bottom strap slightly upwards with long nosed pliers. Similarly bend the top 2 straps slightly downward. This is located on the back of the Tender on the left side half way from the side to the center, with the bottom resting down against the Frame and top looped Grab Rail down on the Deck. The above bending should make this possible. If not, you may have to grind the bent straps a bit narrower. With a pencil, mark the Tender where the Ladder is located, then file off the rivets and beading that would be under the Ladder straps. Put swabs along top and bottom Tender corners on both sides of Ladder location and well over each Handrail. Pre-tin Ladder straps, prop Tender up vertically on front end and add more SIP to straps, hold Ladder in place with probe and torch in place. Test with tweezers to be sure it is well soldered.

HEADLIGHT, only--None for C&O and B&M. Located on back of Deck about 7" from the back. See PIB #86.3, .7 & .8. O-8-0 and O-6-0 switchers(USRA) use #86.7 Sunbeam #4414 half way from the right side to the center, while B&O and NYU Consolidations have it located in the center. NKP and MoPac Consolidations use #86.3 Pyle National in the center. With edge of COD grind off the little pins on the bottom of each foot, set on the Deck and bend all feet to touch the Deck. Pre-tin bottoms of each foot. Put swabs around all top corners of Deck, over horizontal Handrail, top of Ladder straps on Deck and back, and on top of Hatch. Put SIP on each foot again and carefully place it in the center of the Deck and torch.

#227.1 TOOL CHEST--On MoPac and C&O Consolidations only. Hangs down on the right side mid-way between the Trucks and soldered on the Frame cross member as drawn. Pre-tin top of Chest and Frame. (With Trucks removed). Lay Frame on fire-proof material on the work bench, put more SIP on the Frame location, hold Chest in place with probe and torch----best to pre-heat the Frame first.



#222.1 STRAP STEPS--These are located under the rear Sill of all except C&O which is on front Sill. For USRA switchers, remove dotted portion and round corners A. Remove wrapper from Frame. Install as #222.1 and drawing at #200.1 under "Tender Fine Detail". Easiest to solder brace on the bottom of the Step, then bend the brace down to the Frame.

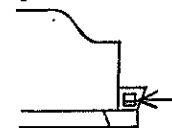


#222.2 CAST STEPS--These are located same as above on bottom side edge of front Sills, except for C&O, which are on the back Sill. See #222.2. Drill the holes 3/32" from side of the Sill.

#57.1 UNCOUPLER BAR BRACKETS--See #57.1 End ones are located 3" from end of Sills and against the back edge, leaning rearward. The center one in line with the end ones. Probably easiest to grind off the assembly pins on the bottom, tho you could drill holes for them in the Frame if you wish. With Wrapper on the Frame, mark where these are to be located, then remove the wrapper. Pre tin the Brackets, put more SIP on the Bracket, put swabs underneath Sill on Step soldered points; touch Brackets to place they will sit to get some SIP on the Frame, then pre-heat the Frame until this solder melts, then with tweezers hold Bracket in place and torch a bit more to solder it, remove torch and squirt some water on the spot to quickly solidify the solder before possibly the Step comes loose.

#60.5 PILOT, STEP STYLE--See #60. These are for switchers or other engines that call for them. Cut off the top of the strap under top rivet. Install with end vertical foot board to the inside and inside strap inward against the Coupler Pocket.

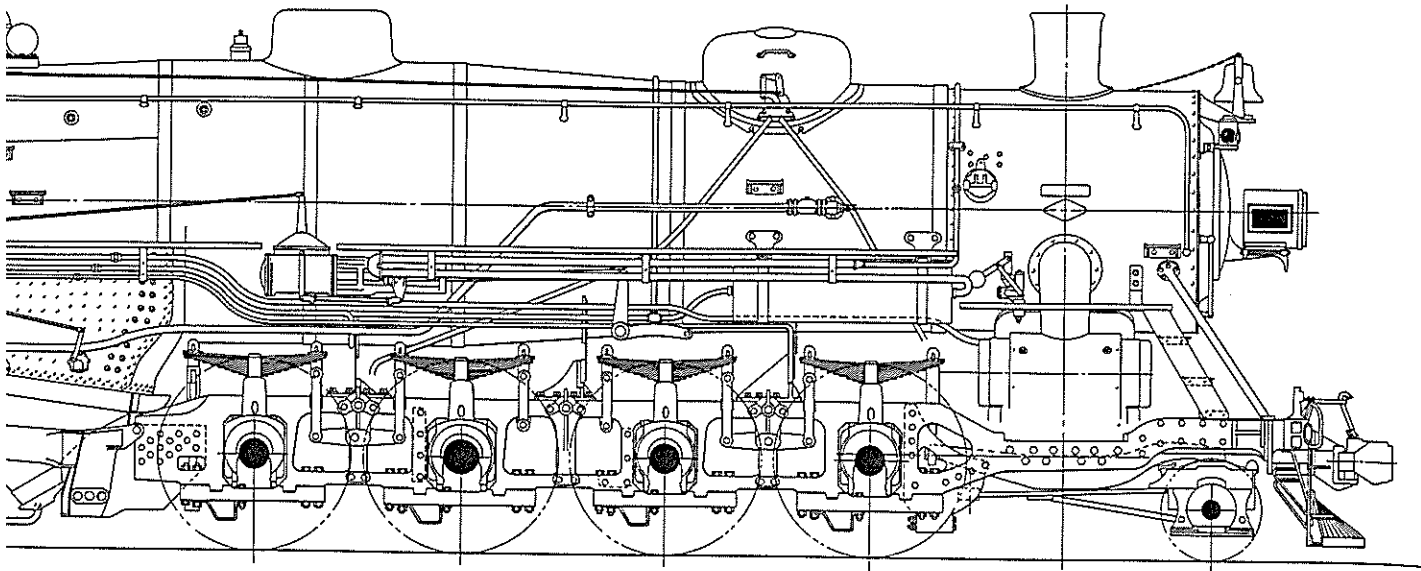
#62.2 CENTER BEAM STEPS--Cut these from cluster with only back vertical portion left on, and bend it vertical, removing any cutting burr with COD. Remove wrapper from Frame and install half way between top and bottom of platform riser, as drawn. Pre-tin Step bracket, add more SIP to it, put swabs on false bottom here, cubical platform, door and over Handrail, hold in place with probe and torch.



#214.1 DRAW BAR, WIRELESS--See PIB. The #24 hole where the plastic sleeve goes thru Draw Bar, change hole size to about .128", if not already changed on PIB instructions.

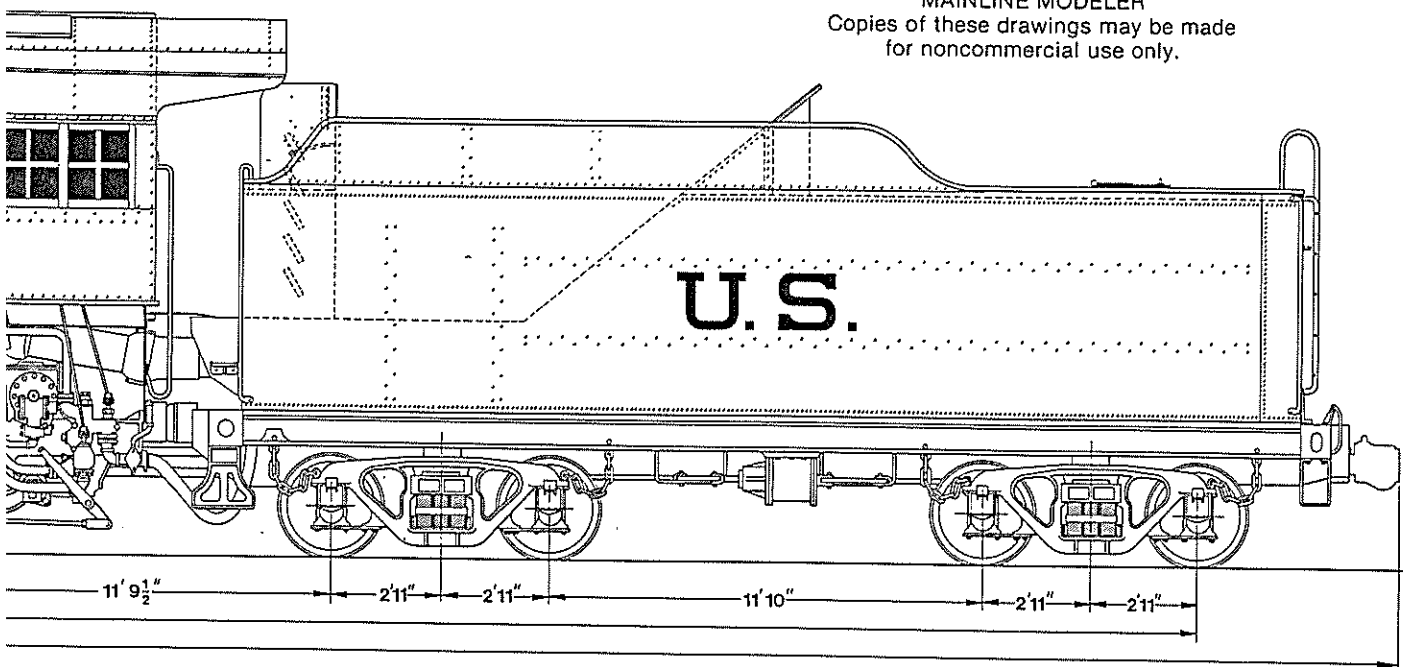
#231.2 8 WHEEL BRAKE SYSTEM--See PIB.

-----Notes or changes you might want to make on the next Tender you make-----

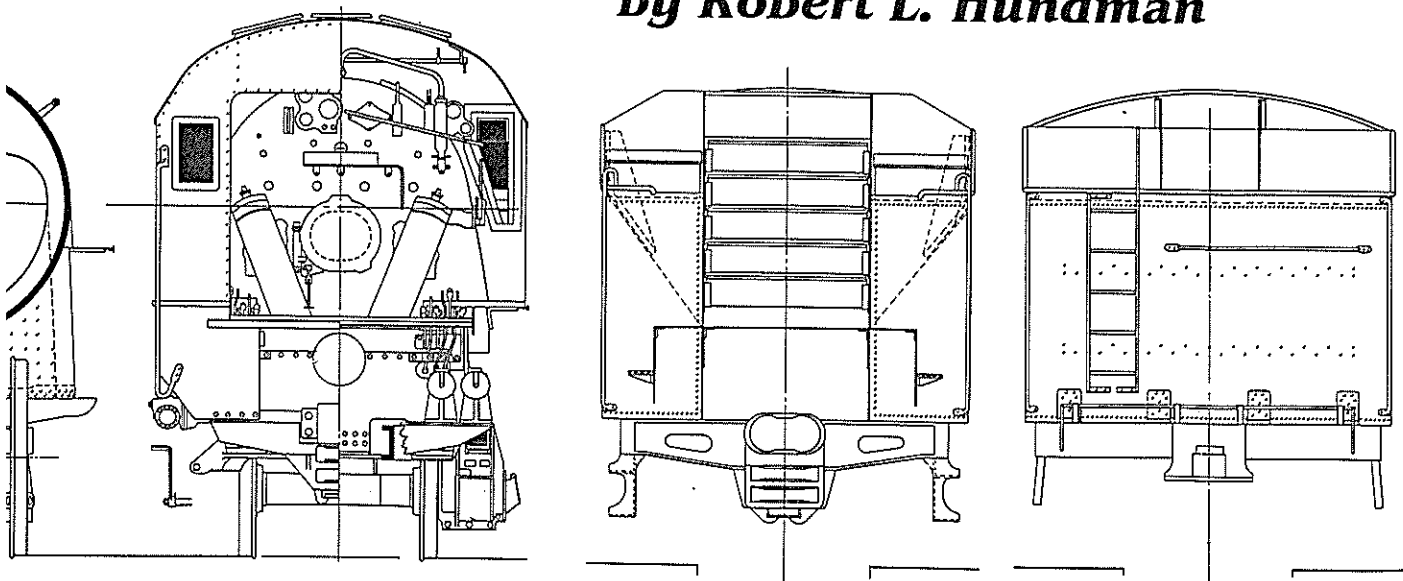


Scale 3/16" = 1'

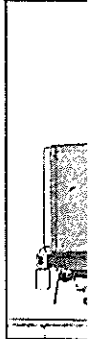
Drawn Expressly for
MAINLINE MODELER
Copies of these drawings may be made
for noncommercial use only.



by Robert L. Hundman

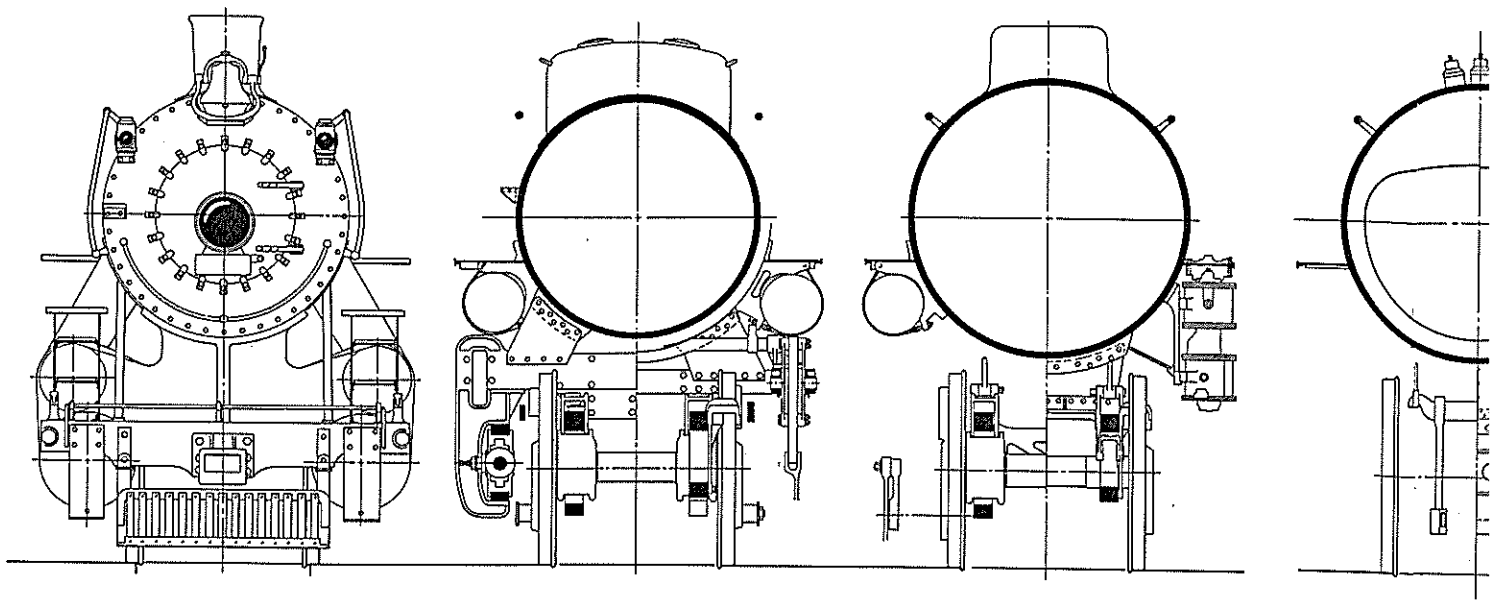
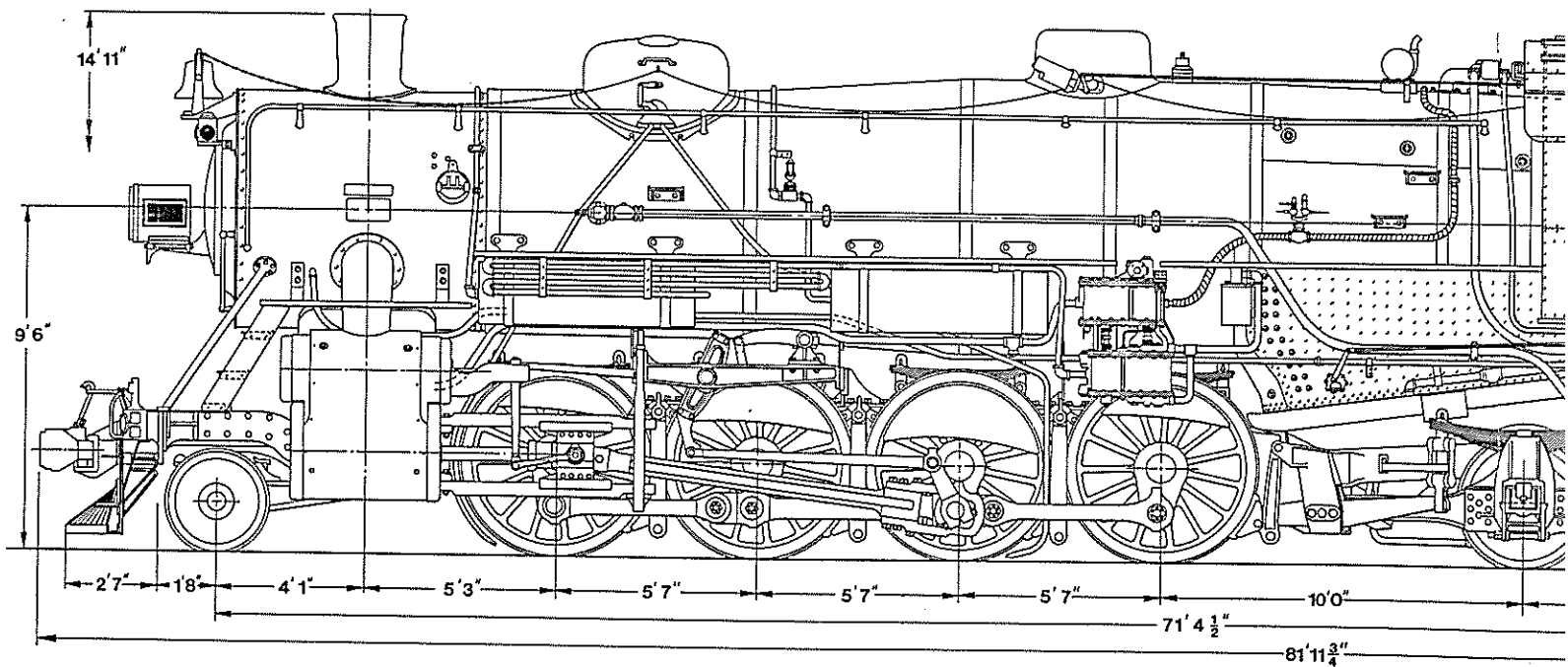
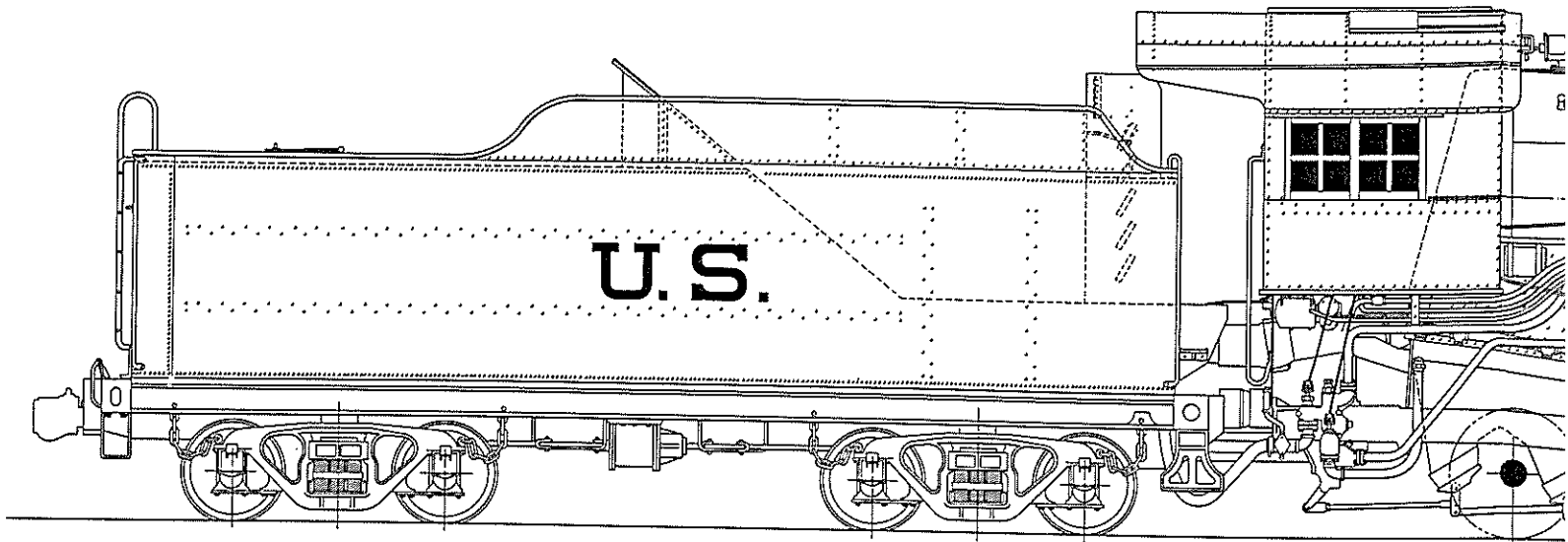


Alco Histor

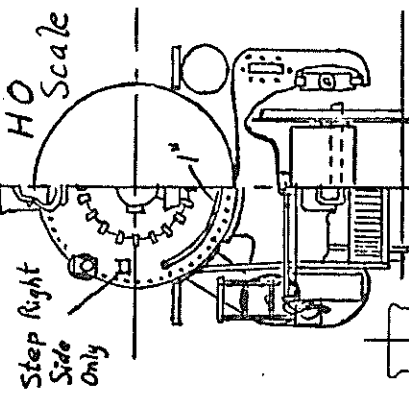
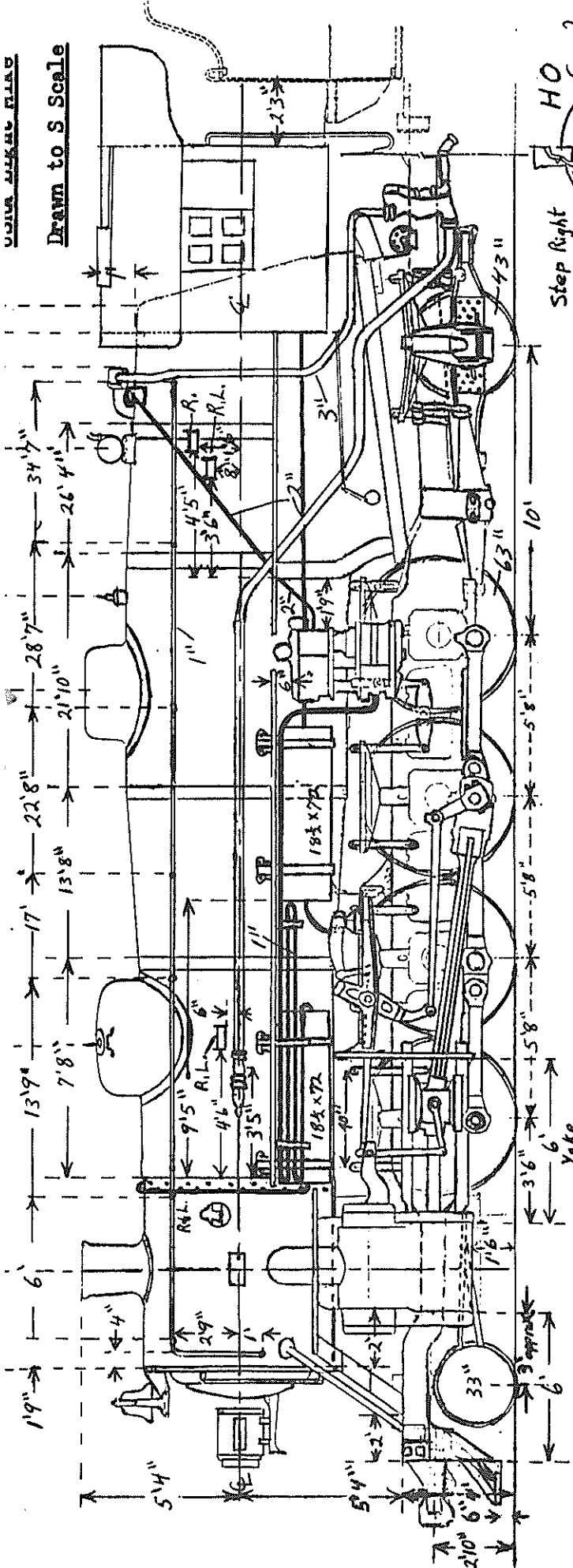


Alco Histor





Drawn to S Scale

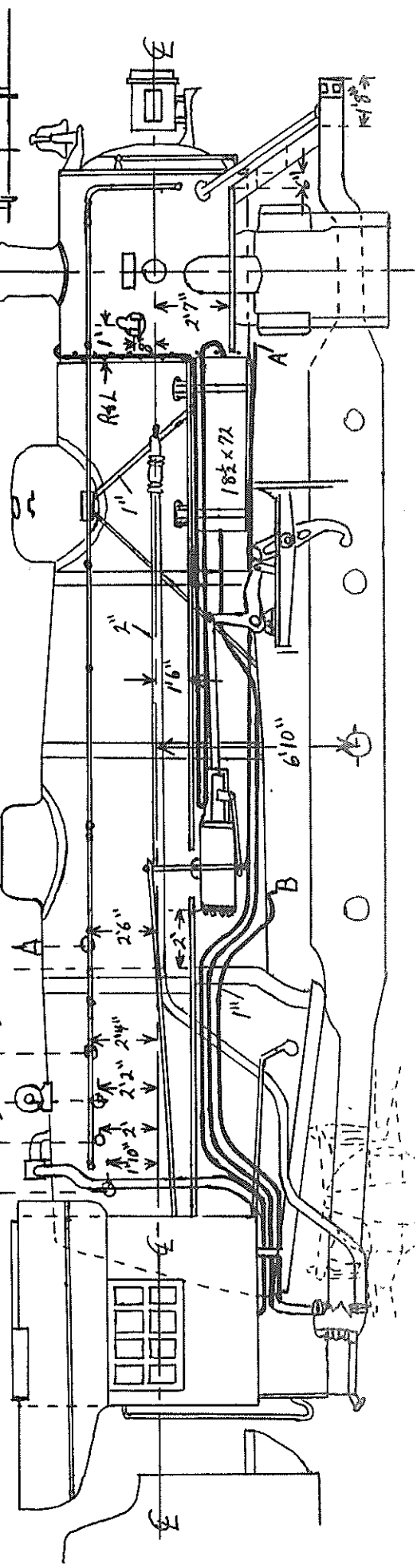


So far as we can tell, there is some slight variation between USRA plans and photos, possibly between different manufacturers, notably the exact placement of top Boiler parts and piping, You can either use the demensions here, which we feel is accurate, or scale demensions from drawing. Steam Chest to front of Pilot Beam increased from 5' to 6', so Pilot Truck will clear Steam Chest, and a couple other model changes necessary, tho drawings to scale.

This drawing is loose so you can insert it in the booklets as you progress.
Note some demensions above Boiler are running totals for easier layout, arrows in one direction.

← 3'12" → 4'8" → L.S. Washout
← 3'12" → 3'1" → 6' → R.S. } Plugs

Prototype Frame shape



---- K I T I N S T R U C T I O N S ----

BERKSHIRES (2-8-4) Last 3 Steam Engines Made

Nickel Plate S-3, #779 (Parts code b)
Chesapeake & Ohio K-4, #2750-2759 (Kanawa) (Parts code r)
Pere Marquett N-2, #1228-1239 (Parts code e)

For those of you that need a second Berkshire for your road, a bit older, back to about the 1930's, and a bit different, you might make a few changes of the regular kits to these.

NKP #723--Bell in Frame instead. Tanks crimped at both ends. No Miller Muffler or Mars Light or Number Boards. All engine journal plain, also Tender. Sanders and Sander Blocks as below.

NKP #730-739--Had regular Sander Blocks, NYAB(New York Air Brake), 8 instead of 12, with small Vilco Sanders (could be omitted) united with the Blocks. Probably Bell in Frame, no Mars Light.

NKP #740-754--Same as above, but 12 Sanders and Blocks. No Mars Light.

NKP #755-769-- " " " , plus some engines had Mars Light. Roller Journals on Pilot Truck. Tanks crimped on both ends

Needless to say NKP liked Berkshires and had quite a fleet of them. They were always making record runs with freight and some passenger. They gave the diesels a great run for their money and out preformed the diesels for some time after dieselization, but diesels had been installed to replace other engine types, so for standardization the great Berkshires had to go also.

C&O #2727--Both domes located as the above NKPs, with Roller Journals on both engine Trucks, Plain on Tender. Rectangular Pop Valve housing.

PM #1213--Both domes located as NKP. Roller Journals on both engine trucks, plain on the Tender. Bell in Frame and no Number Boards or Miller Muffler. Has 8 NKP type Sander Blocks & Sanders(NYAB) as used on NKP #730-739.

Virginian #505--(Subsidiary of C&O, as is PM, so all 3 could be used on the same roads on the commonly used leases). Same as C&O kit, but Sand Dome moved rearward 3-4' and no Steam Dome(inside the Sand Dome). Fourth Sander Block from the front omitted and a Handrail Post in it's place.

Before starting work, re-read "Soft Soldering" in the "Parts Catalog", Page 14. Also consider the "Carbon Rod Resistance Soldering". This is much easier soldering and easy to learn, making torch soldering as obsolete as the torch made the soldering iron, especially if you expect to make several engines. It can be made for about \$45.00 at this writing, 4-83. The 6 volt (non-shocking, same as some flashlights) 16 or more amps. transformer from electronic supply is the biggest cost, about \$35.00, the rest is cheap, and much from your junk box. Remember too when you get to make a pretty good engine, you probably can sell the engine for more than you paid for it by a good margin, to pay for the soldering outfit.

Dimensions herein are the same for each engine unless otherwise noted. While drawing is mainly for the NKP, much the most popular engine, the C&O and PM have the domes reversed, dimensions on drawing. Other differences will be noted here as you go along. The "Parts Installation Booklet" is main instruction of this kit, separate so all that material does not have to be repeat reading for each and every engine you read, keeping actual differences separate and the building order in the "Kit Booklet". We believe when you have built one engine and see how well it looks and runs, you will want to build another and another, so this method will be much simpler and cheaper for you(saving repeated printing costs). Building much cheaper--RTR.

The following part numbers are in building order. The part number to be looked up in the "Parts Instruction Booklet" to find how to install it, and the plans to where it goes, and this booklet for the building order. Where installation is different, it will be noted here. The drawing is fully scale, but some parts cannot be put in scale location, so use the dimensions given. Most dimensions are given for your convenience, as space permits. Some very few you will have to scale the location, some placed by sight. Some few parts are listed here but not part of the kit, in case you will want to add them. The following building order is not absolute for all parts, by and large should be followed if this is your first engine.

BASIC RUNNING GEAR

#3.9 Counterbalances--



#1.4 Drivers--If axle holes in the Frame are a bit too tight, do not file them out to fit, but file them in accordance to taking out the bind in Side Rods, #16, as we have later found best. If barely up and down play in the Frame, do not file any more, remove further bind from Side Rods, see #16. Pick-up on right side.

#18.42 Frame--

#14 Crank Pins--

#16.9 Side Rods--Oilers removed on the bottom. See #1.4 above.

#12.2 Motor--It can be fitted now and get running smooth with drivers, then removed until the engine is done.

#13.1 Flywheel--Same as above.

#25.1 Steam Chest--Vertical pipes may need bending outward or inward, or just one, using protected hammer.

RUNNING GEAR DETAILS

#72.9 Boiler for NKP-- } See note #1

#72.10 Boiler for C&O and PM-- } at end

Engine Screws-- Screws in envelope are for:

1 2-56 x 3/4" brass round head, thru Beam-Deck, Steam Chest lip and into Boiler

1 2-56 x 3/16" brass flat or round head. Rear end Frame and into Cab-Frame angle mount.

1 2-56 x 5/8" brass or steel round head and long sleeve and washer for Trailing Truck.

1 2-56 x 3/8" brass round head and short sleeve, Pilot Truck.

1 2-56 x 3/8" round or fillister head to hold Valve Gear to Frame in the 2nd 2-56 hole from front of the Frame.

1 6-32 x 1/2" steel or brass round head to screw Steam Chest to Frame.

Some screws may be a bit longer than above. Small diameter screws 2-56, larger one 6-32.

#54.1 Beam-Deck--

#45.2 Dual Cross Compound Air Pump--

#47.1 Compressor Filter-- } Both inst-

#48.1 Compressor Governor-- } alled later

#124.1 Cab, Modern--Assemble Cab and

install on Boiler. Differently than cast Boiler, it is torched more than the Boiler. Stray heat will be enough on the Boiler, with wet swabs around on the Boiler except where soldering, to prevent Boiler section from com-unsoldered. Cab is best soldered on Boiler by soldering just several spots, tho well soldered to Boiler, especially if the solder has flowed well between Cab and Boiler. Install the Cab Floor with cut out for the motor. See last paragraph in "Parts Instruc-

tion Booklet" on page 14.

Rear Cab-Frame Mount--

Make bracket Cab Floor

from scrap br- Cab Floor

ass about Bracket

1/4" wide x Frame

about .025" Draw Bar

thick, to a

length to elevate

CL(center line) of Boiler to pro-

distance above rail or axle center.

Drill #43 hole and solder

2-56 nut to the inside of bracket

as shown above. This bracket and

end of Frame should be forward of

rear of Cab Floor about 1/16" so

as to give room to solder Baffle

Plate to Cab Floor. Put wet sw-

abs/corners of Cab sides and floor.

Pre-tin top of bracket,

screw bracket to the Frame, put

thick SIP(Solder in Paste) on

bracket, be sure Frame is in

Center of Cab, then torch brack-

et in place. Of course removing

this screw releases the Boiler

section from the running gear.

#56.1 Flagstuffs--

#57.1 Uncoupler Brackets--

#58.1 Hoses--

#60.1 Pilot for NKP, #60.2 for C&O,

#60.3 for PM.

#62.2 & .5 Steps--for PM only

#50.1 Shields, Individual--for NKP and PM. For NKP add about .016" to .025" thick; step, 1' wide, and solder on shield half way between top and bottom.

- #50.4 Shields, Dual--For C&O.
 #52.1 Shield Irons & Posts--C&O uses only the posts. NKP, both.
Coupler--Not part of kit, see #54.1. Note CL of shank above rail.
 #20.1 Leaf Springs--
 #23 Brake Shoes--Not part of kit.
 #64.1 Pilot Truck--For PM. #64.2 for NKP & C&O. All uses 33" spindleless, plain axle, no plastic covering.
 #65.1 Trailing Truck, 4 wheel--For NKP and PM. #65.2 for C&O and without plastic stiffener on axle of 45" wheel set for use with #70.1 Booster Engine. Use long shouldered screw with washer next to the Truck Frame. All use a 36" and 45" wheel set.
 #70.1 Booster Engine--For C&O only.
 #32.1 Baker Valve Gear, Triangular--Front of hood 6" from back of Steam Chest body, and mounted on the 2nd 2-56 hole from the front of the Frame. Outside edges of Valve Gear Frame 11' apart.
 #36.1 Crosshead Guides, Single--These could be installed before the Valve Gear.
 #37.1 Crosshead, Single--
 #28.1 Valve Crosshead--
 #29.1 Lubricator--
 #41.1 Eccentric Cranks--
 #40.3 Main Rods--Oilers up
 #42.1 Eccentric Rods--

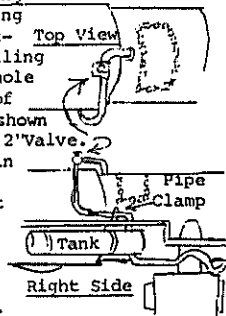
BOILER & BOILER PARTS

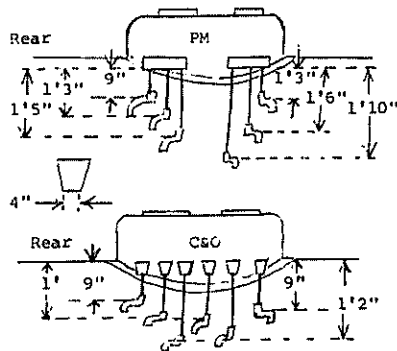
- #78.3 Boiler Front for PM & C&O. #78.4 for NKP.
 #80.1 Bell In Rack for NKP & C&O. #80.2 for PM.
 #86.1 Marshall--For NKP only and random older ones.
 #86.3 Headlight, Pyle Natl.--For all, but C&O's top of light is even with bottom of Boiler Front Door
 #82.1 Number Boards--none on PM
 #84.1 Classification Lamps--On C&O are on side of Smoke Box instead of being on the Boiler Front.
 94.1 Boiler & Boiler Front Steps--The narrow steps go on the Boiler Front.
 #124.1 Cab Modern--For C&O, PM and Virginian, the Cabs were welded, so the rivets should be filed off, occasionally leaving a very slight trace, barely observable, to indicate unevenness of welding.
 #136 Running Boards--Make 5-6 for each side of the engine. Made about 1' square on each leg from brass scrap, from .016 to .025 stock instead of wire on cast Boilers. Otherwise locate as wire Studs. When you are satisfied the Running Boards are level, leave Boards off for now. Best not to have Studs behind the Compressor and the Power Reverse Lever. At the rear the Boards are even with Cab sides, outer edges parallel with top Boiler CL, on to Smoke Box where they are wide. Boards will be next to most of the Boiler, but widely spaced from the Fire Box because of it's smaller diameter. On the Smoke Box you will have to grind out the Board to fit around the Steam Chest Pipes.
 Down to and include #130.1 could all be fitted and soldered on at the same time, but solder a part from one end of the Boiler to the other, so as not to heat the Boi-

- ler in too long an area and loosen the Boiler Joints.
 #92.1 Washout Plugs, Closed--
 #100.1 Feed Water Heater, Worthington--
 #102.1 Smoke Stack, Modern--
 #106.1 Super Heater Door--On NKP only. For C&O and PM make a plain door from about .012" sheet stock, 6' wide and 3' long, plain door. Anneal, tin underside first and solder in place same as NKP. You can wrap wire around it and and Smoke Box to hold it in place while soldering.
 #108.1 Sand Dome--This is too large to spread solder all the way around so file and bend the base for as good a fit as possible, then tack solder it in about 3-4 places. Sander Blocks and Grab Irons installed later. Torch only Dome
 #112.1 Steam Dome--Hole on left side for Whistle later.
 #116.1 Pop Valve, Triangular--
 #118.1 Lower Water Alarm Casing--
 #120.1 Blow off Muffler--
 #126.1 Turret--And #134.1 Handrail Post
 #128.1 Throttle Rod Levers--Put rods in later, but do drill the holes deeper .021 or .026.
 #130.1 Check Valves--Drill holes deeper with undersized drill, then re-drill the proper size later when piping is put in.
 #114.1 Whistle--Install as described for #114.2 Whistle, so that it folds, swivels in the Dome hole.
 #94.1 Boiler Steps--
 #104.1 Miller Muffler--PM installed as shown. NKP same, but piping is the dotted lines, goes on down beneath the Smoke Box. C&O is same as drawn, but on left side.
 #122.1 Turbogenerator--NKP generally had two in this series. C&O and PM only one.
 #62.8 Front Steps--Cut off top side boards of Steps to fit between Running Board and Deck. Align rivets on bottom of Steps with rivets underneath rear of Deck and step set at rear and on side edge of Deck. Actually on the left side the top inside side board is cut out for the Steam Chest to set slightly inward. Steps soldered only to the Deck for easier Boiler-Running Gear separation.
 1 #138.3 Tank and 2 138.1 for NKP
 1 #138.6 Tank and 2 138.8 for PM, none for C&O.
 #144.3 Hot Water Pump, Worthington--Add the piping. You will have have to remove the Running Board to file a notch for the 3" Piping to go thru next to Boiler.
 #142.1 Alco Power Reverse--For C&O installation 'A'.
 #142.2 Franklin Power Reverse--For NKP and PM. Rods for this and above can be added later.
 #144.6 Cold Water Pump--Piping put in later.
 #148.1 Stoker Engine, Double--Not on C&O.
 #152.1 Booster Engine Pipes--C&O only.
 #154.2 Injector, Right--For NKP install as shown in #152.1 and engine drawing, using 3" piping with Overflow Funnel right on the outside, while for C&O and PM the Injector is rotated so the Overflow Funnel is to the rear. For the C&O it will have to be set a bit rearward to clear the Booster Engine Pipes.

- which also needs moving rearward to clear the Truck.
 #78.4 Blow off Cocks--Install as illustrated for NKP and PM. Their left side is exactly the same except the Cock's levers and rods goes into the Cab. C&O appears to have only one, right rear one as illustrated.
 #156.1 Over Flow Funnel--
 #162.1 Cooling Coil Clamps--Cn C&O only. Install piping later.
 #175.1 Grab Irons--Install on Sand Domes, See #108. 2 on each front corner, one vertical and one horizontal, starter holes on domes, and 2 on Super Heater Door for the NKP. For C&O and PM, two on each rear corner as NKP's front corners. Also 1 on each Tender Hatch.
 #160 Piping--By rule of thumb, the heaviest piping is put on first, followed by Cooling Coil Clamps, then those that are the hardest to put on and those that go along the Boiler and not effected by handling. Then Cooling Coils. Some of the foiling piping, some of you may not want to put on.
 #144.6 Cold Water Pump--Put in the 5" piping. If the 2" and 3" is put on, it should be annealed so it bends easily to conform to Truck swing. Of course it does not go into the Boiler as shown, but dead ends in that area--could be left off.
 #148.1 Stoker Engine--Here again the 1" on the sides dead ends under the Cab if the Stoker is attached to the Frame for Cab-Frame separation
 Front of Boiler Piping--

This 2" piping is first installed by drilling about .036" hole on very top of the Boiler--shown here, with a 2" Valve. Drill holes in the 2" Valve deeper, about 1/32" deep with .036" Drill, so piping will hold(solder). To solder the piping in the 2" valve, solder one in, then wrap a wet string around that end and the piping, and will be easy to torch piping on the other end. Just as soon as the Solder In Paste turns black, pull the torch. Be sure all these joints are well soldered so they do not come loose after painting. There should be a small clamp made and installed as shown. See 162.1 to make one, or one can be made by cutting about a 1/16" wide of thin brass, lay a piece of appropriate sized piping on the work bench or a piece of metal, lay the brass strip over the piping, and with tips of long nosed pliers pushed down over the brass strip with each jaw of the pliers just on each side of the piping, then press down hard so brass forms over the brass strip. Then the strip can be cut to desired length.
 #109.1 Sanders, NYAB--Note these are right and lefts.
 #109.2 Sanders & #110.1 Sander Blocks for PM.
 #109.2 Sanders & #109.1 Sander Blocks for C&O. Sanders are cut off of the #109.1 Blocks and discarded. Drill new holes in center of the Blocks





about .060" deep, then file a taper on sides of Blocks as shown in drawing. Assemble as shown here, running piping between Running Board and Boiler, on to bottom of Boiler and soldered there. For soldering technique #109 and 110.

- #96.1 Lima Builder's Plate--One on each side, see instructions. Some older C&O (2727) were American built, other engines differed, but believe all NKP were Lima built.
- #96.4 Owner's Plate--On NKP on both sides, just above Builder's Plate. On C&O and PM they were elsewhere, probably on right side of Frame under Cab.
- #96.5 Superheater Plate--On NKP on both sides just above Owner's Plate. On C&O and PM on right side only, just below Builder's Plate.

TENDER SECTION

The Tender's building is described in "Parts Instruction Booklet", but the following is probably a little better building order. Same for all 3 engines.

- #211.1 Tender Frame--
- #212.1 Bolster Screws (Pins)--
- #234.2 Buckeye Trucks--33" wheels, pick-up on left side, engine right.
- #214.1 Draw Bar (kit)--
- #200.1 Wrapper--
- #209.1 Deck, Coal Chute, False Bottom--Best to remove Trucks to install these.
- #216.1 Bunker Doors--See #200.1, one door on back of Bunker.
- #222.1 Strap Steps--
- #227.1 Tool Chest--
- #217.1 Hatches--These are located length wise of the Tender Deck, 3' from back of Tender and hinges on the left side.
- #224.2 Ladder, Long--2' from left side of Tender.
- #231.1 12 Wheel Brake System--
- #220.1 Rear Light--
- #225.1 Bunker Ladder--See #200.1.

Now other fine details and wiring can be added, see #78, #84.1 and 605.1.

Ground right terminal to motor frame or engine frame, the other motor terminal to the Draw Bar.

Now your engine is complete, one which you can be proud to show to other gaugers, knowing you sport more detail, including O scale, more complete and more accuracy to scale, a real prototype in miniature, aren't you proud of it? Not brought home from the store in a box and

set on the tracks, but put it together yourself. If you want to, and you are sure intitled to, show it off to your friends---who took theirs out of a box. Naturally if you were to build it again, you would do it differently, you are not in a class by yourself, join the club, the "Master Builders" are never quite satisfied either, and would make changes on the next one. This is human nature to not quite be satisfied, always moving upward.

You can help looks some by removing excess solder around parts with small file and small chisel that you made earlier to scrape and push solder away, including corners. Some darkening from flux and handling can be removed by brushing down with thin paste of detergent washing powder and an old tooth brush or ten-cent store paste brush.

Now that the engine is done and you are pleased with it, perhaps you would like to build another road Berkshire, or a USRA to fill those stables of yours. We hope you have enjoyed building your engine and layout.

NOTE #1

Installation of Boiler to Frame--On the bottom of NKP Smoke Box you will find an engraved circle .250" (1/4") back from the front of the Smoke Box. For the C&O and PM you will have to locate this point and drill this hole with #50 drill, straight, then tap 2-56, straight. Should you ever strip these threads, you will have to solder a nut over the hole as described in PIB #211.1. Or another plate soldered on top of this one and drilled and tapped.

This hole will take the long 2-56 screw up thru Pilot Deck (Beam-Deck), rear of #45.2 Dual Compressor, Steam Chest lip and into the Smoke Box hole just tapped, see #18 Frame. (There is no 4-40 screw into Boiler--was for Cast Boilers).

Notice that the top CL (center line) of Boiler appears right on top, possibly lay several Boiler parts on top centered on the CL to see if Boiler appears square. If not square, try to adjust so it will be square.

Now you can go to #124.1, assemble and install Cab and rear Boiler mounting beneath the Cab.

It probably will not be necessary when soldering around where sections are soldered together. to use wet swabs, but it would be on the safe side at a joint to place a ring of wet swabs around the part to be soldered on, but no further than 1/2" from the part. Do not torch parts on from inside the Boiler as with cast or Consolidation Boilers. For larger parts like Domes, Stacks, Cabs, Compressors etc., torch mostly on the part, casting, stray heat will be enough on the Boiler--in fact for some of the larger parts it would be a good idea to pre-tin and pre-heat the part, put in place and torch again, especially Cab and Sand Domes. Do not tap edges of Domes on Boiler to it's contour as you would on cast Boilers, instead file to fit Boiler and bend bases with long nosed pliers--carefully. (continued)

You will find marks at front and back of each Boiler section to locate a CL. On most Boilers we have marked lines between these marks for your convenience for adding parts to these references. Very small engraved circles are for Hand-rail Post locations. These circles give an easy start for your drill. Drill these first with under sized drill and try the posts for fit. Then re-drill later when you are ready to install and solder the posts. You will find these post not perfectly in line, which is OK, as you can bend the posts in alignment for the Hand-rail and is not noticeable, but if more than 1/8" out of line, do not drill it out and relocate. For C&O and PM you will have to locate them on the Smoke Box from the plans.

The larger circles are for Washout Plugs, installed as above. If SIP is applied inside the Boiler, you will not see solder on the outside. Not being able to see the solder, you will have to try to remove them to tell if secure.

NOTES

KIT INSTRUCTIONS

Almost every railroad large enough to be called a railroad had and 0-8-0 switcher of the USRA configuration. Many were up dated as the years after the WWI, many were used right on to the end of steam. For the New York fans, some of them were model U3A, #'s 350, 415, 7702, 7813, 7823, 7828, 7831 7902, 7915, 7924 that we know of and many more similar. Of the Chesapeake & Ohio, #'s 100, 44, 75 and many others that we do not have.

Before Starting work, re-read "Soft Soldering" in the "Parts Catalog," page 14 to refresh your memory---remembering some of it refers to cast boilers. These sheet stock Boilers are much easier to build. Also consider the "Carbon Rod Resistance" soldering. This is much easier soldering and easy to learn, making torch soldering as obsolete as the torch made the soldering iron, especially if you plan making more than one engine. It can be made for about \$45 at this writing, 8-85. The 6 volts is not-shocking, same as the old auto batteries that are now 12 volts. The transformer should be 16 amps. or more, from an electronic supply, and the biggest cost of about \$38, most of the rest you have in your junk box. Remember too, when you get to make a pretty good engine, you probably can sell it for much more than you paid for it and have used it for some time and payed for the soldering outfit, on an import engine you loose money.

The "Parts Installation Booklet" is the main, basic, instruction of this kit. So for every part listed here, go to the PIB for instruction, remembering that some are for cast Boilers. This kit Booklet will give additional or different instructions, and the order of building to keep from making an installation that prevents you from making another installation, or much more difficult. Using this method, after you have built 1 or 2 engines, you will not have to read all the detailed instructions in the "Parts Instruction Booklet" for each engine. The plans show where to put the parts and the instructions how to install the parts. Many parts can be located by sight on the plans. We have used HO scale plans so that you can see both sides if the engine readily as you build, BUILDING HINTS---These are some that we came across that we felt may prove useful to you in your building. Silocone rubber, as used around your bath tubs is useful to cement engine weights in you boiler or tenders. Just make a strip of it the length of the weight, as you would use tooth paste. In about 2 hrs. will set enough to handle carefully. To remove, just push it out with your fingers or a rod. Of course the Boiler and weight cannot have any oil on it. Also it can be used for about all motors used in S Scale, but here put the silicone over the whole bottom of the motor. To remove the motor, roll it to the side. For drilling holes up to about #43, first drill with about .022" drill in a Dremel Hand tool. These drill faster than larger

drills and guides the larger drill. Also the smaller drill can be started more accurately by hand. Several drills by hand could also be used. The smaller drills will drill even faster if you put a drop of saliva in you finger and about every 3 seconds rub the drill in the saliva---cools and lubricates the drill. Should the small drill start off from where you want it, you cantilt the drill at an angle so the drill is pointed in the direction you want to go. Drilling at this angle will start the drill toward the direction you want to go. Just before it seems to get where you want to go, slowly raise the drill to vertical and it will be drilling where you wanted it. Then you can drill with a much larger drill by hand, in a pin vise from the hobby shop, then another 5-8 drill sizes larger etc. to the size you want---repeat this for hand drilling. This step drilling by hand is faster than one large drill. A center drill for small drills can be made by using a broken dental drill or tap that will fit into your Dremel collet, (or other steel), then grind a triangular point on it. This will give a small starter hole for your small drills.

One of your best tools is an old turkish towel. You can rumple this up to hold your engine at any angle easily and protect the engine from the work bench of several hours of work.

Wire, even piano wire can be easily melted with carbon rod even on low heat, but you still can use it by turning it off and on rapidly, about every 1/4 second until the soldering paste is dried out and continued for soldering, also a more blunt carbon rod---conversly for more heat from the carbon, a sharper point. We use a 1/4" diameter rod, but a larger one will heat less.

Something small that we call a probe with a point that is handy to hold pieces while soldering or push in a different position. It could be an ice pick ground to a thinner point, about a 1/8" steel rod ground to a small point or your dentist would be glad to save for you broken probes that are very useful. Probably most useful to apply SIP to parts, as very little is used, sometimes to push melted solder where we want it, or mix epoxy.

When cutting piping the dikes mesh the piping slightly wedge shaped, so will not go in the holes drilled for it, so the edges have to be filed.

Springy or hard brass sheet or wire can be made soft by heating to a dull red color. Wire can be straightened by pulling it thru your fingers.

Stainless steel lock tweezers are handy to hold pieces in place while soldering---rarely for carbon rod, the latter is much faster, easier and much more enjoyable than a torch.

Old dental burrs(drills), that your dentist will be glad to save for you, because he throws them away, come in handy to clear away casting flaws, in large holes or center them up and general hand milling. Take your Dremel collets with you for shank size---you give him at least \$25 to fill your teeth.

Small chisels come in handy, about 1/8" wide and narrower, to scrape or

push solder away(cheseling), even some brass. Made from old dental burrs, old drills or shanks, small drill rod, old small files etc.

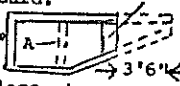
"Solder in Paste" is a must for building engines and tenders, to keep from getting solder all over every thing, and no easier soldering either with torch or carbon rod. We offer it in a squat bottle, #612.1 at a reasonable price. It's use is described with the solder, and probably last you for ever.

Engine drawings are in HO scale so you can readily see both sides of the engine without always turning the drawing over all the time, but remember to take the dimensions off in HO and lay out in S Scale---a divider is very useful for this. pick-up and layout of dimensions.

Many descriptions in the PIB(Parts Instruction Booklet) will be for soldering on brass cast Boilers, so on these sheet stock Boilers you will apply even heat of torch on small parts and Boiler, or large parts like domes and pumps, apply more heat to the part than the Boiler, also much easier to solder and build than cast Boilers, and much fewer wet swabs.

Some abbreviations that we will be using are;
PIB-"Parts Installation Booklet"
COD-Cut off disc
CL-Center line
RB-Running Board
SIP-Solder in Paste

BASIC RUNNING GEAR

- 18.11 51" Frame---Do not file Axle holes now.
- 1.1 51" Drivers---Electrical pick-up on the right side. Blue spot in the inside is on the insulated side.
- 18.90 Dummy Frame---Cut off rear 3'6" with COD and discard.
With COD carefully cut out 'A' and fit in at 'B', solder in place, (or use part of discarded portion). Round corners a bit on the outside. Take a Leaf Spring and remove all of the Hangers(straps), cut off one end as pictured, and fit into Dummy Frame, as drawing. Turn upside down on the work bench and solder in place with as little solder as possible. Then grind off the spring on the back even with the Dummy Frame. It is probably best to epoxy this on the Frame, or use contact cement, such as Pliobond, as drawing, with
- 
- back of Dummy Frame covering in the Engine Frame. Be sure Drivers do not touch Dummy Frame, especially the insulated Driver. If the Driver does have too much end play, switch Drivers.
- 3.3 Counterbalances---For the lack of orders for 51" Drivers, Counterbalances will probably be 56", so with COD grind off the curved areas at 'A' until they fit inside the 51" Rims. The largest one goes on the geared Driver. With COD or files grind down the spokes where 'C' area would touch.

Do not torch these on, as it removes the oil from the Tires and then they will readily rust. If soldered, tin both surfaces and solder with soldering iron or carbon rod. Again, we prefer a contact cement, being sure you apply some to both surfaces. If one falls off, you did not get enough cement.

- 14 Crank Pins--Read PIB. The long sleeve on the geared Driver can be shortened a little--after you have later installed the Eccentric Cranks. See Note #2 at end.
- 16.2 51" 56" Side Rods--Assembled as pictured, and cut the pins off in back as close as your dykes will cut, then be sure to use a ball pean hammer to pean the pins over, as a rivet. A flat surface surface hammer will bend the pin over to one side, making the Rod too long or too short, resulting in binds. Be sure to read PIB. The large hub goes on the geared Driver. Most of the binds should now be removed as described.

- 12.5 DC Motor--Placed geared Driver in slotted Axle hole, and rear Driver in Frame. Hold motor with soldering lugs to the back in place so worm engages the gear, motor in center of the Frame side to side, motor full forward. Wrap a fairly stout rubber band around the motor and Frame to hold it in place. Rotate geared Driver. The worm should engage the gear just so the geared Driver just barely moves, and we mean just barely perceptibly moves without the shaft of the motor moving back and forth. If spaced too far apart, the tops of the gear wears badly. You can feel and see this movement by looking at the worm in the gear teeth as you move the Driver back and forth. To correct mesh, first try the other side of the motor. If the gear and worm are too close together, file off of the back of the motor bed until you get a good mesh. If too far apart, file off the front of the motor bed. Be sure your filing or COD leaves the motor bed flat, not concave or convex. A rule laid across the length of the motor bed will show unevenness. A little concave not bad. If the mesh is not too far off, you can use about 1/16" wide strip about .020" thick, laid across the bed between motor and bed, moved back and forth to get a good mesh, but should not be too close to the middle to form teeter totter. Mark shim location on the Frame and the side of the motor to use. It is better to get the mesh barely too close, barely some noise, chatter, vibration at about 8-10 volts, than too far apart. If barely too close, will quickly wear in. If you are not sure of your above adjustment of the gear and worm, place about 1/16" wide tissue paper down in between teeth of gear--could be cemented down the side of the gear temporarily. Put a rubberband around the motor and Frame, and another around the worm and frame after applying about 1/16" or less of

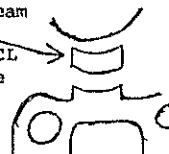
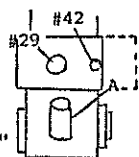
silicone (as used around bath tubs, and you probably already have) thick down the center of the motor or frame, with shim in place, if used and tissue in gear. Again be sure the motor is exactly between the rear driver and worm is exactly in center if gear--as you sight downward from the front--try to sight the shaft of the worm in the center of the gear. Next day remove the rubber bands and check the mesh again--movement barely perceptible. If it is not right, roll the motor to the side to strip it from the Frame. If OK add more silicone in to the crack between the motor and Frame on both sides. Frame can be handled in about 2 hours. The above crack filled even with motor and Frame. See NOTE #3 at the end.

On some few Drivers, the casting protrudes past the inside of the Tire. If motor is between such, carefully grind off the excess casting with your COD, for more clearance. After silicone set and you believe the mesh is not right, simply roll the motor to the side, it will peel off the Frame. Clean off the silicone and start over. It is probably a good idea to take it off any way until all soldering on the Frame is done, or wrap a wet cloth around the Frame between the motor and the soldering. Bend the motor lugs as little as possible, tho they should be bent away from the motor to clear the Flywheel. When the wires are soldered to the lugs, spread some silicone over the lugs and wire to prevent a possible short with the Flywheel.

Be careful with the soldering lugs, they are easily broken off with a little bending. Should you want to make another lug or replace the brushes, first remove the little screw inside the lug to remove the brush and spring. The spring will readily drop out, but you will probably have to tap the motor (up side down) to make the brush drop out. Then remove the large hex nut. If you remove the hex nut first the brush and spring will drop down into the motor. Should you take the motor apart, reassemble it, then put the brushes in (Take brushes out before dis-assembly.) We believe the lead from an old soft wood pencil, about .078" diameter and .150" (1/8") long. Do not know whether we will get spare brushes or not, in lieu of above pencil lead.

- 13.3 Fly Wheel--would probably be best to have the hub next to the motor to clear the motor lugs better.

- 25.5 Steam Chest--Grind off the dotted portion of the Steam Chest close the the screw hole there. Pipes 'A' will later be bent with hammer to touch the Boiler. The approximately .200" thick, curved spacer goes between the Steam Chest and Boiler, making the Boiler CL about 9'9" above the rail, doesn't have to be exact. A divider or compass is



good to measure this and pick-up and lay out demensions. The plate can be ground thinner, or additional sheet stock added to it to get these demensions. Where this spacer touches the Boiler, prototypically there is a plate that sticks out over the spacer 3"-5", all the way around, and about .025"-.036", same for the Steam Chest pipes on the Boiler--neither furnished. When satisfied with the thickness of the spacer, and the holes are properly aligned for the screws that go thru it, it can be soldered to the Steam Chest. Should either of these holes need enlarging, (others later) dental burrs (drills) are excellent for this kind of hand milling.

RUNNING GEAR DETAILS

- 54.2 Beam Deck w/o Knees--Measure back from the front of Beam 4'4", .850", and cut off (save scrap, it may come in handy sometime.) Lay Deck back under Steam Chest and against the Frame, see PIB #18, now front of Beam 3' from Steam Chest. With a mechanical pencil, run the lead out long and put it down in front Steam Chest hole and mark the Deck where you will drill a #43 hole. Or if spacer is already soldered in place, take a #42 or #43 drill with a spot of paint on the back end of the drill (usually pointed) and stick that down in the hole to mark the spot, or sharpen the drill's point more, stick that down in the hole and hit with plastic, lead or copper hammer to mark the spot. Now drill this hole just barely forward of the mark, 1/32" or less, so you can fit the Deck to fit tight against the front of the Frame, so it will not pivot on the long 2-56 screw--file end of Deck for this fit. The longest 2-56 screw will then go thru the Deck, Steam Chest, spacer and into the Boiler.

Tread, completely remove all of it up to the Beam. Notice the Pole Pocket on the back of the Beam.

- 56.1 Flagstuffs--There seems to be a couple choices here. Some about a 1'3" high Flagstaff, with a 1" rod soldered between them near the top. Or just a 1" rod up out of Flagstaff hole about 6" high and over to the other hole. These can be soldered into the Beam with the Uncoupler Brackets.
- 57.1 Uncoupling Brackets--While in the cluster, drill all 3 out with a .018" drill. Solder in their Beam holes with thick SIP. Then the .015" piano wire Uncoupler Bar can be added after the Pilot is soldered on the Beam.
- 60.5 Pilot, Step Type--Cut off the vertical strap at the top between the two rivets there, then solder to Beam with strap flush with top of Beam and open end of the step to the outside and strap next to Coupler Pocket.
- 36.4 Crosshead Guide, Alligator--Solder in Steam Chest, Squarely and

- slightly closer to the Frame at the back.
- 37.8 Crossheads, Alligator--Be sure it slides into the Steam Chest freely, if it is bent just a little it will bind, especially when the Main Rod is attached and not obvious what is wrong or causing it. File shaft smooth and shiny. There could be plaster inside the Crosshead or metal particals. A dental drill is ideal to clean it out, next best a #55 drill.
- 26.1 Valve Guides--Drill out the holes .026" and solder in the Steam Chest. Bend the forks outward so inside fork's inside edge is just to outer edge of Crosshead Guide when viewed from above--this so the Combination Lever & Union Link will clear the Crosshead Guides. Re-drill the .026" holes from one fork into the other.
- 30.1 Union Link & Combination Levers Assemble these on the bench. The .021 pin thru Combination and Valve Rod need not have a head, but pin soldered to back of the Valve Guide. Valve Rod made later, after Valve Gear is assembled. You will have to bend Union Link outward to clear Crosshead, possibly Combination Lever also.
- 40.8 Main Rods--The tip that goes in the Crosshead will have to be ground so rod will rise and lower in the Crosshead as Drivers turn. The hole drilled #44 and the other end drilled #35 for the steel sleeve.
- 41.1 Eccentric Crank--See #14 & #40. With Eccentric Crank assembled you will see quite a space between the Crank and Side Rod, so a little can be ground off of the length of the Crank Pin sleeve here. Assemble only one side at a time--the Drivers should not turn thru much harder. Correct any excess bind. Let the motor make the final run in later. Assemble the other side similarly. The Eccentric Crank will have to be bent outward a bit so Eccentric Rod clears Eccentric Crank.
- 34.1 Outside Yoke--
32.1 Baker Valve Gear, Triangular--Drill all 4 holes .026". Remove block J, complete mounting bracket up to the frame and the Hood, 'A'. You will notice opening in the front is smaller than the other side, you probably will not have to enlarge the smaller opening side, just remember it, in case. Grind off the 3 little pins from the back of the Yoke and the gating. Lay Yoke, with rivets down, on the work bench or other non-inflammable pad. Lay front of the Baker Frame down on the Yoke, even with top of Yoke, but Yoke extending

out to the side a bit--You will see a small edge angle for it to fit into, with ground side of Gear Frame to the inside,--- for appearance sake. Now that you see where these fit, tin front of Frame and complete crossmember on the back of the Yoke. Solder Frame in place on Yoke, both sides square and even. From about .025" or thicker scrap brass make a 1" wide strip and solder to cross member of Yoke, on the back between Gear Frames as a stiffener for the Yoke cross member. Measure exact center between Frames and saw in half with razer saw or tin snips (shears). Now make 2 brackets to be soldered in each side of above cut to screw Yoke to the Gear Frame, or the angle can be incorporated in above stiffener after bending along the dotted lines. Now this assembly set on engine Frame, and make a plate as show in PIB #32.1 over the 2 sections of the above Yoke angles as plates 'S', and 'I' on Power Reverse Lever 'R'. ('S' not printed well in PIB, it is above engine Frame near screw.) This plate preferably made from .050"-.065" brass or 2-3 .025" soldered to gether about 2'9" wide and 1'4" long, with a #43 hole in the center and near rear edge--if like our model. This plate sets over above brackets on the YOKE as 'S' or 'I', and a 2-56 screw thru it into the 2nd screw hole from front of the engine Frame. The hole location in this plate is partially determined by the Leaf Spring location at 1st & 2nd Driver and the front of Valve Gear 5'4" from Steam Chest body and outside edge of Valve Gear's 5'9" out from center of engine Frame. Changing the 5'4" demension will change length Reach Rod 'T' and Valve Rod later. The previously adjusted Crosshead Guide to be a bit closer to the Frame at the back has allowed the Yoke-Valve Gear more inward about as far as possible and prototypical. Where Crosshead Guide touches Yoke, the Yoke at these points could be ground outward with COD a bit, so Yoke can be pushed inward some, not over about 2" per side, hardly worth it. Tin bottom of this plate 'S' and top of bracket that is next to the Frame. With plate 'S' over bracket, you can adjust Valve Gear in and out, slightly backward and forward to above demensions, tighten down screw, apply heat to bracket and plate, making whole Valve Gear one unit now. The Power Reverse Lever 'R' is similarly installed with levers as near in line with center of Valve Gear Yoke 'W', using screw hole just in front of gear slott. You can also bend the lever outward some to align with center of Valve Gear Yoke 'W'. To do this, remove from Power Reverse Lever the dotted area with COD, so the levers

will come outward as far as possible. Make plate 'I' about 2' wide and 1'4" long, tin and install as above. This lever will be a close fit between Leaf springs. You may have to slott the hole in Plate 'I' with dental drill or small file to get levers aligned with center of Valve Gear, you might not get it perfect.

Internal parts of the Gear can now be assembled on the bench, after drilling out all holes of Valve Gear parts .026", Bell Crank, Gear Rod and Eccentric Rod (forked end), but is best not to solder these together at 'M' as PIB notes. Note fork of Gear Rod goes over Bell Crank. Just barely solder the .025" assembly pins on inside of Gear Rod. All pin heads could be filed flat and filed hex shape, see catalog artical, not difficult--does take a little practise. Now install Bell Crank in Gear Frame at the top with .025" pin, but do not solder it in. Now make a small Valve Rod from bottom of Bell Crank to top of Combination Lever in Valve Guide, from any thin sheet stock, about 3" wide and about 4' long from hole to hole, use divider to pick up length needed, or scale. Before cutting width with Dremel, drill .022" hole at each end. then cut to width and length. Now install this, preferably, to inside of Bell Crank .021" pin, do not solder this pin in place either, as yet. Install the pin in the top of the Combination Lever. Now rotate the Drivers, if the rod does not jam against anything, the rod can be made for the other side. Remove internal parts and solder just a speck on pins of Eccentric Rod, Gear Rod-Bell Crank and Bell Crank-Valve Rod, And grind off excess pin length with COD. Put assembly back in Frame and a .025" pin thru top of Gear Frame and top of Bell Crank, solder pin on inside of Frame. Now for the Valve Gear Yoke. For easy installation, assemble it to the Gear Frame by pushing an .025" pin all the way thru Yoke, Frame, Frame and Yoke again--as shown, Yoke on outside of Gear Frame. Solder pin to Yoke at A-A. With COD, grind pins off on the inside flush with Frame, and on the outside flush with the Yoke. Actually Yoke and frame could be soldered together as Yoke does not move. Be sure point 'M' of Gear Rod & Bell Crank joint works between 2 little prongs sticking down inside the Yoke, which could be removed. Now make Reach Rod 'T', so Yoke is vertical or tilt slightly rearward, and solder in place.

42.2 Eccentric Rods--Assembled above. Run .025" pin thru rod into Eccen-

entric Crank and solder on back of Eccentric Crank. You might have to bend the Eccentric Rod outward some, to clear Eccentric Crank. Grind soldered pin short so it does not strick the Main Rod.

20.1

Leaf Springs---Since the Boiler sets so high, you cannot very well go wrong installing them to high. If you solder them, mark locations and remove Valve Gear and Drivers, as the high heat will cause tires to readily rust. We prefer a contact cement such as Pliobond over even epoxy, because if a sharp blow on Epoxy, they will pop off, while contact cement will move some, being rubbery. Remove all but 3" of base (and pin). If desired, one Hanger (strap) can be allowed to hang down over the Frame, but remove the nut on it, also be sure there is not enough end play of the Driver to touch the Hanger. The other Hanger on the inside cut so it rests against the Frame---cement in place.



BOILER SECTION--

72.3 **Boiler, 2-8-0, 0-8-0**---First of all lightly scribe the CL on each side and on top, between very small engraved bars, both Boiler and Smoke Box. In most cases we have scribed them for you, look. Bend Smoke Box and Boiler quite round (need not be perfect) so meeting bottom edges are as close together as you can get them, which will be about 1/4" apart.

Smoke Box---We will start here since it will have to fit the Boiler Front, then fit the Boiler to the SB (Smoke Box), which should not be necessary. At the very back inside of Smoke Box, where the writing is on the outside, past the 4 rows of rivets, solder a little strap about 3/16" wide and 3/4" long over the joint, inward about 1/4"-1/2". On the front end, single row of rivets, outside bottom, you will see an engraved dimple, or circle, 2'4" (.400") back from the front. Over this on the inside, solder either of these: 1) about a .050" or .060" thick brass, about 1/2" square or larger fitting the contour of the SB, tin one side and solder in place about 1' from front of SB, as you did the above strap. 2) Any thickness of brass, preferably at least .025" or thicker. Cut about 3' square laid over joint and about 1' from the front, curved to well fit Smoke Box, preferably annealed (heated red hot) to easier fit. Tin both sides with thick SIP, solder in place---if torched, lay wet swabs at front edge and rear of this plate. Then either solder another similar plate to that one or solder a nut over the hole after drilling. Now drill a #54 pilot hole thru the engraved dimple on the bottom 2'4" back, as noted above on the bottom of Smoke Box. If 1) above or 2) if 2 or more plates soldered together, redrill #50 and tap 2-56. 2) above, if plates too thin for taping, or you are going to use a nut, drill

you are going to use a nut, redrill the hole #43 or #44 to solder a nut over the hole. Barely tin the nut and tin around the hole on the inside. Take a match, (wooden, or make one) and stick it into the hole and screw it into the nut to hold nut close to the SB and to keep solder out of the threads---hopefully, and solder in place.

Boiler---Spread a thin coat of SIP around the inside edge of front of Boiler, about 1/4" wide back from the front edge about 1/4", except bottom 3' on both sides not needed, also along bottom 2 meeting edges on both sides, also on the edges so the solder will flow well. Torch these areas to tin them for better soldering later and wipe off the resulting flux. For torch soldering, to protect the hands, hold the Boiler in the left hand, gloved, or several layers of cloth over the hands and between hands and Boiler, mostly the latter, or you could wrap about 3 turns of wire around the Boiler in a couple spots, or use a pipe clamps to hold the 2 edges close together. Hold Boiler perpendicular to your body in the left hand, at far end from you a small bead of solder, and hold the torch at the head, at a low angle away from you so your fingers will not pick up the heat, soldering only a short length now. If the solder does not flow well, the tip of the torch can be used to push the solder, or use a probe. With a good joint, turn Boiler around and similarly solder the other end, then the center, with wet swabs properly placed. Full length of bottom joint soldered will give lengthwise strength so later soldering of piping will not allow the joint pop open from short soldered joint.

Now slide the back of the Smoke Box into the front of the Boiler to the little short engraved bars engraved "0-8-0" at back of rear 2 rows of rivets of SB and align the bottom joints of both. You should have a good tight fit. Should you have tinned the inside of the Boiler too much to get the SB in, file it out, if still too tight file off all the lettering on the SB that goes into the Boiler, and back edge of the SB---may be flared when it was cut, also the soldered bottom edges of the SB may be pouched out, file round. Should there be too wide a gap between SB and Boiler, pull SB out and bend in these areas on the Boiler---if gap is not too much they can be bent in with the thumb nail after both are soldered together and the brass has softened some. Now put a thin coat of SIP around outside of SB 1/4" wide back from rear 2 rows of rivets about 1/4", except about bottom 3'. Reassemble as above and solder---with medium flame of the torch, torch from just below the CL, up over the top and just below the CL on the other side in about 12 seconds, since you cannot see the solder melt---for carbon rod, solder about 4 points in same area of about 4 seconds at each point, no soldering

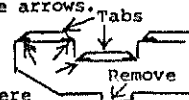
much below the CL not needed. After assembly to Frame and Steam Chest, the Boiler appears leaning, first try pushing the Boiler to the side to spring bottom of Boiler for correction. If not effective, carefully melt solder around the nut, while pushing the Boiler in direction of correction.

Fire Box---The Fire Box bent so when Cab is installed, the Cab sides extend about 1'8" out from the Boiler and the top of Cab Roof 1'4" above Boiler in front. Front of Cab 6" in front of "0-8-0" mark on top of the Rear top of Boiler.

Rear of Fire Box From the plans relocate the forward Handrail Post location, small engraved circle, close to front of Smoke Box and another below the CL there. Also another just to the back of Smoke Box. The larger engraved circles are starter drill locations for Washout Plugs. Both etched for easier drilling, later. On left side file away Washout Plug location just under CL and the rearmost one. On the right side remove the front and rear most plug locations, leaving 3 on the right side and 2 on the left side. Drill these out later, or better drill them out undersize then proper size later. File away forward most 2 rows of rivets, and several others between these and front of Smoke Box. Suggest using the side of COD to grind most of these off quickly, then use file.

124.5 **Cab, 0-8-0**---In case you are on the fence, carbon rod soldering makes this Cab assembly quite simple in comparison to torch or soldering iron---actually enjoyable, like miniature spot welding, tho is still soldering.

Cut out all pieces, removing the out line lines, except the front and back of the Roof and it's rear cutout. The lines act as beading. Some Cabs did not have the angular cut out at the rear of the Roof, but this one did, so cut this area out, leaving the lines as beading. For other Cabs just file the line away. Small tabs were put on the parts, thinking they would make assembly easier, but instead they make assembly harder, cannot bend them sharply or accurately, so remove all of them, 2 each on the front and back, side of the back, top of each side, top and center of Baffle Plate, see arrows. There are small engraved marks showing where

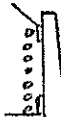


to bend tabs or corners, arrows above. On the top of the sides, scribe a line between these scribe marks so you will

know how far to grind the tabs down, as dotted lines, same for front and back, being especially careful on the front and back meeting the sides. Later engravings probably will not have these tabs. On the treaded floor, leave 9" extra length on both the front and back and 6" on each side for extensions past the Cab. When assembled, any extra length can be ground off with the COD beyond 1/32". In a number of areas all cannot be easily cut out, so will have to be cut out in little pieces, the rest ground out with COD. The Fire Box at the RB (Running boards) should measure about 7" across, which are the outside lines on the Cab front. The top outside lines are about right. So cut out this area not quite to the outside lines and fit to Boiler, Fire Box, now or later. After all pieces are cut and ground out, lay engravings side down on a piece of steel, vise, drill press and lightly tap with hammer to get nice and flat. Straighten all pieces.

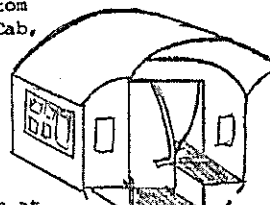
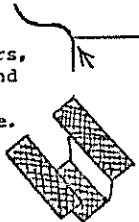
Windows--For windows you want to cut out, lightly scribe a line down the center of the small windows as 'A', then every 1/16" make a light (B) punch mark with a sharp scribe and hammer, so as to start a #60 drill. In the large window scribe a line around it's diameter 1/16" from the pane 'E', and scribe across these lines every 1/16", 'B' & 'E', punch these cross lines as before, then for better control, drill all these with #60 drill, then redrill them with #50 or #51, 'D'. The #60 can be drill with your Dremel hand tool with a small chuck in it, but since the Dremel has such a high RPM, keep drill drenched with slava as lubricant and coolant, much better than water. Finish the windows later. The front and back windows to be drilled later too, as drilled out now makes bending the corners almost impossible. After the cab is formed, you can redrill these holes while holding the drill at an angle, which will drill out the web between the holes, and then filed down. Grind off the burrs in the back.

Cab Forming--With long nosed pliers bend the corners by holding the pliers in the corner so the guide marks just barely along the side of the side of the pliers and holding the window section in the pliers next to you so window section does not bend, hold very tight and bend the corner. Sight across bottom and side while holding the open corner together and bend assembly as square as you can, even tho not perfect. Solder the side over the side back edge, as with drawing it is easier, holding the corner down on the bench for soldering iron or carbon rod, or on steel, asbestos or brick for torch. Just tack solder at first to be sure corners properly jointed, then solder the other end. Roof--To form, bend it over about a 1 1/4"- 1 1/2" diameter form, such as aspirin, Tylenol, herb bottles, shovel handle etc., broom handle to small a diameter. The last 3/4"



over about 1" diameter form. About the last 1/2" bent length wise of the long nosed pliers jaws--but careful, careful, so as not to get bend marks on the Roof. Reading along side the Roof should have been removed, and Roof very slightly overhang the sides (some others seem to be flush). There are CL marks on the front and back of the Roof, transcribe these marks on the bottom and draw a line between them, to center the Roof on the front and back when you solder them. Tack solder the center of the Roof to the front or back only for now, noting the little notch at the angular cut-out is even with the back of the Cab see sketch.

Floor--Bend with long nosed pliers, noticing the bend marks along the pliers as before. Look at in all directions and bend even and square. Fit to bottom of Cab,



with at least 1/32" Baffle plate sticking out all around the bottom of the Cab, you should have much more, that will be ground off even after soldered in place. Should there not be enough material sticking out past the sides, the vertical part can be bent outward slightly. When you get the Floor bent to fit the bottom of the Cab about as close as you can, pencil or scribe Floor along outside of Cab sides. Inside these areas pre-tin, same for bottom edges of Cab sides, front and back, then add a bit more solder to these areas. Hold it and Cab together with a glove over your hand and tack solder one side, then see if the other side will fit properly, if so, solder that side, then solder the first side permanent. We used a 30W. Soldering iron for all this.

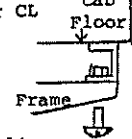
Cab to Boiler--Now you can file out all the windows. Later cement clear plastic on the inside. The front and back windows can now be drilled out and filed, if you wish.

Baffle Plate--We overlooked this, so cut out as previously drawn, removing the tabs. Solder to bottom of upper Cab floor and against the lower floor and solder from the back.

Cab to Boiler--Here you have two choices to assemble the Boiler to the Cab. Finish (See note #1 at the end).

Soldering the Roof to the front, back, and sides, one place each then soldering Cab front to the Boiler from the outside. Especially useful if noticeable cracks between Boiler and Cab that needs solder fillet. If both fit well, then Roof can be removed and front tack soldered to Boiler in about three places on the inside where solder shows little, at each RB location and at the top. Then the Roof re-soldered on. We prefer the latter, especially if you are not going to paint the engine. In either case, it is better to mark the Boiler where the soldering is to be and pre-tin these areas to get a good solid joint--do not want the Boiler to come loose a year from now. Also in either case you should first tack solder the front to the Boiler and view Cab from each side and top to see if it is square and really not permanently solder to the Boiler until the rear bracket is installed to attach the Cab to the Frame, next, may not appear square then Cab (Rear Boiler) to Frame Mount

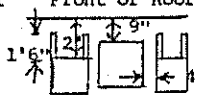
Make bracket from scrap brass about 1/4" wide and about .025" thick and what ever height. Cab to get the Boiler CL here 9'9" above rail head, as at the Smoke Box. Drill #43 hole in bottom of bracket to be in line with last hole in back of the Frame. Pre-tin 2-56 nut and bracket here and top of bracket. Best to screw a piece of wood (match stick) thru bracket and the nut, and solder together. With screw in the nut, and bracket in exact center between the sides, solder to Cab floor, and Baffle Plate if you wish.



Hatches--Material Front of Roof

for these are in the 1'6" x 1'2" kit, 3' square for center Hatch,

about 2'1" square for side ones. You may have a square engraving for one of these, but discard, cannot bend it sharply enough. These Hatches seem to vary widely in size and location. Some have the rails behind the side Hatches and some do not have any, with some having rails for the center Hatch as well. Mark locations, file away the rivets, apply SIP and solder, wet swabs in nearby points if torch-ed.

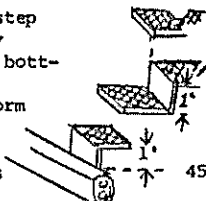


Boiler Front #78.7--See PIB. Trying

various methods to secure the Boiler Front in the Smoke Box is to simply build up the diameter with cardboard or friction or adhesive tape, especially the last couple layers, which has some sticking qualities. On these also could

be added in a couple or three places some contact cement, that can allow front pried off with a knife. The spring method we previously suggested slides out too easily with handling.

- 80.5 Bell, Boiler Mounted-Ringer on left side.
- 86.8 Headlight, Sunbeam, #4414--The next 4 parts, fit and align to the CL on top of the Boiler, and could be all soldered at once.
- 102.1 Smoke Stack, Modern -
- 108.2 Sand Domes, 2 of these, 0-8-0-- If fitted well, need only to be well soldered in 2 places, front and back
- 112.3 Steam Dome, 0-8-0--Before installing, see PIB #114.1 and 114.2 and drill hole for Whistle.
- 126.4 Turret, Open--Drill out the end fittings #43 for 2" piping. Solder close to Cab front.
- 122.2 Turbogenerator--There is a varied mounting, either half way between Turret and Sand Dome or half way between Boiler Front and Smoke Stack
- 92.2 Washout Plugs, Open--These are large engraved circles on the Boiler easy to drill. On the right side there are 2 under rear Sand Dome and 1 under Steam Dome, below CL. First drill #55 then redrill #39, clean off burrs and push the #39 drill thru again. Some plugs you will have to file smaller, or hole larger for tight thumb pressure. Add a little SIP and torch, swabs where needed. On left side 2 under rear Sand Dome. File off one just rear of these and one near Smoke Box under CL, not used.
- 136.2 Running Boards--Disregard most in PIB for cast Boilers. Draw pencil lines on Boiler where RB(Running Boards) go. They are about 1'8" wide, even with the Cab sides, straight from the Cab to Smoke Box, parallel with Boiler. For mounting, make about 6 angle irons, about 6" long on Boiler above RB(Running Board), the other leg same, same width as the RB, about 1'8" Space these about every 6' or less, about as shown on plans. Better to have too many than too few as they are handled a lot. Try to arrange them away from Cooling Coil Clamps and Tank mounting Studs, wire here. Tin side next to the Boiler and next to RB. It is easiest to install the first and last angle iron, bend the RB to be level, then add the other angle irons in between. The RB on the Smoke Box, because it is quite low, will much longer angle irons, and will have a half moon cut out of it to fit around the Steam Chest Tube. Again be sure these angles are well soldered, best to add more SIP to angles after tinning, so when soldered to Boiler and RB, there is a fillet of solder along the edges of the angle iron. These have a tendency to come unsoldered, and a mess to resolder. Most engines had a RB over the Compressor, with riser in front and back, which can be made in one piece, bent sharply.
- 62.1 Beam End Steps--Form step as shown, set slightly forward and solder to bottom of RB at Smoke Box. From the second set form for the Pilot Beam as shown. Mark on the Beam where it goes



in line with the step on the RB. It will be more forward and further spaced than our sketch. Remove the Beam-Deck and solder the step in place. With carbon rod the Beam probably would not have to be removed from the Frame.

- 94.1 Boiler & Boiler Front Steps-- You will notice there are 2 on the right side and 3 on the left side. The narrow step is for the left side of Boiler Front, next to edge, remove rivet here. Drawing in error shows it on the left side. Put some SIP on step and hold in place with probe or tweezers while torching or carbon rod close by.

142.1 Alco Power Reverse--Grind off the holes in the mounting base. For this small Boiler you are going to have add about 1/8" deeper base, of several layers of scrap so the Power Reverse Cylinder is far enough out from the Boiler so the front will line up with lower hole of Power Reverse Lever of the Valve Gear--you will later make a rod connecting them. These are where those scraps come in handy, so always save a few of all thicknesses and sizes. Many times you find a piece just the right size or close. Mark the base outline on the Boiler. Remove Boiler from Frame and solder Reverse to Boiler, carefully, so laminations do not slide. There are 2 ways to do this,--if you are going to paint the engine so discoloration is not important, heat the part and soldered part red hot, which crystallizes the lead so it does not readily move. In this case you could lay the Boiler on an old terry cloth towel so the part just sets in place and torch. Position so it's front is 1' back from Power Reverse Lever. This cylinder is 6" longer than on plan, so it will overhang the Fire Box slightly, 4"-6". With carbon rod it is quite simple. Of course with torch, everything around needs wet swabs. The little 1/16" wide Reach Rod between it and Power Reverse Lever, and other rods (installation 'B') can be made now or later. A draftsman's divider is good for picking up needed dimensions and laying out on material.

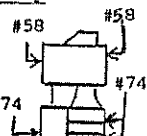
- 130.1 Check Valve--Before cutting from cluster, drill holes deeper .057 then saw from cluster with razor saw (caster gated them too short). Size for hole in Boiler .055"-.062" Grind off the little fitting on top. The hole well tinned and added SIP on Check Valve mounting pin will have little solder to run out.

- 110.2 Sander Blocks, 2 in 1--There are two variations of these Sanders One like in the kit where in the front domes the front unit is used and in the rear domes the rear units. The other style, grind away dotted lines and drill .022" hole in the center. Redrill Sander holes .022" and deeper. Drill hole in dome for it #65, and solder in place so Sander slants downward on dome base. For carbon rod, place tip on dome close to sander. Will put in piping later

45.1 Cross Compound Air Pump--

45.1 Cross Compound Air Pump--

Note position on plans. Re-drill these holes. On this smaller diameter Boiler you will have to add 2" piping mounting bracket as described at #138, 2nd paragraph in PIB, or solder a larger bar on top of the bottom mounting bracket, too long at first and fit to the Boiler, or a brass strip, about 1/4" wide, soldered there and bent at an angle so Compressor is vertical and top close to Boiler, outer edge about even with RB, top of Compressor just above the RB. Solder in place, swabs on RB if torch used. Piping later.



- 96 Boiler Plates, American, Owner, Superheater--A pair of each. We were able to solder ours on, but takes a steady hand. Put some SIP on plates, set in position, hold with probe, slowly heat with torch to evaporate flux. With carbon rod, hold rod on Boiler close to plate. When soldering the next plate, the first one may move a bit and have to be repositioned with probe. Contact cement is an alternative when the engine is completed. Start with the American plate on the CL.

- 132.1 Inspection Doors--PIB inst. are for cast Boilers. Put SIP on the pins only will prevent solder running out.

- 175.1 Grab Irons--Drill out holes in Sand Domes, both. To keep from getting solder all over, use a straight pin or wire to put a bit of thick SIP into Dome holes. Wipe off excess on the Dome. Dip pins of Grab Irons into thin SIP as a flux, and insert in Dome holes. For carbon rod, place rod on Dome near Grab Iron, on low heat. For torch, pre-heat the Dome until the solder melts then with tweezers insert the Grab Irons. Best to have swabs on Dome soldered points and Sander Blocks.

- 134.2 Handrail Posts--Read this then PIB #134.1 for installation. Post locations are the small engraved circles on the Boiler for easy location and drilling. You may find one slightly out of line, but only you will know as when bent to meet straight Handrail, it will not be observable. The top front one could be relocated 1'3" from front of Smoke Box. Also the very low one close to Boiler Front relocated, see plans. Drill them out #63 and file away remaining engraving around holes. While still on the cluster, drill out Handrail holes .022". Temporarily Handrails not necessary, unless you want to. Install brass or piano wire Handrails later. If brass rod is used, don't torch, use soldering iron. For piano wire use only the torch until the piano wire turns gray.

- 162.1 Cooling Coil Clamps--4 on the right side, using only the top 2 loops. 2 on the left side using 4 loops, all drilled out

.022" then cut out as drawing, of course left side has 4 loops. Bottom reinforcement, dotted lines not needed. When installing the 4 on the right side, put all the Clamps on a length of .020" piano wire, but at first solder only the 1st and last Clamp, with them out even with the RB. Then solder those in between, the piano wire being a guide to get all even. For carbon rod, lay engine upside down and hold clamps in place with the carbon rod. Torch similar, but many swabs around other solderings. Piano wire can be left in or taken out until Cooling Coils put in.



138.23 Reservoir Tanks, 20 1/2" x 100"--The band furthest from the end is the back. Tanks should be about flush with edge of RB, and 2-3" below it. Easiest to work on if Boiler is laid upside down on an old terry cloth towel (for any angle). Put scraps of wood or metal between Tank and RB to hold the spacing while soldering. Tank to Boiler. We could not solder it with carbon rod, so had to use the torch with Boiler off of the Frame and plenty of swabs around. Tanks can be installed with 2" piping about the easiest and do not show. Locate position on Tank where RB angles (brackets) are not located on the Boiler. Mark spots on the Tank and drill #58 for 2" piping about 1/4" deep, 2 holes in line with each other. File away meshed ends where cutting meshed piping. Put piping in the holes with SIP around the piping and solder. With both wires straight and parallel with each other lay in position on the Boiler, with the piping level and where the piping touches the Boiler, mark the Boiler, this should be about 3/16 below the RB. It is easiest to first drill these 2 spots with .022" drill in you Dremel, as you can control easier to start the drill on the desired spot, then redrill #58. Use saliva to cool and lubricate the .022 drill. File off meshed end of piping, push them into the holes. You might have to use pliers to bend Tank-piping to the proper location. Put thick SIP around each wire in the Boiler and swabs on all nearby solderings, and solder with torch, very easy with carbon rod without swabs.

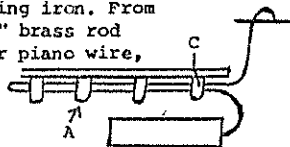
138.30 Reservoir Tank Studs--See PIB #138, 3rd paragraph Description there is for cast Boilers, but the procedure is the same. With carbon rod you just hold them in place with the carbon rod, no swabs as for torch. For torch, put SIP on them, hold in place with probe and torch.

154.2 & .3 Right & Left Injectors--Drill out fitting that goes to the Check Valves on each one #53 for 3" piping, the other 2 #58 for the 2" piping. From each Check Valve run 3" piping close to the Boiler and Fire Box, right on down to the Injector and solder there, see plans. Wrap this fitting with wet string and solder another 2" in the back fitting and solder it to the Baffle plate. A black, round shoe string could go on from there to the Tender. Similarly run another 2" piping up to the end fitting of the Turret and solder there. It is easier to drill a hole thru the RB

between it and the Boiler by first drilling about #28 drill, then another about 3 drill sizes larger, etc, even a dental drill (burr), to size needed.

Piping, Sanders--Soft 1" piping from Sanders down close to Boiler and soldered on bottom of Boiler or end under RB or Tanks. Since these Sanders will move quite easily when soldering in piping, for torch, lay narrow swab across top of Sander, put SIP in hole and slowly torch until flux evaporates and soldered. For carbon rod, on low heat, hold rod on side of Sander and slowly but quickly turn switch on and off to evaporate the flux and also soldering, so will not pit or melt Sander--again very quickly on and off. Maybe extra SIP will have be added again for a good joint at Sander.

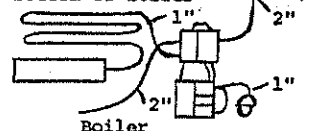
Cooling Coils, Right Side--PIB mentions soldering piping in Clamps with torch--only if piping is piano wire, and heated until the wire turns gray for fusion of solder to the piano wire. Brass will go dead soft, badly bending when handled. We may furnish brass or piano wire, as we have in stock and feel at the time. Usually piano wire for the larger engines, which are heavier. Solder the brass piping with soldering iron. From 1" brass rod or piano wire,



bend end to go into the front of the Tank, thru clamps bottom loops back to next to last clamp 'A' and ends in the center of the Clamp. Now or later you can solder this in one of the Clamps, preferably the second one from the front. Now make a hair pin from 'A' around the back to point 'C', ending in the center of Clamp 'C'. This piping also can now be soldered in any Clamp. (If properly fitted the piping in the Tank need not be soldered, piping bent so tension holds it in the Tank). Now from soft 1" piping run this line from the center of 'C' over the top of Smoke Box and down into the front of the left Tank. For all of the above, first cut the pieces a bit long until fitted. For this piece over the SB, pull the piping thru your fingers to get it straight. However you can leave it curved, so it will go over the SB closer. To hold this piping in place, either tack solder it on top or make as small clamp from about a piece of thin brass about

3/32" wide and tinned on one side. Put this over a piece of 1" Piping, then press the jaws of long nosed pliers down on the strip next to the piping, forming the clamp. Cut from strip and round corners. Add more SIP to it, lay over the piping on top of the SB. May have to remove a rivet or 2. Hold in place with probe while torching, with swabs on anything near by--Bell and Stack will not move. With carbon rod, just hold it near by clamp, held with probe.

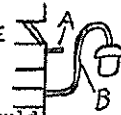
Cooling Coils Left Side--First put in the 2" piping Cab from top left side of Compressor to bottom of Boiler



near the Smoke Box, probably will not need soldering in Compressor. Then the right top, up to the Cab, see plans. Either drill .042" hole in Cab and soldered in the hole or solder in the Compressor. Now make the Cooling Coils from 1" brass rod or piano wire, similar as you did on the other side, making hair pins go as far as you can, then terminate them in the center of a Clamp, then go on from there until into the back of the Tank and should not have to be soldered there or Compressor. Solder piping in Clamps.

47.1 Compressor Filter

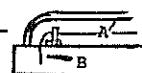
First solder a very short piece of 1" piping in top hole 'A', should be a tight fit so it will stick out straight--if necessary mesh the tip of the piping, solder in place. Form another 1" with Filter, as shown. Push in bottom hole with SIP and solder, then bend to touch at 'B', add thick SIP and solder.



Also Power Reverse Levers--These can now be installed, as previously described.

Handrails--1" brass rod or piano wire. Push in from the front back to the Cab, against the Cab. Bend down to the very low Post in front. When just right, cut and stick into it and cut off at the back Post near the Post. Use soldering iron to solder each Post for Brass, torch for piano wire until the wire turns gray, fusing solder to wire, iron not hot enough.

Miscellaneous--The 1" brass or wire can be soldered between the Flag-staff holes 'A', and the .015" piano wire Uncoupling Bar, 'B' not furnished, See PIB #57.1.



Weight--Install inside the Boiler between 1st & 2nd Drivers,

weight in front, as the Draw Bar always pulls down on the back of the engine. Can be installed in two ways, small wood screws or silicone rubber as used around you bath tubs.

Screws--Inclosed wood screws. Drill 2 holes in the bottom of the Boiler, one near the front for the weight, slightly to one side of the bottom seam, another to back of weight on other side of the seam. Put weight in place, accurately mark the weight thru the holes and drill holes in the weight, very slowly so the drill does not grab and break. perhaps better to use a very small nail, tapping a little at a time, loosening each time. Of course this hole is to be much less diameter than the screw. Screw screws in to get the hole threaded---if they do align with the holes. If you did drill the holes too large, use ball pean hammer or nail set mash lead over the hole, more or less.

Silicone--Really we favor this method even tho it will take a couple hours for it to set enough for further work. Will hold for years to for ever. Just run a small small bead down the center of the weight, so if you want to remove it, you can carefully pry it loose, sidewise. You can also cement another weight on top of the first one, but use more silicone here.

Grab Rail--Make from 1" brass rod, on back of Cab corner down to Baffle Plate, see plans, side and rear view.

NOTE # 1--An easy way to get a good fit of Cab front to Boiler, after you have ground out the Cabfront to about between the 2 Boiler assembly lines, is to squeeze the bottom of the Smoke Box together, then you can stick the Boiler inside the Cab Front up to the mark on the top of the Boiler, then you can run a pencil around the Fire Box against the Cab front, the marks on the Cab front can then be ground with COD, repeating the process until you get a good fit of about 7' between the sides of the Fire Box at the RB level.

There you are, you have your engine built. Don't you feel better that you built it, rather than taking it off of a shelf, and cost you half of what an import would cost. Now you can run engine for years of pleasure and sell it for considerable more than you paid for it. You cannot beat that. You could even build for your friends with the experience you have gott here. to help finance a bigger and better layout. Also now you can build engines that will never be avaiailable. Congradulations. on your building--- and choosing an all American product (except for motors in small engines only).

NOTE #2--It is better to have a bit too little alcohol(not rubbing alcohol)in the bottle with the cut up pieces of spirits copy paper than too much, to make Side Rod dye. Can then be poured in an old finger nail polish bottle, which is ideal for this, removing about half the brush bristles. If glass bottles used, can also use laquer thinner. Since Side Rods are cheaper and easier to replace than Frames, we suggest, instead of filing of Axle holes a part of break in of Side Rods, just file the Side Rod holes only. If Axles are too tight,

put strips of paper between Main Frame and cover plate, between each axle. Paper can be removed when wear makes axles loose, extending Frame life. So every thing goes in it's proper place after break in, mark inside of Rods right and left, and Drivers 1, 2, 3, & 4.

NOTE #3--Sometimes when breaking the Side Rods with motor, the silicone will break loose from the Frame, so clean silicone from the Frame and coat the motor bed with finger nail polish or laquer. The fly wheel will vibratre more in the hand than when pulling a load, lower RPM too. To reduce vibration, rotate the fly wheel on the shaft 1/4th turn, repeat for minimum vibration.

(In General Building Order)

BASIC RUNNING GEAR

51" Frame -----	18.11
Dummy Frame -----	18.90
4 Quartered Drivers, 51" -----	1.1
Crank Pins, 4 pr. -----	14
51"-56" Side Rods -----	16.2
56" Counterbalances -----	3.3
DC Motor and Worm -----	12.5
Fly Wheel -----	13.3
Steam Chest, USRA -----	25.5
Steam Chest Spacer -----	----
All Engine Screws -----	set
"Parts Installation Booklet" ---	260.1
Kit Booklet -----	1
Check List -----	1
Engine Plans -----	1
<i>Tender Instructions</i> -----	<i>1</i>
<i>Rubber Bands</i> -----	<i>2</i>

RUNNING GEAR DETAILS

Beam-Deck, Without Knees -----	54.2
Pilot, Step Type -----	60.5
Cross Compound Air Pump -----	45.1
Valve Guides -----	26.1
Crosshead Guides, Alligator ----	36.4
Crossheads, Alligator -----	37.8
Valve Gear, Triangular Baker ---	32.1
Yoke, Outside -----	34.2
Main Rods -----	40.8
Eccentric Cranks -----	41.1
Eccentric Rods, Forked -----	42.2
Combination Levers & Union Links	30.2
Uncoupler Brackets, Beam & Tender	57.1
Flagstaffs -----	56.1

BOILER SECTION

Boiler, 0-8-0, 2-8-0 -----	72.3
Cab, Small USRA, Engraved -----	124.3
Cab Floor -----	125.1
Cab Hatches -----	-----
Leaf Springs, -4 pr. <i>In Running Gear Detail</i>	<i>20.1</i>
Boiler Front, 80"-79" -----	78.7
Bell, Boiler Mounted -----	80.5
Headlight, Sunbeam #4414 -----	86.8
Smoke Stack, Modern -----	102.1
Sand Dome, 0-8-0 2 -----	108.2
Steam Dome, Light -----	112.3
Turret, Open -----	126.4
Turbo-Generator, Sunbeam -----	122.1
Washout Plugs, Open, <i>26</i> -----	92.2
Running Boards, Straight 2 -----	136.2
Beam End Steps -----	62.1
Reservoir Tanks 20 1/2 x 10 2- -----	138.23
Reservoir Tank Studs 2 pr. -----	138.30

Alco Power Reverse -----	142.1
Whistle; Chime (Old Style) ----	114.2
Check Valves -----	130.1
Sander Blocks, 2 in 1 -----2-pr.	110.2
Inspection Doors -----	132.1
Grab Irons, 2 pr. -----	175.1
Handrail Posts -----	134.2
Boiler Plates, Amer., Owner, Su pr. ea.	96
Boiler, Boiler Front Steps ----	94.1 11
Cooling Coil Clamps, 6 -----	162.1
Compressor Filter -----	47.1
Injectors, Right & Left -----	154.2 & .3
Engine Weight 1 -----	75.1
1" Piping, soft, Brass 6" -----	160.1
1" Piping, Brass Rod, 12" -----	----
2" Piping, soft Brass, 22" ----	160.1
3" Piping, soft Brass, 10" ---	160.1
Scrap Brass for Buffer Plate etc. ---	----
<i>2 Wood Screws</i>	

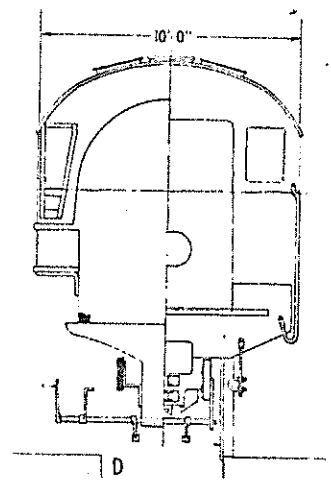
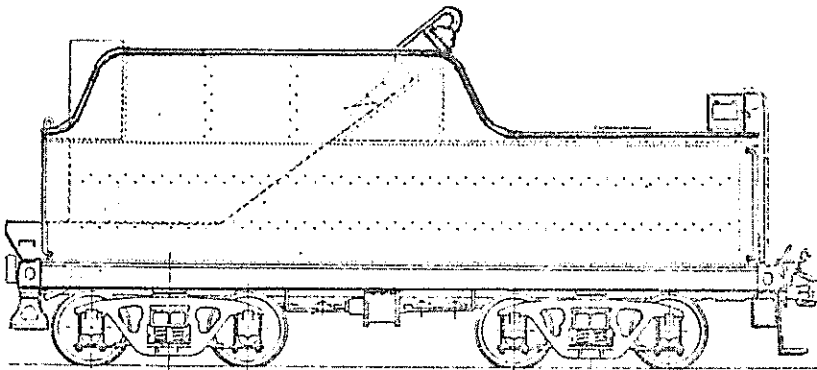
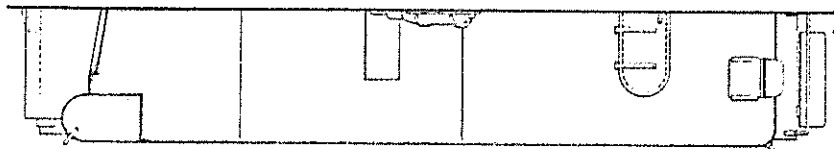
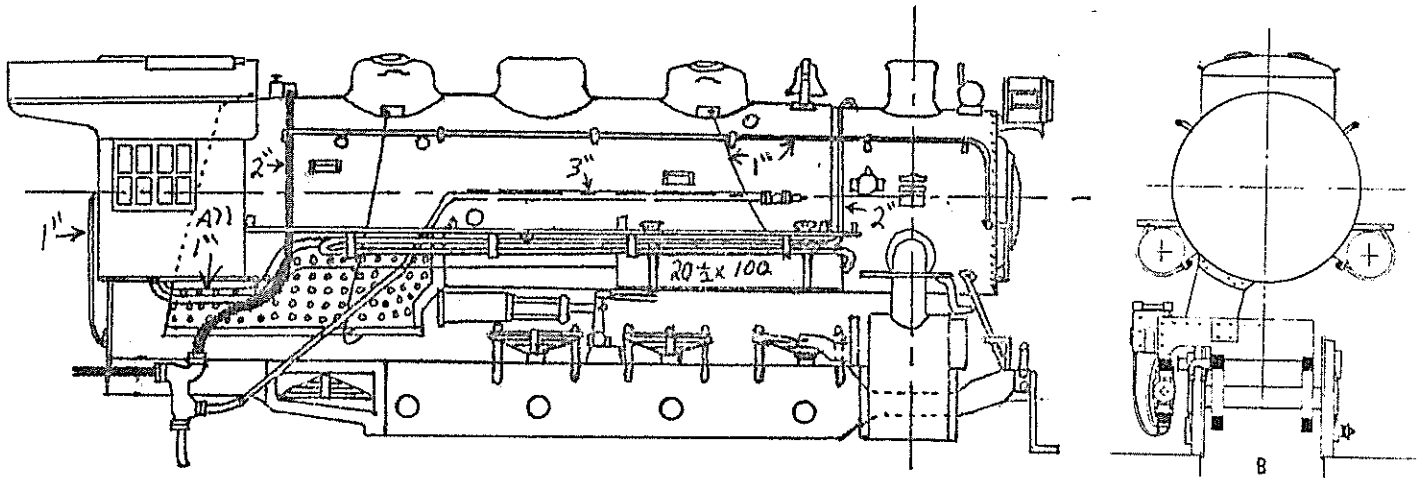
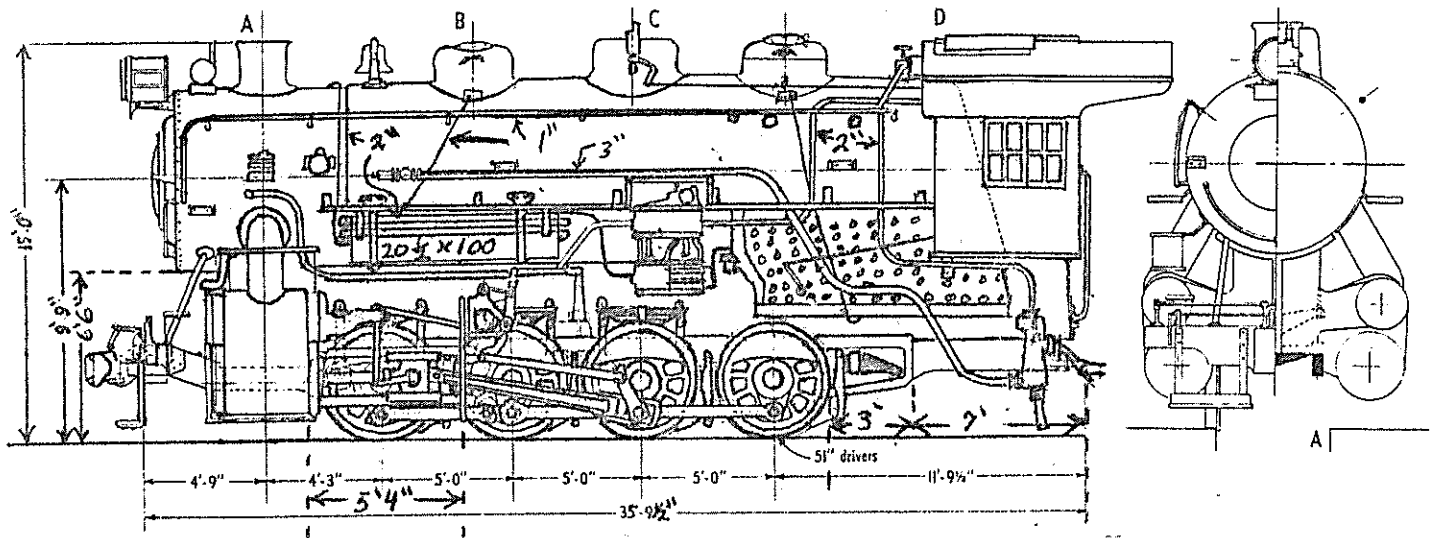
TENDER SECTION

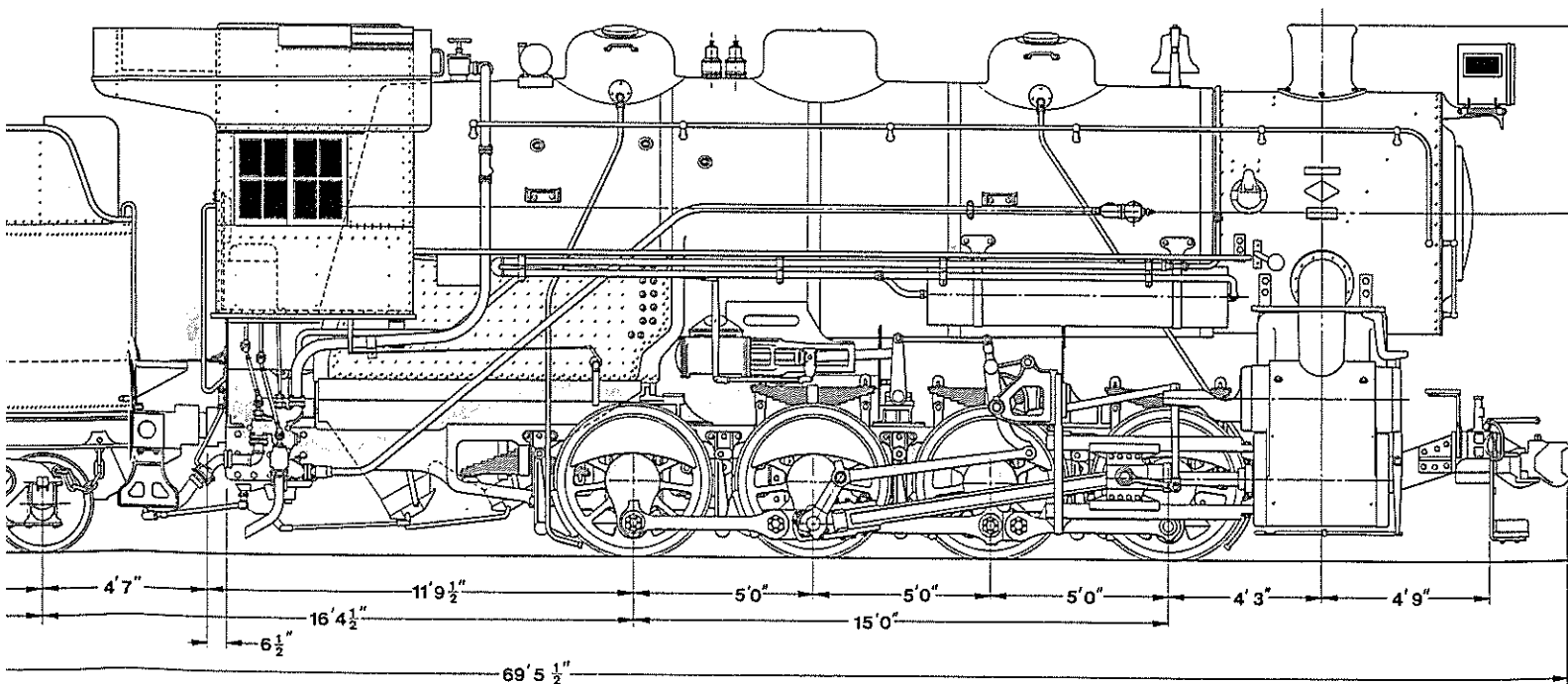
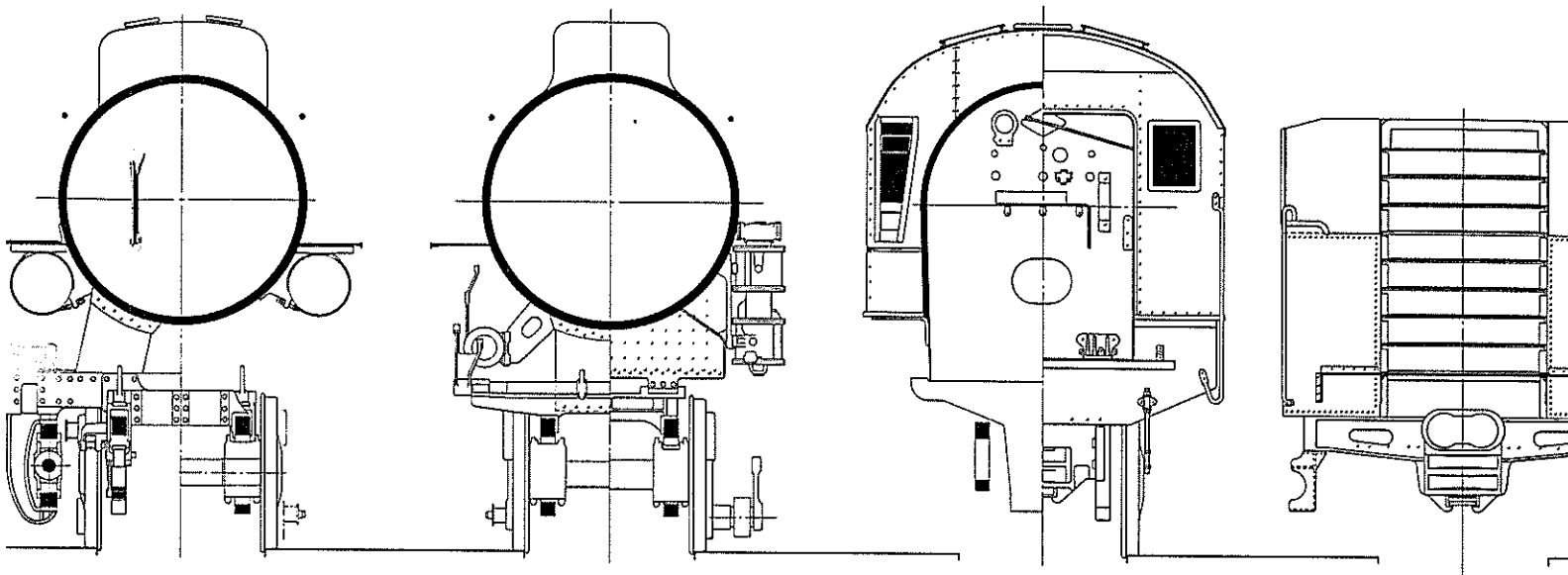
Wrapper, Deck, Chute, & False B.	200.8
Frame, Brass Casting for weight	211.6
Andrews Trucks -----	234.3
33" Wheel Sets, 4 -----	241.3
Bolster Pins (Screws) -----	212.1
Hatch, USRA -----	217.2
Ladder, Medium -----	224.3
Headlight only, Sunbeam #4414 -	86.8
Tool Chest -----	227.1
Center Beam Steps -----	62.2
Strap Steps, 1 pr. -----	222.1
Cast Steps, 1 pr. -----	222.2
Wireless Draw Bar Kit -----	214.1
8 Wheel Brake System -----	231.1
Bunker Ladder -----	225.1
1" Brass Rod for Grab Rail 6" -	----
Instructions, 25'8" Small USRA	
Tender -----	----

BASIC RUNNING GEAR

51" Frame

USRA 0-8-0





DRAWING MODELLED BY
 ROBERT L. HUNDMAN
 Copies of these drawings may be made
 for non commercial use only.

